73 Amateur Radio Today

JUNE 1991
ISSUE #369
USA $2.95
CAN $3.95

A WGE Publication
International Edition

Build a 3-Band QRP Rig

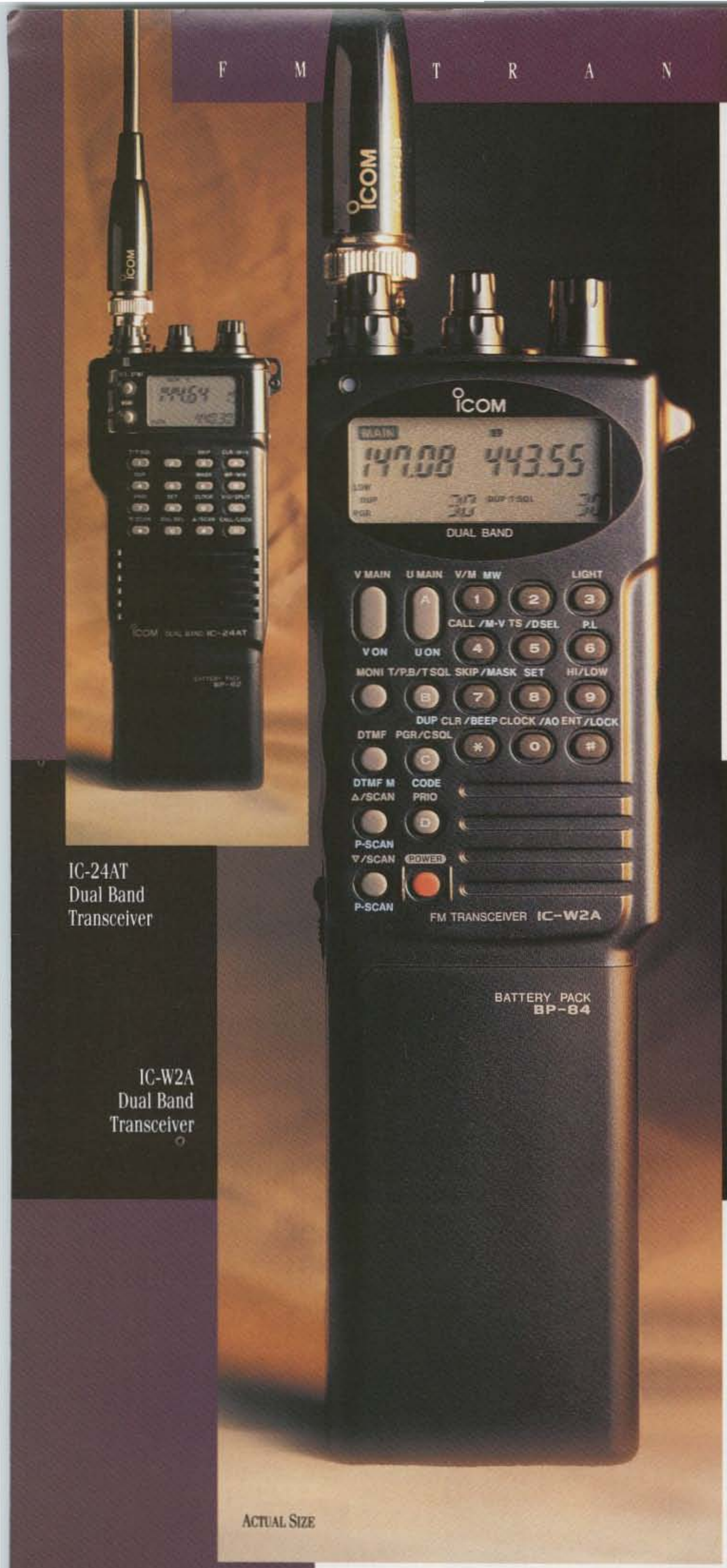
Beginners Guide to Parts Substitution

Brass Pounder's Keyer

73 Reviews
Swiss Log Software

Tripplite Power Supply

F M T R A N S C E I V E R



Icom continues to dominate the industry with exceptional product design and innovation. The IC-24AT firmly established Icom as the leader in dual band technology. Now the IC-W2A gives you the advantage of choosing the dual bander best suited for your needs.

The new IC-W2A dual band handheld sets the pace with its sleek design and superior characteristics. Designed for the user who demands the finest features available, the IC-W2A boasts simultaneous dual band receive. Listen to one band while talking on the other! Three tuning systems, high speed scanning with priority watch and 60 memory channels add to the luxurious IC-W2A.

Both the IC-W2A and IC-24AT give you full operation on the two-meter and 440MHz amateur bands with outstanding wideband receive capability.

Each unit features five watts of power, programmable scanning, priority watch, a battery saver, DTMF pad for memory channel autopatching, 24 hour clock with timing system, multi-function LCD readouts...the list is infinite. See the IC-W2A and the IC-24AT today at your authorized Icom dealer.

SETTING THE PACE IN DUAL BAND DESIGN

For full details and specifications on the IC-W2A and IC-24AT, call the Icom Brochure hotline at 1-800-999-9877.

CORPORATE HEADQUARTERS
ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004
Customer Service Hotline
(206) 454-7619
CUSTOMER SERVICE CENTERS
3150 Premier Drive, Suite 126, Irving, TX 75063
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

ICOM

CIRCLE 179 ON READER SERVICE CARD

WHY

ADVANCED FEATURES SUCH AS

• Speed Dial • Redial • Selectable sampling mode • Keyboard Programmable CW ID • Built-in keyboard/display • Automatic setup, etc.

MAKE OUR CS-700 THE BEST CHOICE GOING IN LOW COST SIMPLEX INTERCONNECT!

The CS-700 will interface any FM base station transceiver to the telephone network. When installed, mobile and portable radios can both initiate and receive telephone calls fully automatically.

SAMPLING MODE: No other interconnect offers user selectable VOX enhanced or VOX controlled sampling. Pick the mode that best suits your application . . .

VOX Enhanced Sampling: The sampling rate is reduced whenever the telephone party is speaking. The sample rate reduction (enhancement ratio) is selectable in nine steps.

VOX Controlled Sampling: No sampling interruptions occur when the land party is speaking. Sampling resumes when the land party is finished speaking. VOX controlled sampling provides crystal clear audio quality.

- **BUILT-IN PROGRAMMING KEYBOARD AND DISPLAY**
- **9 NUMBER SPEED DIALER**
- **LAST NUMBER REDIAL**
- **AUTOMATIC SETUP**
  The CS-700 is programmed to automatically set the optimum sampling window for your transceiver. Saves time and effort.
- **AUTOMATIC DIALTONE/BUSY DISCONNECT**
- **USER PROGRAMMABLE CW ID**
- **HOOKFLASH**
- **REGENERATED TONE OR PULSE DIALOUT**
- **TURN AROUND BEEPS**
- **TOLL RESTRICT**
- **CONNECT CODE**
  Select * up or * plus 1-4 digits. Any combination.
- **TOLL OVERRIDE CONNECT CODE**
  Select * plus 1-4 digits. Any combination.
- **DISCONNECT CODE**
  Select # or # plus connect code digits.
- **CALL LIMIT TIMER**
  Selectable .5-49.5 minutes in .5 min. steps.
- **MOBILE ACTIVITY TIMER**
  Selectable 10-99 seconds in 1 sec. steps.
- **LINE IN USE INHIBIT**
- **CALL WAITING**
- **RINGOUT (REVERSE PATCH)**
  Rings like a phone.
- **REMOTELY CONTROLLABLE RELAY**
  (Relay Optional)
- **NON VOLATILE MEMORY**
- **LIGHTNING PROTECTION**
- **COMPACT SIZE**
  2"H • 7¾"W • 7¼"D

ONE YEAR WARRANTY PARTS & LABOR

Choose Second Best ?

CONNECT SYSTEMS INC.
2064 Eastman Ave., #113
Ventura, CA 93003
Phone (805) 642-7184
FAX (805) 642-7271

TOLL FREE
1-800-545-1349

CIRCLE 12 ON READER SERVICE CARD

Number 1 on your Feedback card

LETTERS

From the Hamshack

Tim P. Yoho WA3D, Lock Haven PA I read several letters in the April issue concerning dissatisfaction with service from American manufacturers of radio products.

I wish to report a very positive experience with a U.S. company, namely Heath. I built the Heath SB-1000 linear amplifier and had a problem with the output. After much searching by myself and several other hams, I sent the unit back to the factory. The unit was returned several weeks later with a plate choke modification; it worked properly for a few days, then the original problem returned.

I wrote Heath about the problem, and the service manager immediately responded, requesting that I send back the unit. He indicated that Heath would reimburse me for the postage (which they promptly did), and give the unit priority treatment. Two weeks later, It came back with an RF choke and 3-500Z replacement at no charge. The unit has worked well since, and I am pleased with the attention and concern expressed by the service people at Heath.

James S. Waters W5YG, Houston TX Now that no-code is a reality, how about some "2 meter FM on a shoestring" like *73* had *years* ago? Let's show poor college students that they *can* afford this hobby.

It's already in the works!. . . Bill WB8ELK

Jim Kelly KK3K, Philadelphia PA I enjoyed the April editorial, as always. I chuckled at your comments about giving basically the same pep talk each year. I enjoy it nevertheless, because it is one of the few indications that there is life still left in the hobby! What a dull bunch we must seem to the uninitiated who stumble into Hara and cannot even get a response from the hoards glued to their HTs, stooped over tables full of connectors.

Ham radio's best kept secret is how much fun and how easy it is to work OSCAR. The sunspot cycle will soon start to decline, and I asked our club members, "What will you do then?" I pointed out that OSCAR-13 work is reliable, full duplex, not propagation-dependent, and requires small antennas. You can do satellite operation for the same amount of $ or less than HF. It offers plenty of DX and rag-chewing, is relatively QRM and lid-free, and available to all hams with Technician class and above licenses. It's a great opportunity for fun in ham radio for our new codeless Technicians!

Doug Brock, Huron SD On March 2, I entered the Amateur Radio Service as a no-code Tech, and I'm proud of it. I had played with the idea of becoming a ham for about nine years, then about six months ago, I decided to get serious about it. I was studying for the Novice when the no-code class came up, so I grabbed a Tech book and went for it. I encourage anyone thinking about amateur radio to go ahead and go for it. But don't stop. Keep going up the ladder. I am.

As for guys like "N0" in the March issue, ignore him. There's always a few sour apples in the bunch. If you're tired of the garbage on 11 meters like I was, get out of there. The best of luck to anyone studying for that next test, for any class license.

Norris Carden, Shreveport LA I'm possibly the first of a group that some people fear will show up in mass and take over the precious ham bands. I'm a no-code Tech. I passed the written tests with just a little effort last February. To me, code was an unnecessary, and to some degree unreasonable, way of communicating.

I'm a professional broadcaster, and I've worked in radio as a DJ, newscaster, sports reporter, and program director. In TV, I've been a news photographer, reporter, director, and now a producer. My words, spoken by myself or by others on the air, are heard by thousands and sometimes millions of people. I must be responsible for and careful with my words. I plan to use on the ham bands the same communication ethics and practices I have used as a professional broadcaster.

Unless I and those around me who are interested in the new license are a fluke, most of the first wave of no-code Techs will be those who have always had a legitimate interest in the hobby, but who were put off by the code requirement. Many of us are already professionals in communications and electronics. The best way to guarantee no trash comes into the hobby is to not construct barriers at the entrance, but rather to guide those who come to the door. Give us a chance and teach us your ways.

Code does not a great radio operator make. Thanks to the FCC for giving me an opportunity to get into the hobby. I'll see you soon on 6 meters and above . . . hopefully in a year, I'll see you on HF as a General, then as an Advanced . . . but not with CW.

Say, if the code requirement were eliminated for all license classes, perhaps we could have a super-duper theory test (like 100 fill-in-the blank and essay questions—and no book with the answers in it, either!), and on-the-air evaluation of proper operating practices!. . . Linda KA1UKM

Jason Kelly NO0CALL yet, Fort Dodge IA It has finally happened! No code. I have been monitoring radio communications for over three years. From the beginning, my main interest has been VHF. I never did understand why a bunch of old men insisted that I learn the code when it is all but nonexistent in the bands above 30 MHz. I have passed the written portion of the Novice test, but have failed the code test three times! It drives me crazy. It is hard for me to waste time learning the code only to forget it after passing the test.

Many hams feel that the no-code Tech should not be allowed access to the 2 meter band. Why? They contend that the band is too crowded, and that there isn't room for "glorified CB operators."

Here in Iowa, I can monitor 20 repeaters all day without my scanner stopping more than three times! When it does, it's usually just some old man kerchunking to see if the unexercised repeater can still hear his handi-talkie that hasn't been charged in five years. Why should I become a ham? There are so few people willing to talk to some new kid under the age of 50. It has been many times that hams driving through the area check in on the local repeater only to be ignored because the old men don't know who they are.

Everything I have learned about amateur radio has been from *73* or Ron KF0LR. Ron deserves a medal of honor from hams trying to promote the hobby. He talks to anyone who might be interested in ham radio. If it weren't for KF0LR, ham radio would be dead in this community. Ron is why I would become a ham. He needs help promoting this great hobby. He cannot possibly elmer everybody that is interested!

Why doesn't the ARRL want new hams in the hobby to have access to the 2 meter band? They certainly aren't using it! If they don't, it will be taken away. Give it to the no-coders; we'll use it to promote ham radio and get more people to join the hobby and make it great again! I'm ready for my test. See you on the repeaters!

Frank Muratore KB2EZV, Copiague NY I would like to comment on an article, "Behold the Back Packet," in the December 1990 issue. Construction could have been simplified by using an electric knife to cut the foam. I have been using this technique for quite some time, and find that the foam cuts like butter.

Adam Harrod, Montpelier VT I am an SW listener, and have been for the past 10 years. As I am not a ham, I cannot transmit to receive any QSL cards. Is there any way to receive them?

Have cards made up for yourself with "SWL" printed on them instead of a callsign. Send your cards out to stations you hear, and you can send them a signal report. Request a QSL card in exchange. . . . Joyce Sawtelle

Stephen Barnett, San Carlos CA Your editorials remind me of a book published about a man in the village of La Mancha. His name was Don Quixote, and if I remember the story right, he liked to joust with windmills. Mr. Green, your windmill seems to be the ARRL. I keep reading your column with much interest. I am studying to become a Novice, and the more I can learn about what is happening in the hobby, the better I'll be able to operate on the air.

I have many questions. What good will the ARRL be to me when I get a license? How will the ARRL help me if I make an FCC error? Will the ARRL represent me in local, state, and federal government? How good are the ARRL publications? What about a magazine geared to the beginner in ham radio?

What can we do to advance, enhance, and expand amateur radio? Many people have lost life's challenge. You see school children "hanging out," young adults in cocktail bars, others sitting in front of the TV.

While SWLing on 10 meters, I heard a man in the San Jose area, who regularly sets up a ham station at the Children's Museum and lets the children become third-party operators. Listening to the hams talking to the children was quite interesting. This ham is doing a lot on his own time to further ham radio. The hams he contacted were also doing ham radio a good turn.

Enclosed is my subscription. I look forward to my first issue of your magazine so I can keep up with the man and his windmill. The local ham store is sometimes sold out of *73*, and now I will not miss out. Your ideas are up front and needed, the wheel that squeaks gets the grease.

The magazine you're looking for is being started—Radio Fun. *The premier issue will be out in time for Dayton. It'll have simple theory, simple construction projects, kit reviews, easy explanations on how to get started. Subscriptions are $10/year.*

Now, the ARRL. I can't think of any good the ARRL will do you other than let you read QST. *The ARRL won't help you with the FCC. They represent their own interests, not necessarily yours.* QST *is worth getting as a reference, but it's not for newcomers.*

Amateur radio can help kids enter a whole new world—technology. It can offer them fun, a whole array of exciting careers, and a way to cope with the teen years. But we need to make this world available to the kids through school radio clubs. . . . Wayne

Ocran M. Carr K9RGV, Racine WI I am a long-time subscriber to *73*. In one of your editorials, you asked the readers what they suggest you do to get their friends to subscribe to *73*.

I suggest you devote one page each month to some deserving black amateur radio operator. As publicist for the Omik Amateur Electronic Communications Association, I can tell you that 10% of today's hams are black, and we have never received the recognition that we deserve. Some examples: Mr. Everett Refroe W9HG, electronics instructor during WWI; Mr. James Cheeks W6TXW, an aviator who trained pilots for the Ethiopian Air Force, and introduced amateur radio to that nation in 1943; Mr. Robert F. Scott W2PWG, technical editor for *Radio Electronics Magazine* for 30 years; Mr. Jack Chancellor W9SON, a physicist at Fernion Lab. And the many black doctors who are hams even surprises me.

I can supply you with photos and information each month that will prove to be interesting and informative. I can guarantee you that our members will subscribe to *73* if they think there is something in it about our organization, and white hams will buy the magazine because they didn't know there were any black hams, and to see what they are up to, hi.

Yep, I'd be interested in some articles on black hams who've contributed to the hobby. But I suspect your estimate of there being 50,000 black hams is wildly optimistic.

While it appears to me that blacks are much more disintegrated than they were a few years ago, and generally tend to go to much greater lengths now to avoid contact with whites, that doesn't explain the almost total vacuum at Dayton and at every other hamfest I've attended in the last 50 years.

Ocran, I've met far more gay hams than black! And the same situation held when I was involved deeply in computers—almost no blacks. I meet many in the music business, but mostly as performers, not as businessmen. This has nothing to do with prejudice or bias; this has been my experience. It's the same for women—few in either radio or computers. Now how can this be explained? What's your take?

. . . Wayne

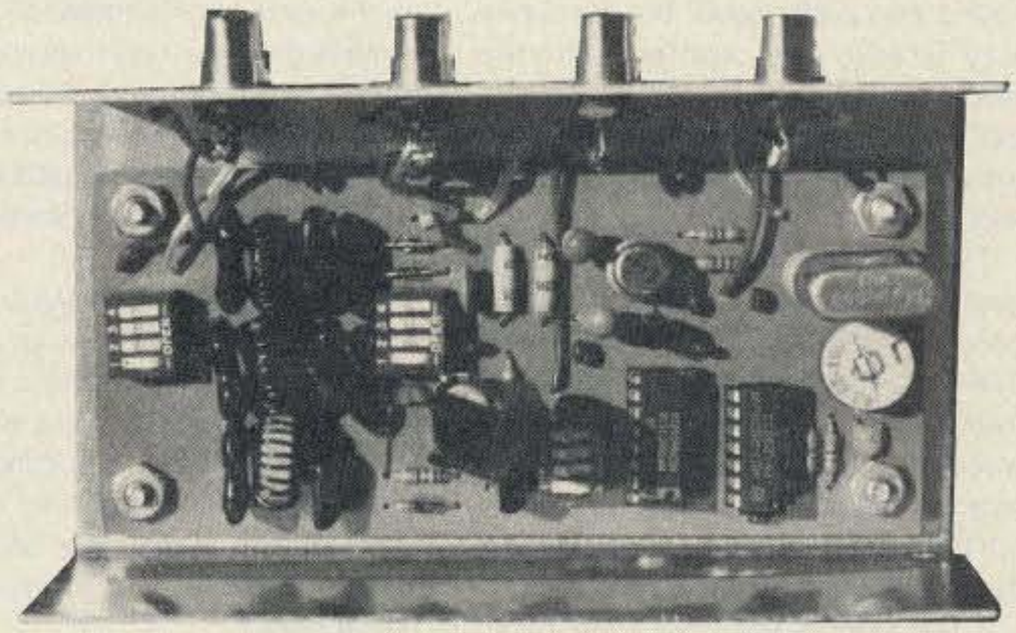
73 Amateur Radio Today

JUNE 1991
Issue #369

TABLE OF CONTENTS

FEATURES

REVIEWS



Three-band QRP with one crystal . . . see page 10.

Cover by Alice Scofield. Stamp photos by Raymond Schuessler.

DEPARTMENTS

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

Editorial Offices
WGE Center
Forest Road, Hancock NH 03449
603-525-4201, FAX (603) 525-4423
Subscription Services
1-800-289-0388
Colorado/Foreign Subscribers
call 1-303-447-9330

Wayne Green Enterprises is a division of International Data Group.

Reprints: The first copy of an article $3.00 (each additional copy—$1.50). Write to 73 Amateur Radio Magazine, WGE Center, Forest Road, Hancock, NH 03449.

FB

Editorial Offices
WGE Center
Hancock NH 03449
phone: 603-525-4201

Advertising Offices
WGE Center
Hancock NH 03449
phone: 800-225-5083

Circulation Offices
WGE Center
Hancock NH 03449
phone : 603-525-4201

Manuscripts Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon publication A premium will be paid for accepted articles that have been submitted electronically (CompuServe ppn 70310,775 or MCI Mail "WGEPUB" or GEnie address "MAG73") or on disk as an IBM-compatible ASCII file. You can also contact us at the 73 BBS at (603) 525-4438, 300 or 1200 baud, 8 data bits, no parity, one stop bit. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts.

73 Amateur Radio Today (ISSN 1052-2522) is published monthly by WGE Publishing, Inc., WGE Center, Forest Road, Hancock, New Hampshire 03449.

For Subscription Services write *73 Amateur Radio*, PO Box 58866, Boulder, CO 80322-8866, or call 1-800-289-0388. In CO call 1-303-447-9330. The subscription rate is: one year $24.97; two years $39.97. Additional postage for Canada is $7.00 and for other foreign countries, $19.00 surface and $37.00 airmail per year. All foreign orders must be accompanied by payment is US funds. Second class postage paid at Hancock, New Hampshire and at additional mailing offices. Canadian second class mail registration number 9566. Microfilm Edition—University Microfilm, Ann Arbor, MI 48106. Postmaster: send address changes to *73 Amateur Radio*, PO Box 58866, Boulder, CO 80322-8866.

Audit Bureau of Circulations (ABC) membership applied for.

Contract: By reading this fine print you have become legally bound to get out of your rut and try something new. Do you spend all your time on SSB? Break out the old straight key and have a few QSOs in the Novice CW bands. Stuck on 2m repeaters? Try 6 meters . . . or microwaves. Does your station consist of $8,000 worth of store-bought gear? Pick up a $30 QRP kit, string together a $2 dipole, and go find a hilltop to operate from. Do something different!

Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

Technology Fugits

On the off chance that your finger on the mike button may be tired for a moment, let's leave your total devotion to the survival at any cost of our hobby of antique technologies and take a short trip into the present.

Are you prepared to get up in front of your local ham club and explain exactly how DSP works? That's Digital Signal Processing, old chap. It's one of those newfangled Japanese developments with which they're whipsawing what shreds we have left of our old consumer electronics industry.

Yamaha came out with the first practical DSP unit two years ago, followed a year later by Sony. I think I wrote about the Yamaha system at the time, in case your memory is still intact. It's a clever invention and will, I expect, get very popular for home entertainment systems. No, it doesn't have a lot of application in amateur radio. But some other new developments have! I'll get to those.

As an electronics "expert," a little facade we practice on our friends and family, we really should have at least a vague understanding of modern technology.

Okay, DSP. What they do here is to shoot off a gun in a series of different types of concert halls and rooms. They record the resulting echoes. Then they set about digitally copying the echoes and phasing which makes each hall sound different. The computer replication of each hall is then programmed into chips. Thus, you can play a CD and make it sound exactly as if it is being performed in a small supper club, in Carnegie Hall, Westminster Abbey, Avery Fisher Hall, etc.

The only hitch in the wagon here is that the original CD sound should be recorded in an anechoic room instead of a normal recording studio. Anechoic means without any reverberations at all. A totally silent room. These are not easy to build and are a real corker to use. They're generally used for loudspeaker development and other scientific applications.

Adding DSP to normal recordings may enhance their sound to some ears, but the result won't be a Boston Symphony Hall sound. Alas, as far as I know there aren't any anechoic recording studios yet. Well, there will be soon since we're building one. To make it possible for the performers to hear what they're playing we're feeding the sound back to them, complete with DSP ambiance. Far's I know we'll have the first DSP-ready CDs on the market in a couple months.

We're in the throes of finishing this new recording studio in time for Scott Kirby to lay down tracks for a third Scott Joplin ragtime CD.

How'd all that happen? Well, I've had it in my mind (no comments) ever since digital audio got started that there would be a growing need for digitally ready state-of-the-art recording studios. I decided to try and not be five years ahead of my time on this, so I've been hanging back.

Kirby did his first recording in the Peterborough Unitarian Church. The sound was pretty good, but the Steinway Grand was crummy and the recording sessions had to be done in the wee hours to avoid the noise of trucks driving down Main Street. That was a downer.

The second CD was recorded in the garage at my farm in Hancock using a couple of 1890s upright grand pianos that Knud Keller KV4GG (now KC1QP) found for us. We jury-rigged some wooden panels to give the garage a nice bright sound. Indeed the CD got a 10/10 rating . . . as high as it gets. It's been selling like hot cakes too.

A few months ago one of my magazine circulation people, Phil Martus, wanted some spare time work so I set him to straightening out my barn. He did such a good job he ended up with the whole center section empty. Hey, what a great spot for a studio! By luck Phil had lots of building experience, so he volunteered to take on the construction job.

Our recording engineer, Dave Torrey, designed the studios and Phil, with some help from friends, did the construction . . . all in a few weeks. A studio is enormously complicated. The walls have to be double and isolated from each other. Even the control room has to be isolated, with double windows. Bass-traps have to be built into the ceiling and walls. The heating, air conditioning and humidity control systems have to be totally silent.

One studio is normal and a second has sound absorbent walls, ceiling and floor, so it'll be the first recording studio in the country capable of turning out digital signal processing-(DSP) ready recordings.

DCC

That stands for Digital Compact Cassette. Philips (Holland) and Tandy (Ft. Worth) are working on a new approach to digital tape. DAT, digital audio tape, requires a new format which is just like a miniature video cassette. DCC uses a cassette which is the same shape as our regular audio cassettes. With a DCC system we'll be able to play both DCC and audio cassettes with the same player.

Which brings up the question of how, without a high speed rotating recording head, can they get all that digital information on that eentsy tape? Well, what they've done is to find ways to cut down on the amount of information required to make our ears think they are hearing digital quality sound. Even though they've cut the amount of information down to about 25% of what's recorded on a DAT system, it still sounds good. I've listened to it.

If we have any technically inclined hams left they might be encouraged to see what they can do about digitizing the really low quality sound we require to talk all day saying nothing (with a few exceptions). Then they can start to work with every data compacting system they can find to improve the throughput.

Hmmm, you know, if we were to first send out an algorithm which makes it possible for a receiver to imitate our individual voice, then all we'd have to do is get the words we're speaking through as compactly as possible and reconstruct our voices with the algorithm. Follow me? Well, it was just a thought.

Every time I get together with engineers I'm amazed at how much progress is being made in data compacting. There are some new systems that were being discussed at the Consumer Electronic Show in Las Vegas in January that are able to cut the data by 1:77 and still not lose anything! They're using some of these approaches to get the bandwidth of HDTV down.

Of course I joke about our being able to get the bandwidth of ham transmissions down to under 1 Hz. Sort of joke, that is. If you've listened in to much ham gabble you know that the amount of data throughput is minimal. Call, name, town, signal report and . . . ? Once those have been said a few times many ops seem to run dry. My suggestion is that we send our call and then a dot which will tell the other op that our name and town are in the *Callbook*, so look it up. The report is 5-9 (what else is there?). Please QSL. 73. Two dots coming back says roger on your name and town in the *Callbook*; roger on the 5-9, you're the same; roger on the QSL; 73. Save a lot of time and hassle.

If you find good information resources for amateur radio associated new technologies, whether magazines, books or newsletters, let me know so I can pass the word along. And if you come up with some ham applications, please consider *73* as a place to get published.

Okay, Experimenters!

There are some new chips which should have you busy breadboarding in short order. They are somewhat expensive, right out of the chute, but I expect we'll see prices declining as production ramps up. Now stop fussing, I'll tell you what it's all about. They're called analog storage chips.

If you have to ask me what to do with an analog storage chip, I know you're asleep at the switch. The whole idea should have had you jumping out of your chair with excitement.

What can you do with 'em? Well, how about building a semi-intelligent QSO machine? Each chip will hold up to 20 seconds of voice, so you're going to need a few. Let's say you rig up the first one so that when you make a contact you speak the other chap's call into a chip. You might store his name in a second chip. Are you getting it yet?

When it's your turn to transmit you turn on your rig and the first chip gives his call. Your QSO machine automatically switches to a series of chips which give your call, your name, signal report (5-9, of course!), and all the stuff you always say during your first transmission. The chip with his name recorded on it clicks in whenever your QSO chip flags it. This personalizes the contact.

A perfectionist might use a separate chip to store the signal reports and just push a button to indicate which report will be given.

All it'll take are three or four chips to hold your normal QSO information, the stuff you've been repeating over and over for years with little variation. You can even free yourself of having to record the other chap's name 90% of the time by having a dedicated name chip with 20 seconds worth of names on it. You just push the button for the name and it'll switch it in for you.

How does all this work? It's simple, the chip samples the voice message 6,400 times per second, digitizing it. This gives you a 2.7 kHz passband, which is fine for most hamming. They have a 3.4 kHz passband chip if you don't mind spending a little more per chip and only getting 16 seconds of voice. Being thrifty (cheap), I know you'll go for the 2.7. Hi-fi fanatics may

Continued on page 73

KENWOOD

Mobile Companion!

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

Compact FM Mobile transceivers

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

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

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

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

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

Optional accessories

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

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

KENWOOD

...pacesetter in Amateur Radio

Specifications guaranteed for Amateur band use only.

KENWOOD

TS-950SD

"DX-clusive" HF Transceiver

The new TS-950SD is the first Amateur Radio transceiver to utilize Digital Signal Processing (DSP), a high voltage final amplifier, dual fluorescent tube digital display and digital meter with a peak-hold function.

The Ultimate Signal.

• Dual Frequency Receive Function. The TS-950SD can receive two frequencies simultaneously.

• New! Digital AF filter. Synchronized with SSB IF slope tuning, the digital AF filter provides sharp characteristics for optimum filter response.

• New high voltage final amplifier. 50 V power transistors in the 150-watt final section, resulting in minimum distortion and higher efficiency. Full-power key-down time exceeds one hour.

• New! Built-in microprocessor controlled automatic antenna tuner.

• Outstanding general coverage receiver performance and sensitivity. Kenwood's Dyna-Mix™ high sensitivity direct mixing system provides incredible performance from 100 kHz to 30 MHz. The Intermodulation dynamic range is 105 dB.

• Famous Kenwood interference reduction circuits. SSB Slope Tuning, CW VBT (Variable Bandwidth Tuning), CW AF tune, IF notch filter, dual-mode noise blanker with level control, 4-step RF attenuator (10, 20, or 30 dB), switchable AGC circuit, and all-mode squelch.

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications, features and prices subject to change without notice or obligation.

DSP

Digital Signal Processing

• Digital Signal Processor. DSP is a state-of-the-art technique that maximizes your transmitted RF energy.

• High performance IF filters built-in† Select various filter combinations from the front panel. For CW, 250 and 500 Hz, 2.4 kHz for SSB, and 6 kHz for AM. Filter selections can be stored in memory!

• Multi-Drive Band Pass Filter (BPF) circuitry. Fifteen band pass filters are available in the front end to enhance performance.

• Built-in TCXO for the highest stability.†

• Built-in electronic keyer circuit.

• 100 memory channels. Store independent transmit and receive frequencies, mode, filter data, auto-tuner data and CTCSS frequency.

• Digital bar meter.

Additional Features: • Built-in interface for computer control • Programmable tone encoder • Built-in heavy duty AC power supply and speaker • Adjustable VFO tuning torque • Multiple scanning functions • MC-43S hand microphone supplied

Optional Accessories

- DSP-10 Digital Signal Processor*
- SO-2 TCXO* • VS-2 Voice synthesizer
- YK-88C-1 500 Hz CW filter for 8.83 MHz IF*
- YG-455C-1 500 Hz CW filter for 455 kHz IF*
- YK-88CN-1 270 Hz CW filter for 8.83 MHz IF
- YG-455CN-1 250 Hz CW filter for 455 kHz IF*
- YK-88SN-1 1.8 kHz SSB filter for 8.83 MHz IF
- YG-455S-1 2.4 kHz SSB filter for 455 kHz IF*
- SP-950 External speaker w/AF filter
- SM-230 Station monitor w/pan display
- SW-2100 SWR/power meter
- TL-922A Linear amplifier (not for QSK)

* Built-in for the TS-950SD
† Optional for the TS-950S

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

KENWOOD

...pacesetter in Amateur Radio

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

STS-37 Success!

Some exciting amateur radio firsts were achieved during the lastest flight of the space shuttle *Atlantis*. Astronaut Ken Cameron KB5AWP reported seeing good video from KC6A in Los Angeles, WA4NZD at the Marshall Space Flight Center, N9AB in the Chicago area (the farthest north contact), and WA3NAN at the Goddard Space Flight Center (linking via the 40-foot dish at the U.S. Naval Academy, shown in the May "QRX"). In addition, Andy N9AB sent up a video tape of the STS-37 launch. This is the first time live television has been uplinked to any U.S. spacecraft, and the first time a shuttle crew could watch their own launch while still in space.

It is uncertain at this writing whether the other two uplink sites were successful. KE4PT at the Motorola club in Florida, and the Johnson Space Center radio club (W5RRR), made several attempts, which may be on the second video tape recorded on board the orbiter.

In another first, a brief contact was completed between Ken Cameron KB5AWP on board the *Atlantis* and Musa Manarov U2MIR on the Soviet space station *Mir*. Musa later confirmed the contact via a message on his orbiting packet BBS. On the tape recorded on the shuttle, Musa could be heard clearly.

A number of school contacts were established via a telephone bridge during several of the passes. Each of the all-ham crew answered questions from members of the selected schools.

A problem occurred in the audio path of the SAREX module which prevented any packet contacts or SSTV uplinking. However, at least a few SSTV downlinks were successful.

Watch for the complete STS-37 story in the July issue of *73*. *Thanks to Lou McFadin W5DID, Andy Bachler N9AB and Dick Christiansen KK4HF for the above info.*

Photo A. Members of the Marshall Amateur Radio Club pose in front of antennas for sending ATV to Atlantis. *Left to right: Terry Jones NZ8C, Randy Galloway KN4QS, Gene Marcus W3PM, Don Heidiger N4MSN, Larry Savage WA4CAX, Ed Stluka W4QAU, Tim Cunningham N8DEU.*

Amateur Radio Talk Show on Satellite TV

"QSO Amateur Radio," a weekly TV show hosted by Jack Smith WA2QYT, has been active over the past few months to an ever increasing audience. The video portion of the show airs every Monday night from 10 p.m. to midnight on Spacenet One, transponder 15 (S1-15). Plans are for a call-in talk show from 9 p.m. till midnight, Mondays through Fridays, on the same channel. The nightly talk shows will cover topics on amateur radio, specialty modes, shortwave listening, and satellite TV.

You don't need a satellite dish to tune in to the program. All amateur radio operators have permission from QSO Amateur Radio to retransmit the show over both audio and ATV repeaters. Also, every Tuesday night from 9 to 10 p.m., the ATV net on 3.871 MHz will actually be uplinked to the satellite. Check into the net and hear your signal via the satellite as well! Bill WB8ELK will host an ATV talk show after the net until 11 p.m.

The talk shows can be heard on the standard 6.8 MHz subcarrier, except Mondays between 10 p.m. and midnight when the talk show will operate on the 6.2 MHz subcarrier (concurrent with the video show).

For more information, contact Jim Bass at (315) 673–3752.

Photo B. Moody T. Law WQ6I, the 22nd president of OMIK, will serve the 39-year-old organization for the next two years.

Videos Needed

Tapes of the recent SAREX hams-in-space mission are needed to produce a new educational video. Specifically sought is footage of youngsters in schools making contact with the all-ham crew on the shuttle. It may be in Betacam, 3/4" U-Matic, M-II or 1" Type C. Also acceptable are tapes on the Super VHS (S-VHS) and Hi-8 home video formats. NOT wanted are standard 8, VHS or VHS-HQ, Betamax, or home movie film. Producers Roy Neal K6DUE and Bill Pasternak WA6ITF will use as many shots as possible in the finished video, due out in late summer or early fall. Include a self-addressed, stamped mailer, if you want your video back. Send all videotapes to SAREX '91 VIDEO, %Bill Pasternak WA6ITF, 28197 Robin Ave., Saugus CA 91350. *TNX Westradio.*

Power Audit Results

As a result of "power audits" of 209 amateur radio stations last winter, the FCC has come to three conclusions. First, that most amateurs are not operating at minimum power as required by Rule 97.313(a). Second, that reduced power can alleviate significant reception interference problems in consumer electronics gear without serious degradation to communication capabilities. And third, that in addition to lowering output power, installing filters at either the transmitter or receiver might be required to eliminate interference.

FCC Field Operations Bureau Chief Richard Smith said that 75% of the stations surveyed experienced no degradation when their output power was reduced by more than 50 percent. However, even running low power cannot solve interference problems in many cases.

The study is being forwarded to

QRX . . .

Photo C. The parents and students of the Springfield Estates Ham Club. Luke is in the center.

the Private Radio Bureau for evaluation. It would be the purview of the PRB to make any recommendation to the Commissioners for regulatory action. *TNX* Westlink Report.

OMIK's WQ6I

The nation's largest black amateur radio organization, OMIK Electronic Communication Association, elected a new slate of officials this year at a convention held in Atlanta, Georgia. Elected for president was Mr. Moody T. Law WQ6I of Claremont, California, to head OMIK for the next two years. Mr. Law, the twenty-second president of OMIK, majored in biology at the Spring Hill College in Mobile and also in Nashville at the Tennessee A&I University. He completed graduate work in business administration at Laverne University in Laverne, California. For the past 19 years he has worked with Schering Labs, training and supervising pharmaceutical service representatives. He is past president of the Los Angeles Amateur Radio Club and is committed to the challenges encountered by OMIK.

The name "OMIK" originated from the first letters of the states of Ohio, Michigan, Indiana, and Kentucky, where the first members of the organization lived. OMIK had its beginnings on the campus of Wilberforce State College in Wilberforce, Ohio, in the early '50s. The original group of 11 black members has grown to several thousand, with members located in 42 states and several other countries. A sizable number of YLs and XYLs have been associated with the group since its inception, and they have been invaluable to its success over the years.

OMIK's fundamental purpose is to promote fellowship among those interested in the advancement of amateur radio. This includes electronics, technology, public service, and the promotion of international good will. OMIK also serves as the national organization for a network of local amateur radio clubs. Any licensed amateur radio operator who supports the ideals of the association may join OMIK.

OMIK membership enjoys a diverse range of professional, skilled, and retired people—all brought together by their common interest in and enjoyment of amateur radio. *TNX Ocran Martin Carr K9RGV.*

Luke Ward KC4UJS

Every Friday evening at the Springfield Estates Elementary School in Springfield, Virginia, eight-year-old General Class Luke Ward KC4UJS and his father, Keith Ward KC4TZJ, teach amateur radio to a group of 17 students and 15 parents. Studying together makes learning fun and easy for everyone. Parents and children are members of the Springhill Estates Ham Club, the second ham club started this year by volunteers of the Mt. Vernon ARC. Luke Ward KC4UJS is in the front center row in the photo, wearing his blue Mt. Vernon ARC shirt.

KC4UJS sometimes writes for "The Bacon Bits," a newsletter for young hams and hams-to-be in kindergarten through eighth grade. It is published by the Marlborough Communications Club and the Marlborough Desktop Publishing Class in Kansas City, Missouri. *TNX David Cowhig WA1LBP.*

Ham Arrested

Last April, amateur radio operator James A. Haas of Athens, Ohio, was arrested by federal authorities for making false distress calls. At a hearing, he was released on $100,000 personal recognizance bond. If convicted, Haas could get five years in prison and be fined $250,000.

Haas is suspected of making dozens of fake distress calls in Athens, Cincinnati, and Columbus, Ohio, and also in Kenton County, Kentucky. Many of the calls resulted in massive searches by police agencies. One call resulted in a 10-hour search involving 15 police agencies and helicopters.

FBI spokesman Ed Bolt said the calls also included tones and noise broadcast over police frequencies, interfering with legitimate police transmissions, and some "harassing and obscene statements" over the Kentucky State Police frequency.

Haas was located by the FCC, FBI, and Prince William (Virginia) police using sophisticated radio direction finding equipment. A cassette marked "siren" with a variety of sounds of police sirens, was found in the van with Haas. Haas was in the Washington, D.C. area to attend an amateur radio convention.

The 39-year-old ham is adviser to the ham radio club at the high school where he teaches physical education. *TNX David B. Emmons for the* Washington Post *clipping and* Westradio *for the AP material.* 73

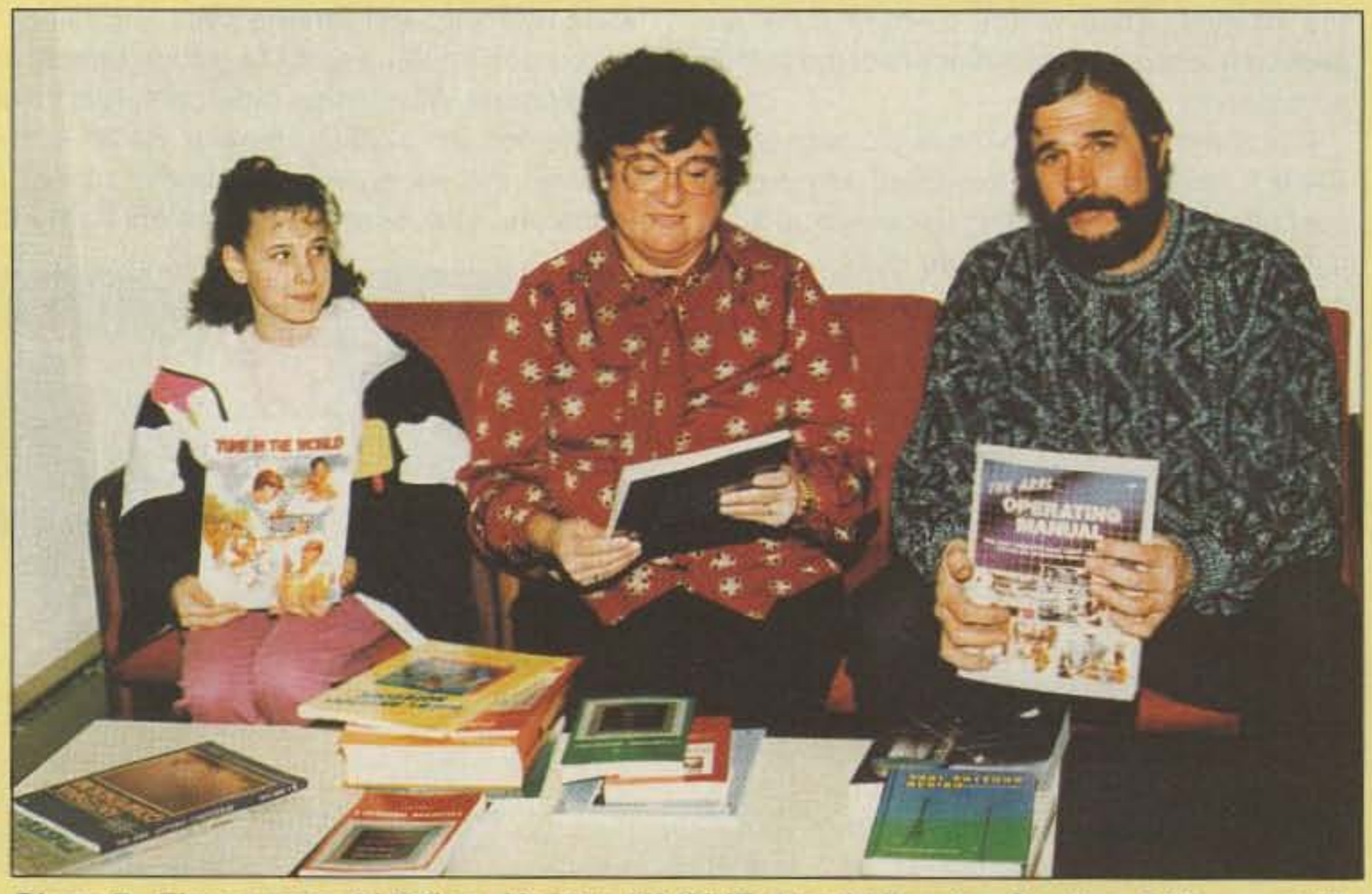


Photo D. Eleven-year-old Tiffany Karabin KA3YHF, Head Librarian Caroline Gillis, and Mike Karabin N3GJT, look over the books donated to the library by the Warminster Amateur Radio Club.

MFJ TUNERS

MFJ-949D Deluxe 300 Watt Tuner

Covers 1.8-30 MHz . . . plus you get dummy load, peak reading meter, antenna switch, balun and one full year unconditional guarantee . . . for only $149.95

More hams use the MFJ- 949D than any other tuner in ham radio.

Why? Because no other 300 watt tuner gives you this combination of features and value

The MFJ-949D gives you a highly developed product with years of proven reliability and a reputation for being able to match just about anything.

A lighted peak reading cross-needle meter that shows you SWR, forward and reflected power. A 6-position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and built-in dummy load. You also get a balun and 1.8-30 MHz coverage.

MFJ-949D **$149.95**

Special Inductor Switch

The inductor switch is the most likely tuner component to burn up.

The MFJ-949D gives you an inductor switch that's specially designed to withstand the extreme voltages and currents that are developed in your tuner.

You get a solid feel and positive click action -- not a spongy unsure feeling like some others have.

1 full year unconditional guarantee

You get MFJ's famous one full year unconditional guarantee. That means we will repair or replace your MFJ-949D or other MFJ tuner (at our option) **no matter what** happens to it for a full year.

Others give you a 90 day limited warranty. But what do you do after 90 days if it burns up? Or before 90 days if they say, "Sorry, your limited warranty does not cover that?"

Why take chances when MFJ gives you the world's leading tuner with no matter what protection for a full year?

Hard-earned reputation

There's just no shortcut. MFJ is the most trusted name in the business. More hams trust the MFJ-949D and MFJ tuners than all other tuners combined.

Proven Reliability

MFJ has made more tuners for more years than anyone else. With the MFJ-949D, you get a highly devloped product with proven reliability.

Continuing Service

MFJ Customer Service Technicians will help you keep your MFJ tuner performing flawlessly -- no matter how long you own it. Just call (601) 323-5869.

Made in USA

The MFJ-949D is made in USA. We're not an importer adding profits and sending your money to a foreign country.

Your Very Best Value

The MFJ-949D gives you your very best value -- first-rate performace, proven reliability and the best guarantee in ham radio -- all from the most trusted name in antenna tuners. Don't settle for a copy-cat when you can own an MFJ original. Get yours today!

MFJ's New 300 Watt Tuner

MFJ-948 **$129.95**

If you don't need a dummy load but want all the other features of the MFJ-949D, choose the MFJ-948 for $129.95.

The MFJ-948 features a **peak** reading **lighted** meter with a built-in lamp switch, one year **unconditional** guarantee and is made here in the USA.

MFJ's Very Best 3 KW Tuner

MFJ-989C **$349.95**

The MFJ-989C is not for everyone. And not everyone can afford it.

However, if you do make the investment, you get the finest 3 KW tuner money can buy.

The MFJ-989C is a compact 3KW PEP roller inductor tuner that covers 1.8-30 MHz. Exceptionally hefty tuning components include 2 massive capacitors that can withstand 6000 RF volts with ease and a big roller inductor. You can run high power without fear. A 3-digits turns counter lets you quickly re-tune to your favorite frequency. A giant 2-core balun lets you operate balanced feedlines without core saturation and voltage breakdown. Dummy load.

Peak and average cross-needle meter shows you forward/reflected power in two ranges (2000/500 and 200/50) and SWR. Lamp uses 12 VDC or 110 VAC with MFJ- 1312, $12.95. Flip stand, 6-position antenna switch. 10¾'' x 4½' x 15''. Add $10 s/h.

MFJ's smallest Versa Tuner

MFJ-901B **$59.95**

The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP tuner -- when both your space **and** your budget is limited. Good for matching solid state rigs to linears.

MFJ'S Super Value Tuner

MFJ-941E **$109.95**

The new MFJ-941E gives you a 300 watt PEP tuner that covers everything from 1.8-30 MHz -- plus you get a cross-needle meter, antenna switch and balun . . . for an incredible $109.95. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Antenna switch selects 2 coax lines (direct or through tuner), random wire, balanced line or external dummy load. 4:1 balun. 1000 volt capacitors. Measures 10-5/8'' x 2-7/8'' x 7''

2-Knob Differential-T™ Tuner

MFJ-986 **$289.95**

The new MFJ-986 Differential-T™ 2-knob tuner uses a differential capacitor to make tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only **one** best setting. Handles 3 KW PEP.

Roller inductor makes tuning smooth and easy. Turns counter lets you quickly re-tune to frequency.

MFJ's peak and average reading cross-needle meter reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95. Current balun reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced. It covers 1.8-30 MHz. Get yours today! Add $10s/h.

MFJ's Random Wire Tuner

MFJ-16010 **$39.95**

Operate all bands anywhere with any transceiver with the MFJ-16010. It lets you turn a random wire into a transmitting antenna. 1.8-30 MHz. 200 watts PEP. Ultra small 2''x3''x4''.

MFJ's Mobile Tuner

MFJ-945C **$89.95**

Don't leave home without this **mobile** tuner! Have an uninterrupted trip as the MFJ-945C extends your antenna bandwidth so you don't have to stop, go outside and adjust your mobile whip.

Small 8 x 2 x 6 inches uses little room. SWR/Wattmeter and convenient placement of controls makes tuning easy in motion. Balun. Covers 1.8-30 MHz. 300 watts PEP. Mobile Mount, MFJ-20, $3.00.

MFJ's Versatile 1.5 KW Tuner

MFJ-962C **$229.95**

MFJ-962C lets you use your barefoot rig **now** and have the capacity to **add** a 1.5 KW PEP amplifier **later.** It covers 1.8-30 MHz.

You get MFJ's **peak** and average reading Cross-needle SWR/Wattmeter. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Plus . . . 6-position antenna switch and teflon wound balun with ceramic feedthru insulators for balanced lines. 10¾ x 4½ x 14-7/87 in. $10 s/h.

MFJ's VHF or UHF Tuners

MFJ-921 or MFJ-924 **$69.95**

MFJ-921 VHF tuner covers both 2 Meters and the 220 MHz bands. **MFJ-924** covers **440** MHz. Built-in **SWR/Wattmeter.** 8'' x 2½'' x 3''. 2-knob tuning convenient for mobile or base.

Nearest Dealer/Orders: 800-647-1800

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; **TELEX:** 53 4590
FAX: (601) 323-6551; Add $5 s/h.

MFJ . . . making quality affordable

CIRCLE 86 ON READER SERVICE CARD

Three Bands with One Rock

Versatile QRP transmitter for 80, 40 and 20m.

by Mike Gasperi WW9X

When building simple QRP rigs, the most expensive and difficult part to find is the crystal, or rock. Usually they have to be specially ordered, and delivery may be slow. The transmitter design in this article allows the same crystal to serve multiple bands, which makes for flexible and economic operation.

The Circuit

The circuit consists of seven basic elements: the oscillator, divider, keying circuit, amplifier, receiver limiter, filters, and power supply. It's designed to operate from 12 VDC, with about 1 watt output on all three bands. Operation is simple. The desired frequency is selected for amplification, and the appropriate low pass output filter switched in line with the antenna. Forty meter band crystals can also be used in the oscillator, with division by two to get frequencies in the 80 meter band. Or you can use 80 meter band crystals with no division.

The transmitter block diagram is shown in Figure 1. Central to its operation is the fact that the amateur bands are harmonically related. Twenty meters is twice the frequency of 40 meters, and twice again that of 80. Normally, frequencies are synthesized upward, starting with a low one and doubling or tripling it to the desired higher frequency. However, digital logic chips easily divide high frequencies to low, and this is how I used one 20 meter band crystal to operate on 40 and 80 meters as well.

The Oscillator

The variable crystal oscillator is made from two TTL inverters in U1. Gates from the high power CMOS (HC) family should be used since they have much better logic levels and thresholds (nearly zero to Vcc) than other TTL families, such as LS. Vcc. Resistors R1 and R2 bias the gates into linear operation while variable capacitor C1 is used

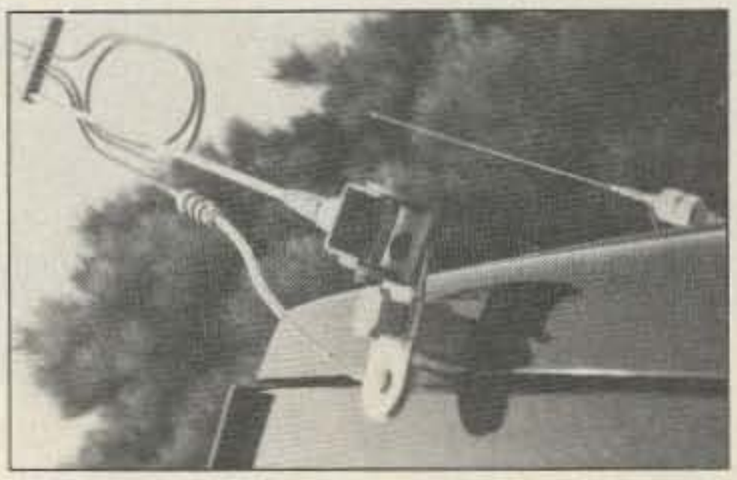


Photo. A peek inside at the finished circuit.

to shift the crystal frequency. The other inverters are used to buffer the oscillator and shape up the waveform.

Crystal X1 is a plated, AT-cut fundamental crystal in a HC-6/U holder. However, this oscillator design is very tolerant, and works with most microprocessor, color burst, and other surplus crystals. For three-band operation, the crystal must be cut for the 20 meter band. I use 14.060 MHz since it is the standard QRP for 20 meters. Divided by two, it gives 7.030 MHz, which is near the 7.040 MHz, 40 meter QRP frequency. Dividing by four gives 3.515 MHz for 80 meters, which is fine if you have an Extra class license.

You could also cut the crystal for the 14.11 to 14.15 MHz subband; this would make the divided frequencies near 7.060 and 3.530 MHz usable with a General class license. Unfortunately, not a lot of CW goes on that far up the 20m band, since other countries can broadcast single sideband there.

The Divider

U2 is a 4-bit binary divider that creates frequencies harmonically lower than the oscillator. Usually, only division by two or four are of any use for amateur operation, but connection to eight is provided just in case. The HC logic family should be used for U2 for reasons already mentioned. A 74HC163 can be substituted for the 74HC161 since the clear function is not utilized. All unused inputs to the chip must be tied appropriately high or low for reliable operation.

Keying

Keying is accomplished by powering U1 and U2 through transistor Q1. Voltage regulator U3 is used to create the five-volt power needed for the TTL gates. Wave-shaping is controlled by C5, C6, and R3. The values given create a crisp wave shape without noticeable clicks or chirps. If a keyer is used, it should be set for positive keying.

Amplifier

The selected frequency is first amplified in current by the emitter follower Q2. It then passes to the Class C output amplifier transistor Q3 via C8. Resistor R6 guarantees that Q3 is off during key-up, while diode D1 keeps the base voltage from going too negative. Transistor Q3 is a 2N2219A, which is just able to handle the 1 watt output power. It is inexpensive and easy to find. You should definitely heat-sink it.

Harmonic Filters

Depending on the selected frequency, an appropriate filter must be used to reduce harmonic content. Basically, the waveforms are square up to this point, and rich with odd harmonics. The three filters given are pi-configuration low pass, with 14, 7, and 3.5 MHz cutoffs. An option of bypassing the filters is given with S2 and S3, so that off-board filters can be used or circuits debugged. Changing frequency bands requires setting both switches, S2 and S3, so that only the desired filter is connected.

Limiter

Full break-in QSK operation is achieved by picking off the antenna signal with C11. During transmit, the RF is limited by a pair of diodes, D2 and D3. Although this only limits the signal to about 1 Vpp, it's sufficient to prevent damage to receivers. There is quite a bit of signal loss with this technique. An external transmit-receive TR switch is another good alternative.

Power Supply

Capacitors C4 and C9 filter the input voltage to the transmitter. The 5-volt power for U1 and U2 is created by U3, a TO-5 package voltage regulator. C2 and C3 are bypass capacitors located at each digital integrated circuit. Radio frequency choke L1 and

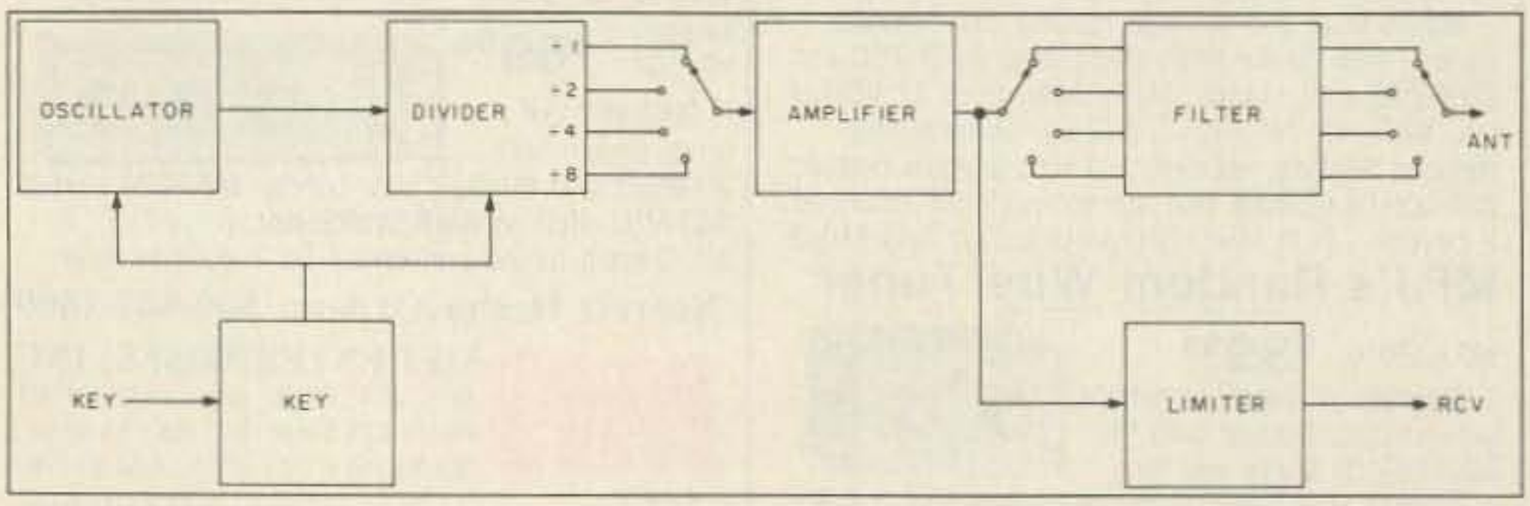


Figure 1. Circuit block diagram.

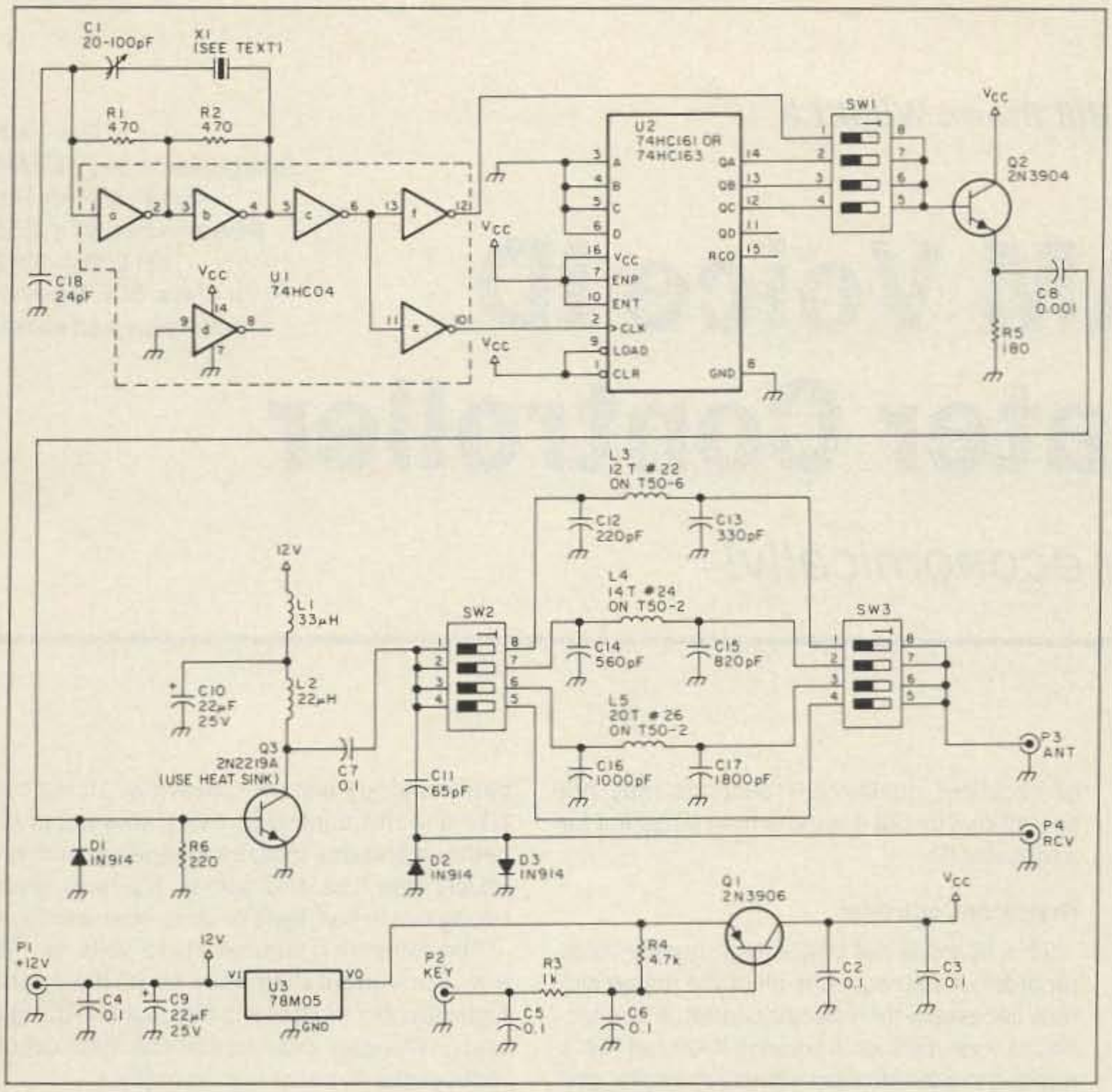


Figure 2. Schematic diagram.

capacitor C10 keep the 12 volt power to the final transistor clean and solid.

Construction Notes

A circuit board etching pattern is illustrated in Figure 3, and a component layout for the pattern is shown in Figure 4. Other construction techniques should also work. The digital integrated circuits need solid grounds and proper bypass capacitors. Toroidal inductors L3, L4, and L5 should be wound spreading the turns over about two-thirds of the circumference. Leads should be kept as short as possible on all components. The DIP switches need to be easily accessible when you're switching bands, so don't bury them in a deep enclosure. Variable capacitor C1 also needs to be available to fine-tune the operating frequency. Simple RCA jacks can serve for all four external connections; just make sure they are properly labeled to prevent accidental damage.

Performance

The prototype transmitter output power to a 50 ohm load with 12 volts input power was 0.8 watts on 20 meters, and 1.2 watts for 40 and 80 meters. Power supply input current was measured at 250 mA for an input power of 3.0 watts. This gives about 40% total efficiency for the entire transmitter. Harmonics were 30 dB down, and no key click or chirp was observed. Operation on as little as 6 volts

Continued on page 42

Parts List

C1	20–100 pF, mica trimmer
C2–7	0.1 µF, monolithic
C8	0.001 µF, disk ceramic
C9,10	22 µF 25V, electrolytic or tantalum
C11	65 pF, disk ceramic
C12	220 pF, silver-mica or polystyrene
C13	330 pF, silver-mica or polystyrene
C14	560 pF, silver-mica or polystyrene
C15	820 pF, silver-mica or polystyrene
C16	1000 pF, silver-mica or polystyrene
C17	1800 pF, silver-mica or polystyrene
C18	24 pF, disk ceramic
R1,2	470 ohms, 1/4 watt
R3	1k, 1/4 watt
R4	4.7k, 1/4 watt
R5	180 ohms, 1/4 watt
R6	220 ohms, 1/4 watt
D1–3	1N914
S1–3	DIP switches, 4-position
Q1	2N3906
Q2	2N3904
Q3	2N2219A, with heat sink
L1	33 µH, RFC
L2	22 µH, RFC
L3	12 turns #22 enamel, on T50-6
L4	14 turns #24, on T50-2
L5	20 turns #26, on T50-2
U1	74HC04
U2	74HC161, or 74HC163
U3	78M05 5V regulator, TO-5 package
X1	fundamental mode, with socket (See text.)
P1–4	RCA jacks

Suitable enclosure with mounting hardware.
A blank PC board is available for $4.50 & $1.50 postage/handling per order from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

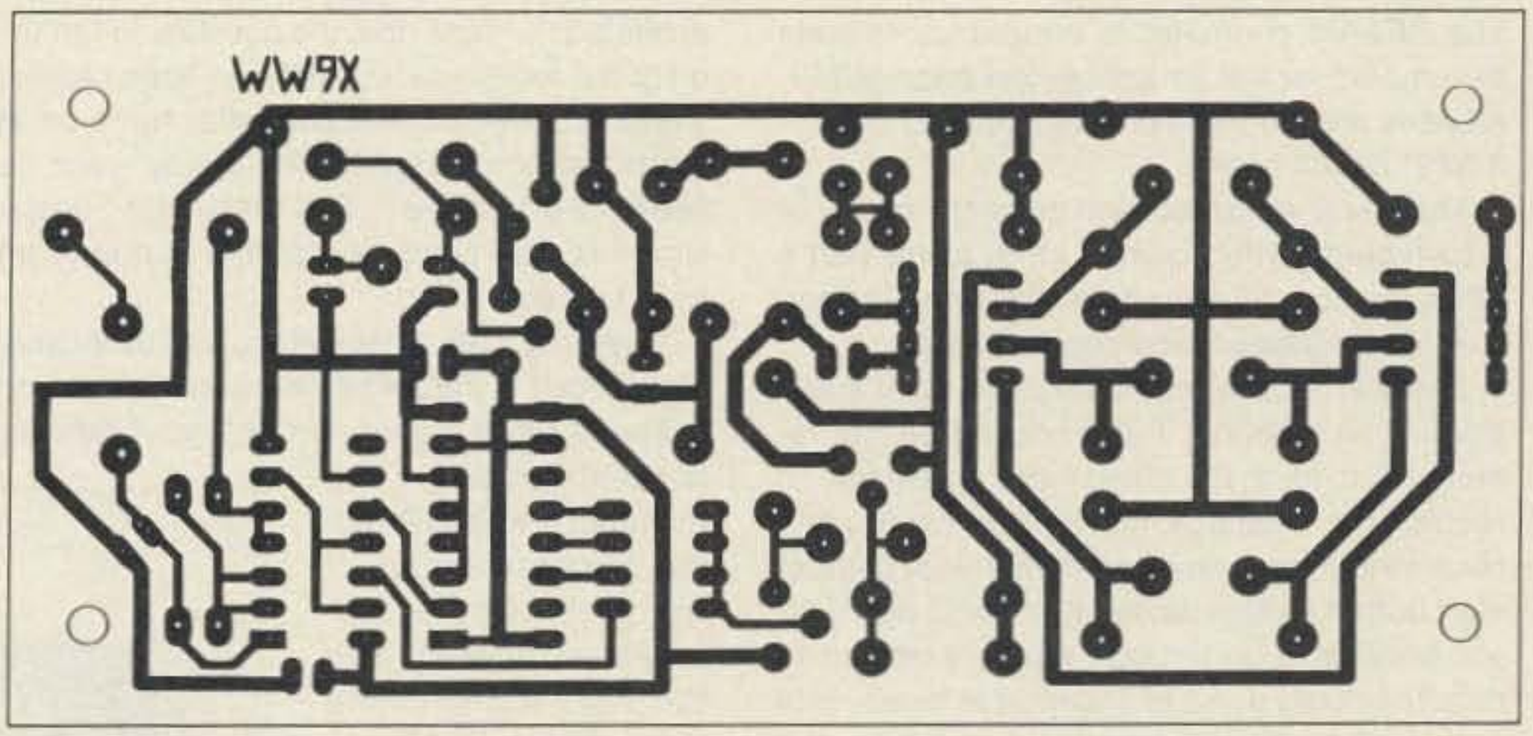


Figure 3. Printed circuit pattern for foil side.

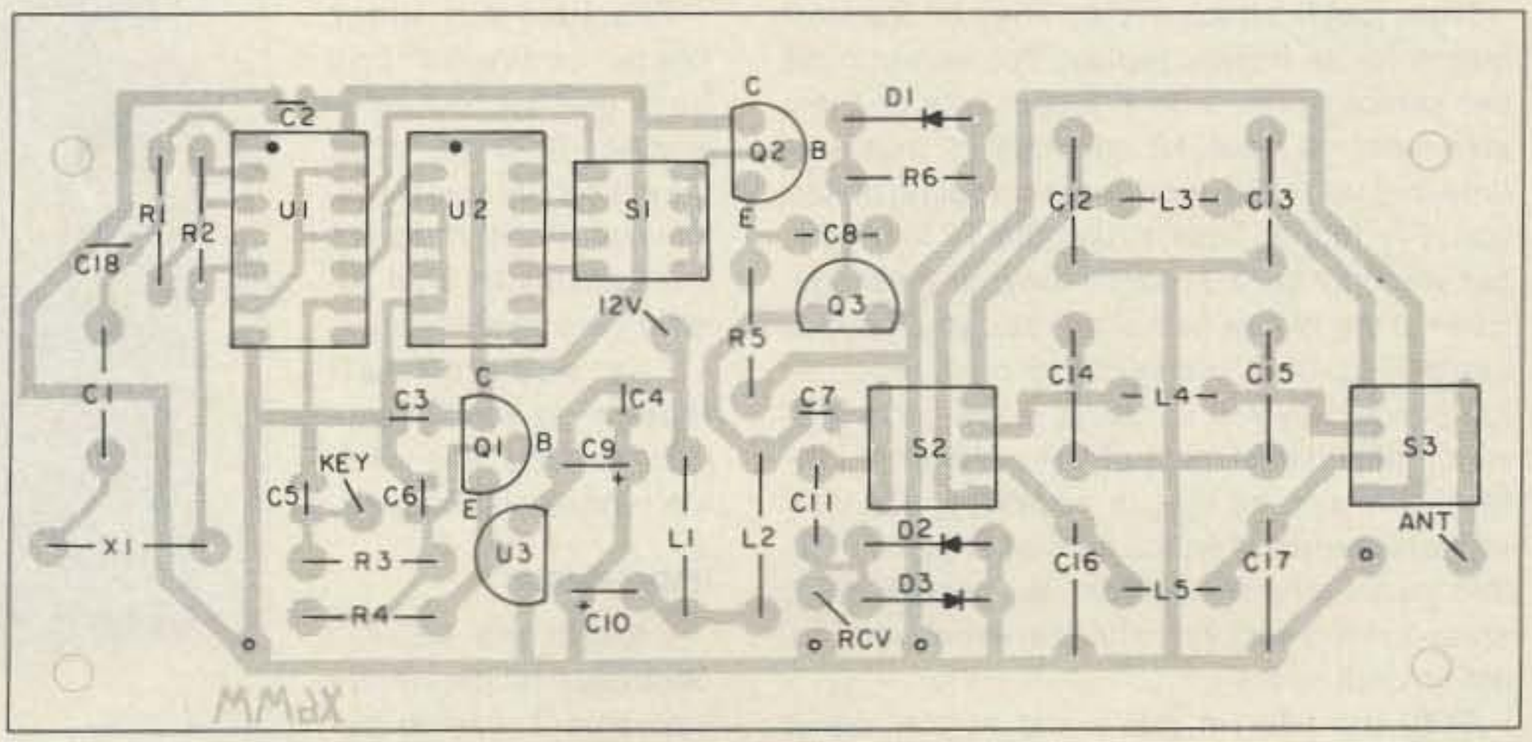


Figure 4. Parts placement.

73 Review *by Bill Brown WB8ELK*

Get-Tech
George Tarnovsky KE2AM
201 RD2 Riley Rd.
New Windsor NY 12550
(914) 564–5347
Price Class: $69, $85 with battery-backed socket

The KE2AM Voice ID and Repeater Controller

Control your repeater economically!

How would you like a repeater controller/ID that actually identifies in your own voice? George Tarnovsky KE2AM of Get-Tech has designed just such an animal. His controller provides you with the basic timing signals to put together a very economical repeater system. It even provides you with the capability of identifying in your own voice with the onboard digital voice recorder.

The Voice Recorder/IDer

The KE2AM controller is offered completely assembled for the amazingly low price of $69. All parts are mounted on a high quality 3.75″ x 3.375″ circuit board.

The voice record section consists mainly of a surface-mounted control chip, along with a 256K memory IC. A jumper chooses between 6 or 12 seconds of recorded message.

The unit is designed to take low-level audio from a microphone. I just hooked up my remote HT mike to the audio input terminals. To record your message, just flip the record/playback switch and press the momentary contact start button. When using other audio sources, you may want go through a potentiometer to drop the audio down to acceptable levels. The audio will sound clipped if you overdrive the recorder.

Now, just flip back to play, then hit the start button for an instant replay. You can choose two sampling rates via a jumper wire. In the 5 kHz rate, you get 12 seconds of message time, but you will notice some sampling distortion. For higher fidelity, use the 11 kHz rate, but you only get 6 seconds for your message. Even at the higher sampling rate, you'll notice something of a background hiss. Another jumper allows you to select a low-pass filter which eliminates most of this. Although low-level audio is all that is necessary for your repeater transmitter, the controller has an LM-386 audio amplifier which can drive a small speaker loud enough to hear in even the noisiest environments.

With the filter in place and at the higher sampling rate, I found the reproduction to be of excellent quality. Six seconds may not seem like a lot but it is more than sufficient for a repeater ID.

Repeater Controller

This board is not only a high quality voice recorder, it also supplies all of the timing signals necessary for repeater control. A connection to your receiver's squelch line is all that's needed to activate the transmit controller and timer logic. Your receiver's squelch circuit must be able to supply 3 to 12 volts when activated. In most rigs, it's possible to tap this off of the receive LED. When an open squelch signal is detected, the controller turns on an open collector transistor to key your repeater's transmitter. The transmitter enable signal is also controlled by the status of onboard timers.

Three separate timers, along with associated logic circuitry, comprise the controller section.

The **ID timer** makes sure that your repeater is identified every 7.5 minutes. It won't ID with each transmission. It will reset when first activated and identify with the next transmission after 7.5 minutes has elapsed.

The **time-out timer** keeps conversations from getting too long-winded. After two minutes of continuous transmission, it will drop out the transmitter until reset by the squelch line.

The **squelch tail timer** gives you 2.5 seconds of hang time when the repeater is dropped.

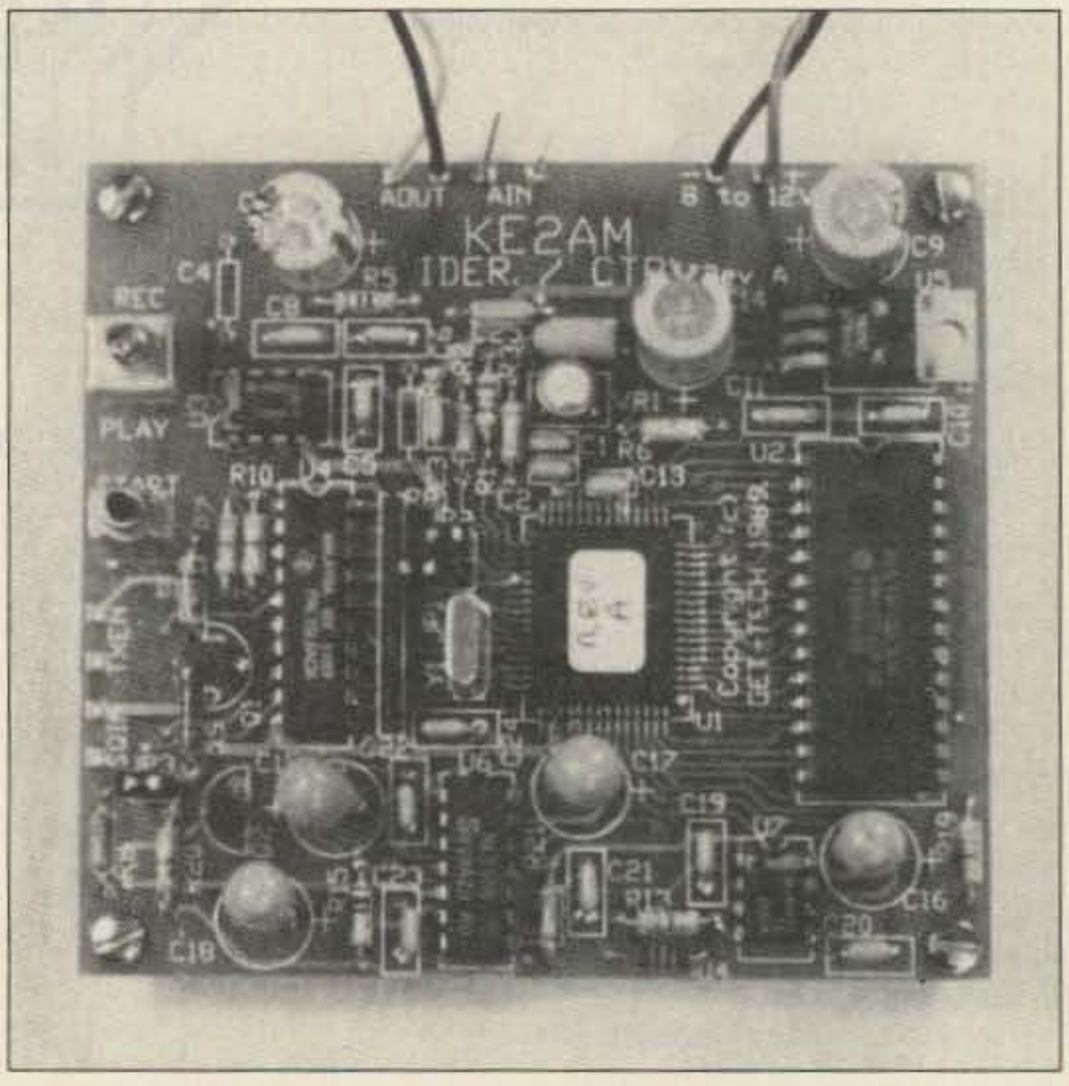
Impressions

I found the KE2AM controller to be a very convenient way to put together a basic repeater quickly and inexpensively. Using two HTs and this controller, I was able to put together a portable crossband repeater with relatively little fuss and bother. It's been great taking this to hamfests or up to mountaintops.

The controller requires 8–15 volts at 118 mA. The current drain may be a little on the high side, but most of it is due to the PAL logic array. The plus side is that the PAL circuit reduces the IC count considerably.

Since the RAM memory is erased when the power drops out, your voice message disappears. This could prove to be a major problem if your repeater site has a power glitch or outage. Fortunately, Get-Tech offers a battery-backed socket option that retains RAM memory when power to the controller is removed.

I highly recommend the KE2AM controller. It's a high quality unit that will leave enough money in your pocket to build the rest of your repeater. 73

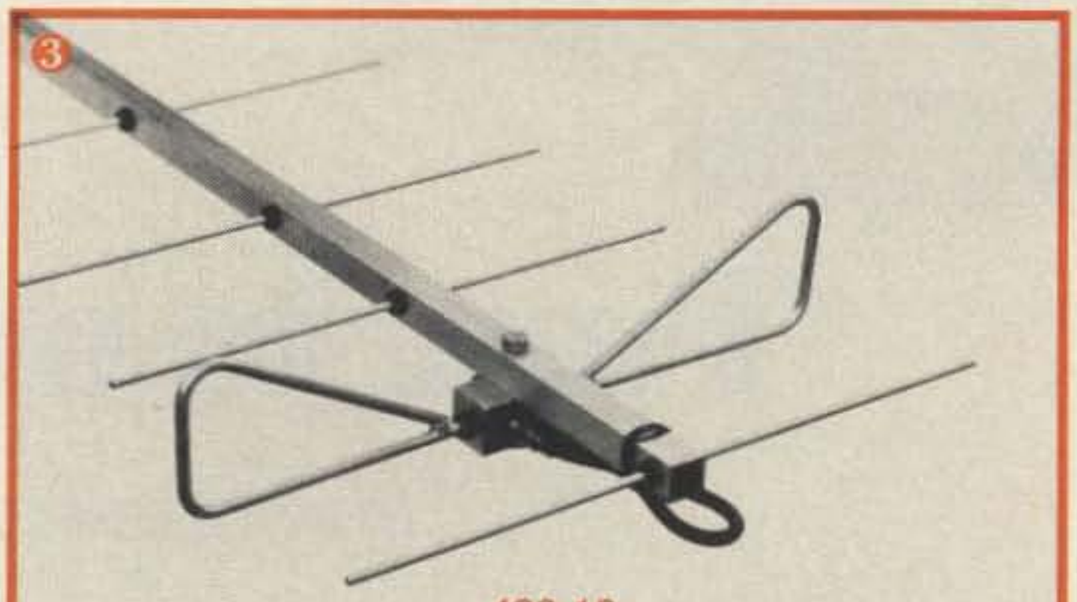


The KE2AM voice recorder and repeater controller.

high-quality

low-cost Amateur Television Products

VSB-70



430-16

RLA-70 w/MPS-100

AVT Master

① ***NEW!*** **VSB-70 ATV Transceiver:** *the only amateur television transceiver utilizing VSB (Vestigial Sideband) technology to minimize adjacent channel interference and preserve spectrum space; built-in UHF GaAsFET preamp to improve reception; covers the 70 cm band, 420 - 440 MHz; inter-modulation distortion less than -42 dBc; one watt PEP output; monitor transmitted and received signals on your standard TV receiver; audio and video input via front panel 10-pin camera jack or rear panel RCA audio and video inputs (switchable); crystal-controlled or variable-tuning down converter; crystals for 434 and 439.25 MHz are included; optional crystals for 421.25 and 426.25 are available; requires 13.6 VDC @ 1.5 amps* **$349.95**

② ***NEW!*** **RLA-70 Remote Linear Amplifier with Power Supply:** *mast-mounted amplifer boosts your ATV signal up to 50 watts PEP; equivalent to a 100 watt amplifier in the ham shack with a 3 dB line loss; built-in GaAsFET preamp mounted at the antenna where it does the most good; power supplied through the coax; includes* MPS-100 Multi-purpose Power Supply: *provides a well-regulated 28V DC @ 6 amps for the RLA-70; also provides regulated 13.6V DC @ 2 amps for the VSB-70* **$699.00**

③ **430-16 Antenna:** *high-performance, computer optimized yagi specifically designed for ATV operation; broadband frequency coverage from 420 to 440 MHz; 16 elements gie you 14.3 dBd gain; O-ring sealed connectors; 28 degree E-plane beam width; 32 degree H-plane beam width; 10 foot boom* **$119.95**

④ **AVT Master Amiga Video Terminal:** *SSTV and FAX system (hardware and software) for transmit and receive with your Commodore Amiga Computer; 55 SSTV modes in up to 4,096 simultaneous colors; Nine FAX modes in up to 16 grey levels; eight function "repair kit" vastly reduces damage caused by QRM or QRN; on-screen tuning scope; mode-to-mode conversions; interpolating zoom; image tinting, brightness and contrast control; text overlay using multiple fonts, boldface, italics and underlining in any combination or color; automatic CW and/or synthesized speech ID after transmit; custom color bar generation; user-defined FAX demodulation curves; image rotation and flipping; paint compatible; extensive ARexx language support; real-time software filtering for scope and receive operations; grab screens to transmit from any digitizer or operating program in real-time; automatic start and run at any time; image printing in both black-and-white and color on hundreds of printers* **$299.95**

Specifications subject to change without notice or obligation. Prices listed are suggested Amateur Net through participating dealers.

Technical support may be obtained through CompuServe's Hamnet forum. Messages should be sent to user ID #76702, 1013.

Advanced Electronic Applications, Inc.

P.O. Box C2160/2006 196th St. S.W. Lynnwood, WA 98036-0918
Technical Support & Sales: (206) 775-7373 Fax: (206) 775-2340

Tune in on Philately

Immortalized in stamps.

by Raymond Schuessler

All around the world, countries have honored amateur radio and ham radio operators on their postage stamps. Collecting these stamps can be a fun hobby for hams.

Postage stamps originated in England in 1840. From the beginning, postal authorities designed stamps to honor the great milestones in science, medicine, the arts, and history. The people and events so depicted have earned a permanent niche in world history—for stamps never perish. If archaeologists of the far future unearthed our civilization, they would have a good idea of our culture and history from our stamps.

Ham operators deserve the honor they have received in philately. When you hear stories of lives saved, you know these badges of honor are well-deserved. Stories I have heard include a New Orleans operator who heard an emergency call for snake serum in Columbia, and relayed the call; an operator who heard a call for help from a ship in the arctic that had struck an iceberg; and an operator in Canada who helped rescue four soldiers in Manitoba, 1,500 miles away.

The postage stamps honoring amateur radio commemorate the handful of pioneers in 1901 who, inspired by Marconi, the father of wireless communications, grew into an international fraternity.

In those days, all transmitting and receiving apparatus had to be assembled by hand, and there were few books and no magazines on the subject. Because of hams, many new inventions came into existence. For example, hams were the first to discover the value of shortwaves, which opened the way for TV and FM broadcasting. And it was a ham who helped track the first satellite.

The wartime stamps are well-taken, since World War II saw over 25,000 hams in uniform designing "commo" equipment, setting up global networks, and manning radar installations.

Israel honored its amateur radio operators in 1987. The Palestine Radio Club was organized during the British Mandate, and eventually became the Radio Amateur Association of Israel. These hams played an important role in laying the foundations of the Army Signal Corps, as well as the civilian communication network during the early years of the state of Israel. The association has 900 members, 700 of which hold official licenses.

Ascension Island issued a stamp in 1982 showing King George V making his first Christmas BBC radio broadcast to the empire.

A variety of old ham equipment is portrayed on some stamps. This adds to their collectibility. Even Disney's Chip and Dale get into the act on the Bhutan stamp shown.

Your Own Collection

If you want to start your own stamp collection, consult a stamp catalog (such as Scott's, Gibbons, or Minkus) in your local library. It lists or illustrates all stamps and their official call number and current value. The catalog is revised annually to include all new stamps and price changes.

Subscribe to a good weekly stamp newspaper (such as *Linn's*), which you can also look over at most libraries. Search their ads for dealers who specialize in the nations whose stamps you need. You can mail-order stamps, too.

You can also subscribe to a "new issue" postal service. The service will send you all the new ham issues as soon as they are released.

Visit a local stamp shop. They may have a good selection. You may be able to fill out some blank spaces in your collection. Used stamps are cheaper than new, mint stamps.

Stamps should be stored in three-ring plastic sheets with windows to protect the stamps from creasing, humidity, and dust. These sheets can be kept in a loose-leaf notebook.

Accidental Benefits

The greatest monetary profits lie in printing errors. Once a man in London bought a sheet of 100 nine-cent stamps. When he got home, he found that no price had been printed on them. A stamp shop bought the sheet for $60,000.

Another example: In 1918, the U.S. airmail stamp of the Jenny plane was printed upside down. Today, one of those stamps sold at a recent auction for $148,000!

Some ham club bulletins carry columns dealing with philately, and others carry stamp news over the airways, as they do in Canada, Sweden, Cuba, Czechoslovakia, Berlin, East Germany, Bulgaria, Belgian, and Portugal.

As a ham, you'll have a special advantage. You'll be able to ask ham philatelists to send you ham stamps from their countries. You'd even be able to trade your duplicates worldwide.

Few hobbies are more rewarding and useful than ham radio, with its friends, fun, and excitement. An interest on the side in philately will add to the fun. Tune in and see. 73

Stamps from all over the world, honoring amateur radio and hams.

You may reach Raymond Schuessler at P.O. Drawer 69, Lake Helen FL 32744-0069.

high-quality

RF products

low-cost

Manufactured in Canada
Exlusively for AEA

① 

QT-1

② 

WM-30

③ 

ET-1

④ 

LPF-30

⑤ 

DL-1500

① QT-1 Antenna Tuner:
1.8 - 30 MHz; built-in dummy load; illuminated cross-needle SWR & power meter; 30 or 300 W range; peak or average; matches virtually any receiver, transmitter or transceiver from 1.8 to 30 MHz with almost any antenna; versatile input/output selections allow tuned or direct dummy load, coax 1, coax 2, balanced line and end-fed wire $159.95

② WM-30 Power/SWR Meter:
true shielded directional coupler; illuminated cross-needle meter measures forward and reverse power and SWR simultaneously; peak or average; 300 or 3000 watt range; 160-10 meters; 6"D x 5-1/4"W x 3-1/2"H, 1-1/4 lbs $99.95

③ ET-1 Antenna Tuner:
1.8 - 30 MHz; 30 or 300 W; cross-needle SWR & power meter; compatible with almost ANY real antenna including verticals, dipoles, inverted vees, beams and mobile whips that are fed by coax cable, balanced lines or a single wire; built-in 1:4 balun; 9-3/8"D x 10-1/4"W x 3-1/2"H; weighs 3-1/2 lbs $129.95

④ LPF-30 Low Pass Filter:
suppresses TVI at the source; reduces TVI radiated by transmitters operating below 30 MHz; additional attenuation to TV IF frequencies above 40 MHz; nine-pole inverse Chebyshev filter design; -60 dB or better, depending on freq.; insertion loss 0.5 dB in passband; handles up to 1500 watts; 8-5/8"D x 2-7/8"W x 2-3/4"H, 1 lb. $49.95

⑤ DL-1500 Dry Dummy Load:
1500 W (10 sec); 100 W continuous; DC to 650 MHz; VSWR 1.3:1 simulates matched 50 ohm antenna to test your transmitter; compact (8-5/8"D x 2-7/8"W x 2-3/4"H) and lightweight (2 lbs.) . . . 69.95

The above products all feature alodined aluminum cases for eye-pleasing protection against scratches and corrosion.

Prices listed are suggested Amateur Net through participating AEA authorized dealers. Specifications are subject to change without notice or obligation.For more information, contact AEA at (206) 775-7373.

Technical support may be obtained through Compuserve's Hamnet forum. Messages should be sent to user ID #76702,1013.

Advanced Electronic Applications, Inc.
P.O. Box C2160/2006 196th St. S.W. Lynnwood, WA 98036-0918
Technical Support & Sales: (206) 775-7373 Fax: (206) 775-2340

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

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

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Feedback# Title

1 Letters
2 Never Say Die
3 QRX
4 Three Bands With One Rock
5 Review: KE2AM Voice ID and Repeater Controller
6 Tune in on Philately
7 A Pseudo CW Filter
8 Build the Brass Pounder's Keyer
9 SPSM Mobile Mount
10 Review: Tripp Lite PR-25A Power Supply and Isobar 8 GS Surge Suppressor
11 Parts Substitution
12 Software for the Hamshack, Part II
13 Review: SWISSLOG Version 3.66
14 Barter 'n' Buy
15 Get on the WARC Bandwagon
16 Homing In
17 Hamsats
18 Hams with Class
19 RTTY Loop
20 New Products
21 Above & Beyond
22 Special Events
23 Ask Kaboom
24 Looking West
25 Updates
26 QRP
28 Ham Help
29 Dealer Directory
30 DX
31 73 International
32 ATV
33 Random Output
34 Propagation

A Pseudo CW Filter

Be good to your ears.

by Jim Melton WR5B

To my ear, most CW filters have a more or less "ringing" sound. Some operators can live with it, but to me it's very distracting.

The circuit presented here is not actually a filter; hence, the name Pseudo Filter. It completely eliminates the original CW signal and its normal background noise. At the same time, it uses the decoded signal to switch on and off the output of an 800 Hz oscillator. An added feature is that while tuning, it automatically zero beats with the received CW signal.

About the Circuit

The circuit is built around two 567 tone decoder ICs. Refer to Figure 1 for the 567 pinout. The 567 contains a PLL (phase-locked loop) with a center frequency that can be set with one external series resistor-capacitor combination (R1, C2) and (R4, C7) to any frequency between 0.01 Hz and 500 kHz.

The approximate center frequency can be determined using the formula $f = 1.1/RC$, where f is the center frequency of the internal oscillator. Capacitors (C3, C4) and (C5, C6) set the capture bandwidth of the 567 IC anywhere from zero to 14% of center frequency. The values shown in Figure 3, the schematic, set the bandwidth to the widest value, which

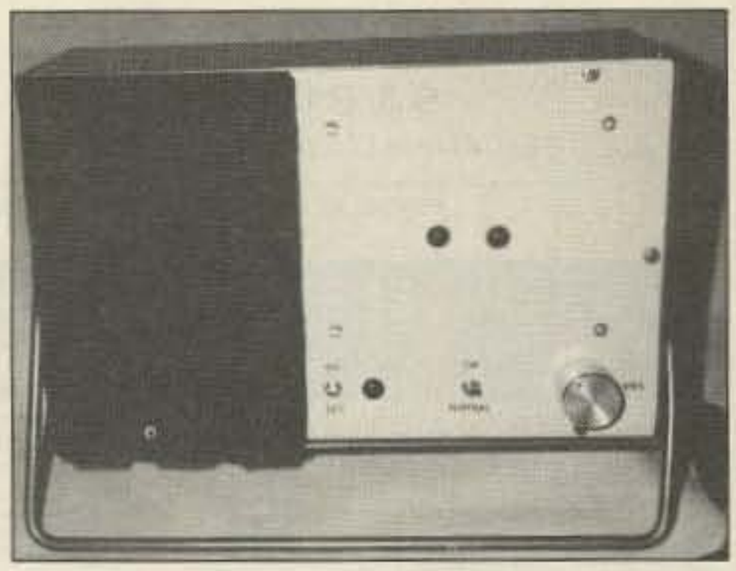


Photo. The Pseudo Filter installs easily in a speaker enclosure.

gives a "lock on" of a little over 100 Hz for an 800 Hz tone.

Since we're interested in an audio frequency, we take the input to the 567 directly from the speaker jack of the receiver. The 567 is designed so that pin 8 goes low when the input frequency is within the passband. Pin 8 is an active low output. This means it goes from near the positive supply voltage to ground through an internal open collector transistor switch when a tone is detected. When this happens, its associated LED will glow as long as the CW signal is present.

Set Up

Adjusting the two 567 center frequencies is much easier if you have access to an audio frequency generator and a frequency counter. Hook up the frequency counter to pin 5 or 6 of U1 and adjust for a center frequency of 775 Hz with R1, move your counter probe to pin 5 or 6 of U2 and set it to a center frequency of 825 Hz with R4. At these settings, the two frequencies should overlap approximately 50 Hz. If you don't have access to either of these instruments, try setting R1 to 13.33k ohms, and R4 to 14.19k ohms. On the two units I built, these values put me in the ball park. You might have a friend send you some code while you do a little "tweaking" of the two-variable resistors until you are satisfied with the operation of the unit.

Circuit Operation

In operation, audio from the receiver is connected through a 0.1 µF capacitor to the

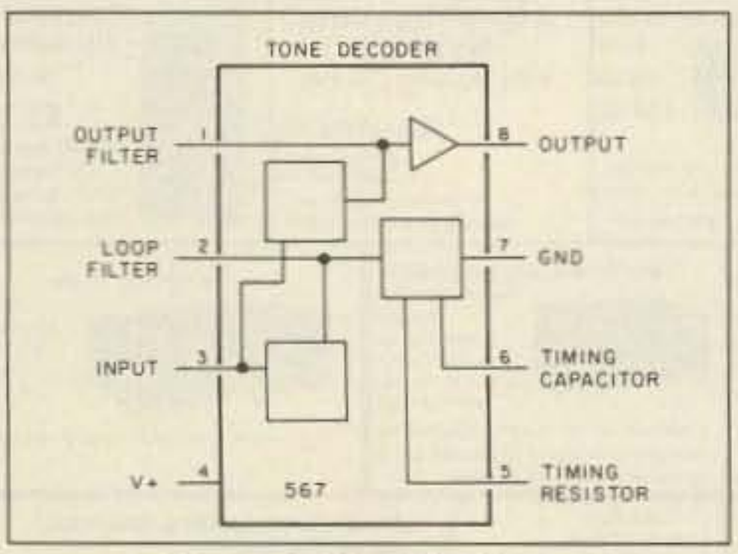


Figure 1. The 567 pinout.

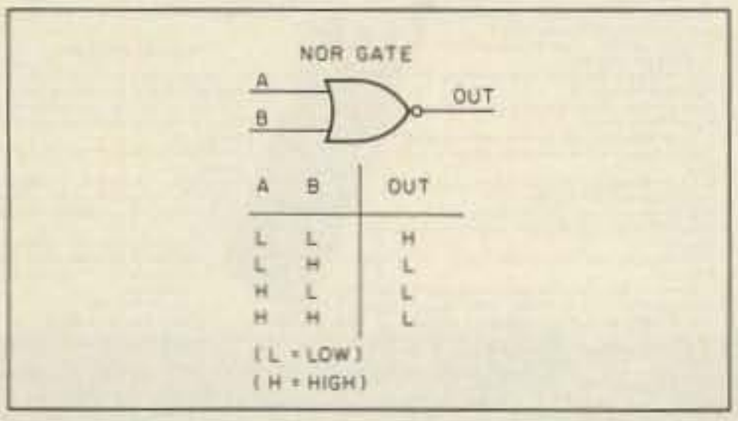


Figure 2. NOR gate truth table.

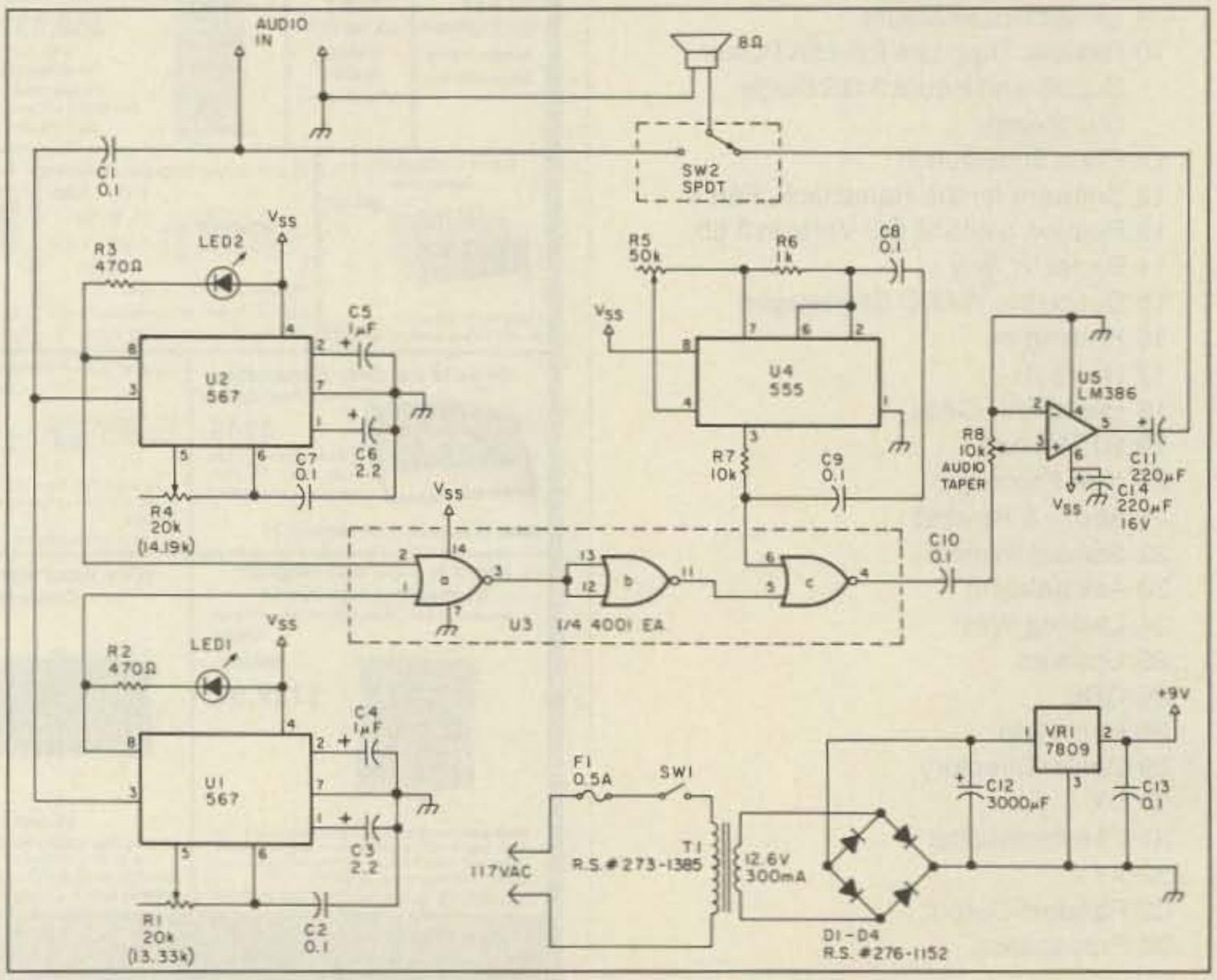


Figure 3. The schematic for the Pseudo Filter.

RAMSEY ELECTRONICS

COM-3 $279.00

2 WAY RADIO SERVICE MONITOR

COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantatic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features •Direct entry keyboard with programmable memory •Audio & transmitter frequency counter •LED bar graph frequency/error deviation display •0.1–10.000 µV output levels •High receive sensitivity, less than 5 µV •100 kHz to 999.9995 MHz •Continuous frequency coverage •Transmit protection, up to 100 watts •CTS tone encoder, 1 kHz and external modulation.

RSG-10 $249.00

SYNTHESIZED SIGNAL GENERATOR

Finally, a low-cost lab quality signal generator—a true alternative to the $7,000 generators. The RSG-10 is a hard working, but easy to use generator ideal for the lab as well as for production test. Lease it for less than $3.00 a day. Features •100 kHz to 999 MHz •100 Hz resolution to 500 MHz, 200 Hz above •−130 to +10 dBm output range •0.1 dB output resolution •AM and FM modulation •20 programmable memories •Output selection in volts, dB, dBm with instant conversion between units •RF output reverse power protected •LED display of all parameters—no analog guesswork!

FREQUENCY COUNTERS

CT-70 7 DIGIT 525 MHz

CT-90 9 DIGIT 600 MHz

CT-125 9 DIGIT 1.2 GHz

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

NEW CT-250 2.5 GHZ

ACCESSORIES FOR COUNTERS

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

ALL COUNTERS ARE FULLY WIRED & TESTED

MODEL	FREQ. RANGE	SENSITIVITY	DIGITS	RESOLUTION	PRICE
CT-50	20 Hz–600 MHz	<25 mV to 500 MHz	8	1 Hz, 10 Hz	$189.95
CT-70	20 Hz–550 MHz	<50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	<10 mV to 150 MHz <150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	<25mV to 50 MHz <15 mV to 500 MHz <100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	<25 mV to 50 MHz <10 mV to 1 GHz <50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$239.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	<50 mV	Convert your existing counter to 1.5 GHz		$89.95

SPEED RADAR $89.95 complete kit SG-7

ew low-cost microwave Doppler dar kit "clocks" cars, planes, boats, rses, bikes or any large moving ob- t. Operates at 2.6 GHz with up to mile range. LED digital readout splays speed in miles per hour, kilo- ters per hour or feet per second! rphone output allows for listening to tual doppler shift. Uses two 1-lb cof- cans for antenna (not included) d runs on 12 VDC. Easy to build— microwave circuitry is PC stripline. includes delivery. ABS plastic case h speedy graphics for a profession- ook. A very useful and full-of-fun kit.

BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz, 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.
PR-2, wired, includes AC adapter $59.95

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.
PA-1, 40W pwr amp kit $29.95
TR-1, RF sensed T-R relay kit $8.95

FM WIRELESS MIKE KITS

FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88–108 MHz FM band up to 300' except for hi power FM-4 that goes up to ½ mile.

FM-1, basic unit	$ 5.95
FM-2, as above but with added mike preamp	$ 7.95
FM-4, long range, high power with very sensitive audio section, picks up voices 10' away	$14.95
FM-3, complete unit includes case, battery, switch, antenna, and built-in condensor mike. Excellent fidelity, very small, kit	$16.95
FM-3WT, as above, but fully wired and tested	$19.95
SMC, miniature sensitive mike cartridge for FM-1, 2, 4	$ 2.95

CROWAVE TRUSION ALARM

real microwave Doppler nsor that will detect a hu- n as far as 10 feet away. erates on 1.3 GHz, and is t affected by heat, light, or rations. Drives up to 100 output, normally open or sed, runs on 12 VDC. mplete kit MD-3 ..... $16.95

MUSIC MACHINE

Neat kit that will produce 25 different classical and popular tunes, plus 3 doorchime sounds. Lots of fun for doorbells, shop, or store entrances, car horn, music boxes, etc. Runs on 9V battery or wall transformer. Excellent speaker volume and adjustable tempo and pitch. Add our case set for a handsome finished look.
Complete kit, MM-5 ..... $24.95
Case + knob set, CMM-5 ..... $12.95

PACKET RADIO

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

LO NOISE PREAMPS

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

NE DECODER

omplete tone decoder single PC board. Fea- s: 400–5000 Hz ad- able range via 20-turn voltage regulation, 567 Useful for touch-tone detection, FSK, etc. also be used as a sta- one encoder. Runs on 12 volts. plete kit, TD-1 $5.95

VOICE ACTIVATED SWITCH

Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.
VS-1 kit $6.95

TELEPHONE TRANSMITTER

Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!
PB-1 kit $14.95

TICKLE STIK

A shocking kit! Blinking LED attracts victims to pick up innocent-looking can—you watch the fun! Ideal for office desks, parties, nosey know-it-alls!
TS-4 kit $9.95

TV TRANSMITTER

Transmit your VCR or TV camera throughout your house. Stable quality signal, tunable Ch 4–6. Accepts standard video and audio inputs.
Complete kit, JM-7 ..... $14.95

LOR ORGAN

e music come e! 3 different lights ker with music. e light each for , mid-range, and s. Each individual- adjustable and es up to 300 W. s on 110 VAC. 1 kit. $8.95

LIGHT BEAM COMMUNICATORS

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

FM RADIO

Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!
FR-1 kit $14.95

SUPER SLEUTH

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.
BN-9 kit $5.95

BROADBAND PREAMP

Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.
SA-7 kit $14.95

NEW FANTASTIC 2M FM TRANSCEIVER

SYNTHESIZED—NO CRYSTALS TO BUY!

$129.95

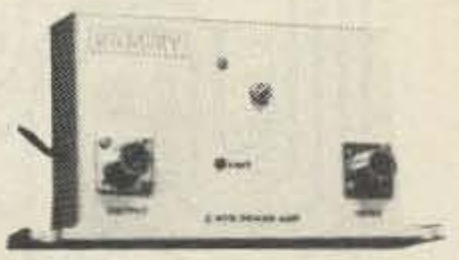
Ramsey breaks the price barrier on 2 meter rigs! Here's the ideal rig for field days, hamfests, vacations, second cars and packet (it even has dedicated packet connections). Six expandable diode-programmed channels, 5W RF output, sensitive dual conversion receiver and EASY assembly. Why pay more for 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.

FTR-146 kit	$129.95
FTR-146-C aluminum case & knob set	$24.95

2 M & 220 BOOSTER AMP

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

PA-10 2 MTR POWER BOOSTER (10 X power gain) Fully wired & tested	$79.95
PA-20 220 MHz POWER BOOSTER (8 X power gain) Fully wired & tested	$79.95



QRP TRANSMITTERS HAM RECEIVERS

20, 30, 40, 80M CW TRANSMITTERS

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

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

20, 30, 40, 80M All Mode RECEIVERS

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

Your choice of bands (Specify band: HR-20, HR-30, HR-40, HR-80)	$27.95
Matching case & knob set, CHR	$12.95

E-Z KEY CMOS KEYER

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

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

ACTIVE ANTENNA

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

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

SPEECH SCRAMBLER

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

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

SHORTWAVE RECEIVER

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

Shortwave receiver kit, SRI	$27.95
Shortwave converter kit, SCI	$24.95
Matching case set for SRI, CSR	$12.95
Matching case set for SCI,CSC	$12.95

2, 6, 10 MTR, 220 FM RECEIVERS

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

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

FM STEREO TRANSMITTER

STEREO

Run your own stereo FM station! Transmit a stable signal in the standard FM broadcast band throughout the house, dorm or neighborhood. Connects easily to line outputs on CD player, tape decks, etc. Runs on 9V battery, has internal whip antenna and external antenna jack. Add our case set for a "station" look!

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

AIRCRAFT RCVR

Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110–136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.

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

TERMS: Satisfaction guaranteed, examine for 10 days. If not pleased, return in original form for refund. •Add 7% (up to a maximum of $10) for shipping, handling and insurance. •For foreign orders add 15% for surface mail. •COD (USA only), add $4.50. •Orders under $20, add $3.00. •NY residents, add 7% sales tax. •90-day parts warranty on kits. •1-year parts & labor warranty on wired units.

VISA MasterCard

PHONE ORDERS CALL 716-924-4560

FAX 716-924-4555

RAMSEY ELECTRONICS, INC. 793 Canning Parkway, Victor, NY 14564

CIRCLE 34 ON READER SERVICE CARD

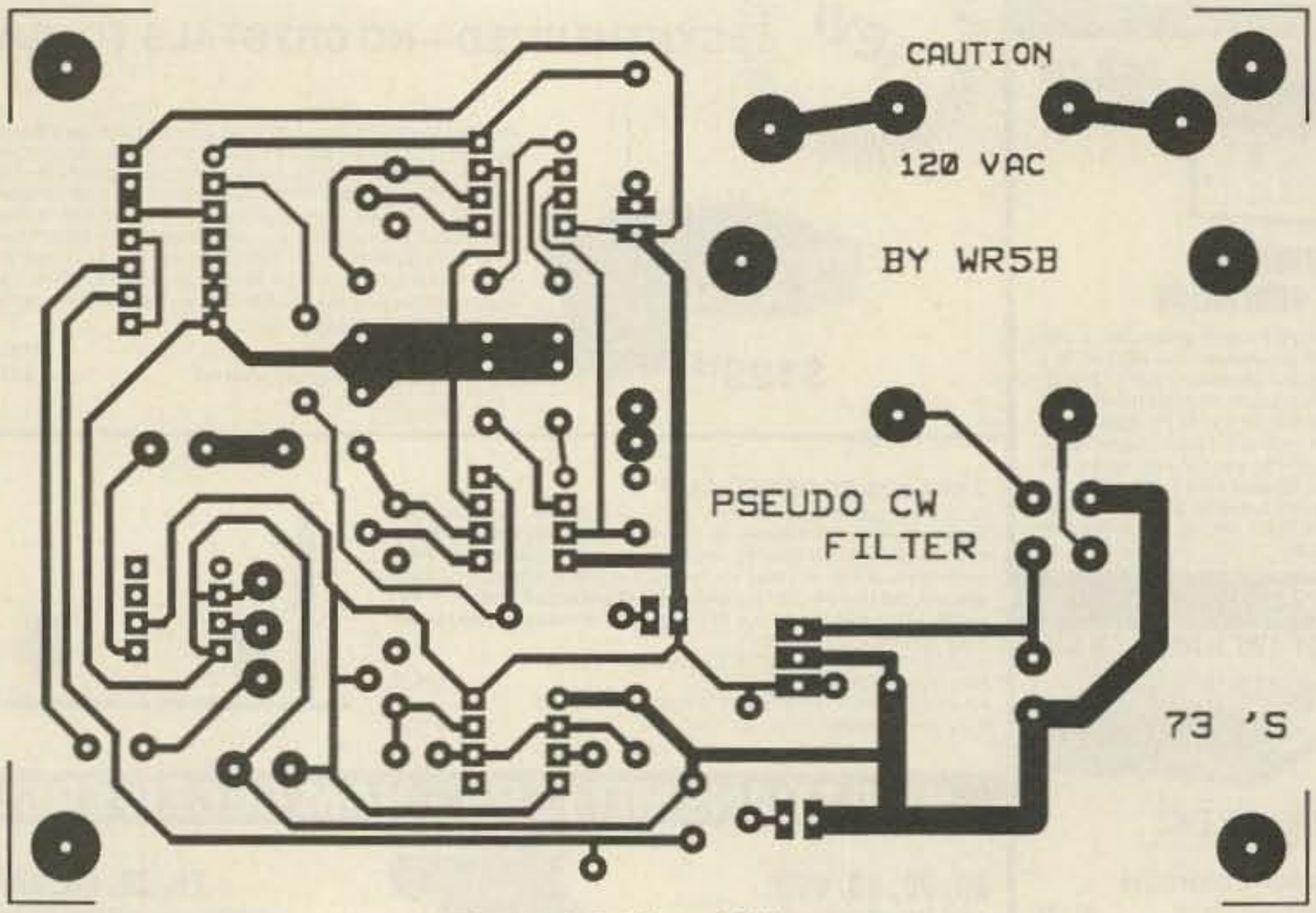


Figure 4. PC board foil pattern.

input (pin 3) of each 567 IC. When the received signal is approximately centered between the two 567 frequencies (775 and 825 Hz), pin 8 of both ICs will go low. These pins are connected to pins 1 and 2, respectively, of U3-a, which is 1/4 of a quad two-input NOR gate. Both inputs to this gate must go low for the output (pin 3) to go high. See the truth table for a NOR gate in Figure 2.

U3-b is connected to function as an inverter. An inverter is necessary because the 555 timer IC generates a continuous audio frequency, and without the inverter you would hear a steady tone interrupted only in unison with the received CW signal. Try copying code that way sometime!

The audio frequency generated by U4 is controlled by a PC mount trimmer, R5. Adjust R5 for either 800 Hz, or any tone pleasing to you. Pin 11 of U3-b is the output of the inverter. This point then goes to pin 5 of U3-c. Pin 6 of U3-c goes to pin 3 of U4, which is the output of the 555 timer, after some waveshaping done by the RC combination of C9 and R7. In the case of U3-c, pin 5 will remain low for the exact duration of each DIT/DAH signal. The other input to this gate, pin 6, fluctuates between the high and low state 800 times per second as a result of the audio signal generated by the 555 timer IC.

Keep in mind that U3-c is being used as a digital switch. Therefore, instead of "keying" the audio oscillator on and off—its output, which is a continuous triangle wave, is simply switched in and out of the circuit 800 times per second as long as a decoded CW signal is present. Last, the output of U3-c (pin 4) is an 800 Hz square wave that is then amplified by U5, an LM386 audio amplifier.

One last thing about U3: All unused inputs of this chip should be tied to either the supply voltage or ground, so connect pins 8 and 9 to pin 7, and leave pin 10 open.

I used the 555 timer to generate the 800 Hz tone because that happened to be what I had on hand. Also keep in mind that the amplified square wave will sound just a tiny bit raspy. Admittedly, different ICs and an oscillator generating a pure sine wave could be used to follow the 567 decoders; however, as I stated, I chose the least expensive route and used the components I had on hand.

Don't be afraid to experiment. On that same subject, I also had a 7809 voltage regulator—hence the 9 volt power supply. A 5 volt supply would work just as well. But don't exceed 9 volts, as that is the maximum for the 567 IC. As you can see in the schematic, the power supply is just a standard, full-wave regulated supply.

Using the Filter

The SPST switch is wired so that you can switch the speaker between the audio as received from the receiver—standard operation—or audio only from the filter. Set the switch for standard operation, and as you slowly tune across a CW signal, either one or the other of the LEDs should start blinking in time with the received codes. Keep turning the dial slowly until the second LED starts blinking. At that point, switch to the filter audio, and the only sound you should hear is code—minus any hash or static. Also note that when both LEDs are blinking, you should be within approximately 25 Hz of zero beat. If you are answering a CQ, use only the tuning dial to zero in on the signal. If you are calling CQ, you will need to use the RIT control if your receiver is so equipped to fine-tune the answering call's frequency. Finally, there is nothing critical in wiring. If you choose not to go with a PC board (see Figure 4), you can use either wire wrap or perf board. 73

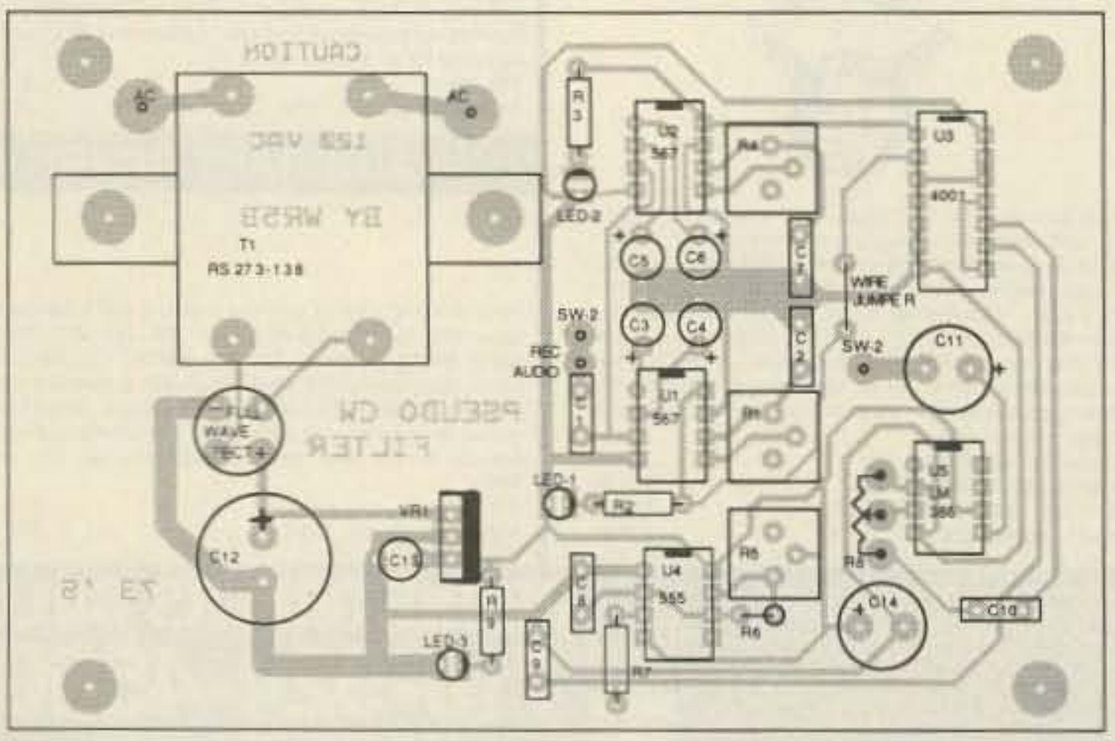


Figure 5. Parts placement.

Pseudo Filter Parts List

R1,4	20k PC mount potentiometer
R2,3,9	470 ohm resistor
R5	50k PC mount potentiometer
R6	1k ohm resistor
R7	10k ohm resistor
R8	10k ohm panel mount audio taper potentiometer
C1,9	0.01 µF
C2,7,8,10,13	0.1 µF
C3,6	2.2 µF electrolytic or tantalum
C4,5	1.0 µF electrolytic or tantalum
C11,C14	220 µF/16V electrolytic
C12	3000 µF electrolytic (see below)
U1,2	567 tone decoder IC
U3	4001 quad two-input NOR gate
U4	555 timer IC
U5	LM386 audio amplifier
F1	fuse holder
SW1	SPST switch
SW2	SPDT switch
T1	117V to 12.6V; 300 mA transformer
D1–D4	full-wave rectifier module
VR1	7805, 7808 or 7809 voltage regulator IC
LEDs	red (3)
SPKR	8 ohms

It's OK to use three 1000 µF capacitors for C12. You may also use Radio Shack 273-1385 for T1, and Radio Shack 276-1152 for the rectifier module.

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

WE SHIP WORLDWIDE

Barry Electronics Corp.

WORLD WIDE AMATEUR RADIO SINCE 1950

Your one source for all Radio Equipment!

For the best buys in town call:
212-925-7000
Los Precios Mas Bajos en Nueva York
WE SHIP WORLDWIDE!

L. Juli

DEANNA KB2JYL, BIKAR, KITTY WA2BAP,
EMIL N2EZZ, JAN KB2RV, LEWIS W2BIE

KITTY SAYS: WE ARE NOW OPEN 7 DAYS A WEEK.
Saturday & Sunday 10 to 5 P.M.
Monday-Friday 9 to 6:00 PM
Come to Barry's for the best buys in town

DRSI

ONV Safety belts-in stock

YAESU

FT-767GX, FT-757GXII, FT-747GX, FT-990, FRG-8800, FT-736R, FT-1000D, FT-5200, FT-2400, FT-470

ICOM

IC-R71A, 751A, 781, 229H, R-7000, IC-765, 275A/H, 3220A, 475A/H, 735, IC-901, IC725, IC-2400A/2500A

CES

Simplex Autopatch SDI-50 Will Patch FM Transceiver To Your Telephone. Great For Telephone Calls From mobile To Base. Simple To use. SDI-50, SSI-68.

KENWOOD

ANTENNAS
A-S, AES, Cushcraft, Hy-Gain, Hustler, KLM, METZ, Urban, MODUBLOX, TONNA, Butternut, Multi-Band

TS440S/AT, R-5000, TS-850S, TM 241A/441A, TM-2550A, TR-751A, Kenwood Service Repair, TM-731A, TS-811A, TH225A, TM-631A, TS140S, TS680S, RZ-1, TS-790A, TS950SD, TH-77A, TH27/47A, TM-941A.

YAESU ICOM
FT-23R IC2/3/4SAT
FT411E-811-911 IC02AT/32AT
FTH-2008/7008 IC2/4GAT/24AT
IC-A20/U16

Landmobile HT's
ICOM: U16, H16, V100, U400
MAXON, MOTOROLA,
YAESU: FTH 2008/7008
UNIDEN, REGENCY, KING,
MARINE ICOM: M5, M56, M700
AVIATION ICOM: A20 H.T., TAD

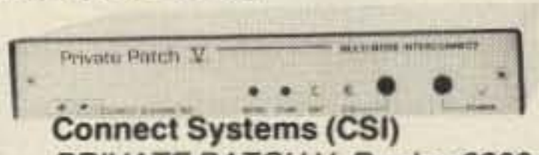
IC-W2A

IC-H16/U16

MOTOROLA RADIUS COMMERCIAL RADIOS

TH-77A

FT-470



Connect Systems (CSI)
PRIVATE PATCH V, Duplex 8200, CS700

TUNERS STOCKED:
NYE MBV-A 3 Kilowatt Tuner

Covercraft/Coaxseal Stocked

SHORTWAVE RECEIVERS STOCKED

AMPLIFIERS STOCKED:
RF Concepts
Mirage
TE Systems

MARINE RADIOS
ICOM M5, M56, M700TY, M800
AVIATION PORTABLE ICOM A-20
KING KX-99

Budwig ANT. Products

FLUKE 77, 83, 85, 87 Multimeters

Philips DC 777
Shortwave Cassette Car Receiver

Panasonic
Shortwave Radios/Marine

Kantronics
KAM, KPC II,
KPC IV, Data Engine,
DVR 2.2

VoCom/Mirage/Alinco
Tokyo Hy-Power/TE SYSTEMS
Amplifiers & 5/8λ HT Gain
Antennas IN STOCK

Computer Interfaces Stocked: MFJ-1270B, MFJ-1274, MFJ-1224, AEA PK-88, MFJ-1278T, PK-232 MBX W/FAX, DRSI PRODUCTS

DAIWA DIGITAL WATT METERS

COMMERCIAL & HAM REPEATERS STOCKED. WRITE FOR QUOTES

MOTOROLA AUTHORIZED DEALER
KACHINA COMMUNICATIONS DEALER

JRC NRD-525, JST135, NRD-535

G&G ELECTRONICS ART1,
Air Disk, SWL, Morse Coach

Professional Soldering Station 48 Watts $79

METRON KW HF Mobile Amplifier Stocked

AOR,AR-1000—wide range, hand held scanners

Wide selection of SW & Amateur Publications

AUTHORIZED
SONY
DEALER

DIGITAL FREQUENCY COUNTERS
OPTOELECTRONICS model 1300 H/A, 0-1300MHz
2210 H, 0-2200 MHz, 2600H, UTC-3000

Long-range Wireless
Telephone for export in stock

Radios for Business, Gov't, 2-way, etc. Stocked & serviced, call for great prices!

COMET ANTENNAS STOCKED

HEIL EQUIPMENT IN STOCK

Alpha Delta Products Stocked

AEA Isopoles (144, 220, 440 MHz), Isoloop.

EIMAC
3-500Z
572B, 6JS6C
12BY7A &
6146B

BIRD
Wattmeters &
Elements
In Stock

BENCHER PADDLES, BALUNS, LOW PASS FILTERS IN STOCK

MIRAGE AMPLIFIERS
ASTRON POWER SUPPLIES
Belden Wire & Cable, Int'l Wire
OPTO KEYERS STOCKED

Media Mentors—
Amateur Radio Course

New TEN-TEC
PARAGON, OMNI V

Hy-Gain Towers will be shipped direct to you FREE of shipping cost.

IIX Towers, Antennas, Mobile Radio mounts stocked. Call.

AMERITRON AUTHORIZED DEALER

MAIL ALL ORDERS TO: BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012 (FOUR BLOCKS NORTH OF CANAL ST., BETWEEN SPRING AND BROOME ST.)

New York City's LARGEST STOCKING HAM DEALER
COMPLETE REPAIR LAB ON PREMISES

"Aqui Se Habla Espanol"

BARRY INTERNATIONAL TELEX 12-7670
MERCHANDISE TAKEN ON CONSIGNMENT
FOR TOP PRICES

Monday-Friday 9 A.M to 6:00 P.M.
Saturday & Sunday 10 A.M. to 5 P.M. (Free Parking)

IRT/LEX-"Spring St. Station". **Subways:** BMT-"Prince St. Station". IND-"F" Train-Bwy Station"
Bus: Broadway #6 to Spring St. Path-9th St./6th Ave. Station.

COMMERCIAL RADIOS STOCKED: ICOM, Motorola, MAXON, Standard, Yaesu. We serve municipalities, businesses, Civil Defense, etc. Portables, mobiles, bases, repeaters...

ALL SALES FINAL

We Stock: AEA, ARRL, Ameco, Ameritron, Antenna Specialists, Astatic, Astron, B&K, B&W, Bencher, Bird, Butternut, CDE, CES, Cushcraft, Daiwa, Eimac, Henry, Heil, Hustler, Hy-Gain, Icom, KLM, Kantronics, Larsen, MFJ, J.W. Miller, Mirage, Nye, Palomar, RF Products, Saxton, Shure, Tempo, Ten-Tec, TUBES, Yaesu, Vibroplex, Duplexers, Repeaters, Scanners, Radio Publications, Uniden, Kenwood, Maxon, RFC.

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
HAM DEALER INQUIRES INVITED PHONE IN YOUR ORDER & BE REIMBURSED
COMMERCIAL RADIOS stocked & serviced on premises.
Amateur Radio Courses Given On Our Premises, Call
Export Orders Shipped Immediately. TELEX 12-7670

Technical help offered upon purchase

FAX: 212-925-7001

CIRCLE 41 ON READER SERVICE CARD

Build the Brass Pounder's Keyer

A memory keyer that reproduces your true CW "fist."

by Dan Mc Cranie AA6GG

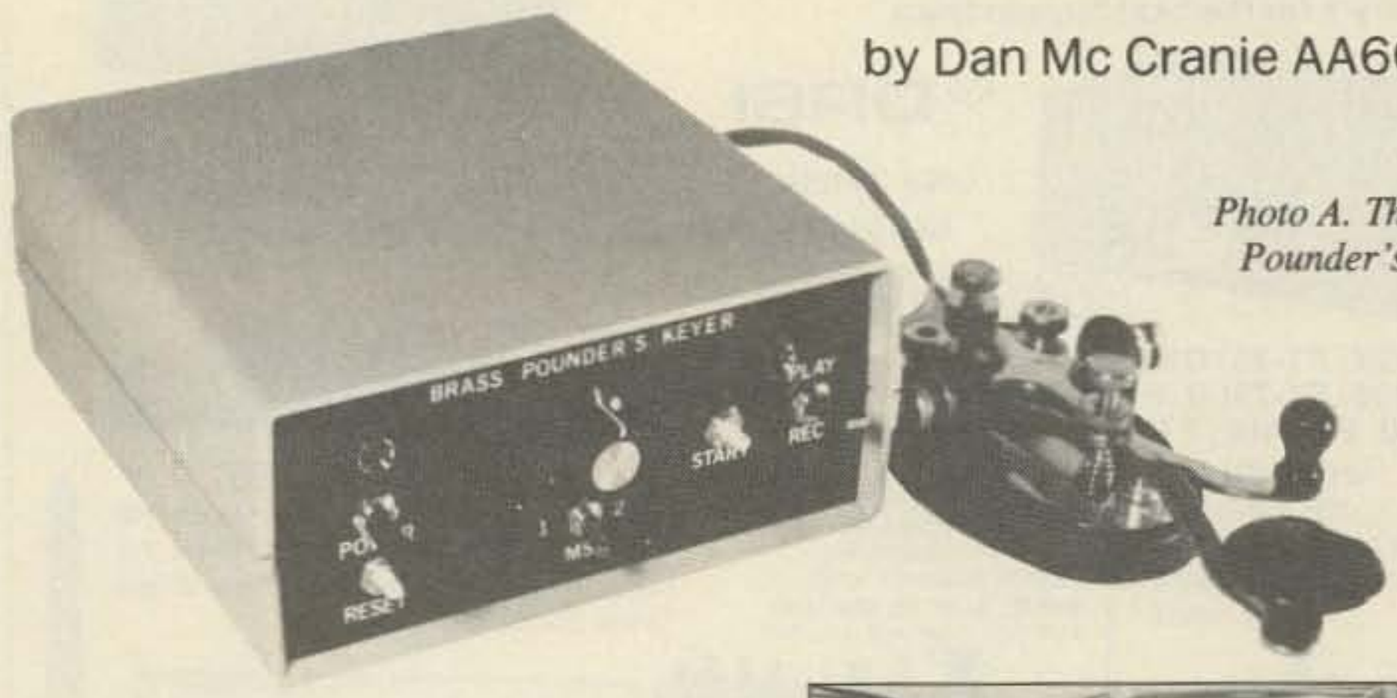


Photo A. The Brass Pounder's Keyer.

I've been in ham radio since I was 12, and I've always used a hand key for CW. My father was a chief radioman during WWII. When the family was back together after the war, he taught me the code and how to send on a hand key. There is a cadence and a distinct rhythm that you can detect when someone uses a hand key and, through the years in ham radio, I've really come to enjoy rag-chewing with other CW operators, and especially with the guys still using hand keys.

This project is a little specialized. I started it a while back with the intention of building a solid-state keyer that would accurately record the "fist" of the operator. I realized that, in doing this, I wouldn't be maximizing the storage efficiency of the semiconductor memories—but I didn't care. Memories are getting cheap enough to allow for some "programmed inefficiencies."

The Brass Pounder's Keyer is the result of this effort. In designing the controls for the keyer, I tried to make the machine as user friendly as possible. Control switches closely resemble that of a tape recorder (record, playback, start, etc.), and the machine can be left installed between your hand key and your rig without affecting normal (non-keyer) operation.

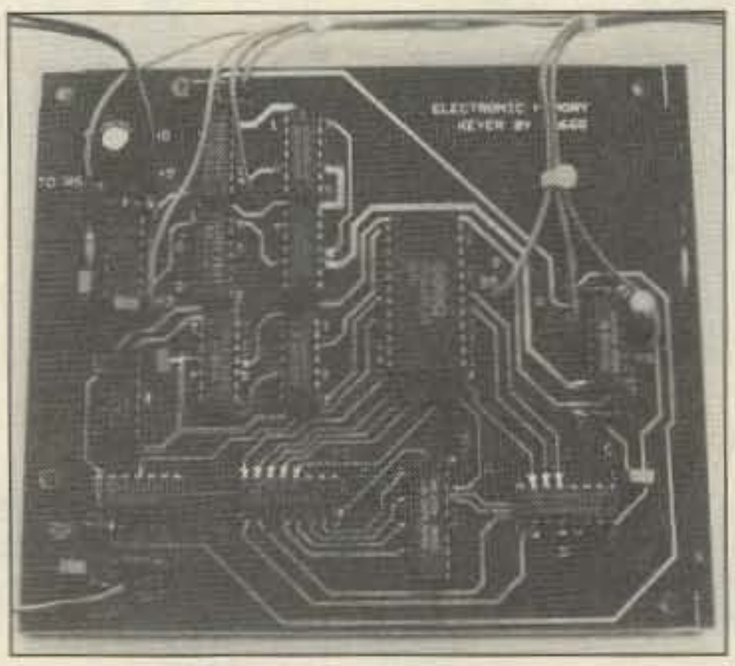


Photo B. The assembled PC board.

Theory of Operation

The Brass Pounder's Keyer is a digital recorder that will accurately reproduce the speed and cadence of the operator's keying. The heart of the circuit is a new type of semiconductor memory known as Electrically Erasable Programmable Read Only Memory, or EEPROM. Data is written into this memory in much the same fashion as conventional semiconductor memories. Unlike conventional memories, however, the EEPROM has the ability to retain previously stored information, even when power is removed. The EEPROM is guaranteed to hold this data for a minimum of 10 years. In addition, contents of the EEPROM data can be rewritten up to 10,000 times. By using this type of memory, power can be removed from the device at any time, and for any length of time.

For this project, I chose a SEEQ Technology PQ2816A 16K-bit EEPROM. This is the smallest density manufactured by the company, and is available at a reasonable price. This density provides for over four minutes of recorded code. The next size larger would be the PQ2864 64K-bit EEPROM, providing for over 16 minutes of recorded code, but I felt that for most contest applications, four minutes was more than adequate. See Figure 1 for a functional block diagram of the Brass Pounder's Keyer.

Record and Playback Clocks and Modes

Two clocks are used in the keyer: a fixed frequency clock for recording, and a variable clock to allow the operator to vary the playback speed of the recorded message. The speed of the record clock is set to provide high reproduction accuracy, even at speeds up to 30 wpm. The variable clock can change the playback output speed from one-third to over twice that of the original recorded signal.

Record and play logic provides the controls necessary for either loading data into, or retrieving data from, the EEPROM. The EEPROM is a *byte parallel* random access memory device. As such, each byte (8 bits) has a unique address location in the memory. Data comes from the hand key in *bit serial* mode. The output is either a logical "1" (key depressed), or a logical "0" (key up).

In order to store the continuous stream of bit serial key data into a byte parallel random access EEPROM, it is necessary to do two things: First, the individual bits have to be collected and temporarily stored until a full byte is available to load into the memory; second, the address locations have to be sequentially presented to the

Brass Pounder's Keyer Parts List

Part	Description	Manufacturer
U1	NE 556 dual timer	Signetics
U2, U3, U4, U5	SN74LS93N 4-bit counter	Texas Instruments
U6, U10	SN74LS74N dual D type F/F	Texas Instruments
U7, U11	SN74LS00N quad NAND gate	Texas Instruments
U8	SN74LS04N hex inverter	Texas Instruments
U9	PQ2816A 16K EEPROM	SEEQ Technology
U12, U13	SN74LS195 4-bit shift register	Texas Instruments
U14	SN74LS244 octal transceiver	Texas Instruments
R1	5.1K 10% ¼ watt resistor	Radio Shack
R2	56K 10% ¼ watt resistor	Radio Shack
R3, R8, R9, R11	10K 10% ¼ watt resistor	Radio Shack
R4	27K 10% ¼ watt resistor	Radio Shack
R5	100K potentiometer	Radio Shack
R6, R7	1K 10% ¼ watt resistor	Radio Shack
R10, R12	200Ω 10% ¼ watt resistor	Radio Shack
C1, C2, C6, C7	0.1 µF ceramic cap	Radio Shack
C3	50 µF electrolytic 35V	Radio Shack
C5	25 µF electrolytic 35V	Radio Shack
S1	DPDT miniature switch	Radio Shack
S2, S3	SPST momentary push-button	Radio Shack
S4, S5	SPDT miniature switch	Radio Shack
Q1, Q2	2N2222A NPN transistor	Texas Instruments
D1	red LED (20 mA)	Radio Shack
P1, P2	miniature phone jacks	Radio Shack

The etched and drilled double-sided PC board is available for $18 from JDM Electronics, 1974 Alpet Drive, Morgan Hill CA 95037. Add $1.50 for shipping. The U9 EEPROM is available from JDM Electronics for $7 (no charge for shipping). The complete Brass Pounder's Keyer is available in kit form (less chassis) from JDM Electronics for $70 unassembled and $85 assembled and tested, plus $2.50 shipping.

COMMUNICATIONS ELECTRONICS INC.™

Emergency Operations Center has expanded to our new two acre facility and World Headquarters. Because of our growth, CEI is now your *one stop source* for emergency response equipment. When you have a command, control or communications need, essential emergency supplies can be rushed to you by CEI. As always, for over twenty two years, we're ready, willing and able to help.

Our RELM two-way radio transceivers were especially created for government agencies. When you need to talk to police, fire, ambulance, or state, federal and international response forces, RELM transceivers may be quickly programmed for up to 48 frequencies. Listed below, are some of our most asked about transceivers. For additional assistance, call CEI at 313-996-8888.

NEW! RELM® RSP500-A

List price $465.00/**CE price $319.95/SPECIAL**
20 Channel • 5 Watt • Handheld Transceiver
Frequency range: 148-174 MHz. continuous coverage. Will also work 134-148 MHz. with reduced performance.
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.

NEW! RELM® UC102/UC202

List price $128.33/**CE price $79.95/SPECIAL**
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.

RELM® Programming Tools

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.*

★★★ *Uniden CB Radios* ★★★

The *Uniden* line of Citizens Band Radio transceivers is designed to give you emergency communications at a reasonable price. Uniden CB radios are so reliable they have a two year limited warranty.

PRO310E-A3 *Uniden* 40 Ch. Portable/Mobile CB . . . $72.95
PRO330E-A3 *Uniden* 40 Ch. Remote mount CB . . . $99.95
GRANT-A3 *Uniden* 40 channel SSB CB mobile $152.95
WASHINGTON-A *Uniden* 40 ch. SSB CB base . . . $209.95
PC122-A3 *Uniden* 40 channel SSB CB mobile . . . $113.95
PC66A-A *Uniden* 40 channel CB Mobile $78.95
PRO510XL-A3 *Uniden* 40 channel CB Mobile $34.95
PRO520XL-A3 *Uniden* 40 channel CB Mobile $49.95
PRO535E-A *Uniden* 40 channel CB Mobile. $73.95
PRO538W-A *Uniden* 40 ch. weather CB Mobile . . . $78.95
PRO640E-A3 *Uniden* 40 ch. SSB CB mobile $133.95
PRO810E-A *Uniden* 40 channel SSB CB Base . . . $174.95

★★★ *Uniden Radar Detectors* ★★★

Buy the finest *Uniden* radar detectors from CEI today.
CARD-A3 *Uniden* credit card size radar detector. . . $127.95
RD3XL-A3 *Uniden* 3 band radar detector. $124.95
RD9GTL-A *Uniden* "Passport" size radar detector . . . $89.95
RD9XL-A3 *Uniden* "micro" size radar detector . . . $107.95
RD25-A *Uniden* visor mount radar detector $54.95

Bearcat® 200XLT-A

List price $509.95/**CE price $239.95/SPECIAL**
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.

NEW! Uniden® MR8100-A

Call 313-996-8888 for special CEI pricing
12-Band, 100 Channel • Surveillance scanner
Bands: 29-54, 116-174, 406-512, 806-956 MHz.
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.

NEW! Ranger® RCI2950-A3

List price $549.95/**CE price $259.95/SPECIAL**
10 Meter Mobile Transceiver • Digital VFO Full Band Coverage • All-Mode Operation Backlit liquid crystal display • Repeater Splits RIT • 10 Programmable Memory Positions
Frequency Coverage: 28.0000 MHz. to 29.6999 MHz.
The *Ranger* RCI2950 Mobile 10 Meter Transceiver has everything you need for amateur radio communications. The RF power control feature in the RCI2950 allows you to adjust the RF output power continuously from 1 watt through a full 25 watts output on USB, LSB and CW modes. You get a noise blanker, roger beep, PA mode, mike gain, digital VFO, built-in S/RF/MOD/SWR meter. Frequency selections may be made from a switch on the microphone or the front panel. The RCI2950 gives you AM, FM, USB, LSB or CW operation. For technical info, call Ranger at 619-259-0287.

RELM LMV2548B Only $289.95

OTHER RADIOS AND ACCESSORIES

XC365-A *Uniden* Ultra Clear Plus Cordless Phone. . . $89.95
CT785S-A *Uniden* speakerphone cordless phone. . . $109.95
BC55XLT-A *Bearcat* 10 channel scanner $114.95
AD100-A Plug in wall charger for BC55XLT. $14.95
PS001-A Cigarette lighter cable for BC55XLT $14.95
VC001-A Carrying case for BC55XLT. $14.95
BC70XLT-A *Bearcat* 20 channel scanner. $159.95
BC142XL-A *Bearcat* 10 ch. 10 band scanner $84.95
BC147XLT-A *Bearcat* 16 ch. 10 band scanner $94.95
BC172XL-A *Bearcat* 20 ch. 11 band scanner. $134.95
BC177XLT-A *Bearcat* 16 ch. 11 band scanner . . . $134.95
BC590XLT-A *Bearcat* 100 ch. 11 band scanner. . . . $194.95
BC760XLT-A *Bearcat* 100 ch. 12 band scanner. . . . $254.95
BC002-A CTCSS tone board for BC590/760XLT $54.95
BC003-A Switch assembly for BC590/760XLT $22.95
BC855XLT-A *Bearcat* 50 ch. 12 band scanner . . . $199.95
BC1-A *Bearcat* Information scanner with CB $129.95
BC330A-A *Bearcat* Information scanner $99.95
BC560XLT-A *Bearcat* 16 ch. 10 band scanner $94.95
BP205-A Ni-Cad batt. pack for BC200/BC100XLT. . . $39.95
TRAVELLER2-A *Grundig* shortwave receiver $89.95
COSMOPOLIT-A *Grundig* shortwave receiver $199.95
SATELLIT500-A *Grundig* shortwave receiver $679.95
SATELLIT650 *Grundig* shortwave receiver. $949.95
ATS803A-A *Sangean* shortwave receiver. $159.95
74102-A *Midland* emergency weather receiver $39.95
77116-A *Midland* CB with VHF weather & antenna. . . $66.95
77118-A *Midland* CB mobile with VHF weather $62.95
77913-A *Midland* CB portable with VHF weather $79.95
76300-A *Midland* CB base station $92.95
FBE-A Frequency Directory for Eastern U.S.A. $14.95
FBW-A Frequency Directory for Western U.S.A. $14.95
RFD1-A MI, IL, IN, KY, OH, WI Frequency Directory . . . $14.95
RFD2-A CT, ME, MA, NH, RI, VT Directory $14.95
RFD3-A DE, DC, MD, NJ, NY, PA, VA, WV Dir. $14.95
RFD4-A AL, AR, FL, GA, LA, MS, NC, PR, SC, TN, VI . . . $14.95
RFD5-A AK, ID, IA, MN, MT, NE, ND, OR, SD, WA, WY . . . $14.95
RFD6-A CA, NV, UT, AZ, HI, GU Freq. Directory. . . . $14.95
RFD7-A CO, KS, MO, NM, OK, TX Freq. Directory $14.95
PWB-A Passport to World Band Radio $16.95
ASD-A Airplane Scanner Directory. $14.95
TSG-G7 "Top Secret" Registry of U.S. Govt. Freq. . . . $16.95
TTC-A Tune in on telephone calls. $14.95
CBH-A Big CB Handbook/AM/FM/Freeband. $14.95
TIC-A Techniques for Intercepting Communications . . . $14.95
RRF-A Railroad frequency directory $14.95
EEC-A Embassy & Espionage Communications. . . . $14.95
SMH-A2 Scanner Modification Handbook, Vol. 2 . . . . $18.95
LIN-A Latest Intelligence by James E. Tunnell. $16.95
A60-A Magnet mount mobile scanner antenna $34.95
A70-A Base station scanner antenna $34.95
USAMM-A Mag mount VHF ant. w/ 12' cable $39.95
USAK-A ¾" hole mount VHF ant. w/ 17' cable $34.95

Add $4.00 shipping for all *accessories* ordered at the same time. Add $15.00 shipping per radio and $4.00 per antenna.

BUY WITH CONFIDENCE

Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically or equivalent product substituted unless CEI is instructed differently. A $5.00 additional handling fee will be charged for all orders with a merchandise total under $50.00. Shipments are F.O.B. CEI warehouse in Ann Arbor, Michigan. No COD's. Not responsible for typographical errors.

Mail orders to: Communications Electronics,™ Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add $15.00 per radio for U.P.S. *ground* shipping and handling in the continental U.S.A. For Canada, Puerto Rico, Hawaii, Alaska, or APO/FPO delivery, shipping charges are two times continental U.S. rates. If you have a Discover, Visa, American Express or MasterCard, you may call and place a credit card order. 5% surcharge for billing to American Express. For credit card order, call toll-free in the U.S. Dial 800-USA-SCAN. For information call 313-996-8888. FAX anytime, dial 313-663-8888. Order today.

Sale dates 3/15/91 — 10/31/91 AD #032591-A

For more information call 1-313-996-8888

Communications Electronics Inc.
Emergency Operations Center
P.O. Box 1045 □ Ann Arbor, Michigan 48106-1045 U.S.A.
For orders call 313-996-8888 or FAX 313-663-8888

CIRCLE 121 ON READER SERVICE CARD

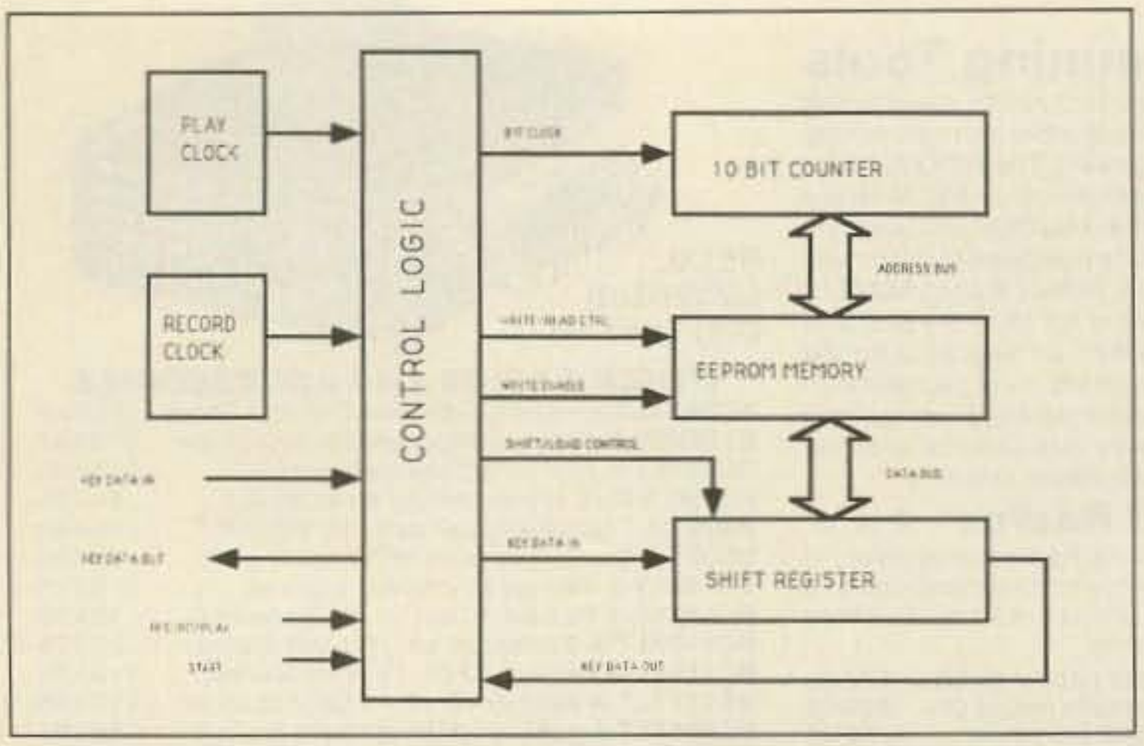


Figure 1. Functional block diagram of Brass Pounder's Keyer.

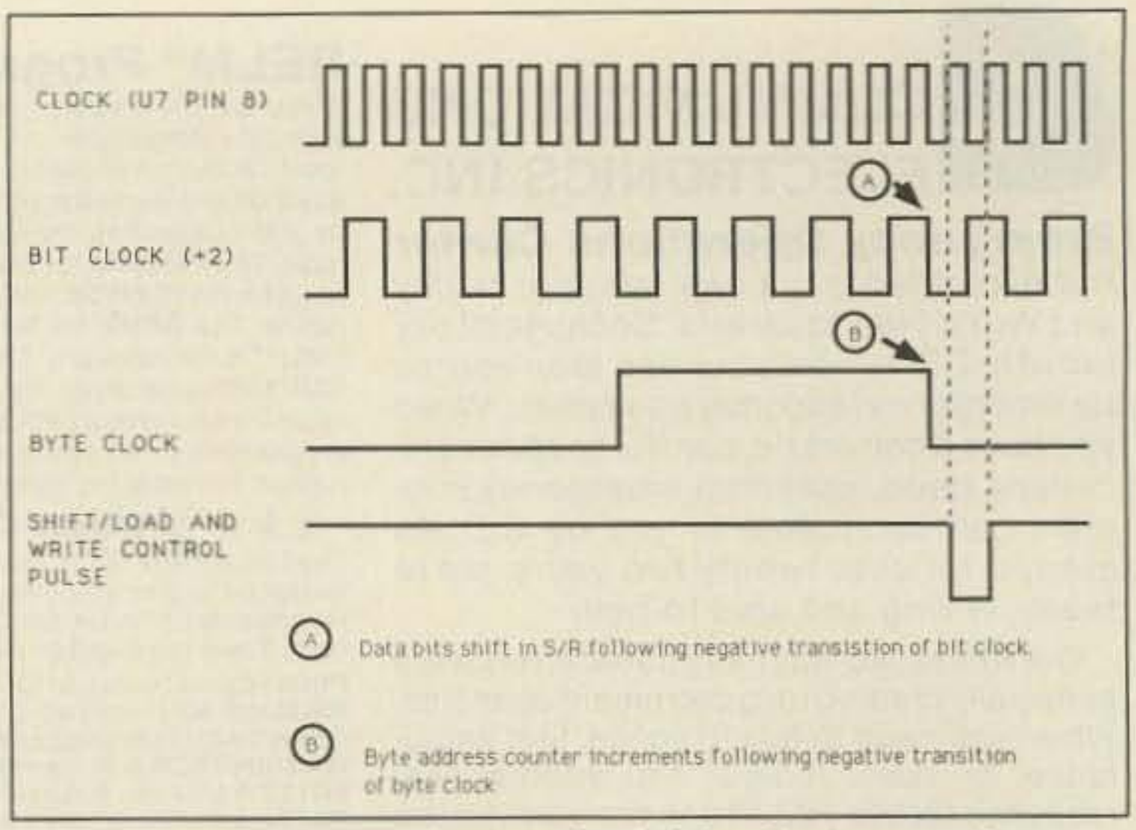


Figure 2. Timing diagram for shift/load/write control.

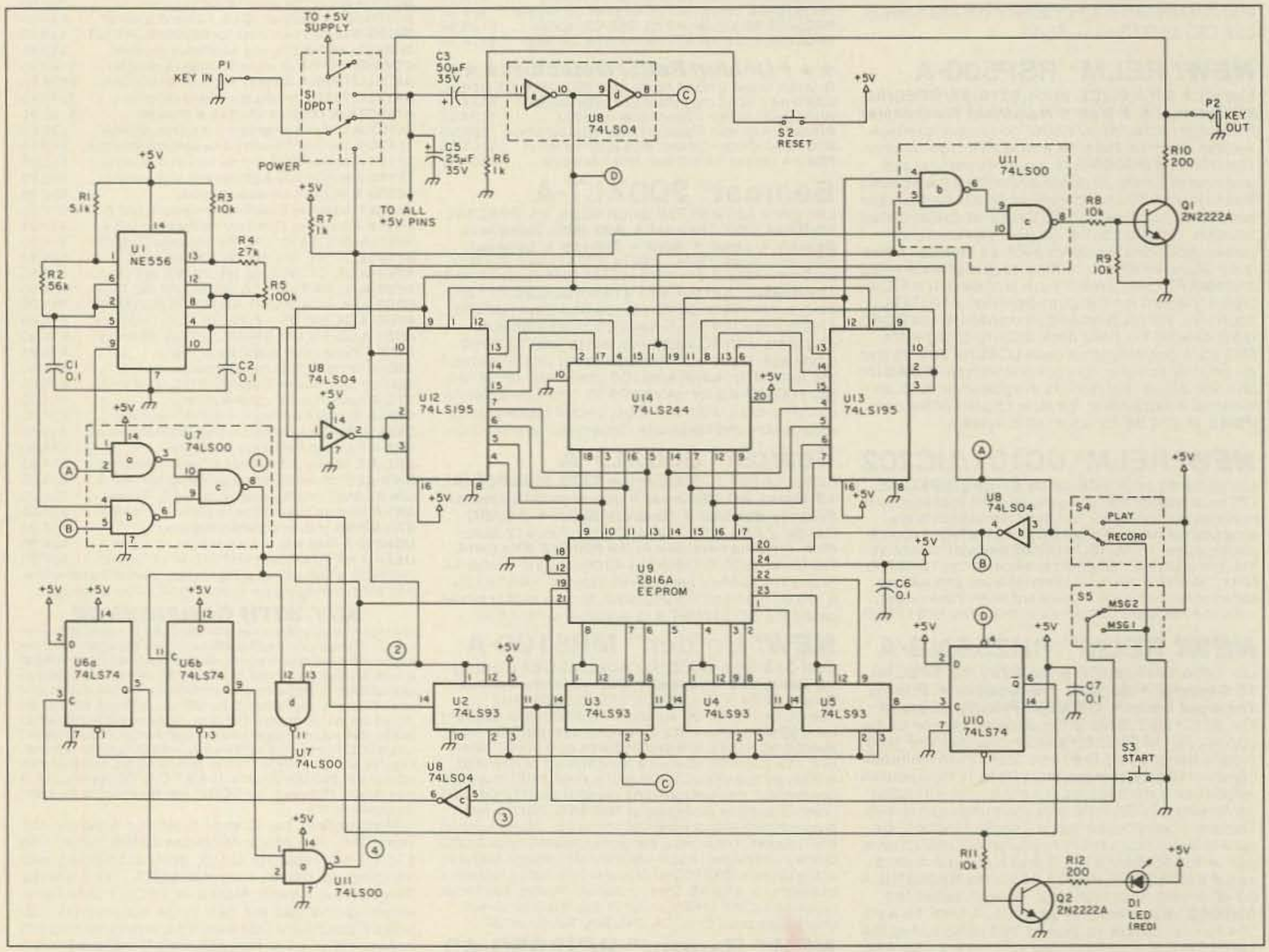


Figure 3. Schematic diagram.

EEPROM in order to seamlessly transfer the serial stream into the memory.

The first task of collecting the serial data into 8-bit bytes is accomplished by a shift register controlled by the record clock. The data recorded in the shift register is a logical "1" when the key is depressed, and a logical "0" when the key is open. After eight clock pulses, the shift register has a complete byte of information and is ready to be transferred to an address location in the EEPROM. This is accomplished by the record/play control logic, which momentarily inhibits shifting of any new serial data into the register, loads the contents of the shift register into one of the 1,024 memory locations of the EEPROM, and moves the EEPROM address to the next highest address by incrementing the 10-bit counter. All of this operation is performed synchronously between the end of the eighth shift register clock pulse, and before the beginning of the next shift register clock pulse. This will allow for continuous recording of the keyed data.

In the record mode, the keyer will, once started, continue to "walk" through all 1,024 address locations, recording all data presented to the input of the shift register. This takes approximately two minutes. At the completion of the 1,024th address, the clocks will automatically stop and recording is complete.

In playback mode, a reverse operation is

THE JAPAN RADIO CO.

NRD-535

THE NEXT GENERATION IN HIGH-PERFORMANCE HF RECEIVERS

Once again JRC breaks new ground in shortwave receiver design. The new NRD-535 has all the features SWLs and amateurs have been waiting for. General coverage from 0.1 to 30 MHz in AM, USB, LSB, CW, RTTY, FAX and Narrow FM modes. Advanced ECSS operation for phase-lock AM reception. Variable bandwidth control (BWC). Tuning accuracy to 1 Hz possible with direct digital synthesis. 200 memory channels with scan and sweep operation. Triple Superheterodyne receiving system. Superb sensitivity, selectivity and image rejection. Dual-width noise blanker eliminates impulse noise. Squelch, RF Gain, Attenuator, AGC and Tone controls. Optional RTTY demodulator available. 24 hour clock/timer. Easy to read vacuum fluorescent display with digital S-meter. AC and DC operation. Plus the most comprehensive computer interface found on any radio to date. Call or write today for a full color brochure, price list and dealer information.

JRC Japan Radio Co., Ltd.

MAIN OFFICE: Akasaka Twin Tower (Main), Akasaka 2-chome, Minato-ku, Tokyo 107, JAPAN
Tel.: (03) 584-8836 Telex: 242-5420 JRCTOK J

IN U.S.A.: 430 Park Avenue (2nd Floor), New York, NY 10022
Tel.: (212) 355-1180 FAX: (212) 319-5227 Telex: 961114 JAPAN RADIO NYK

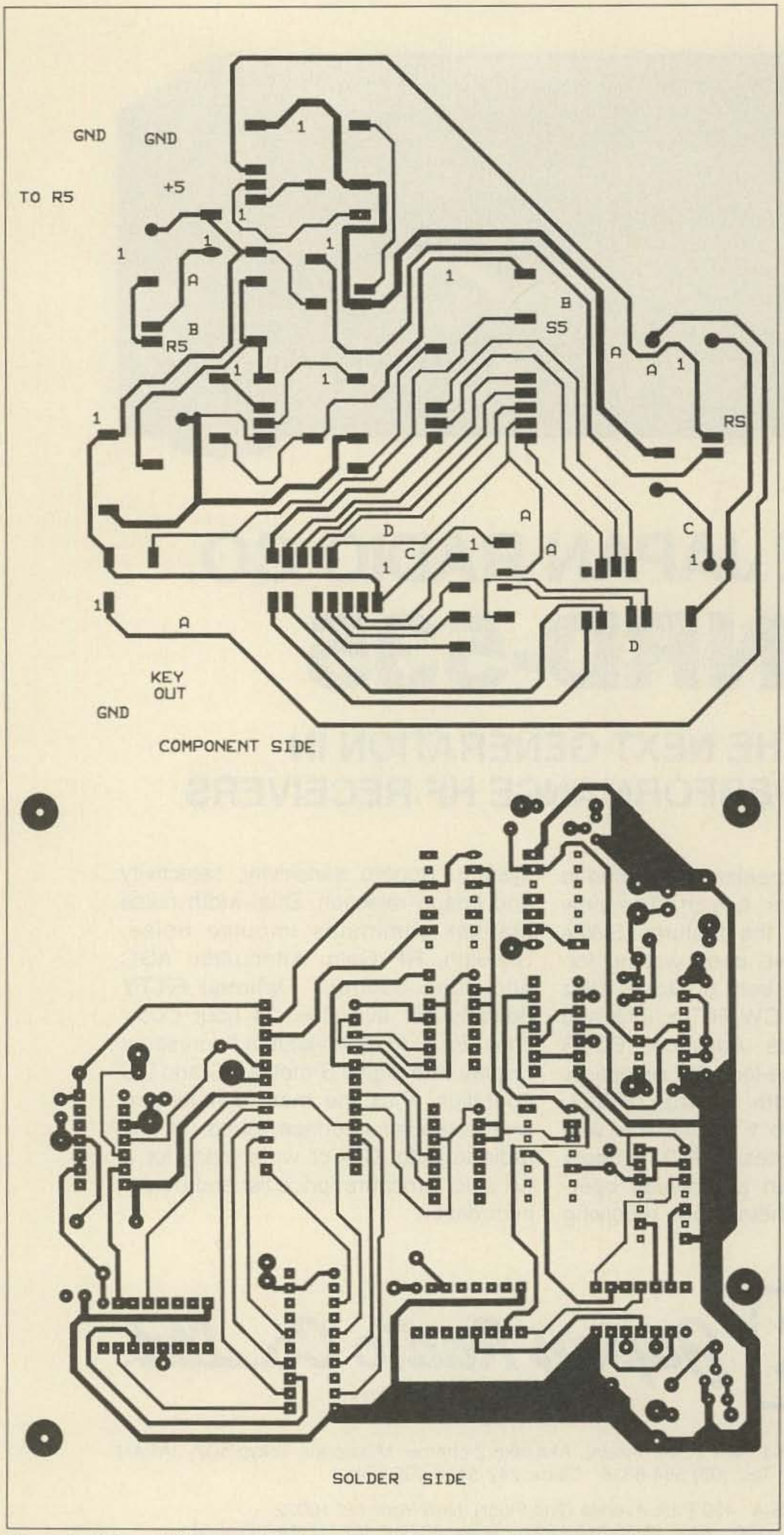


Figure 4. PC board foil patterns. Top layer (a) and bottom layer (b). Note: All pads on top layer must be soldered. Letters 'A' through 'D' indicate jumper locations.

needed. In this case, the data stored in the EEPROM will be coming out in byte parallel format and will have to be converted to bit serial. This is accomplished by first downloading the byte information from the EEPROM into the same shift register originally used to collect a byte of data from the input serial stream, and then serially shifting this information out to the key input of your rig.

In the playback mode, the play clock allows the operator to vary the playback speed. The play clock and the record/play control first transfer the contents of the first address location of the EEPROM to the shift register. This transfer is done between normal shift clock pulses, so as to make playback seamless. Following loading of the shift register, the data is then shifted out to the key-out jack. At the end of the eighth shift, the address counter is incremented and the next byte of information is loaded into the shift register. This process is continued until all 1,024 memory locations have been loaded and shifted to the key-out jack, at which time the keyer automatically stops.

Operation

The complete Brass Pounder's Keyer schematic is shown in Figure 3. Integrated circuit U1 is a NE556 dual timer that provides both the record and play clocks. The clock output of pin 5 is controlled by R1, R2 and C1. The values of these circuits provides a clock of approximately 50 Hz. R3, R4, R5 and C2 provide the variable clock with an approximate frequency range of 20 to 200 Hz. The record clock of 50 Hz was selected to provide high resolution of incoming hand-key code of up to 30 wpm, while still allowing a total of four minutes of recording from the EEPROM memory.

Clock selection, memory write and register load signals are provided by U2, U7, U6, and a portion of U8. The clock selection circuit of U7 is controlled by the record/play switch, S4. The chosen clock appears at pin 8 of U7. The clocks are turned on by control signals applied to pins 4 and 10 of U1. This is controlled by flip/flop U10. The clock starts when S3 is momentarily depressed and will run until the 1,024th count. At the end of the 1,024th count, the low-to-high transition at Pin 8 of U5 will flip U10 and stop the clocks at U1. The clocks can be restarted by momentarily depressing S3, thus resetting the U10 flip/flop.

The flip/flops and the 4-bit counter at U2 are used to provide the shift register load/EEPROM write pulse. This design was used to provide a synchronous control pulse between bit clock shifts and memory address byte shift commands. The output control pulse is present at pin 3 of U11. Figure 2 shows the timing diagram. This control pulse is applied to the EEPROM write enable signal (pin

FLYWEIGHT BODY with HEAVYWEIGHT FEATURES

Alinco's New DJ-F1/F4T Realized Super Compact Body and Plenty of Features including:

***40 Memory Channels** store Frequency, Shift direction, Split operation Setting, Tone encoder/Tone decoder setting (with optional Tone squelch unit), DSQ setting, Tone frequency and Offset frequency independently.

***Digital Signal Display and Memory Function**
The DJ-F1T/F4T has special memory channels for transmitting, receiving, and store "Two Digit" DTMF Tones, for communication messages. This feature allows for the DJ-F1T/F4T to receive a "Two Digit" message and display it at any later time, at the convenience of the operator.

***Wide Band Receiving range**
F1T:140-170MHz(AM Mode 118-136MHz after modification)
F4T:430-460MHz

*Battery Pack Lock
*Pager and Code Squelch
*Triple Stage Selective Power Output
*5W Output Power with Optional Battery Pack EBP-18N
*8 Scan Modes
*Programmable VFO Range Function
*Battery Save Function
*Six Channel Steps - 5, 10, 12.5, 15, 20, and 25KHz
*Priority Function (Dual Watch)
*Automatic Power Off (Programmable Timed)
*Automatic Dialer Function
*Illuminated DTMF Keypad
*Many Optional Accessories such as:
EMS-8:Remote Control Speaker/Mic.
EME-11:Earphone/Mic. with PTT/VOX
EME-10:Headset with PTT/VOX
EJ-2U:Tone squelch Unit
EDC-33:Quick Charger (Compatible with standard battery pack)

and many more. . . . .

DJ-F1T

DJ-S4T

DJ-S1T/S4T is Simple Type and Low-Priced But Offers Features such as:

*5W Output Power with Optional Battery Pack EBP-18N
*Triple Stage Slective Power Output
*Dry Cell Battery Case Lock
*Programmable VFO Range Function
*Frequency Lock, PTT Lock Function
*One Touch Squelch De-Activation Function
*8 Scan Modes
*Wide Band Receiving Range

Available Features with Optional DTMF Unit (DJ-10U) and DTMF Keypad (ESK-1) Include:

*Pager and Code Squelch
*Digital Signal Display and Memory Function
*Automatic dialer Function
*Many Optional Accessories Available

•Specifications

Frequency Range:
DJ-F1T/S1T
TX:144-148MHz
RX:140-170MHz (AM Mode 118-136MHz after Modification)
DJ-F4T/S4T
TX:440-450MHz
RX:430-460MHz

Output Power:
* with Battery Pack EBP-16N (Standard for F1T/F4T)
Hi:2W(F1T/S1T) 1.5W(F4T/S4T)
Mid:1W Low:0.1W
* with Optional Battery Pack EBP-18N
Hi:5W Mid:1W Low:0.1W
* at 9V
Hi:2.5W(F1T/S1T) 2W(F4T/S4T)
Mid:1W Low:0.1W

Weight:
DJ-F1T/F4T Approx.:13.2 oz.: with Standard Battery Pack
DJ-S1T/S4T Approx.:13 oz.: with Dry Battery case

Dimensions:
4.3(H) × 2.1(W) × 1.5(D) inch (Without Projections)

Specifications and features are guaranteed for amateur bands only and subject to change without notice.

ALINCO ELECTRONICS INC.
438 AMAPOLA AVE. LOT 130
TORRANCE, CALIFORNIA 90501
Phone: 213-618-8616
FAX : 213-618-8758

STAY TUNED with

ALINCO

CIRCLE 67 ON READER SERVICE CARD

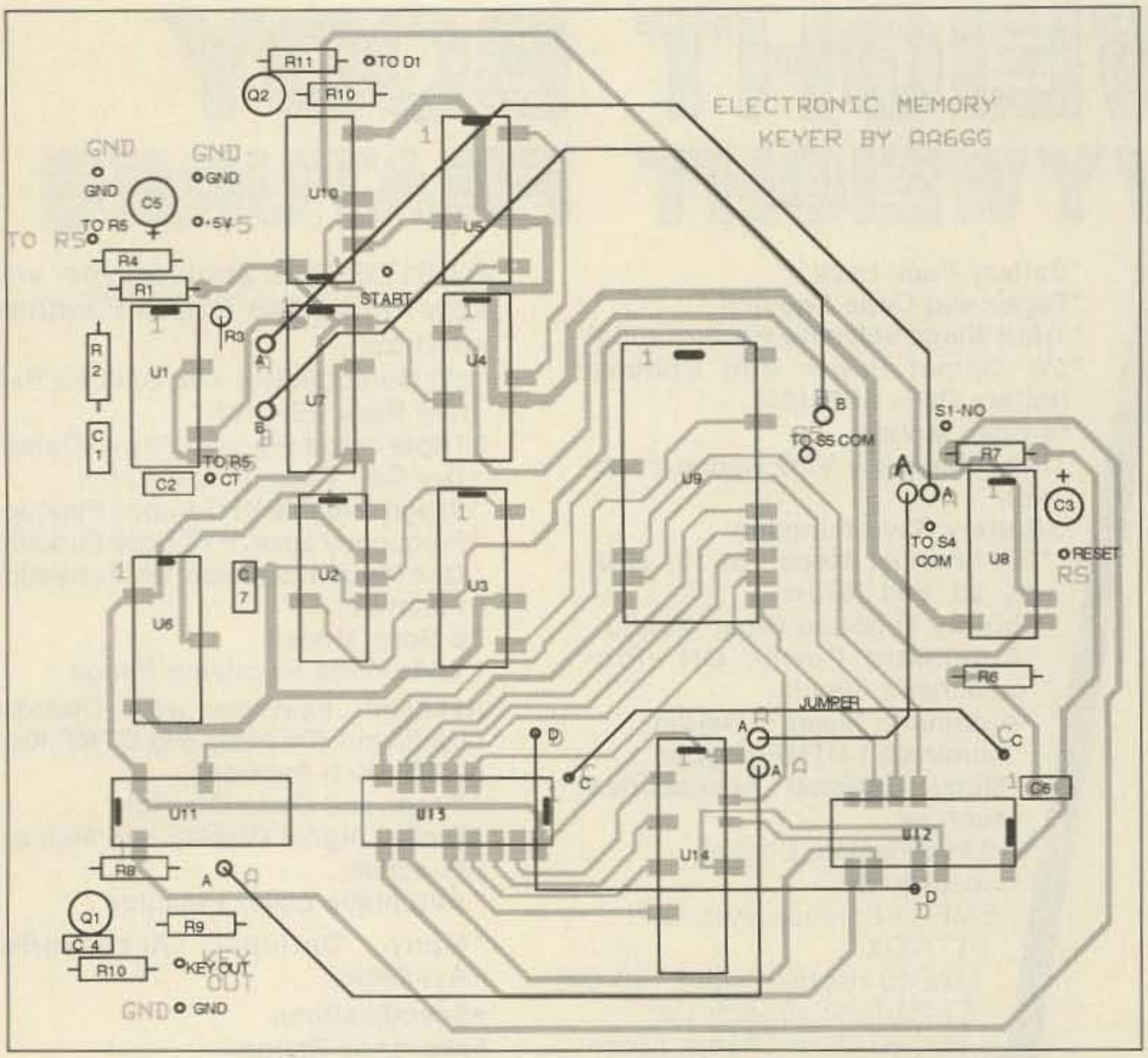


Figure 5. Parts placement (component side). Lines indicate jumper wire locations.

21 of U9), as well as the shift/register load control pin 9 of U12 and U13.

ICs U3, U4 and U5 form the 10-bit counter used to increment the address data for the EEPROM U9. The outputs of the 10-bit counter are fed into the address inputs of the 2816 EEPROM.

Data from the operator is entered into J1. The power switch, S1, is a DPDT device that allows the key to be "hard wired" directly to the key-out jack when the keyer is turned off. C3 and R4 are used to provide a momentary reset pulse to all flip/flops, counters and registers when power is first applied.

During record operation, data is fed into the first 4-bit shift register U12, and clocked by the bit clock applied from U2 pin 1. In the record mode, transceiver U14 is presenting output data from U12 and U13 in anticipation of the memory load pulse. This is accomplished by applying a low signal at pins 1 and 19 of U14.

At the end of the eighth bit clock, a write enable control pulse is generated from U11 pin 3. The EEPROM U9 then automatically latches address and data signals, erases previous contents in the addressed byte, and writes the data presented in the I/O lines to the previously specified address from U3, U4 and U5.

This record cycle will repeat until the counters U3, U4 and U5 complete 1,024 counts, at which time a low-to-high transition of U5 pin 8 will flip U10 and stop the clocks at U1.

The 2816 EEPROM (U9) is capable of storing 2,048 bytes of data, enough for four minutes of code. In the hand keyer, I elected to have a hard wire selection of two messages, each approximately two minutes long. Message selection is accomplished by S5, which is tied to the highest order address pin of U9. If your application requires a single longer message, S5 can be removed and pin 19 of U9 can be attached to U5 pin 8. In this mode, U5 pin 11 should be connected directly to U10 pin 3. These connections will allow for a single message in excess of four minutes.

During playback mode, data from the 2816 EEPROM is presented to U12 and U13, and block-loaded by the load control signal applied to pin 9 of U12 and U13. Data is then clocked out serially to J2 via the play bit clock.

The control gate of U11 pin 6 inhibits shifted data from being presented to the output during the record mode and, instead, presents the key-in signal directly to the key-out jack. The reason for doing this is to allow the operator's keying to be directly presented to the rig so that the audio tone is coincident with the operator's keying. When I first breadboarded the Brass Pounder's Keyer, I didn't have this feature, so I "heard" my keying delayed by eight-bit clock times (approximately one-quarter of a second). From firsthand experience, I can tell you that it's difficult to key code when the audio feedback is delayed by a quarter of a second! This circuit eliminated that phenomenon.

Another feature of this circuit is that it allows you to "send over" your recorded message. I found this useful, for example, when injecting RST data into my canned first response on CW QSOs.

Transistor Q1 is a garden variety 2N2222A with a small collector resistor R10, just in case I accidentally connect the output jack directly to a high-current voltage source.

The Brass Pounder's Keyer is powered by a 5 volt power supply. For my application, I connected directly to a 5 volt power supply. I also experimented with using four 1.5 volt AA Alkaline batteries, with a silicon diode in series with the load to drop the output voltage to approximately 5.4 VDC. The hand keyer consumes approximately 100 mA in standby, and about 160 in record or play. I ran the hand keyer continuously with these batteries and found that the battery life was equivalent to about 250 continuous messages. With my CW activity, I felt that I could do at least 250 messages in about three months, so I elected to use the power supply. If your usage is significantly less, and you don't have a 5 volt power supply in your shack, perhaps the internal battery pack would suit the application. Power dissipation can be reduced, obviously by removing the LED indicators. A more significant reduction can be achieved by replacing the low power Schottky devices with CMOS logic. The ready availability and extreme low cost of 74LS logic, however, was more personally persuasive when I did the first design.

Construction

For my prototype, I chose to use wire wrapping. The advantages of wire-wrapping the keyer are both speed and density. I was able to mount the wire-wrap sockets on the punched phenolic board and wire-wrap all 14 sockets in one evening. In addition, I could place the ICs side by side for maximum packing density.

The disadvantage is cost. The wire-wrap sockets ended up costing me more than some of the TTL 74LS products! The speed of assembly, however, finally persuaded me to use wire wrapping.

Another potential disadvantage (for those of us whose mind wanders from time to time during construction) is during trouble shooting. Digital circuits can behave very strangely with just one wire-wrap error, and finding the error in the rat's nest of a typical wire-wrapped board is a real challenge.

I completed the wire-wrapping project with (for me) the normal amount of de-bug headaches. To minimize construction problems for *73* readers, we decided to contract a printed circuit board design for this project, using Fred Reimers of FAR Circuits. The resulting double-sided board is shown in Figure 4. *[Note: Since the PC board doesn't have plated-through holes, it is necessary to solder the IC pins on the top layer as well, wherever a pad exists. Likewise, solder any wires both top and bottom if there is a pad on the top layer. Also be sure to run jumper wires between the lettered points as shown in Figure 5. Although the jumper wires in Photo B.*

Continued on page 32

DIGITAL VOICE RECORDER

VERY SIMPLE

Due to its advanced circuit design, the operation of the DVM-58C Digital Voice Recorder is as easy as 1-2-3.

1. Connect DC power source
2. Hook up a microphone
3. Start recording

(and, believe it or not, it's done!)

VERY USEFUL

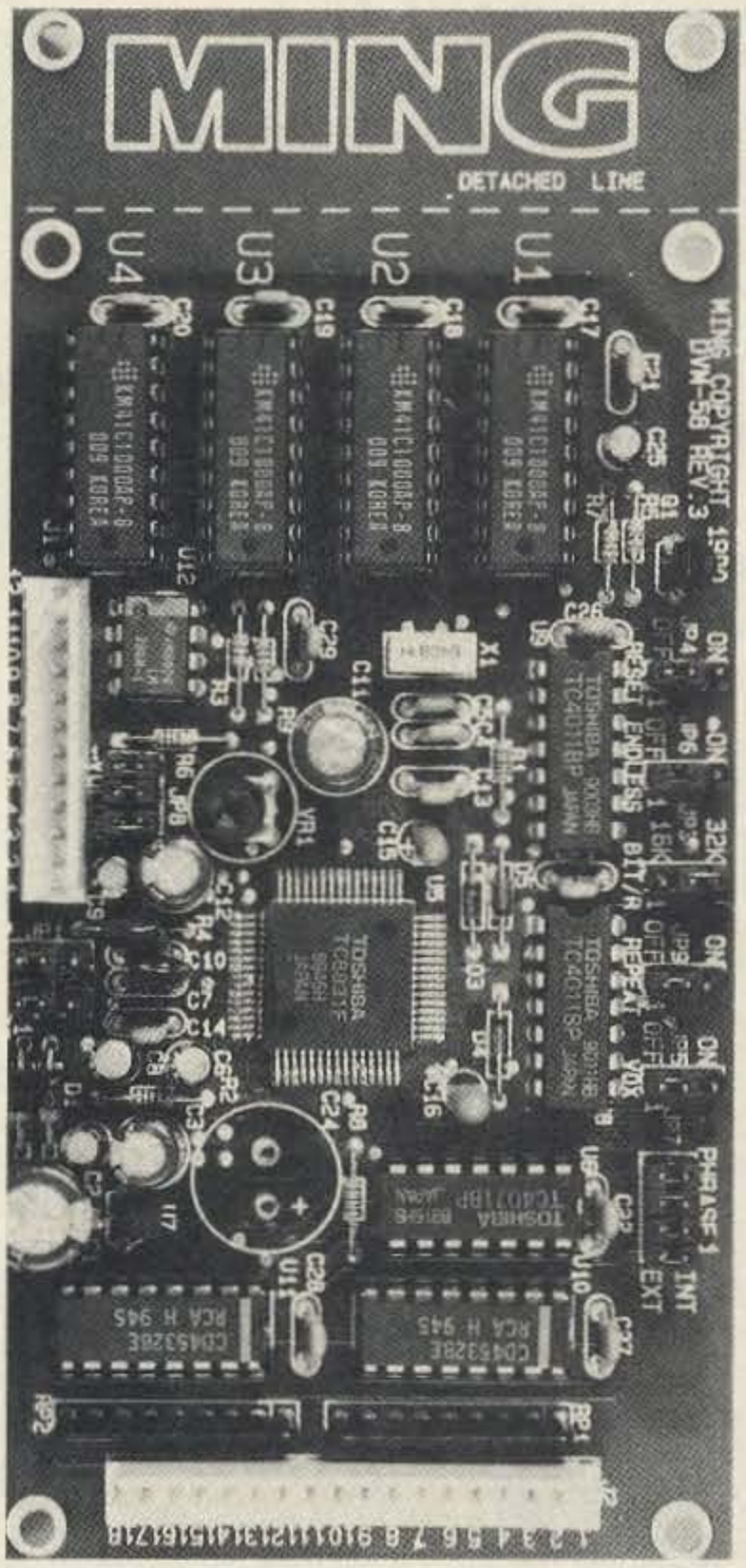
When you need something for your projects or any "Top Secret" invention, the DVM-58C is your best solution for all the followings:

1. Instant recording and playing, no rewind, no hassles.
2. Multiple message applications.
3. HAM radio communications.
4. CB radio communications.
5. Telephone applications.
6. Verbal instruction and warning systems

VERY ECONOMICAL

UNDER **$90**

with 1 Meg DRAM onboard.
(Additional DRAMs available at extra charge)



VERY POWERFUL

State-of-the-art technology & circuit design make the DVM-58C Digital Voice Recorder very powerful, compare following features:

- Very low standby current - only 8mA w/ 4 Mega DRAM.
- On board 0.5W audio amplifier w/ volume control (internal or external).
- ADM (Adaptive Delta Modulation).
- Selectable 16K/32K bps sampling rate.
- Memory expendable up to 4 Mega DRAM which gives you total of 2 minutes recording at 32K bps.
- Selectable "REPEAT" mode switch.
- 16 variable length messages each w/ direct triggering terminal enables you to play back any one of the messages at anytime you want -instantly.
- Selectable "VOX" automatically starts recording when you start talking.
- "AUTOMATIC RESET" simplifies single message recording operation.
- EOS (End of Sentence) output lets you control other device at end of the message in play back mode.
- "ENDLESS RECORDING" option allows continuous recording that can be stopped at any time to review past conversation.
- Reserved space for 0.1F/5.5V Gold Capacitor used for memory back-up system during short power failures.
- PCB dimensions 5.75" X 2.75" X 0.5".

RE-DEFINING RADIO COMMUNICATIONS

Call for dealer nearest you.

(818) 912-7756

Sales Office
1661 Hanover Rd., Suite 227
City of Industry, CA 91748
(818) 912-7756
(818) 912-9378 FAX

MASTER THE IMPOSSIBILITIES

MING
Engineering & Products, Inc.

Corporate Headquarters
977 S. Meridian Ave.
Alhambra, CA 91803
(818) 570-0058
(818) 576-8748 FAX

AD0491-1

CIRCLE 297 ON READER SERVICE CARD

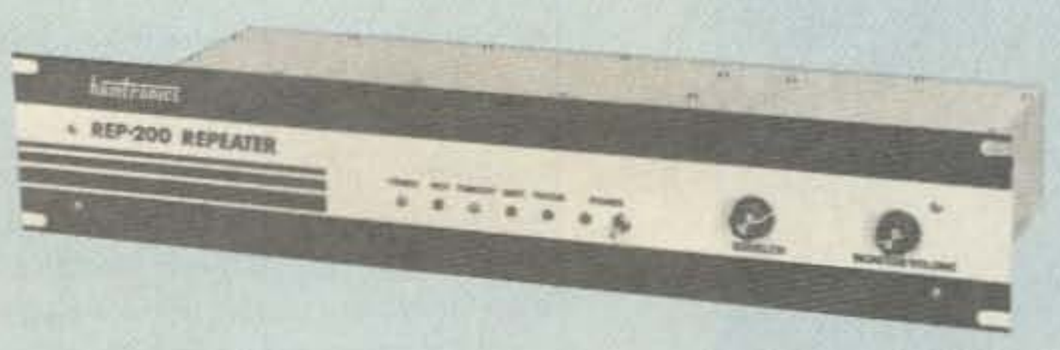
If you always thought a microprocessor-controlled repeater had to be expensive, LOOK AGAIN! You could easily spend this much just for a controller.

REP-200 REPEATER

A premium repeater with autopatch and many versatile dtmf control features at *less than many charge for a bare-bones repeater!*

We don't skimp on rf modules, either! Check the features on R144 Receiver, for instance: GaAs FET front-end, helical resonators, sharp crystal filters, hysteresis squelch.

Kit $1095; w/t only $1295!

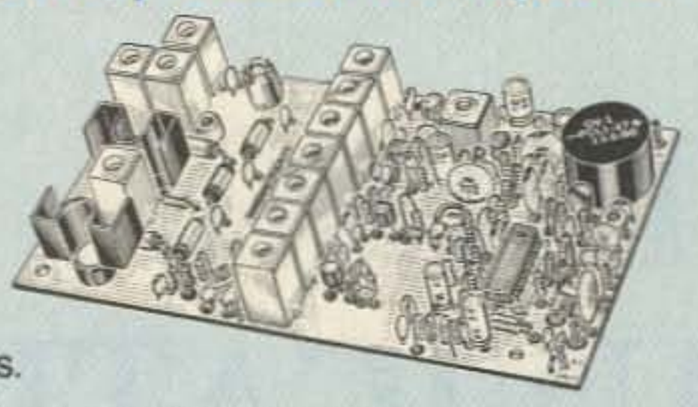


- Available for the 2M, 220MHz, 440MHz, 902MHz bands. ***FCC type accepted*** *(vhf and uhf commercial bands).*
- **Rugged exciter and PA**, designed for continuous duty.
- Power output 15-18W (25W option) on 2M or hi-band; 15W on 220MHz; 10W on uhf or 902MHz.
- Accessory add-on PA's available with **power levels up to 100W.**
- **Six courtesy beep types**, including two pleasant, sequential, multi-tone bursts.
- **AUTOPATCH**: either **open or closed** access, **toll-call restrict**, auto-disconnect.
- **Reverse Autopatch**, two types: auto-answer or ring tone on the air.
- **DTMF CONTROL**: over 45 functions can be controlled by touch-tone. Separate 4-digit control code for each function, plus extra **4-digit owner password**.
- **Owner can inhibit** autopatch or repeater, enable either open- or closed-access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr, and other options, including two auxiliary external circuits.
- The cwid message, dtmf command codes, and owner-specified default parameters for cor and cwid timers and tones are burned into the eprom at the factory.
- Cw speed and tone, courtesy beep and tail timers, and courtesy beep type **can all be changed at any time** by owner-password-protected dtmf commands.
- Many **built-in diagnostic** & testing functions using microprocessor.
- Color coded led's **indicate status** of all major functions.
- **Welded partitions** for exciter, pa, receiver, and controller. PEM nuts hold covers.
- 3-1/2 inch aluminum rack panel, finished in eggshell white and black.
- **Auxiliary receiver input** for independent control or **cross linking repeaters.**

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

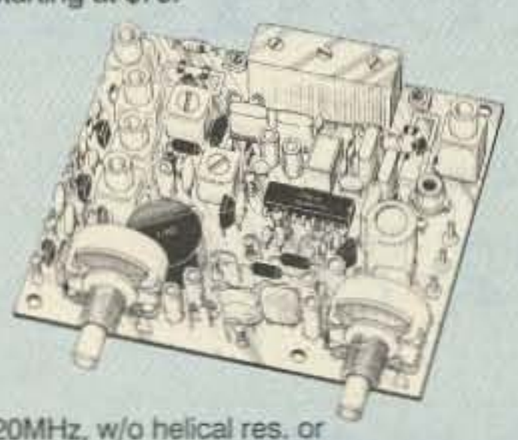
HIGH PERFORMANCE XMTRS & RCVRS FOR REPEATERS, AF & DIGITAL LINKS, TELEMETRY, ETC.

FM EXCITERS: kits $99, w/t $169. 2W continuous duty. TCXO & xtal oven options available. *FCC type accepted for com'l uhf & hi bands.*



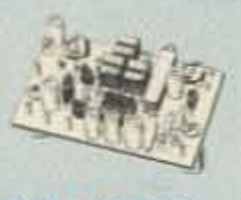
- **TA51** for 2M, 150-174, 220MHz.
- **TA451** for uhf.
- **TA901** for 902-928MHz, (0.5W out; w/t only).
- **VHF & UHF AMPLIFIERS.** For fm, ssb, atv. Output from 10W to 100W. Several models, kits starting at $79.

FM RECEIVERS: kits $139, w/t $189.

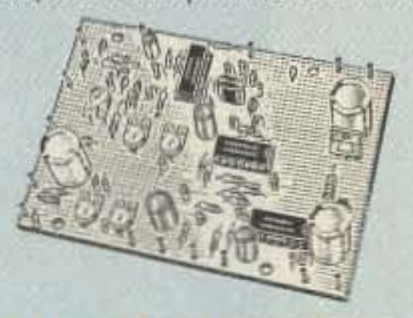


- **R144/R220 FM RECEIVERS** for 2M, 150-174, or 220MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift.
- **R451 UHF FM RCVR,** similar to above
- **R901 902-928MHz FM RCVR.** Triple-conversion, GaAs FET front end.
- **R76 ECONOMY FM RCVR** for 6M, 2M, 220MHz, w/o helical res. or afc. Kits $129.
- **R137 WEATHER SATELLITE RCVR** for 137 MHz. Kit $129, w/t $189.

ACCESSORIES

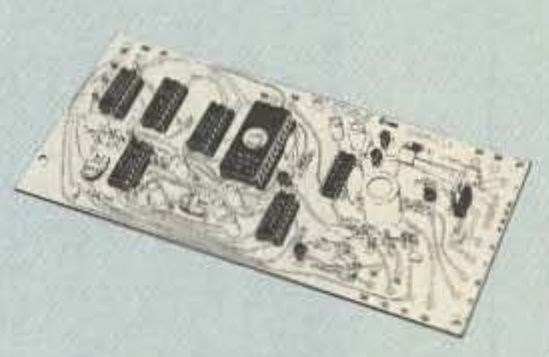


TD-3 SUBAUDIBLE TONE DECODER/ENCODER kit. Adjustable for any tone. Designed **especially for repeaters,** with remote control activate/deactivate provisions $24

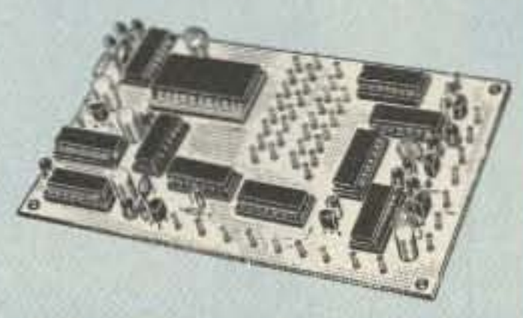


COR-3 REPEATER CONTROLLER kit. Features adjustable tail & time-out timers, solid-state relay, courtesy beep, and local speaker amplifier $49

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



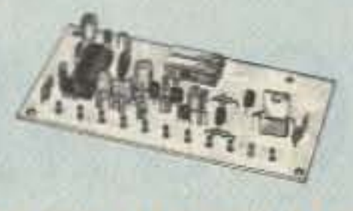
COR-4 kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call $99



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, tool $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

9600 BAUD DIGITAL RF LINKS. Low-cost packet networking system, consisting of new MO-96 Modem and special versions of our 220 or 450 mHz FM Transmitters and Receivers. Interface directly with most TNC's. Fast, diode-switched PA's output 15 or 50W.

GaAs FET PREAMPS

at a fraction of the cost of comparable units!

LNG-(*)

***ONLY* $59** wired/tested

FEATURES:
- **Very low noise:** 0.7dB vhf, 0.8dB uhf
- **High gain:** 13-20dB, depends on freq
- **Wide dynamic range** - resist overload
- **Stable:** low-feedback dual-gate FET

**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.

**Specify tuning range: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, or 400-500 MHz.*

LNS-(*) IN-LINE PREAMP

***ONLY* $79**/kit, **$99** wired/tested

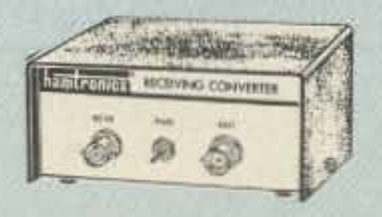
- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

**Specify tuning range: 120-175, 200-240, or 400-500 MHz.*

HELICAL RESONATOR PREAMPS

Preamps with 3 or 4 section helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRG-(*),** $49 vhf, $94 uhf.

**Specify tuning range: 142-150, 150-162, 162-174, 213-233, 420-450, 450-470.*



RECEIVING CONVERTERS

Low noise converters to **receive vhf and uhf bands on a 10M receiver.** Choice of kit with case & BNC jacks, kit with pcb only, or w/t unit in a case.

Request catalog for complete listings.

VHF input ranges avail: 136-138, 144-146, 145-147, 146-148; kit less case $39, kit w/case $59, w/t in case $89.

UHF input ranges avail: 432-434, 435-437, 435.5-437.5; kit less case $49, kit w/case $69, w/t in case $99.

TRANSMITTING CONVERTERS

XV2 for vhf and XV4 for uhf. Models to convert 10M ssb, cw, fm, etc. to 2M, 432, 435, and for atv. 1W output.

Kit only $79. PA's up to 45W available.

Request catalog for complete listings.

- For complete info, call or write for FREE 40-page catalog.
  Send $2 for overseas air mail. For casual interest, check reader service; allow 3-4 weeks.
- Order by mail, fax, or phone (9-12, 1-5 eastern time)
- Min. $3 S&H charge for first pound plus add'l weight & ins.
- Use VISA, Mastercard, check, or UPS C.O.D. ($3 fee).

OUR 29TH YEAR!

hamtronics, inc.

65 MOUL RD. - HILTON NY 14468-9535

Phone: 716-392-9430 -- FAX: 716-392-9420

CIRCLE 57 ON READER SERVICE CARD

A New Amateur Radio Magazine!

Radio Fun

Here's your chance to subscribe at a pre-publication rate to a brand new ham publication. The Premiere Issue alone should turn out to be worth several times the subscription price! The first issue of *73* is going for hundreds of dollars these days.

The pre-publication subscription price is only $9.97 for 12 issues! Not only that, but you'll get at least $25 in discount coupons as a bonus. That's right, you'll be able to save over double the subscription price when you order from Uncle Wayne's Bookshop and other *Radio Fun* supporting advertisers.

SO, WHAT'S IN IT?

If we sent you blank pages it would be a bargain, so what's the difference? Well, if you insist on looking a gift horse in the mouth, to coin a phrase, okay, here's what's in store for you.

First out, *Radio Fun* is aimed at helping newcomers to amateur radio to both get their higher class licenses and to have more fun with the tickets they have. This means we'll be running simple theory articles to help you actually learn how electronics and radio work. That's a lot better than memorizing the Q&A baloney and feeling dumb for the rest of your life. We're talking simple, so don't panic. Much of this will be the same as we'll be using to teach 5th-8th grade students about electronics and communications.

No, it isn't going to be all theory. The name is *Radio Fun*, so we'll be reviewing every kit we can get our hands on. The idea is to get you to buy, assemble and use all kinds of gadgets - some for amateur radio, some not. There's nothing like building to actually get familiar with electronics and turn book theory into practical understanding.

We'll have columns on activities which are geared to Novices and Techs. We'll be trying to get you involved with repeaters, packet radio, SSB on 2m, satellite communications, DXing on 10m, and stuff like that. We'll also be urging you to forget how much you hate the code and learn it Uncle Wayne's way so you can go on to General and Advanced tickets. How else can we get you up on 15m and 20m so you can help clean up the mess the Extras have made of those bands? We need your help...badly.

Yes, we'll be running stuff on QRP (rigs running under one watt), on hidden transmitter hunting, on how to cope with overbearing old timers at ham club meetings, on how to find parts, on how to put up simple antennas...things like that.

The Premiere Issue will be out in late April and the regular monthly issues will start in September. If you pass up this one you'll never forgive yourself. Just send your order with payment and we'll see that you get the big Premiere Issue, a wad of discount coupons, and our eternal thanks for helping a new ham publication get started. —Wayne W2NSD/1

☐ YES! Sign me up right now! 12 issues of *Radio Fun* for $9.97.

NAME _____ CALL _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

MC ___ Visa ___ Amex ___ Check ___ $10 cash ___ MO ___

CARD # _____ EXPIRES _____

Class License _____ Year licensed _____ *73* Subscriber _____

QST subscriber _____ *CQ* Subscriber _____

Mail to: *Radio Fun;* Forest Rd. Hancock, NH 03449

[Yes, you can call it in via 800-722-7790 or fax it to 603-525-4423]

Canada add $7.00 plus .70 GST. Foreign add $12.00 surface, $36.00 airmail. Newsstand Rate $18.00. Basic Subscription Rate $14.97. Premiere Issue available 4/91. Monthly publication begins 9/91.

RF004

Continued from page 28

were mounted on the bottom side (away from view), it's easier to mount them on the top side.] With the PC board, I was able to build a second unit in about one hour . . . and I didn't go blind trying to correct any wire-wrapping errors. The board level product worked perfectly. I built the board level keyer without using sockets. However, if you decide to use the printed circuit board, I recommend that you consider socketing all of the ICs.

All of the components, with the possible exception of the 2816 EEPROM (U9), should be available either at Radio Shack or at most electronics parts stores. The 2816 EEPROM is a relatively new product and tends to be available only from industrial electronic distributors, such as Anthem Electronics, Inc. For that reason, I can provide the part (see the Parts List).

Operating the Brass Pounder's Keyer

To use the keyer in your station, connect a cable between the key-out jack of the keyer and the key-in of your rig. Next, connect your hand key to the key-in jack of the Brass Pounder's Keyer.

The keyer's controls are very straightforward. For recording a message, select Message 1/Message 2, place the keyer in record mode and press the START switch. The keyer is now recording. Key in your message. At the completion of your message, wait until the keyer times out and the "complete" (red) LED is on.

To play a recorded message over the air, select Message 1/Message 2, place the keyer in play mode and momentarily press the START switch. The keyer will now play your previously recorded message. Speed of the playback is controlled by the 100k potentiometer. At the completion of your message, you may either wait until the keyer automatically times out, or depress the RESET button.

The Brass Pounder's Keyer is wired so that normal hand key operation is possible whether the keyer is on or off.

That's pretty much it. Good luck on the construction. 73

Contact Dan McCranie AA6GG at 1974 Alpet Drive, Morgan Hill CA 95037.

STARTEK INTERNATIONAL, INC.

- **8 DIGITS**
- **2 GATE TIMES**
- **ALUMINUM CABINET**
- **AC • DC • BATTERY**
- **FULL YEAR WARRANTY**

1-1500 MHZ FREQUENCY COUNTERS

FROM

$99.95

MADE IN USA

Absolutely the best values in the frequency counter industry. Choose either the ***STARTEK*** Model 1500A or the 1500HS for finding and counting RF frequencies from 1 to 1500 MHZ (1.5 GHZ). The 1500HS is the same size and has the same features as the 1500A but in addition contains Monolithic Microwave Integrated Circuit, Low Noise Amplifiers which provide an **"ULTRA HIGH SENSITIVITY"** signal input. The 1500A can be purchased without the custom NI-CAD batteries and AC adaptor, the 1500HS is priced complete. Both counters can be powered by 9-12 VDC, an AC adaptor or internal NI-CAD batteries. The excellent HF to UHF sensitivity of these instruments makes them ideally suited for use with an antenna to find and display transmit frequencies from handheld, fixed and mobile radios such as: police, ham, surveillance, phone, marine, aircraft, etc. They can be used with the model #DC-10 Probe to measure computer clocks, oscillators, etc.

TYPICAL INPUT SENSITIVITY IN MILLIVOLTS RMS

FREQUENCY	1500 A	1500HS
10-600 MHZ	5-30 mV	<1 mV
150 MHZ	8 mV	.5 mV
800 MHZ	50 mV	3 mV
1.3 GHZ	250 mV	15 mV

#1500A	1-1500 MHZ Frequency Counter Only	**$99.95**
#BP-15	Custom Internal NI-CAD Pack (Installed)	**20.00**
#AC-15	110 VAC to 9 VDC Adaptor/Charger	**9.00**
#1500A/C	Counter Including NI-CAD Pack & AC ADP	**128.95**
#1500HS	HI-SENS Counter Inc. NI-CAD Pack and AC ADP	**169.00**
#TA-90	Telescoping BNC Antenna, General Usage	**12.00**
#DC-10	Probe, 50 OHM, 1X, 3 Ft. Cable	**20.00**

MADE IN USA

NEW MODEL DT-90 DRAM TESTER

The DT-90 is a new, compact memory IC tester that can READ/WRITE FUNCTION TEST, VOLTAGE TEST and MEASURE THE SPEED of 1 MEG x 1, 256K x 1 and 64K x 1 Dynamic RAMS. LED indicators show 3 Vcc TEST VOLTAGES and a RED/GREEN LED flashes when test is running then indicates PASS or FAIL. A switch is provided to continuously cycle a test if desired. The DT-90 is housed in a rugged aluminum cabinet 3.4" W x 3.8" H x 1" D. Two ZIF TEST SOCKETS are provided for the IC under test. The unit is powered by a 110 VAC to 9 VDC @ 300 mA adaptor which is included. The DT-90 is sold in KIT FORM with complete assembly instructions or FACTORY ASSEMBLED, calibrated and tested.

MODEL DT-90-CK
$89.95 Kit Form

MODEL DT-90
$119.00 Factory Assembled

TOLL FREE ORDER LINE
800-638-8050
FOR INFO PLEASE CALL (305) 561-2211

STARTEK INTERNATIONAL, INC.
398 NE 38TH ST., FORT LAUDERDALE, FL 33334
PHONE: (305) 561-2211 FAX: (305) 561-9133

ORDERS TO US & CANADA
ADD 5% S/H ($4 Min., $10 Max.)
FL RES. ADD SALES TAX, COD $3.50

MasterCard VISA

CIRCLE 247 ON READER SERVICE CARD

SPSM Mobile Mount

Build this reliable Hustler classic.

by David A. Clingerman W6OAL

Many of us enjoy working mobile on a variety of HF bands. An average commute to work of, say, 10–20 miles will afford us a couple of QSOs before and after the work day, and maybe even a couple at noon.

Often, the problem detouring a lot of mobile operation is the problem of how to mount the antenna. Of course, we all know the best way: ball mount on the rear deck of the vehicle. That's fine and lasts a long time, but do you really want to knock a hole in the rear deck of your new $58,000 Porsche? I didn't think so, and the housefrau probably doesn't either.

The next best way is the bumper mount. Fine for an old pickup truck, but just try to get a chain or two around the bumper of some of today's sporty autos. It's next to impossible, but not totally impossible, if the auto has metal bumpers. But, usually, you'll find they're made of some sort of high impact plastic that collapses or breaks under any sort of pressure.

On down the list is the gutter clamp. Great to hold a 2 meter stinger in place, but it will only survive your 80 meter, high power, Hustler resonator and three- to four-foot extension until you round a corner pulling about 3 G's. About that time, the entire lash-up parts from the vehicle from centrifugal force, gets airborne and spears the parking attendant a block away. Or it lies flat like a scythe, and decapitates the top of a camper. No real loss, but not conducive to your longevity.

Like I said, the gutter clip is great for VHF stingers and UHF "J's," but not for arrays of any substance. The list narrows; how about lip mounts? Trunk, hood, or whatever you can get a hold on, that wonderful little device that destroys metal with its nasty set screws. Is this the answer? Or is your Mercedes much too precious to invert-dimple for the sake of a few neat QSOs to while away the travel time?

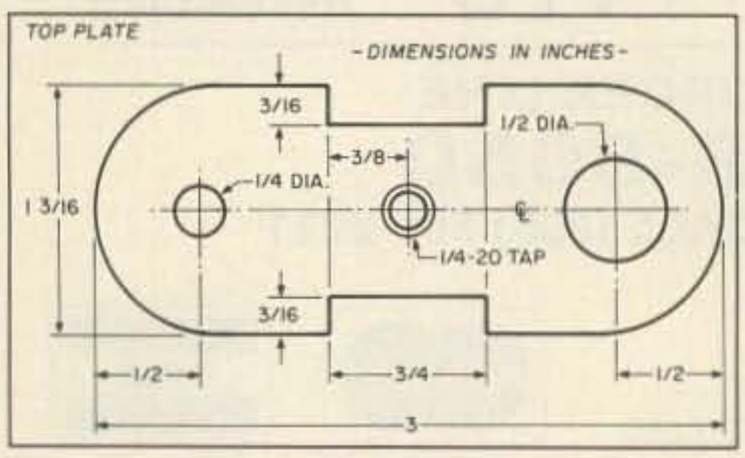


Figure 1. The top plate.

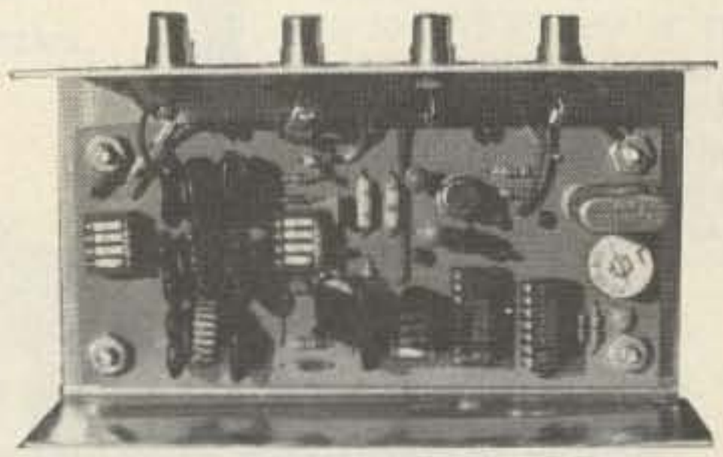


Photo A. The completed SBSM mobile installation ready to hit the road.

A Bargain Find

At one time, Hustler made a lip mount of sorts that used a compression block of cyclonic (resistant to wind damage?), high impact plastic instead of those nasty little set screws. However, when they moved their operations from Texas, they also cleaned house on a few products that weren't real movers. One of these items was the SPSM mobile mount. I picked one up from a bargain table for a dollar at R&L Electronics in Hamilton, Ohio, just because I'd never seen one before, and secondly because it was only a dollar. As things worked out, it was one of the best dollars I ever spent.

A Pontiac Fiero, as some of you probably know, has an all-fiberglass body, a difficult thing to try to find a ground point on. But the SPSM mount worked just great on the rear deck, as there are two metal ventilators which actually attach somehow to chassis ground. Also, the SPSM can be compression-fit to a fiberglass edge, with a short piece of braid and ground clip attached to one of the ventilators.

This mount worked great for supporting my Hustler RMX 10 meter antenna and a standard stainless steel (102″) CB whip, though not both at the same time.

I tired of the Fiero and purchased a van. The Plymouth Voyager has a lift-type rear door with edges that are just perfect for mounting the SPSM. The SPSM worked so well I wanted a second one for mounting my 2 meter "J" on the opposite side of the van.

Construction

I contacted Hustler to see if they had any more SPSMs, or parts still around that I might buy. They didn't have a trace, not even any drawings. Many years of special project work in the Navy taught me that if you need it and it doesn't exist, you have to build it yourself. After a few hours of sawing, tapping, and drilling, I had my very own SPSM mount. It was worth it. I feel this little mount is so versatile that I would like to share my construction with you.

The Top Plate

I acquired some strap stainless steel (1.2″ wide x 0.1875″ thick x 36″ long) at the local ACE hardware store for about $3.50 and a couple of 1/4-20 stainless steel nuts and bolts for about $1. Using a band saw, I cut a 4″ length of stainless from the flat stock. Then I rounded the corners with a bench grinder to a 1/2″ radius. Let's call this item the "top plate."

On each of the long side dimensions of the top plate, and evenly centered, I used a flat file to grind in ¾″ long slots to a depth of 3/16″. I then drilled two holes centered about ½″ from each end of the top plate. Drill one of the holes to a diameter of 0.250″ and the other to 0.375″. In the center of the top plate drill a 3/16″ hole and tap it with a 1/4-20 die. See Figure 1.

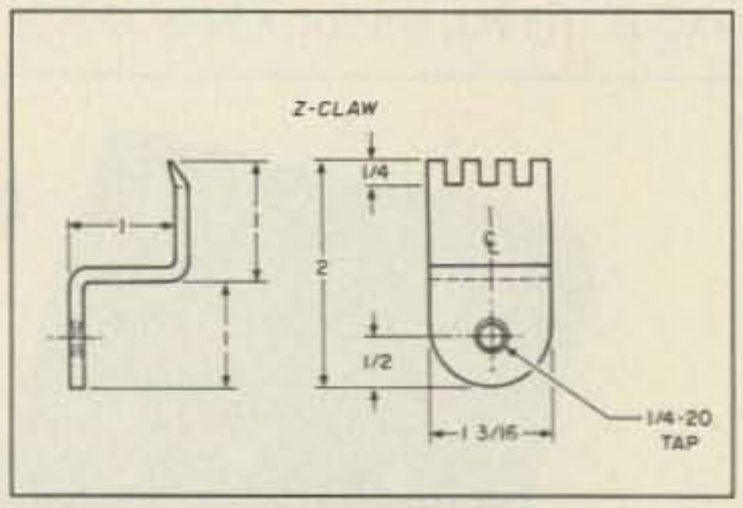


Figure 2 (a). Side view of the Z-claw. (b). Top view.

The Z Claw

I cut another piece of stainless from the flat stock. This one was 3″ long. I rounded the corners on only one end to a radius of 1/2″. Drill a 3/16″ hole at a point ½″ in from the rounded end. Then tap it for a 1/4-20 hole. I placed 1″ of this end in the vise to effect a 90 degree bend using a ball peen hammer. Next, I placed the opposite end 1″ in the vise, and made another 90 degree bend in the opposite direction of the first bend. This makes the device almost "Z" shaped. I'll call this piece the "Z-claw."

RF ENTERPRISES

To Order: **1-800-233-2482**

Service & Info. 218-765-3254 Fax: 218-765-3308

ANTENNAS, TOWERS, & ACCESSORIES

ROHN TOWERS:

SELF-SUPPORTING

BX64	64 ft.	6 sq. ft. .....$CALL
HBX40	40 ft.	10 sq. ft. .....$CALL
HBX48	48 ft.	10 sq. ft. .....$CALL
HBX56	56 ft.	10 sq. ft. .....$CALL
HDBX40	40 ft.	18 sq. ft. .....$CALL
HDBX48	48 ft	18 sq. ft.. .....$CALL

ROHN self-supporting towers are today's best tower buy. Nowhere else do you get more height and strength for the money. Call us for yours !!

(Ratings based on 10 ft. boom.)

GUYED TOWER SECTIONS

25G, 45G, 55G **& accessories.**

7 ft. UPS shippable 25G sections

FOLD-OVER T0WERS

FK2548	FK2558	FK2568
FK4544	FK4554	FK4564

Guy Kits & Accessories! CALL!

Phillystran Guy Systems:

A non-conducting, electrically transparent guy system. Eliminates the need for guy insulators to break-up guy wires into non-resonant lengths.

HPTG1200I -- 1200 lb cable
HPTG2100I -- 2100 lb cable
HPTG4000I -- 4000 lb cable
HPTG6700I -- 6700 lb cable

CALL FOR YOUR SYSTEM!

ACCESSORIES

3/16 EHS Guy wire & 1/4EHS Guy wire
CCM clamps 3/16 " & 1/4"
Thimbles; 1/4TH
Turnbuckles: 3/8 & 1/2" E&E; E&J.
Preformed **"Big Grips"** 3/16" & 1/4"
Guy Insulators: 500D & 502
Earth Anchor; 4 ft. screw-in
TB-3 & TB-4 Thrust bearings.
Anchor rods & Equalizer plates.
Guy brackets and assemblies.
Bases: Plates, concrete, hinged.
Side mounts and Dish mounts.
AS25G & AS455G rotor shelves.
House brackets & Eve brackets.
Replacement BX top & rotor plates.
Masts: Popular lengths & diameters.
Ginpoles, Tripods, Safety belts.
Work platforms & Safety rings.
Remote Coax Switches.
Transi-trap protectors & cartridges.
BALUNS: W2AU, VGE, Palomar, hy-gain, KLM, Bencher & others.
Noise bridges and antenna bridges.
Mobile mounts, masts, & resonators.
Ampire preamplifiers.
Coax Seal & anti-corrosives.
Connectors: UHF, N, BNC, & Heliax
Insulators: end, center, & strain.
Grounding accessories.
IIX Tower equipment and accessories.
Handheld antennas and wattmeters.
Larsen & **Antenna Specialists** systems.
Trap dipoles, G5RV Antennas, Shortened Dipoles, Slopers, and Much More!

HY-GAIN TOWERS:

CRANK-UPS

16 Sq. Ft. Models:
HG-70HD 70 ft., 4 sections
HG-54HD 54 ft., 3 sections

9.5 Sq. Ft. Models:
HG-52SS 52 ft., 3 sections
HG-37SS 37 ft., 2 sections

ACCESSORIES

HG-COA Coax Arms
HG-TBT Thrust Bearing
HG-GP Gin pole
HG-5, HG-10, & HG-15 Masts.

Hy-gain crank-up towers let you raise the antenna for optimum performance and retract it for service and for security in severe weather.

Order your antenna- tower package from us and save!

ROTATORS

TELEX/hy-gain	YAESU
HDR-300	G600RC G1000SDX
T2X	G800SDX G500A
HAM IV	G5400B
CD 45 II	

ALLIANCE **M²**

HF, VHF, OSCAR, & EME.

ORION

HY-GAIN ANTENNAS:

TH7DXS:	7-el. tribander.
TH5Mk2S:	5-el. tribander.
Explorer-14:	4-el. 14.1 ft. boom.
TH3JrS:	3-el. compact, low power.
Discoverer:	40 meter beams.
205BAS:	5-el. 20 meter monobander.
204BAS:	4-el. 20 meter monobander.
203BAS:	3-el. 20 meter monobander.
115BAS:	5-el. 15 meter monobander.
153BAS:	3-el. 15 meter monobander.
105BAS:	5-el. 10 meter monobander.
103BAS:	3-el. 10 meter monobander.
DX-88:	New HF vertical!
18HTS:	80 - 10 meter vertical.
64BS/ 66BS:	4 & 6 el. 6 meter beams.
V2S,3S,4S:	Verticals: 2M, 220, & 440.
OSCAR Link:	OSCAR antenna system.

M² ANTENNAS

2M5WL.....2 Mtr, 17 elements.
2M18XXX.....2 Mtr, 18 elements.
2MCP14.....2 Mtr, 14 elements, circular.
2MCP22.....2 Mtr, 22 elements, circular.
432-13WL .....70 Cm, 39 elements.
6M2.5WL.....6 Mtr, 11 elements.
6M2WL.....6 Mtr, 9 elements.

BUTTERNUT

HF6VX Vertical, 80-10M.
HF2V Vertical, 80 & 40M.
RMK II roof mount kit
STR II radial kit
TBR-160, coil kit for 160M
WARC resonators
HF5B Compact beam, 20-10M

HUSTLER

6BTV 80-10 mtr vertical.
5BTV 80-10 mtr vertical.
G6-144B 2 mtr base antenna.
G7-144 2 mtr base antenna.

Complete mobile systems.

ALPHA-DELTA

DX-A Sloper $46.95
DX-CC.....79.95
DX-DD.....65.95
Transi-Trap Surge Protectors for coax lines and rotor control cables.

DIAMOND

Base/Repeater Antennas:
X-500MA, X500A, & X-300A
X-200A, X-50A, F-22A, F-23A
Dual-Band Mobile Antennas:
NR-770HA, NR-790A, NR-770SA
SX-Series Power/SWR Meters
Choose from 5 models: 1.8 -1300MHz
Coaxial Switches, Dummy Loads, Duplexers, Triplexers, Surge Protectors.

MFJ

1270B & 1270B/T TNC's
1278 & 1278/T TNC's
989C Tuner: Cross needle, roller ind.
986 Tuner: 3KW, roller ind.
941D Tuner: 300W, 1.8 - 30MHz.
949D Tuner: 300W, 1.8 - 30MHz Deluxe
931 Artificial ground. 1.8 - 30Mhz.
482B Grandmaster memory keyer.
484C Grandmaster memory keyer.
264 Dry dummy load,1.5KW to 650MHz.
262 Dry dummy load, 1KW.
260 Dry dummy load, 300W.
250 1KW dummy load, oil.

We have a complete MFJ inventory. Check the catalogs, then call us for great deals on MFJ products.

AEA ICOM ALINCO

IC-765

OMNI -V

FT-767GX

TEN-TEC YAESU

CUSHCRAFT

A3S: Tribander. A743 add-on.
A4S: Tribander. A744 add-on.
R5: 10,12,15,17,20. ***SPECIAL!!***
AP8: 80 - 10 Vertical.
APR18: 8-band radial kit for AP8.
AV3, AV4, & AV5 verticals.
D3W: 10, 12, & 17 meter dipole.
D4: 7, 14,21,28 MHz dipole.
40-2CD: 2-el 40M. beam
A50-6, A50-5, & A50-3 6M beams.
617-6B: 6 Mtr. Boomer.
AR-6: Ringo for 6 meters.
ARX-2B: Ringo Ranger II.
ARX-220B: Ringo Ranger II.
ARX-450B: Ringo Ranger II.
AR-270: 2M/440MHz vertical
A147-11: 11-el 146-148MHz.
215WB, 32-19, & 4218XL 2M Boomers.
220B: Boomer for 220MHz.
424B: 24-el 432MHz Boomer.
AOP-1: OSCAR pack.

KLM

KT34A & KT34XA Tribanders.
Complete line of VHF/UHF/OSCAR ants.

HF Monobanders in stock!

AMERITRON

AL-84:	600W PEP.
AL-80A:	1000W PEP.
AL-82:	1500W output.
AL-1200:	1500W output.
AL-1500:	1500W output.

RCS-4 & RCS-8V remote coax switches.

ASTRON DC SUPPLIES

RS-4A	**RS-7A**	**RS-12A**
RS-20A	**RS-35A**	**RS-50A**
RS-20M	**RS-35M**	**RS-50M**
VS-20M	**VS-35M**	**VS-50M**

WIRE & CABLE

BELDEN COAX: (Performance ... not problems)

9913 low loss; 50 ohm.
RG-213/U (8267) 50 ohm. Mil-spec.
RG-8/U (8237) 50 ohm.
RG-8/U (8214) 50 ohm. Foam.
RG-8X (9258) 50 ohm; foam
RG-11A/U (8261) 75 ohm.
RG-58A/U (8259) 50 ohm.
RG-59/U (8241) 75 ohm.
RG-214/U (8268) 50 ohm, double shield.

Don't settle for less than the best. Call us for BELDEN.

COPPERWELD ANTENNA WIRE:

Solid: 12 ga. Solid: 14 ga. Stranded 14 ga. ***Call for prices!!***

ROTOR CABLE:

Standard(6-22, 2-18) Heavy Duty(6-18,2-16) ***Call for prices!!***

We stock Amphenol Connectors and Andrew Heliax.

VISA **Mastercard**

Checks verified with **Telecheck**

Prices subject to change without notice. Shipping additional except as noted. Returns subject to 20% restocking fee. No returns on antennas or towers.

RF ENTERPRISES

HC 86 BOX 580

Merrifield, Minnesota 56465

Call or write today! We ship worldwide.

PACKET SPECIALS!!

Join the packet revolution! Get AMTOR, RTTY, & other digital modes as a fringe benefit. Want a new challenge? How about starting DXCC over again on RTTY. Call us for **AEA**, **MFJ**, & **Kantronics** TNC's. You'll be glad you did.

CIRCLE 171 ON READER SERVICE CARD

The Z-claw should be placed with the top plate so that the 1/4-20 holes line up. Grind the bottom side of the square end until it's sharp. Using a flat file, your next task is to make four teeth in this sharp end. To do this, you need to file three notches ¼" deep. Bend these teeth about 10 degrees toward the top plate, using the ball peen hammer. This completes the Z-claw. See Figure 2.

The Compression Block

I didn't have any hard or "cyclonic" plastic around, so I used a piece of hardwood (maple) to produce the third device, known as the "compression block." This object is drawn in Figure 3, and is probably easier to see than to describe in words. I made it using a band saw, a drill press, and a flat file. First make two saw cuts about ½" deep into the wood block (vertical sections of the channel). Then take a wood chisel to chop out the channel. If you take a look at Figure 3, you'll see a ⅜" diameter hole in the center of the compression block. Be careful to drill only to the depth shown in the drawing (⅜"), otherwise the compression block loses its compression.

I cut a ¾" length from a ⅜" O.D. steel rod and drilled it right down the center with a ¼" drill (its "Z" axis) to a depth of ⅝". About ¼" from the open end of this "cup" I drilled three holes 120 degrees from each other around the periphery, and tapped for 4-40 set screws. See Figure 4.

I used a small triangular file to score a 1/16" deep circular groove into a 1.5" long 1/4-20 bolt ⅜" from its threaded end. Next, I screwed this "prepared bolt" into the center hole of the top plate, all the way to the bolt head. Slip the little cup affair with the three

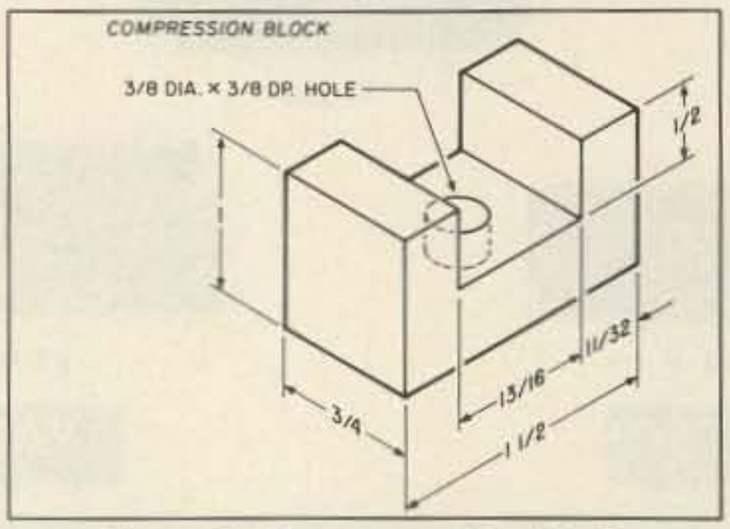


Figure 3. The compression block.

set screws over the bolt, and snug the set screws into the groove so that the cup can just barely turn freely. Press the cup affair into the ⅜" diameter hole of the compression block and bottom it out. Then back out the 1/4-20 compression block drive bolt until the hardwood compression block is snugged up against the top plate.

Affix the Z-claw to the top plate with a 1/4-20 bolt and snug it to the point where the Z-claw swings freely beneath the top plate. The teeth of the Z-claw, as you'll see, line up about the center of the bottom of the compression block so that when the drive bolt is screwed toward the teeth, considerable compression can occur. You can use a locking nut beneath the head of the drive bolt and tighten it against the top plate if you want. I didn't use one because I felt that, especially under tension, the drive bolt was not likely to unscrew.

Photo B. Closeup view of the SBSM mount.

Once you have affixed a small "ball mount assembly" to the top plate in its remaining hole, you will have created an SPSM just like Hustler used to make. See Figure 5.

Application

It's easy to install this device. You simply turn the Z-claw out from the compression block, and insert it under any metal or plastic lip of a vehicle. Swing the compression block/top plate assembly over the lip, align the compression block over the teeth of the Z-claw with the metal or plastic lip between, and tighten down on the compression block drive screw. The surface of the metal or plastic won't be harmed, or at least very little, by the hardwood compression block.

The teeth of the Z-claw will dig in slightly to the underside of the lip, but that will not be in view, and if metal, it can be hit with a shot of Rustoleum™ to prevent any oxidation. The teeth digging into the metal will affect a good ground at the mount. Regardless of the position in which the SPSM is mounted, the small ball assembly will always have two degrees of freedom which should allow enough latitude for almost any situation you can imagine. All you have to do now is mount your mobile antenna and mobile away.

My first test run in my vehicle to ascertain mechanical integrity entailed a trip down the

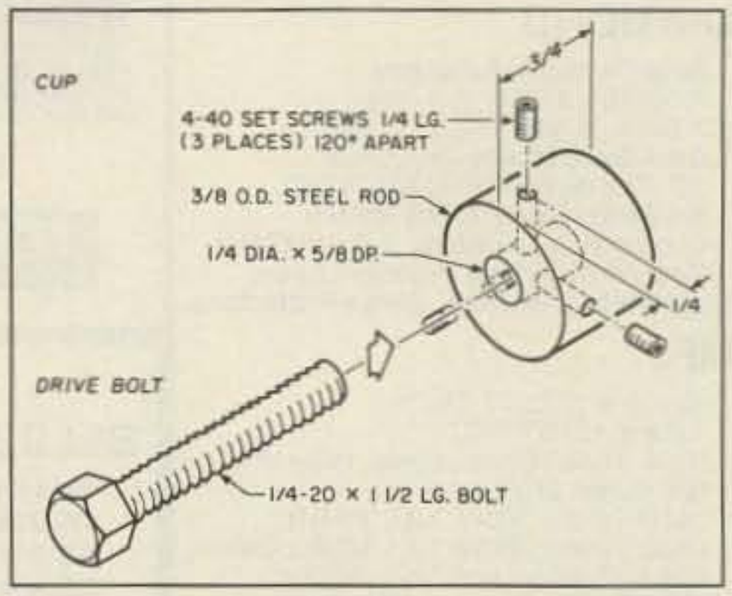


Figure 4 (a). Details of the "cup" construction. (b). The completed drive bolt arrangement.

Parts List

1 Stainless steel strap (0.1825" thick), 1.2"W x 3'L
2 ¼-20 x 11/2" bolt
1 Length of ⅜" steel rod
3 4-40 x ¼" set screws
1 Block of hardwood (1"H x ¾"W x 1½"L)
1 Ball antenna mount

Santa Fe Trail, south out of Littleton, Colorado, at a speed of about 60 MPH. Nothing fell off in the first few miles, so I tried a few QSOs to see if the device would also work electronically. I made a number of contacts all over the country. My third QSO was with none other than Bill Brown WB8ELK in Hancock, New Hampshire, giving a demonstration of the *73* hamshack to a group of students.

Good luck in your construction endeavors and enjoy your mobile operations with the knowledge that your antenna will remain firmly in place! 73

You may reach David A. Clingerman W6OAL at 4725 W. Quincy #1014, Denver CO 80236.

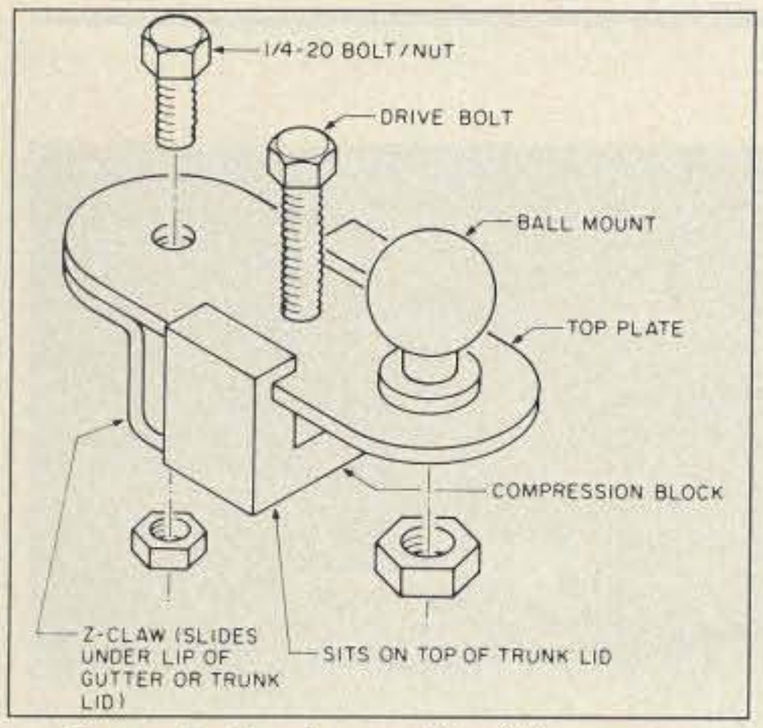


Figure 5. Final assembly of the mount.

MODEL #	DESCRIPTION	BOOM LENGTH	GAIN dBd	SUG. RETAIL
	HF			
10--30LPY	10-30 mHz	30'	6.0	$ 899.00
20M4	4 ELE	45'	9.0	$ 649.00
18M3	3 ELE	18"	6.3	$ 249.00
15M4	4 ELE	33'8"	9.0	$ 369.00
10M4	4 ELE	23' 2'	9.0	$ 169.00
10M7	7 ELE	45'	10.5	$ 499.00
	6 METERS			
6M5	5 ELE	15' 10"	9.3	$ 149.00
6M7	7 ELE	25'6"	10.5	$ 229.00
6M2WL	9 ELE	39'6"`	12.2	$ 379.00
6M2.5WL	11 ELE	50'2"	12.7	$ 449.00
	2 METERS			
EB-144	HORIZ OMNI	NONE	1.0	$ 119.00
2M7	7 ELE	8'10"	10.5	$ 105.00
2M12	12 ELE	19'6"	13.0	$ 129.00
2M5WL	17 ELE	33"	15.0	$ 169.00
2M18XXX	18 ELE	36'3"	15.3	$ 219.00
18XXXKIT	KLM 2M 16LBX Conv KIT	36'3"	15.3	$ 69.00
2MCP14	14 ELE CIRC / OSCAR	10'6"	10.3	$ 149.00
2MCP22	22 ELE CIRC / OSCAR	18' 7"`	12.5	$ 225.00
2M6WLHD	19 ELE HD	41'8"	15.8	$ 379.00
2M5-440XP	5 ELE / 10 ELE ON 440	5'	9'12"	$ 149.00
	220			
220-7WL	23 ELE	32'6"	16.5	$ 189.00
	70 CM			
EB-432	HORIZ OMINI	NONE	1.0	$ 109.00
420-50-11	11 ELE FULL BAND	5'	11.3	$ 99.00
440-18	MULTI-USE	11'4"	14.6	$ 109.00
436-CP30	30 ELE CIRC / OSCAR	9'9"	14.5	$ 229.00
432-9WL	28 ELE	21'2"	17.3	$ 149.00
432-13WLA	39 ELE	30'8"	18.6	$ 229.00

Effective 3/20/91

73 Review

by David Cassidy N1GPH

Tripp Lite PR-25A Power Supply and Isobar 8 GS Surge Suppressor

Tripp Lite
500 North Orleans
Chicago IL 60610-4188
Tel. (312) 329–1777;
FAX (312) 644–6505.
Price Class: PR-25A, $180; Isobar 8 GS, $115.

The PR-25A

A good 12 volt power supply is probably the most used accessory in any ham shack. Just think of all the things you call upon your power supply to run: HF rig, 2 meter gear, packet station, amplifier . . . . The lowly power supply just sits there, spitting out the amps, day after day, year after year.

Unless you splurged and bought the matching 12 volt supply with your HF rig, your power supply probably looks like a cross between a billboard and a refrigerator—a big metal cabinet covered with all kinds of ominous writing. After all, it's only a power supply. Hook it up, throw it under the desk and forget it—right?

The Tripp Lite company has recently upscaled their line of power supplies. The new cabinets are an attractive charcoal color, to match modern communications equipment. Since power supplies in the 25 amp range seem to be the most versatile for amateur use (you can power everything from an HT to a standard 100W transceiver), I took a look at the Tripp Lite PR-25A (Tripp Lite offers supplies in 3—60 amp sizes, with prices starting at $38.50).

The PR-25A is housed in a sturdy cabinet and weighs in at about 20 pounds. The cabinet is well ventilated, and even during all-afternoon sessions in the shack, it did not get more than slightly warm. Two rear-mounted bolts provide connection to your power cable. These bolts are clearly marked, so unless you're not paying attention, chances of reversing your power leads are slim (it's a good idea to always check one more time before powering up your gear). A large rocker switch is the only thing (other than the company logo and model number) on the front panel, glowing red to show when the unit is turned on.

Photo A. The PR-25A power supply.

The PR-25A is rated at 20 amps continuous duty cycle, so I tuned the RTTY portion of 15 meters to see how it would measure up. Even during long transmissions of over five minutes at 50 watts output, the PR-25A never dropped below 22 amps and 13.1 volts. (Remember, even though we call them 12 volt supplies, they all provide 13.8 volts.) Even at short-duration, full-power transmissions (one to two minutes at 100 watts), the PR-25A continued to provide a minimum of 22 amps and 13 volts.

I now have the PR-25A powering my packet setup (HT and 30 watt 2 meter amp), as well as a 45 watt 2 meter mobile rig. I can run all three pieces simultaneously, and the PR-25A never misses a beat.

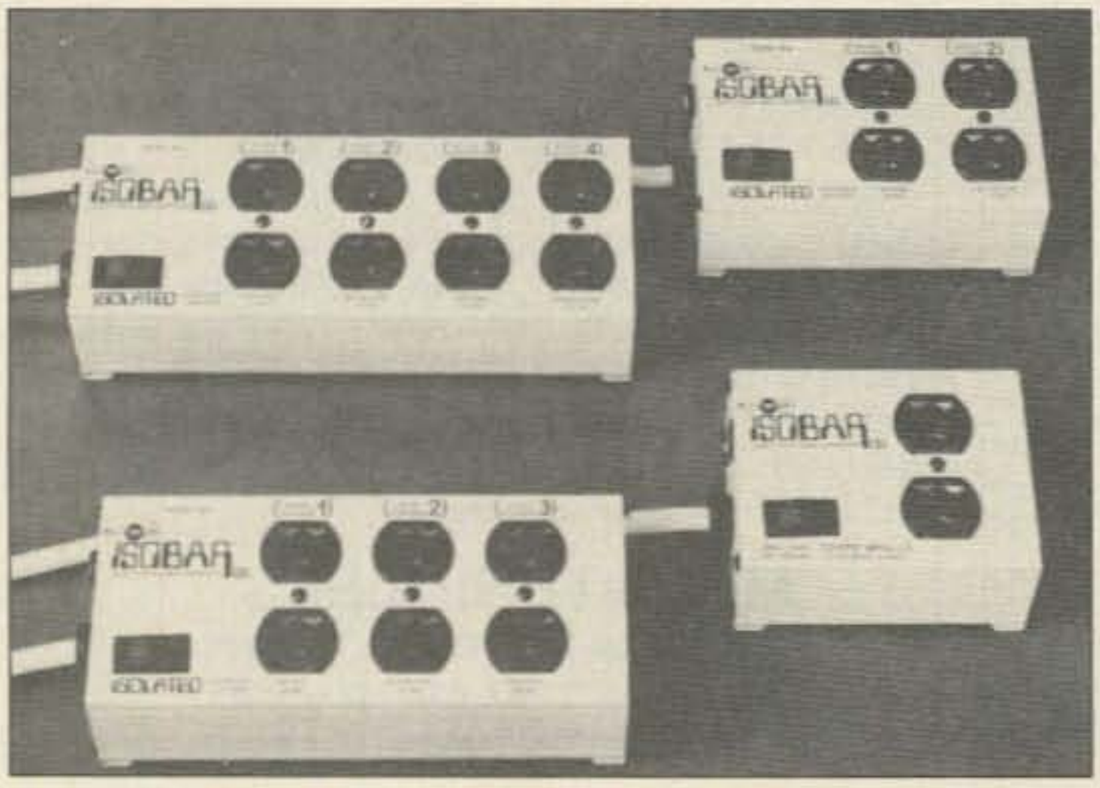


Photo B. The Isobar 8 GS surge suppressor.

The Isobar 8 GS

Most of us who use computers are familiar with surge suppressors. They protect delicate computer chips from the occasional voltage surge. These surges occur everywhere from time to time, and are more frequent in rural areas (like where I live). If you plug your computer directly into your wall socket, it's only a matter of time before a line surge does something nasty—from wiping out a file or hard disk, to frying your RAM chips.

Since modern ham transceivers are really computers (your average low-end transceiver has more computing power than an entire room full of early computers), I am often surprised to see hams going to all kinds of trouble to protect their computer and then simply plugging their transceiver into a wall socket (often on the same circuit with other high current appliances). The chips inside your HF rig are every bit as susceptible to line surge as your computer, and you ought to consider using a surge suppressor.

Tripp Lite's Isobar GS line offers a couple of unique features. Tripp Lite provides its Gold Seal Warranty on the complete line of Isobar GS surge suppressors. The warranty covers not only the Isobar itself, but any equipment plugged into the Isobar. If surge damage occurs, the Isobar *and* the equipment will be repaired or replaced (contact Tripp Lite for details).

The Isobar GS also features isolated filter banks, preventing connected equipment from causing interference with each other. What Tripp Lite calls "Cascade Circuitry" allows you to choose the amount of suppression you need for various pieces of equipment. For instance, the 8-outlet Isobar provides 50, 75, 100 and 120 dB suppression.

The Isobar GS is available in 2, 4, 6 and 8 outlet models, with prices starting at $59.95. You'll feel better knowing that your expensive rig is protected from line surges. 73

David Cassidy is the Associate Publisher of 73 Amateur Radio Today.

HF Equipment

		Regular	SALE
IC-765	Xcvr/ps/keyer/tuner ... *(Spec.)*	3149.00	2499

IC-781	Xcvr/ps/tuner/scope ... *(Spec.)*	6149.00	4999

IC-751A	9-band xcvr/.1-30 MHz rcvr	1699.00	1399
PS-35	Internal power supply.....	219.00	199.95
FL-63A	250 Hz CW filter (1st 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
AH-3	Automatic antenna tuner	489.00	429.95
IC-726	10-band xcvr/6m.....	1299.00	1089

Accessories		Regular	SALE
IC-2KL	HF solid state amp w/ps.....	1999.00	1699
IC-4KL	HF 1KW amp w/ps.... *(Special)*	6995.00	5795
EX-627	HF auto. ant. selector *(Special)*	315.00	269.95
PS-15	20A external power supply	175.00	159.95
PS-30	Systems p/s w/cord, 6-pin plug	349.00	319.95
SP-3	External speaker	65.00	
SP-7	Small external speaker	51.99	
CR-64	High stab. ref. xtal; 751A, etc ...	79.00	
SM-6	Desk microphone	47.95	
SM-8	Desk mic - two cables, scan	89.00	
AT-500	500W 9-band auto. ant. tuner	589.00	519.95
AH-2	8-band tuner w/mount & whip...	758.00	689.95
AH-2A	Ant tuner system, only.....	559.00	499.95

Accessories for IC-765/781/725 • Call for Prices

ICOM

★ Large Stocks
★ Fast Service
★ Top Trades at AES®

VHF/UHF Base Transceivers		Regular	SALE
IC-275A	25w 2m FM/SSB/CW w/ps...	1299.00	1129
IC-275H	100w 2m FM/SSB/CW.....	1399.00	1199
IC-475A	25w 440 FM/SSB/CW w/ps *c/o*	1399.00	1199
IC-475H	100w 440 FM/SSB/CW *(Spec)*	1599.00	1269
IC-575A	25w 6/10m xcvr/ps *(Special)*	1399.00	1099
IC-575H	25w 100w 6/10m xcvr.....	1699.00	1469
IC-1275A	10W 1.2GHz FM/SSB/CW...	1849.00	1599

VHF/UHF Mobile Transceivers		Regular	SALE
IC-229A	25w 2m FM/TTP mic .. *(Spec.)*	449.00	319.95
IC-229H	50w 2m FM/TTP mic .. *(Spec.)*	479.00	379.95
IC-448A	25w 440 FM/TTP ... *(Closeout)*	599.00	469.95
IC-1201	10W 1.2GHz FM xcvr	799.00	699.95

Dual-band FM Transceivers		Regular	SALE
IC-3220A	25w 2m/440 FM/TTP mic...	659.00	569.95
IC-3220H	45w 2m/35w 440 FM/TTP	699.00	599.95
IC-2400A	2m/440 FM/TTP ... *(Special)*	899.00	639.95
IC-2500A	35w 440/1.2GHz FM *(Spec.)*	999.00	849.95

Multi-band FM Transceiver		Regular	SALE
IC-901	2m/440 Fiber opt. xcvr *(Spec.)*	1199.00	839.95
UX-R91A	Broadband receiver unit...	389.00	349.95
UX-19A	10w 10m unit.....	299.00	269.95
UX-59A	10w 6m unit.....	349.00	319.95
UX-S92A	2m SSB/CW module	599.00	529.95
UX-39A	25w 220MHz unit *(Special)*	349.00	279.95
UX-S94A	430 SSB/CW module	TBA	
UX-129A	10w 1.2GHz unit	549.00	499.95

VHF/UHF Mobile Transceivers		Regular	SALE
IC-970A	25w 2m/430 MHz transceiver	2895.00	2499
IC-970H	45w 2m/430 MHz transceiver	3149.00	2699
UX-R96	50-905 Mhz receive unit....	389.00	349.95
UX-97	1.2GHz band unit	999.00	869.95

Mobile Antenna		Regular	SALE
AH-32	2m/440 Dual Band mobile ant	39.00	
AHB-32	Trunk-lip mount.....	35.00	
Larsen PO-K	Roof mount	23.00	
Larsen PO-TLM	Trunk-lip mount.....	24.70	
Larsen PO-MM	Magnetic mount	28.75	

Repeaters		Regular	SALE
RP-1510	2m 25w repeater	1849.00	1649
RP-2210	220MHz 25w rptr ... *(Special)*	1649.00	1399
RP-4020	440MHz 25w repeater	2299.00	1999
RP-1220	1.2GHz 10w repeater.....	2599.00	2249

MasterCard VISA DISCOVER AMERICAN EXPRESS

Hand-helds		Regular	SALE
IC-02AT/High Power		409.00	349.95
IC-04AT	440 *(Closeout)*	449.00	329.95
IC-2SA	2m HT *(Spec)*	419.00	289.95
IC-2SAT	2m/TTP *(Spec)*	439.00	319.95
IC-3SAT	220 HT/TTP	449.00	369.95
IC-4SAT	440 HT/TTP	449.00	369.95
IC-2GAT	2m HT/TTP	429.00	379.95
IC-4GAT	440MHz/TTP	449.00	369.95
IC-12GAT	1.2GHz/TTP	529.00	469.95
IC-W2A	2m/440 HT	629.00	529.95
IC-24AT	2m/440 HT	629.00	419.95

Aircraft band handhelds		Regular	SALE
A-2	5W PEP synth. aircraft HT	525.00	479.95
A-20	Synth. aircraft HT w/VOR *(Spec.)*	625.00	499.95

Call for information and Prices on accessories for Handhelds

Receivers		Regular	SALE
R-7000	25MHz-2GHz receiver.....	1199.00	1029
RC-12	Infrared remote controller....	70.99	
EX-310	Voice synthesizer	59.00	
TV-R7000	ATV unit.....	139.00	129.95
R-71A	100kHz-30MHz rcvr.....	$999.00	869.95
RC-11	Infrared remote controller	70.99	
FL-32A	500 Hz CW filter.....	69.00	
FL-63A	250 Hz CW filter (1st IF).....	59.00	
FL-44A	SSB filter (2nd IF).....	178.00	159.95
EX-257	FM unit.....	49.00	
EX-310	Voice synthesizer.....	59.00	
CR-64	High stability oscillator xtal	79.00	
SP-3	External speaker	65.00	
CK-70 (EX-299)	12V DC option	12.99	
MB-12	Mobile mount.....	25.99	

R-9000 100KHz-2GHz all-mode rcvr ... 5459.00 **4699**

Due to the size of the ICOM product line, some accessory items are not listed. If you have a question, please call. Prices subject to change without notice.

Top Trades ! • We'll take your Clean Late Model gear in trade towards New ICOM Equipment.
Write or Call for our Quote Today!

AES® ★ Over 34 Years in Amateur Radio
HOURS: Mon. thru Fri. 9-5:30; Sat. 9-3

Order Toll Free: 1-800-558-0411 FAX: (414) 358-3337

AMATEUR ELECTRONIC SUPPLY® Inc.

5710 W. Good Hope Road; Milwaukee, WI 53223 • Phone (414) 358-0333

AES® BRANCH STORES

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (407) 894-3238
1-800-327-1917

CLEARWATER, Fla. 34625
1898 Drew Street
Phone (813) 461-4267
No Toll Free Line

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
1-800-634-6227

Associate Store
CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
1-800-621-5802

Parts Substitution

A beginner's guide.

by Bruce S. Hale KB1MW/7

As I look through the latest issue of *73*, a construction article catches my eye. Let's see if I have the parts. As usual, I have most, but not all, of them. And also as usual, Radio Shack doesn't have everything that I need. I could mail-order the parts, but I can't get them all from one place, and I can't put together a minimum order for any one mail-order company. Oh, well. Another project for the "if I ever find the parts" file.

Sound familiar? Maybe it's one reason why "nobody builds anymore." In the old days, they'll tell you, everyone built with standard parts, and if you needed something, you could substitute one standard part with another. Today, there are too many "special-purpose" parts. But is that really true?

There are a few special parts these days, mainly large-scale ICs. But there are also quite a few standard parts you can substitute for what looks like a special part, if you know how. My experience in building has taught me a few tricks, and I'd like to share them with you.

Can I Use This Resistor?

With resistors, the *power rating* is your main concern. You're always safe using a resistor with a power rating *greater* than what the designer specified. If the designer used a ¼-watt resistor and you've got a 1-watter, go ahead and use it. It will be a bit larger, but so what, if it saves you from waiting for mail order?

Using a smaller resistor is generally a bad idea. You could try to calculate or measure the current and power dissipation, or try it and see if you "let the smoke out of it," but you might be right on the edge of causing the part to fail. Failure might occur only after you've used the device for a while, and it could take something expensive with it!

If the design doesn't specify the resistor power rating, you can usually get away with ¼-watt parts (especially in digital circuits, 12V receivers, and low-power transmitters). If you have ½-watt parts, they're OK, too.

Resistor *tolerance* is another important parameter. Resistors typically come in 10%, 5%, and 1% tolerances. The tolerance is the amount that the value of the component can vary from the value printed on the resistor. If the tolerance is critical for a project, the design will usually specify it. If the design calls for 1% resistors, don't use 10% parts! On the other hand, going towards *better* tolerance is OK. Using a 1% resistor where a 5% value will do is a waste of money, but the device will work.

To rate parts for tolerance, manufacturers usually measure each part. It's impossible to manufacture parts that all stick to a close tolerance, but some of the parts in a given batch will be within 1%, a few more will be within 5%, and most will be within 10%. So as the parts come out of the manufacturing process, they are measured and placed in bins according to tolerance. This means that the 10% resistors will most often not be any closer than 5% of the given value. If they were within 5%, they'd be in the 5% bin! Some of the 10% parts will be on the high side, and some will be on the low side. Keep this in mind if you use 10% parts. The best way to be sure of the value is to use a digital multimeter to measure each resistor.

As for the actual value of the resistor, pay attention to the tolerance the designer specified, and use it to your advantage. If the design specifies 2.2k at 10%, the expectation is that anything plus and minus 10% from 2.2k will work. This means anything from 2k to 2.4k should be OK here. With larger value resistors, the percentage gives you an even wider margin for substitution.

Remember the series/parallel formulas you had to learn for your exam? Here's a chance to put them to use. If you need a 2.2k resistor, but all you've got is a box of 4.7k resistors, use two of the 4.7k's in parallel! That gives you the equivalent of a 2.35k resistor. If you use your imagination, you can usually come up with some combination of the values you have on hand that will equal the value you need. If you keep a good stock of some "standard" values, like 470, 1k, 4.7, 10k, and so on, your substitution job will be that much easier.

Did the designer specify a particular type of resistor (carbon-film, carbon composition, or metal film)? Usually, you can interchange types; if you have a carbon-composition resistor, and the design calls for carbon-film, you're probably OK (as long as your power and tolerance ratings are OK). If the type of resistor is important, the designer should specify it: "R1 must be a carbon-film resistor." If this is specified, don't substitute.

Pull-up Resistors

A pull-up resistor is a special case for parts substitution. What's a pull-up? It's usually one of the only resistors in a digital circuit, connected from one or more unused IC inputs to the power-supply (usually 5 volts). It "pulls up" the unused inputs and keeps them from "floating."

This is one case in which you can substitute a wide variety of parts. The designer may use 1k or 10k resistors for pull-ups. You can generally substitute *anything* within this range.

Smaller values will probably work, but they may increase the circuit's power consumption. Larger values may also work (especially in a low-power CMOS circuit), but they may also be unreliable. It's best to stay within the 1k to 10k range. As always, if you have the value the design specifies, use it!

What About This Capacitor?

With capacitors, the important parameter is the *voltage rating*. Again, it's always safe to use a capacitor rated at a higher voltage than the designer specified. A higher voltage rating just gives you a greater margin of safety. If the design specifies a 50V cap, and you have a 100V cap, use it. On the other hand, you're asking for fireworks if you use a cap with a lower voltage rating than the design calls for.

If the designer doesn't specify the voltage rating, it's best to use caps rated at twice the power-supply voltage or more. For example, using 25V caps in a 12V circuit is fine, but using 50V caps in a 150V circuit is a *bad* idea.

Here again, you can use the series/parallel formulas to combine capacitance to get the value you need. Understanding the way voltage and current divide through series and parallel capacitor combinations is a bit more difficult than with resistors; try to stick with capacitors that have at least the specified voltage rating, even if you use a series or parallel combination.

Capacitor *tolerance* is also important. There are even more kinds of capacitors than there are resistors, and the tolerance can vary widely, depending on the capacitor type. In addition, capacitors are much more sensitive to temperature, and their value may shift widely as your circuit heats up. Disc-ceramic capacitors are usually the worst. They can vary as much as 80% from the printed value!

There are some special purpose ceramic caps, however, such as the NP0 (negative-positive-zero or n-p-zero, but *not* n-p-oh). These caps should be used in VFO circuits where their *temperature coefficient* (capacitance drift as the temperature varies) is the important factor. Standard disc ceramic caps will drift all over the place, which makes them unsuitable for VFO use. NP0 caps hardly drift at all. If the design specifies NP0, don't use a standard cap.

Choice Selection.

Now you can have it all! Take all the qualities you've come to depend on in our programmable CTCSS tone equipment: Astonishing Accuracy, Instant Programming, Unequaled Reliability; and add full spectrum tone versatility, multi-tone capability without diodes, a reprogrammable memory... It's our new harvest of CTCSS tone equipment.

The choice is yours! If standard CTCSS EIA tones do not suit your taste, select any 32 tones of your liking from 15.0Hz to 255.0Hz. And if you change your mind, no problem; the memory can be changed in your shop with our HHP-1 programmer, or at our factory for free. Your working tone is accessed by a simple DIP switch, so there's no fussing with counters or other test equipment.

Call today toll-free and find out more about this fresh new flexibility in tone signalling, and don't forget to ask about multi-tone switching without cumbersome diode networks or binary switches.

It's all brought to market by the people who introduce the freshest ideas in tone signalling, and of course our customary same day shipping and one year warranty apply.

TS-32P CTCSS ENCODER-DECODER Based on the time proven TS-32, the industry standard for over a decade. The TS-32P gives you the added versatility of a custom, changeable memory base. A low price of $57.95 makes it an even sweeter deal.

SS-32P ENCODER Based on the equally popular SS-32 encoder. Available for CTCSS, or audible burst tones up to 6550.0Hz. Price is $28.95.

SS-32SMP SUB-MINIATURE ENCODER Our smallest encoder for handheld applications. Now you can satisfy that customer that needs to access multiple repeater sites with a radio that has precious little space inside. At $27.95, the price is small too.

HHP-1 HANDHELD PROGRAMMER For programming the 32 memory locations in any of our new programmable products, including our SD-1000 Two-Tone Sequential decoder. The HHP-1 is battery operated for field use, and will program ANY 32 tones from 15.0 to 6550.0Hz in .1Hz. increments. Price is $199.95.

MasterCard VISA

COMMUNICATIONS SPECIALISTS, INC.

426 West Taft Avenue • Orange, CA 92665-4296

Local (714) 998-3021 • FAX (714) 974-3420 • **Entire U.S.A. 1-800-854-0547**

CIRCLE 10 ON READER SERVICE CARD

What about "silver-mica" and "polystyrene" capacitors? As far as drift goes, these are almost as good as NP0 caps. If you can't find an NP0, try either of these two. But again, if the design calls for one of these three types, don't substitute a standard cap! If you have to use a silver-mica where a standard ceramic is called for, that's OK, but you're "gilding the lily" and wasting money.

Large-value capacitors (above about 2 µF) usually come in two types: tantalum and aluminum electrolytic. Both types are polarized, and must be wired into a circuit in a particular way. Some people like to use tantalum caps because they're small. They do have advantages over aluminum electrolytics—tantalum caps have lower leakage current and closer tolerances. Their actual value will be closer to the printed value, and the value will change less with temperature and time.

This makes tantalum caps ideal for RC timing applications, where you want the cap to hold a charge for a long period, and you want the circuit to be easy to duplicate. Most of the time, it's not a good idea to substitute a regular aluminum electrolytic for a tantalum capacitor. This is one of those places where the designer should help you out and tell you if it's important to use a tantalum cap. If you really can't find the specified part, go ahead and try the aluminum cap.

Bypass Capacitors

Bypass capacitors are like pull-up resistors when it comes to substitution. A bypass cap is usually connected from the power-supply pin of an IC to ground. The bypass cap gets rid of any AC spikes or noise on the power-supply voltage. You can use just about anything from 0.001 µF to 0.1 µF for a bypass cap, and any type of capacitor is fine. Most designers use 0.001, 0.01, or 0.1 µF caps because those values are easy to keep around. If you plan to build a lot of digital circuits, you should also try to keep a good stock of these values handy in your junk box.

You may also see higher-value capacitors (between 10 and 100 µF) connected from the power supply to ground near where the power connects to a digital circuit board. These are also bypass capacitors. While just about any value in this range will work, the designer may specify tantalum capacitors in a low-power circuit. Leakage current is the important factor here. Even though capacitors block the flow of DC, there will usually be some small leakage through the capacitor, and this leakage can be much higher with aluminum electrolytic capacitors. It's still very small, however, and you can almost always forget about it, especially if you are using an AC power supply. If a tantalum cap is critical, the designer should tell you.

Using Transistor Substitution Guides

Transistor selection was a thorn in my side for quite a while. It seemed like every time I wanted to build a project I had everything but one or two of the transistors. I've since learned that I could have built most of those projects with a few standard transistors.

The table shows some of these "standard" transistors. With a little creative research, you can probably substitute one of the transistors in the table for the device in that circuit you're working on.

Most transistor manufacturers (and a few parts companies) publish transistor substitution guides. You can use any one of these guides as a cross-reference to find a replacement from the table. The substitution guide will usually give you the manufacturer's standard replacement for the part. Write that number down, then look up the replacements for the transistors in the table. If the manufacturer recommends the same substitute for one of the standards, you're in business. You don't need the special part; one of the standards will do.

One other thing about transistors—you may see some deviation from the typical "2NXXXX" part numbers. For example, a PN2222 is simply a 2N2222 in a plastic case ("P" for "plastic"). Keep this in mind as you search for parts.

Manufacturer's Part Numbers

And then there are those cryptic IC designation numbers. What's the difference between a DM74151AN and an SN74151A? Each comes from a different manufacturer. Will both of them work in the same circuit? You bet. Each has the same part number: 74151A. The "baggage" in the designator is manufacturer information.

On the other hand, if a design calls for a 74LS00, and you have a 7400 IC, you might not get away with substituting your IC in the circuit. Letters in the *middle* of an IC designator tell you about the IC family. The "LS" in this part number means "low-power Schottky." There are many more IC families, but that's a subject for another article. Just remember that letters at the beginning and end of an IC number aren't usually important, but letters in the middle are.

Catalogs, Books, and Magazines

Parts supply catalogs are usually full of information. You can use a lot of this information to help you find substitutes for hard-to-find parts. Write or call parts companies and ask for their catalogs. Some of them charge a small fee, but the catalogs are usually worth it as reference material.

Read all the construction articles you can find. Look at the schematics. You'll start to see patterns after a while. Most engineers don't re-invent the wheel—if there's a good design out there, you'll see parts of it in other circuits. Keep a file of schematics; when you find something you want to build, check through your file for similar circuits. You may see the same basic circuit using a different transistor—maybe one that's easier to find!

Join a Club

Nothing beats being able to ask someone who has more experience than you. Try to find a club where some of the members build their own gear. If no one is building, encourage them to. You may start something. Even if they're not building, most hams can tell you stories about when they did build, and you can pick up a lot of useful information.

Build and Experiment!

Parts substitution is really not that difficult. The best way to find out what works is to build! Don't be afraid to experiment; if you're not sure about something, try it, and keep a record of your results. You'll learn a lot, and you'll have fun as you learn. That's what home-brew ham radio is all about. 73

Some Standard Transistors

Part Number	*Type*	*Typical Use*
2N3904	NPN	oscillator, switch
2N4123	NPN	oscillator, switch
2N4124	NPN	oscillator, switch
2N4401	NPN	oscillator, switch
2N2222	NPN	oscillator, switch, low power amp
2N3053	NPN	medium power amp
2N3553	NPN	medium power RF amp
2N3866	NPN	medium power RF amp (to VHF)
2N3906	PNP	oscillator, switch
2N4037	PNP	oscillator, switch
2N4125	PNP	oscillator, switch
2N4126	PNP	oscillator, switch
2N4403	PNP	oscillator, switch
2N2907	PNP	medium power switch

Three Bands with One Rock

Continued from page 11

was possible, but with about half the output power.

Improvements

The transmitter is a broad-band design. With appropriate output filters, you can transmit on 30 or 17 meter operation. The crystals must be fundamental mode, and no division from other bands results in the needed frequencies. Frequencies above 20 MHz are usually third harmonic types that will probably either oscillate at their fundamental frequency or be very chirpy.

Acknowledgments

The design is a mixture of many QRP rigs that have come before. Certainly no one has written more on the subject than Doug DeMaw. His *QRP Notebook*, available from the ARRL (and "Uncle Wayne's Bookshelf"), is an invaluable resource for QRP designs. *QRP Classics*, an excellent anthology of past *QST* articles, is another. It is also available from both sources.

I'd like to thank the many members of the Allen-Bradley Company Amateur Radio Club, who helped in the preparation of this project. 73

Mike Gasperi WW9X, 4529 W. Johnson Ave., Racine WI 53405.

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

MODEL VS-50M

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

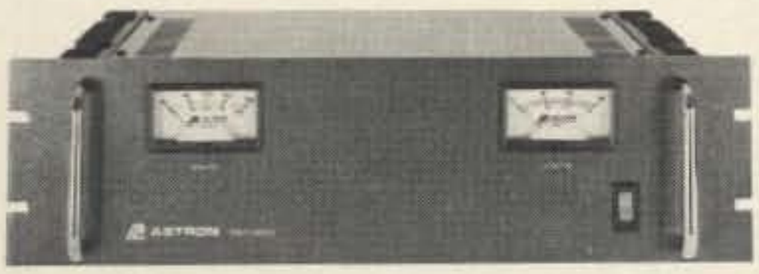
- LOW PROFILE POWER SUPPLY

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2¾ x 7⅝ x 9¾	11

RS-L SERIES

- POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

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



RM SERIES

MODEL RM-35M

- 19" RACK MOUNT POWER SUPPLIES

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

RS-A SERIES

MODEL RS-7A

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

RS-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)

CIRCLE 16 ON READER SERVICE CARD

Software for the Ham Shack, Part II

Useful ham calculations you can program yourself!

by Bill Clarke WA4BLC

With luck, you have the first part of your ham computer system up and running (if not, see Part I in the May 1991 issue). In fact, you may well have new wire antennas all over the yard that you have designed with your computer. Now it's time to add a little more to the system. This month the MAIN MENU will grow to five choices. These will be added to the first two in Part I:

3 - OHM'S LAW
4 - POWER FORMULAS
5 - EFFICIENCY FORMULA

Module Three

Make your selection from the OHM'S LAW menu, selection 3 of the MAIN MENU, and the computer will figure the unknown value for you.

Module Four

With the POWER FORMULAS menu, you can figure power output in watts. Just select the proper menu choice, and the computer will do all the math work for you.

Module Five

Just how efficient is your rig or amplifier? Merely enter the input and output powers, and the computer will tell you the percentage of operational efficiency.

Entering the Listing

Before you add program lines from this month's listing, you must first LOAD HAM1 (again, see last month's issue; if you don't have it, you can call or write the *73* editorial office for one). After it's loaded, LIST it. Then you're ready to start typing. Don't worry if some of the lines appear out of order. The computer will straighten out all the problems during the SAVE, after you finish entering the program lines.

There are quite a few lines to enter this month, so take your time and be careful. You might be well advised to enter part of the listing, save it, and take a break. Come back later, reload, and add the remaining lines.

After you have completed typing in all the lines, you must SAVE your work. Save it under the name HAM2.

Don't forget to use the modifications for the C-64 which were listed in Part I of this series.

Listing for HAM2

```
C-64 Users: Don't forget to make the modifications listed in
Part I of this article series.

16 PRINT SPACE$(26);"3 - OHM'S LAW"
17 PRINT SPACE$(26);"4 - POWER FORMULAS"
18 PRINT SPACE$(26);"5 - EFFICIENCY FORMULA"
34 IF M$ = "3" THEN 300
35 IF M$ = "4" THEN 400
36 IF M$ = "5" THEN 500
300 CLEAR : CLS
301 PRINT SPACE$(30);"OHM'S LAW"
302 PRINT SPACE$(20);"-----------------------------"
303 PRINT : PRINT : PRINT
310 PRINT SPACE$(26);"1 - UNKNOWN CURRENT"
311 PRINT SPACE$(26);"2 - UNKNOWN VOLTAGE"
312 PRINT SPACE$(26);"3 - UNKNOWN RESISTANCE"
315 M$ = INKEY$
316 IF M$ = "1" THEN 320
317 IF M$ = "2" THEN 330
318 IF M$ = "3" THEN 340
319 GOTO 315
320 CLEAR : CLS
321 PRINT SPACE$(30);"OHM'S LAW"
322 PRINT SPACE$(20);"-----------------------------"
323 PRINT : PRINT : PRINT
324 INPUT "ENTER THE VOLTAGE IN VOLTS:    ";E
325 INPUT "ENTER THE RESISTANCE IN OHMS: ";R
326 I = E/R
327 GOSUB 390
328 PRINT : PRINT"THE CURRENT IS: "FNA(I)" AMPS"
329 GOTO 380
330 CLEAR : CLS
331 PRINT SPACE$(30);"OHM'S LAW"
332 PRINT SPACE$(20);"-----------------------------"
333 PRINT : PRINT : PRINT
334 INPUT "ENTER THE CURRENT IN AMPS:     ";I
335 INPUT "ENTER THE RESISTANCE IN OHMS: ";R
336 E = I*R
337 GOSUB 390
338 PRINT : PRINT"THE VOLTAGE IS: "FNA(E)" VOLTS"
339 GOTO 380
340 CLEAR : CLS
341 PRINT SPACE$(30);"OHM'S LAW"
342 PRINT SPACE$(20);"-----------------------------"
343 PRINT : PRINT : PRINT
344 INPUT "ENTER THE VOLTAGE IN VOLTS: ";E
345 INPUT "ENTER THE CURRENT IN AMPS:  ";I
346 R = E/I
347 GOSUB 390
348 PRINT : PRINT"THE RESISTANCE IS: "FNA(R)" OHMS"
349 GOTO 380
380 PRINT
381 PRINT "N - TRY AGAIN"
382 PRINT "M - MAIN MENU"
383 M$ = INKEY$
384 IF M$ = "N" THEN 300
385 IF M$ = "M" THEN 10
386 GOTO 383
390 DEF FNA(I) = INT (I*100+.5)/100
391 DEF FNA(E) = INT (E*100+.5)/100
392 DEF FNA(R) = INT (R*100+.5)/100
393 DEF FNA(P) = INT (P*100+.5)/100
```

(Continued)

Using the New Program

LOAD the new program by typing LOAD "HAM2" 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 five selections: ANTENNA DESIGN MATH, TRANSMISSION LINE MATH, OHM'S LAW, POWER FORMULAS, and EFFICIENCY FORMULA.

Next month, in Part III of this four-part series, you'll add modules six and seven: RADIO HORIZONS and OHMS TO RESISTOR COLORS to your ham shack software. 73

You may reach Bill Clarke WA4BLC at RD#2 Box 455-A, Altamont NY 12009.

```
394 DEF FNA(D) = INT (D*100+.5)/100
395 DEF FNA(L) = INT (L*100+.5)/100
399 RETURN
400 CLEAR : CLS
401 PRINT SPACE$(28);"POWER FORMULAS"
402 PRINT SPACE$(20);"------------------------------"
403 PRINT : PRINT : PRINT
410 PRINT SPACE$(23);"1 - KNOWN VOLTAGE & CURRENT"
411 PRINT SPACE$(23);"2 - KNOWN VOLTAGE & RESISTANCE"
412 PRINT SPACE$(23);"3 - KNOWN CURRENT & RESISTANCE"
415 M$ = INKEY$
416 IF M$ = "1" THEN 420
417 IF M$ = "2" THEN 430
418 IF M$ = "3" THEN 440
419 GOTO 415
420 CLEAR : CLS
421 PRINT SPACE$(28);"POWER FORMULAS"
422 PRINT SPACE$(20);"------------------------------"
423 PRINT : PRINT : PRINT
424 INPUT "ENTER THE VOLTAGE IN VOLTS: ";E
425 INPUT "ENTER THE CURRENT IN AMPS:  ";I
426 P = E*I
427 GOSUB 390
428 PRINT : PRINT"THE POWER IS: "FNA(P)" WATTS"
429 GOTO 480
430 CLEAR : CLS
431 PRINT SPACE$(28);"POWER FORMULAS"
432 PRINT SPACE$(20);"------------------------------"
433 PRINT : PRINT : PRINT
434 INPUT "ENTER THE VOLTAGE IN VOLTS:    ";E
435 INPUT "ENTER THE RESISTANCE IN OHMS: ";R
436 P = (E*E)/R
437 GOSUB 390
438 PRINT : PRINT"THE POWER IS: "FNA(P)" WATTS"
439 GOTO 480
440 CLEAR : CLS
441 PRINT SPACE$(28);"POWER FORMULAS"
442 PRINT SPACE$(20);"------------------------------"
443 PRINT : PRINT : PRINT
444 INPUT "ENTER THE CURRENT IN AMPS:     ";I
445 INPUT "ENTER THE RESISTANCE IN OHMS: ";R
446 P = (I*I)*R
447 GOSUB 390
448 PRINT : PRINT"THE POWER IS: "FNA(P)" WATTS"
449 GOTO 480
480 PRINT
481 PRINT "N - TRY AGAIN"
482 PRINT "M - MAIN MENU"
483 M$ = INKEY$
484 IF M$ = "N" THEN 400
485 IF M$ = "M" THEN 10
486 GOTO 483
500 CLEAR : CLS
501 PRINT SPACE$(26);"EFFICIENCY FORMULA"
502 PRINT SPACE$(20);"------------------------------"
503 PRINT : PRINT : PRINT
524 INPUT "ENTER THE POWER OUTPUT IN WATTS: ";O
525 INPUT "ENTER THE POWER INPUT IN WATTS:  ";I
526 X = O/I : E = 100*X
527 GOSUB 390
528 PRINT : PRINT"THE EFFICIENCY IS: "FNA(E)"%"
529 GOTO 580
580 PRINT
581 PRINT "N - TRY AGAIN"
582 PRINT "M - MAIN MENU"
583 M$ = INKEY$
584 IF M$ = "N" THEN 500
585 IF M$ = "M" THEN 10
586 GOTO 583
```

73 Review

by Dick Goodman WA3USG

SWISSLOG Version 3.66

A complete QSO tracking system in one fast software program.

Frank Greenhalgh KD2LL
10 Robbins Ave.
Amityville NY 11701
Tel. (516) 598–0011
Price Class: $75

Computer logging programs have certainly proliferated in the last 10 years. Until I found Swisslog, I never really deemed them exciting enough to explore in detail. Over the course of the last 20 years I have maintained my log in a variety of ways. During the pre-computer era of the early 1970s, I used the official ARRL logbooks. They worked out pretty well. They had all the necessary fields for mandatory information, such as call, date, time, signal report, etc. The back side of each page was blank, making it excellent for free-form remarks. The only problem was that after the log contained about 200–300 entries there was no efficient way to look up a particular QSO unless you knew the date. So I went to 3″ x 5″ cards for a while (one for each QSO). What a pain!

Eventually I switched over to an MSDOS machine and tried a variety of commercial logging programs, but none quite suited my needs. I ended up using "DBASE III Plus" as a development system, and finally "Clipper" (a DBASE program code compiler) to write my own logging program. You can spend hours programming up your own system or make it easy on yourself and get a copy of SWISSLOG.

More Than Just Logging

SWISSLOG is not just another logging program. It is a complete amateur radio QSO tracking system with its own versatile reports generator/formatter, statistics generator, worldwide prefix/call library, beam heading routine, grid locator, awards tracking system, propagation prediction program (with graphic display of signal path), Grayline program, and other features too numerous to mention. SWISSLOG can be used as a full-featured logging program by the novice computer user, but its features really shine when the user has rudimentary computer skills.

The documentation provided with SWISSLOG is just about the best I have ever seen. Version 3.66 comes with a 102-page, professionally-bound reference manual, plus a 33-page addendum. It is clear, concise and includes beautifully printed screen dumps and screen layouts. It is written to be a tutorial as well as a reference manual. There are also tutorial files included with the SWISSLOG program itself. This documentation, along with "READ.ME" files, will enable new computer users to come online with this program very quickly. Users who have had generic query language programming experience (e.g. reports generator in DBASE III) will find this program almost intuitive. The ability to sort on any field and generate your own record selection criteria based on any combination of fields is quite impressive.

Photo A. The SWISSLOG main menu.

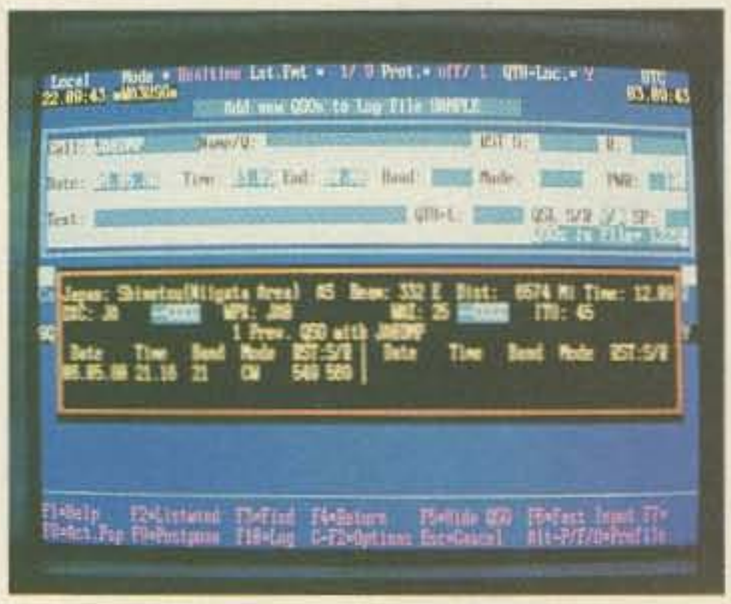


Photo B. Menu for Option 1, "add/update QSO records."

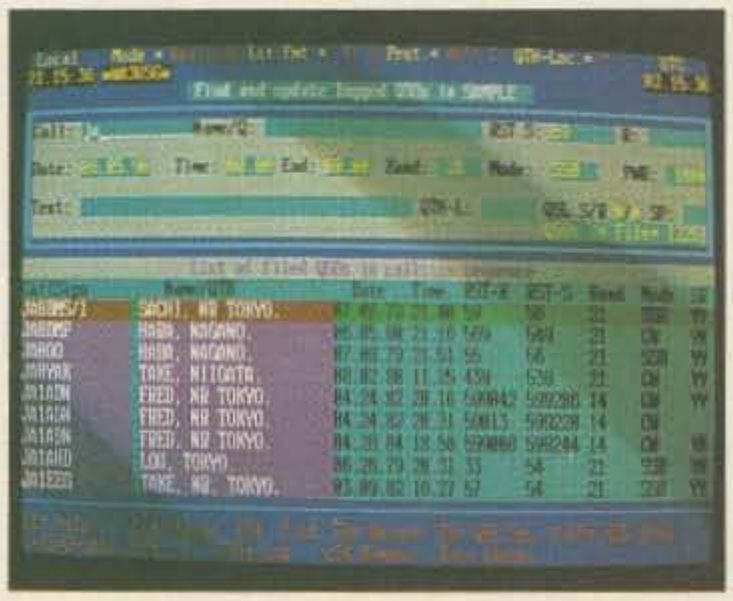


Photo C. Sequential list of all "JA" contacts currently logged.

SWISSLOG is also quite fast. Included on the distribution diskettes is a sample log which contains over 1,200 entries. It took a maximum of about 15 seconds to sequentially search through this entire database and generate on-screen reports from my specified record selection criteria. It should also be noted that SWISSLOG uses index files to control the sorting of the database. Even when the total database becomes much larger than the current 1,200-plus entry size, the time to sort by callsign will not increase once the index file has been built. This was a great limitation on older and less sophisticated logging systems. Another advantage is that an index file takes up much less space then a duplicate data file sorted in the desired sequence. Using index files also makes field seeks (e.g. finding QSOs by callsign) effectively instantaneous.

The reference manual clearly documents installation of SWISSLOG. The installation is totally automatic and takes about five minutes. SWISSLOG requires 512K of memory, and it will run on monochrome or color systems with DOS version 3.1 or higher. I would recommend a hard drive, but a system with two floppy drives will handle up to 2,000 QSOs. This review was conducted on a Comp-U-Add 286 running at 20 MHz with a

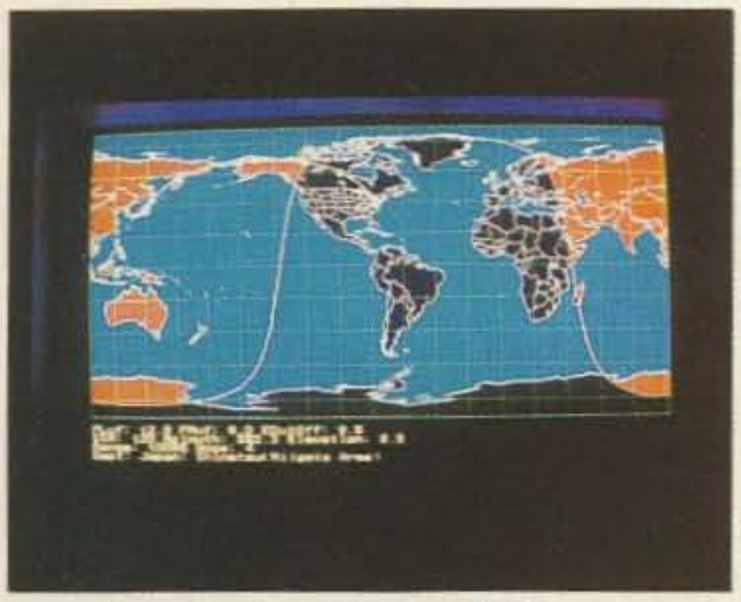


Photo D. Progation prediction map.

VGA display. The default color configuration for all SWISSLOG screens is, in my opinion, striking! The color scheme can also be changed by the user. Liberal use is made of pop-up windows. Virtually the entire program is menu driven. To enter the system, simply type "SWISSLOG" and press ENTER>.

SWISSLOG's Offerings

The first time SWISSLOG is executed, the user will be prompted to enter a "personal profile." This consists of the latitude and longitude of the QTH, the offset to UTC, display type (color/mono), and several other parameters unique to the user. This is all requested via a friendly menuing system and only has to be done upon initial program installation. Any of these values may be changed later if desired. The SWISSLOG main menu will follow, as shown in Photo A.

Please keep in mind that because of the sophistication of this program, this review will cover only the main points. The capabilities and versatility of this system are limited only by the imagination of the user.

Option 1, "Add/Update QSO Records," is almost self-explanatory. Upon selecting this option, the user is presented with a menu similar to that shown in Photo B. From here you may enter new QSO data or, by using the appropriate function key as identified on the bottom of the screen, call up existing logged entries to be viewed and edited. Index files are used so the search is instantaneous, regardless of the database size. The order of data entry on this screen may be changed from Option 5 on the main menu to best suit the user's needs. For example, the callsign may be prompted for first, followed by the date and start time, then signal reports and other applicable fields. There is also a contest mode that checks for dupes on each band and notifies the user with inverse video and an audible signal. A sequence number can be kept updated for each QSO for contests that require it. Finally, the **propagation prediction** feature may be called up from here. This displays a world map with the propagation path displayed, and estimated signal strength on each available band (See Photo D.).

Option 2, "Select QSO-Records," presents a sub-menu. This allows the user to select QSO records via the SWISSLOG query language, sort records in any sequence, print, list to the screen or a file those selected records, and browse/update the selected records. Fields selected by the user may also be globally updated or deleted. Additional log files may also be created from this selected data. Reports generated may be formatted as desired.

Option 3, "Sort and Rebuild Index," allows the regeneration of the SWISSLOG index file in callsign sequence. The "Sort" function will physically move the actual QSO records in any sequence of your choice.

Option 4, "Merge Log-Files," allows the user to add the QSO records of one log file to the currently active log. This function enables several log files to be used in parallel, and is particularly useful in contests where a unique file would be required for dupe checking, etc.

Option 5, "Set Options and Profile," allows the user to customize SWISSLOG. Names of files that are to be used, data relevant to your station (e.g. lat, long), definition of the most used options, input sequence of QSO fields, initial values of each QSO record, printer control sequences, display mask attributes, and QSO entry window size and placement may be specified. The color scheme of all SWISSLOG screens may also be modified from this option.

Option 6, "Change Filenames," allows the selection of the active log from all available log files.

Option Q, "QTH-Locator Conversion," will convert from latitude and longitude to grid square, or vice versa. It also provides beam headings and distance from your station.

Option G, "Experimental Graphic-Support," allows tailoring of station and environmental parameters, such as antenna type and height (for each band) and sunspot number. This is used with the propagation prediction feature.

Option S, "Statistic-Support," generates reports on the user's progress on getting DXCC, WAZ, ITU and WPX awards. These reports are beautifully formatted and would be of great assistance to the devoted contester.

SWISSLOG has numerous other features not touched upon in this review. One important capability is the ability to import ASCII data into the database. This makes it possible to transfer data from other logging programs, or programs such as DBASE III, into SWISSLOG. The table which contains country/prefix/geographical coordinates may also be updated as prefixes or other related data changes. Finally, SWISSLOG may be made resident and popped up from within other programs. The configuration options of this feature are diverse and should satisfy most applications where memory allocation could be a problem.

It is impossible to describe the capabilities of SWISSLOG in the space allocated here. I can say with absolutely no reservations that this is the best logging program that I have ever seen, and I am now using SWISSLOG myself! 73

BARTER 'N' BUY

Number 14 on your Feedback card

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

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

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

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

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

Send your ads and payment to the *Barter 'n' Buy*, Donna DiRusso, Forest Road, Hancock NH 03449 *and get set for the phone calls.*

BATTERY PACK REBUILDING: SEND YOUR PACK/48HR SERVICE. ICOM: BP2/BP3/BP22 $19.95, BP5/BP8/BP23 $25.95. BP24/BP70 $26.95, BP7 $32.95. KENWOOD PB21 $15.95, PB21H/PB6 $22.95, PB25/26 $24.95, PB2/PB8 $29.95. YAESU: FNB9 $19.95, FNB10/17 $23.95, FNB11 $29.95, FNB3/4/4A $36.95. STS: AV7600 $27.95, ZENITH/TANDY LT PACKS $54.95 "U-DO-IT INSERTS" ICOM: BP3/BP22 $16.95, BP5/8/24/70 $21.95. KENWD: PB21 $12.95, PB21H $18.95, PB24/25/26 $19.95, TEMPO/S $22.95. YAESU: FNB9 $16.95, FNB10/17 $18.95, FNB4/4A $32.95. AZDEN: $19.95. "NEW PACKS": ICOM BP8B (BS CHG) $32.95. SANTEC: 142/1200 $22.95, YAESU: FNB2/500 $19.95, FNB2/600 $23.95, FNB17 $34.95, FREE CATALOG. $3.00 Shipping/order, PA+6%, VISA-M/C +$2.00 CUNARD, R.D.6 BOX 104, Bedford, PA 15522. (814) 623–7000 BNB258

CHASSIS, CABINET KITS SASE, K3IWIC, 5120 Harmony Grove Rd., Dover PA 17315. BNB259

AMATEUR RADIO CLASSIFIED Quality Buy/Sell/Trade publication. Twice monthly. Inexpensive, easiest to read. Subscriptions: $12/yr. Ads: 25 cents/word. FREE SAMPLES. POB 245-S, Jonesboro GA 30237. BNB263

HOME-BREW PROJECTS lists for S.A.S.E. Kenneth Hand, P.O. Box 708, East Hampton NY 11937. BNB264

TRANSISTORS RF FOR SALE: Looking for repair shops, manufacturers and dealers. MRF454, MRF455 series TOSHIBA 2SC2290, 2SC2879, and more. Call (800) 842–1489. BNB265

COMPLETE HF STATION FOR SALE Kenwood TS-940-AT, SP-940, MC-60A, HS-5 phones, PC-1A, LF-30A, YK-88-C, SW-2000, IF-10B, IF-232C, Heil Boomset, Alliance HD-73, Ameritron AL-80A, ATR-15 tuner, Hy-Gain Explorer-14 beam with 30/40M option, PLUS all cabling. OVER $6000 new, ONLY $3500. Don Bledsoe WB6LYI, P.O. Box 91299, Long Beach CA 90814. (213) 494–6765. BNB266

HAM RADIO REPAIR CENTER, quality workmanship. Solid state or tube, all makes and models. Also repair HF amplifiers. A-Z Electronic Repair, 3638 East, Indian School Rd., Pheonix AZ 85018. (602) 956–3024. BNB267

QSL CARDS—Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSLs, Dept A, 310 Commercial, Emporia KS 66801, or FAX request to (316) 342–4705. BNB434

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $10. LEARN MORSE CODE IN 1 HOUR. Amazing new supereasy technique. $10. Both $17. Moneyback guarantee. Free catalog: SASE. Bahr, Dept 73-2, 7320 Normandy, Cedar Rapids IA 52402. BNB531

ROSS' $$$$ USED June SPECIALS: KENWOOD TS-130S/CW,SSB,FL $599.90, TS-940SWAT $1695.90, TH-415A $269.90, TS-830S $829.90; ICOM 551D $549.90, PS-15/CF-1 $144.90; YAESU FT-301D $379.90, FP-310 $109.90; TEN-TEC 562,288 $1699.90, 961 $179.90, 229B $249.90; MFJ 989B $229.90, 1030BX $48.90; MIDLAND 13-770 $49.90, 13-777B $49.90. LOOKING FOR SOMETHING NOT LISTED?? CALL OR SEND S.A.S.E., HAVE OVER 185 USED ITEMS in stock. MENTION AD. PRICES CASH, FOB PRESTON. HOURS TUESDAY–FRIDAY 9:00 TO 6:00, 9:00–2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852–0830. BNB654

WRITTEN EXAMS SUPEREASY. Memory aids from psychologist/engineer cut studytime 50%. Novice, Tech, Gen: $8 each. Advanced, Extra: $12 each. Moneyback guarantee. Bahr, Dept 73-2, 7320 Normandy, Cedar Rapids IA 52402. BNB691

ROSS' $$$$ NEW June (ONLY) SPECIALS: LOOKING FOR THAT HARD TO FIND ITEM?? KENWOOD TM-241A $379.90, TM-701A $449.90, VFO-700S $149.90, TH-26A $259.90; ICOM IC-471-H $899.90, IC-O4AT $269.99, EX-108 $109.90; YAESU FT-470 $399.90, FV-101DM $319.90; NYE VIKING MB-II-02 $244.90, MB-VA $619.90; ENCOM/SANTECK ST-220UP $269.90, ST-142 $249.90; AEA PM-1 $129.90, PK-232MBX $309.90, PK-64A/HFM $149.99; BIRD 4304 $329.90, 43N $198.90; BUTTERNUT HF6V-X $144.90, HF-2V $142.90, STR-II $35.90. SEND S.A.S.E. FOR USED LIST. ALL L.T.O. (LIMITED TIME OFFER) LOOKING FOR SOMETHING NOT LISTED?? CALL OR WRITE. Over 9039 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. PRESTON. HOURS TUESDAY–FRIDAY 9:00 TO 6:00, 9:00–2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852–0830. BNB709

HAM RADIO REPAIR all makes, models. Experienced, reliable service. Robert Hall Electronics, Box 280363, San Francisco CA 94128-0363. (408) 729–8200. BNB751

WANTED: Ham equipment and other property. The Radio Club of Junior High School 22 NYC, Inc., is a nonprofit organization, granted 501(C)(3) status by the IRS, incorporated with the goal of using the theme of ham radio to further and enhance the education of young people nationwide. Your property donation or financial support would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. As 1991 begins, please look over whatever unwanted equipment you may have, and call us. We will pick up or arrange shipping. You will receive the tax deduction, but most important, the privilege of knowing that your gift really made a difference in the education and upbringing of a child. Meet us on the WB2JKJ CLASSROOM NET, 1200 UTC on 7.238 MHz, and hope to see you at the KNOXVILLE HAMFEST June 1. Write us at: The RC of JHS 22 NYC, Inc., P.O. Box 1052, New York NY 10002. Round the clock HOTLINES: Voice (516) 674–4072, FAX (516) 674–9600. BNB762

"HAMLOG" COMPUTER PROGRAM Full features. 18 modules. Auto-logs, 7-band WAS/DXCC. Apple, IBM, CP/M, KAYPRO, TANDY, CR8 $24.95. 73-KA1AWH, PB 2015, Peabody MA 01960. BNB775

LAMBDA AMATEUR RADIO CLUB International amateur radio club for gay and lesbian hams. On-air skeds, monthly newsletter, and annual gathering at Dayton. (215) 978–LARC. P.O. Box 24810, Philadelphia PA 19130. BNB812

INEXPENSIVE HAM RADIO EQUIPMENT. Send postage stamp for list. Jim Brady—WA4DSO, 3037 Audrey Dr., Gastonia NC 28054. BNB890

WANTED: BUY & SELL All types of Electron Tubes. Call toll free 1 (800) 421–9397 or 1 (612) 429–9397. C & N Electronics, Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. BNB900

ELECTRON TUBES: All types & sizes. Transmitting, receiving, microwave . . . Large inventory = same day shipping. Ask about our 3-500Z special. Daily Electronics, P.O. Box 5029, Compton CA 90224. (800) 346–6667. BNB913

COMMODORE 64 HAM PROGRAMS—8 disk sides over 200 Ham programs $16.95. 25¢ stamp gets unusual software catalog of Utilities, Games, Adult and British Disks. Home-Spun Software, Box 1064-BB, Estero FL 33928. BNB917

FOR SALE RTTY, AMTOR, CW, packet system, including AEA PK-232MBX controller in mint condition. Two RCA APT smart terminals, Reutres 9" monitor, etc. $350. Call Ron Brandenburg N2ARQ, (718) 996–0700 before 3:00 weekdays. BNB940

WANTED: For museum and author—pre-1980 microcomputers and publications—also need CPM computers, Osborne, Kaypro, etc. Need author to write detailed book on how to use the PACKRATT software. Dave Larsen KK4WW, Blacksburg Group, P.O. Box 1, Blacksburg VA 24063-0001. (703) 763–3311/231–6478. BNB945

JUST IMAGINE your own beautiful Blue Ridge mountain top QTH—selling my 323-acre Christmas tree farm—all or part—trees optional. KK4WW, Floyd VA. (703) 763–3311. BNB956

CUSHCRAFT, Barker & Williamson, power supplies, rotors, baluns, center insulators, ladder line, coax, connectors, surplus tubes. ATKINSON & SMITH, 17 Lewis St., Eatontown NJ 07724. 1 (800) 542–2447. BNB957

AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur radio and electronics PD software, $4.00 per disk. Send 2 stamps SASE for catalog. Specify which computer! WA4EFH, Box 1646, Orange Park FL 32067-1646. BNB958

FREE Ham Gospel Tracts, SASE, N3FTT, 5133 Gramercy, Clifton Hts. PA 19018. BNB960

BUILD 35-FOOT FREE STANDING TILT-OVER TOWER. Plan book, $8.95 plus $1.00 S&H. Build metal lathe, metal shaper, milling machine, drill press, brake, engines, etc. Large S.A.S.E. for book list. Gingery Tool, P.O. Box 75, Fordland MO 65652-0075. BNB962

PRINTED CIRCUIT BOARDS for projects in *73, Ham Radio, QST, ARRL Handbook.* List SASE. FAR Circuits, 18N640 Field Ct., Dundee IL 60118. BNB966

SATELLITE MONTHLY AUDIO CODES 1 (900) HOT-SHOT. Intended for testing only. $3.50 per call. BNB976

BLIND, DISABLED would like friends who will donate a new or used shortwave radio. I like to listen to the world. I'm a shut-in. Please write: Richard Jastrow, 5909 West 6th St., Hollywood CA 90036, or phone (213) 938–5341. BNB978

AZDEN SERVICE by former factory technician. NiCds $36.95 plus shipping. Southern Technologies Amateur Radio, Inc., 10715 SW 190 St. #9, Miami FL 33157. (305) 238–3327. BNB979

DIGITAL AUTOMATIC DISPLAYS Kenwood, Yaesu, Collins, Drake, Atlas, etc. No bandswitching required. Business 52¢ S.A.S.E. Be specific. GRAND SYSTEMS, Dept. A, P.O. Box 3377, Blaine WA 98230. BNB981

COMMODORE 64 REPAIR Fast turn around. Southern Technologies Amateur Radio, 10715 SW 190th Street #9, Miami FL 33157. (305) 238–3327. BNB982

TRAVEL! HIGH INCOME! Radio officers needed for shipboard employment. Must have FCC Second Class Radiotelegraph license and background in electronics. Salary approximately $4,000 monthly to start, including vacation plus full benefits. Rae Echols, W7FFF, American Radio Association, 5700 Hammonds Ferry Road, Linthicum Heights MD 21090. BNB983

IT'S BACK AND BIGGER THAN EVER: THE HW-8 HANDBOOK. Modifications for the Heath HW series of QRP rigs. A must for every QRPer. $7.95 plus $1.00 for first class postage, or DX $14.95 air, to Michael Bryce WB8VGE, 2225 Mayflower NW, Massillon OH 44647. BNB984

REPOSSESSED VA & HUD HOMES available from government from $1 without credit check. You repair. Also S&L bailout properties. Call 1–805–682–7555 ext. H-4470 for repo list your area. BNB985

SEIZED CARS, trucks, boats, 4wheelers, motorhomes, by FBI, IRS, DEA. Available your area now. Call 1–805–682–7555 ext. C-3968. BNB986

WANTED: RF MAGNETOMETER (gaussmeter); computer for packet use. KB4QGJ, G. Rose, 524 N. Quaker Lane, Alexandria VA 22304. (703) 370–1880. BNB991

HIGH EFFICIENCY BALUNS Legal limit on HF bands. Excellent for dipoles. 1:1 ratio. $39.00 post paid U.S., or for more info: WB5L, P.O. Box 157, Pflugerville TX 78660. BNB992

LIKE CONTESTS? Write for details on America's most rewarding contest. TSRAC, Box 240, RD 1, Adena OH 43901. BNB993

VIDEOCIPHER II/Scanner/Cable/Satellite modification and repair books. Catalog, $3.00. TELECODE, P.O. Box 6426-PE, Yuma AZ 85366-6426. BNB994

SOFTWARE: IBM, COMMODORE & APPLE. Hi-tech available only here! $2.00 each. $1.00 for catalog. OFFShore Software, P.O. Box 180242, Mobile AL 36618. BNB995

DIPOLES CUSTOM MADE for your frequency. Catalog $2.00. Beacon Hill Antenna Works, 201 Coach House Drive, Madison WI 53714. BNB996

MORSE CODE COMPUTER INTERFACES $49.95 License study programs, $14.95. DX audio processor for CW, packet, AMTOR, RTTY, $49.95. Free Public Domain and ham catalog for IBM or CoCo. Dynamic Electronics, Box 896, Hartselle AL 35640. (205) 773–2758. BNB997

NOW YOU CAN OWN THE ULTIMATE JRC-JST 135 or JST 135 HP HF transceiver. Also the general coverage HF receiver JRC-NRD 525 or NRD 535. Our special prices: JST-135, $1749.00; JST-135 HP $2949.00; NRD-525 $1049.00; and NRD-535 TBA. Call Henry, N4EDQ, AMATEUR RADIO SALES, 1 (800) 828–6433. Also let us be your accessories and complete radio store. BNB998

HamBase™

Data Retrieval Software

1922-1990

- Contains 501,906 US licensees.
- Name, address, class, and year of birth.
- Instant retrieval on Macintosh or PC.
- Export in text format to any database.
- Use with a hard disk, or from diskette.
- Source code and documentation included.
- 100% verified on high quality diskettes.

PC 5.25" 1.2Meg	Macintosh® 800K
17 disks $69.95	25 disks $79.95

VISA® MasterCard

Plus $5 shipping and handling.
CA residents add 7% sales tax.
Call for other disk formats.

1991-...

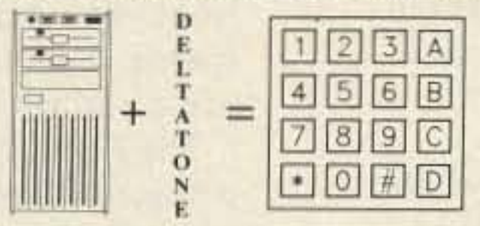
j•Com · P O Box 194 S · Ben Lomond · CA · 95005 · (408) 336-3503

CIRCLE 270 ON READER SERVICE CARD

ATTENTION REPEATER OWNERS—DELTATONE™ 2.0
The Ultimate 16-Digit DTMF Repeater Programmer

DELTATONE™ 2.0, the perfect complement to your repeater controller investment. DELTATONE and your MS-DOS computer offer unlimited 16-digit tone generation for local or remote programming of your repeater controller. DELTATONE accepts programming commands from a file created using your favorite word processor. Commands and comments can be freely mixed within the file. DELTATONE's intelligent device driver conveniently sends only the commands to the DELTATONE interface via your printer port.

- Effortless installation program
- DTMFTONE.SYS Intelligent device driver uses less than 2K system memory
- Interfaces with LPT1, LPT2 or LPT3 printer ports without interfering with normal printer operation



- Transformer coupled, balanced 600 ohm adjustable to -10 dbm output level.
- Software controlled relay contacts for PTT or COR switching.
- Easy 4-wire connection interfaces directly to controller, radio or user supplied approved telephone coupler.

You simply won't find a more flexible and powerful hardware/software package for generating DTMF tones. **30-DAY MONEY-BACK GUARANTEE.** We'll even guarantee your complete satisfaction with DELTATONE in 30 days, or return it for your money back. It's your opportunity to put the power of DELTATONE 2.0 to work for you — RISK FREE!

$149 Includes Interface/Software
Check, MO, VISA or MASTER
Accepted + $4 for S&H
(WI Res. Add 5% Sales Tax)

DELTA RESEARCH
PO Box 13677 • Wauwatosa, WI 53213
FAX or Phone Weekdays (414) 353-4567

CIRCLE 257 ON READER SERVICE CARD

ATV CONVERTERS • HF LINEAR AMPLIFIERS

AMATEUR TELEVISION CONVERTERS
ATV2 420–450 ..... $ 44.95 Kit
ATV3 420–450 (GaAS–FET) ..... $ 49.95 Kit
ATV4 902–928 (GaAS–FET) ..... $ 59.95 Kit

AUDIO SQUELCH CONTROL for ATV
SIL ..... $ 39.95 Kit

2 METER VHF AMPLIFIERS
35 Watt Model 335A ..... $ 79.95 Kit
75 Watt Model 875A ..... $119.95 Kit
Available in kit or wired/tested

HF AMPLIFIERS per MOTOROLA BULLETINS

Complete Parts List for HF Amplifiers Described in the MOTOROLA Bulletins.

AN758 300W $160.70
AN762 140W $ 93.25
AN779L 20W $ 83.79
AN779H 20W $ 93.19
AR313 300W $403.00
EB63 140W $ 88.65
EB27A 300W $139.20
EB104 600W $448.15
AR305 300W $383.52

NEW!! 1K WATT 2–50 MHz Amplifier

POWER SPLITTERS and COMBINERS
2–30MHz
600 Watt PEP 2–Port ..... $ 69.95
1000 Watt PEP 2–Port ..... $ 79.95
1200 Watt PEP 4–Port ..... $ 89.95

100 WATT 420–450 MHz PUSH–PULL LINEAR AMPLIFIER – SSB–FM–ATV

KEB67—PK (Kit) $159.95
KEB67—PCB (PC Board) ..... $ 18.00
KEB67—1 (Manual) ..... $ 5.00

UNIVERSAL DIGITAL FREQUENCY READOUT
TK–1 (Wired/tested) $149.95

HEAT SINK MATERIAL
Model 99 Heat Sink(6.5x12x1.6) ..... $ 22.00
CHS–6 Copper Spreader(6x6x1/4) ..... $ 18.00

We also stock Hard–to–Find parts

CHIP CAPS–Kemet/ATC
METALCLAD MICA CAPS–Unelco/Semco
RF POWER TRANSISTORS
MINI–CIRCUIT MIXERS
SBL–1 (1–500Mz) ..... $ 6.50
SBL–1X (10–1000Mz) ..... $ 7.95
ARCO TRIMMER CAPACITORS
VK200–20/4B RF Choke ..... $ 1.20
56–590–65–3B Ferrite Bead ..... $ .20
Broadband HF Transformers

Add $ 3.50 for shipping and handling.

For detailed information and prices, call or write for our free catalog.

We ship worldwide. VISA

CCI Communication Concepts Inc.
508 Millstone Drive * Xenia, Ohio 45385 * (513) 426–8600
FAX 513–429–3811

master charge

WE SHIP WORLDWIDE

CIRCLE 99 ON READER SERVICE CARD

More POWER from MIRAGE
PRE-AMPLIFIERS

All models give you more than 20dB gain with less than 0.6dB noise. Mast-Mount KP-2 models handle better than 160W and In-Shack KP-1's handle 100W of power. These Pre-Amps are the best on the market for the price.

KP-1 List Price $117.00 In-Shack Models		KP-2 List Price $165.00 Mast-Mount Models
KP-1/10M	28-30 MHz	KP-2/10M
KP-1/6M	50-52 MHz	KP-2/6M
KP-1/2M	144-148 MHz	KP-2/2M
KP-1/220	220-225 MHz	KP-2/220
KP-1/440	420-470 MHz	KP-2/440

If your dealer is unable to supply any of our amplifiers or antennas, please call us at 1-800-628-5181.

We carry all of our products in stock for same day shipment and will be happy to identify a dealer who will accommodate your needs.

MIRAGE/KLM

Post Office Box 1000 Morgan Hill, CA 95038 (408) 779-7363

CIRCLE 231 ON READER SERVICE CARD

COMET

ANTENNAS FOR THE PROFESSIONAL AMATEUR

MULTI-BAND ANTENNA SYSTEMS

146 MHZ
446 MHZ
DUAL-BAND

NEW
◀ CA-2×4MAX (Shown)
Base/Repeater Antenna
GAIN: 146MHz 8.5dB 5/8 Wave x 5
446MHz 11.9dB 5/8 Wave x 12
IMPEDANCE: 50 Ohm
SWR: Less than 1.5:1
144-148 MHz
440-450 MHz
MAX POWER: 200 watts
LENGTH: 17'8"
WEIGHT: 5lbs. 12 oz.
MOUNTING MAST DIA.: 1¼-2½"
CONNECTOR: UHF (SO-239)
CONSTRUCTION: Heavy Duty Fiberglass
SCREW-TOGETHER ABS JOINTS

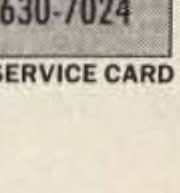
■ CA-2×4Z
Base/Repeater Antenna
GAIN: 146MHz 8.2dB 446MHz 11.5dB
POWER: 200 watts
LENGTH: 15'11"
CONNECTOR: N

■ CA-2×4FX
Base/Repeater Antenna
GAIN: 146MHz 4.5dB 446MHz 7.2dB
POWER: 200 watts
LENGTH: 5'11"
CONNECTOR: UHF type

■ CA-2×4MB
Mobile Antenna w/Fold-over feature
GAIN: 146MHz 4.5dB 446MHz 7.0dB
POWER: 150 watts
LENGTH: 5'
CONNECTOR: UHF type

■ CA-2×4SR
Mobile Antenna w/Fold-over feature
GAIN: 146MHz 3.8dB 446MHz 6.2dB
POWER: 150 watts FM
LENGTH: 3'4"
CONNECTOR: UHF type

■ CF-416
Duplexer w/Coax
POWER: 146MHz 800 watts
446MHz 500 watts
CONNECTOR OUTPUT: N-type
146MHz INPUT: UHF
446MHz INPUT: N-type



■ CF-4160I CF-4160K
Duplexer w/o Coax
POWER: Same as CF-416
CONNECTOR OUTPUT: UHF
146MHz INPUT: UHF
I MODEL 446 INPUT: N-type
K MODEL 446 INPUT: UHF

Call For Your Nearest Dealer Or Catalog
1 [800] 962-2611

N.C.G. CO.
NCG

NCG Companies
1275 North Grove Street
Anaheim, CA 92806
(714) 630-4541/FAX (714) 630-7024

CIRCLE 54 ON READER SERVICE CARD

Get on the WARC Bandwagon

You can still enjoy good DXing, even as propagation conditions decline.

by Drayton Cooper N4LBJ

Even though Sunspot Cycle 22 has shown some marked idiosyncracies lately, the consensus of opinion is that the number of spots will soon be showing a marked decrease once again. To any avid user of our higher frequency bands (20 meters and above), that means declining conditions on long-haul paths, and increasing frustration over the scarcity of good openings to faraway places. Looking ahead two or three years to the bottoming out of Cycle 22, there is a ray of hope for those of us who enjoy DXing: The WARC bands are now all in place, and one of them in particular should ease the need for a DX fix.

The WARC Bands

The WARC bands are the "new" bands, assigned to amateur radio as a result of the last World Administrative Radio Conference, in 1979. These relatively small slices of spectrum space were handed to us over a period of 10 years, with the last one, 17 meters, opened for U.S. operators less than two years ago.

For the first time in our history, we will be facing the bottom of a sunspot cycle with more choices of frequencies than we have ever enjoyed before. If you have not tried the WARC bands (and there is a surprisingly large number of hams who haven't), this article will introduce you to them. And, along the way, even hams familiar with these frequencies will find a few tips for better using them.

30 Meters

The granddaddy of the WARC bands is 30 meters. It's an all-digital band, meaning that you dyed-in-the-wool CW fans have a home now, just as you did years ago when 40 meters was King of the Air.

The 30 meter band runs from 10.100 MHz to 10.150 MHz, and in that 50 kHz you'll hear nothing but CW, AMTOR, RTTY and HF packet since, with few exceptions, voice modes are not allowed in this band.

Clustered near the lower end of 30 are the CW operators. If you're not the holder of a 35 wpm code proficiency certificate, don't feel that there's no place for you on 30. The vast majority of fists you'll hear on the lower end of 30 are sending at a comfortable rate of 15–20 words per minute.

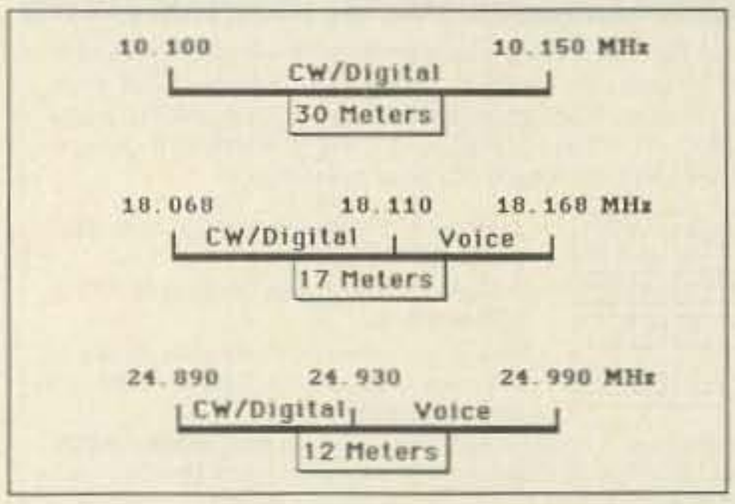


Figure. Frequency chart of the WARC bands.

The propagation on 30 is not necessarily what you would expect it to be. Many hams felt it would combine the best of 20 and 40, and to a degree it does.

One of the charms of 30 meter operation is that it can exhibit some very unexpected surprises. For instance, you may be rag-chewing with a friend in the 350-mile range, sign with him, and suddenly hear a station calling you from another continent!

DX possibilities are generally quite good on 30. One reason for this is that all hams are on fairly level ground on this band as far as power is concerned. Most countries have set limitations on power output on 30m (250 watts is generally the maximum), and antennas on this band continue to be primarily fairly simple ones.

12 Meters

The next WARC band to be opened to U.S. hams was 12 meters. Nestled about halfway between the very popular 15 meters and the quixotic 10 meters, 12 meters runs from 24.890 to 24.990 MHz. The mode plan on 12 divides the band at 24.930 MHz: Below that point, communication is limited to the digital emissions; above it, SSB reigns supreme.

If you're a DXer trying this band for the first time, look for stations around 24.935 on SSB. In the early days of 12 meters, many DXers settled in a few kHz up from the lower SSB band edge and, out of habit, they continued to center in this area.

On CW, however, it seems that there is no fixed DX window. Both stateside and foreign stations are found throughout the lower portion of the band.

Propagation on 12 meters seems to be much more like 10 meters than 15. This means that the band is often apparently dead, with few, if any, signals coming through. However, there might be plenty of ionospheric support for communications if someone would put out a CQ.

The 12 meter band does seem to be underoccupied. There was an initial rush of stations trying it out, but now the number of operators using it seems to have leveled off considerably, so there is practically no QRM.

Because of its proximity to 10 meters in the radio spectrum, conditions on 12 are often a "delayed" mirror of 10. For instance, from the East Coast, operators on 10 meters look west late in the afternoon for contacts with Oceania.

Sometimes, just as a rare Pacific island becomes readable in the east on 10, the band folds, and the station is lost. Dropping down to 12 meters at this time, the East Coast ham would still be able to hear signals from the same general area that he had on 10. However, because 12 meters is principally a daytime band like 10, he might get only another 30–60 minutes of use before it, too, closed down.

17 Meters

The "sleeper" in the WARC bands appears to be 17 meters. More and more, this band seems to be catching on with hams around the world. Band occupancy on 17 is now quite good, and QRM is becoming an everyday occurrence.

This band runs between 18.068 MHz and 18.168 MHz, with the dividing point between CW and SSB (in the United States, at least) at 18.110 MHz. Above that point, SSB is permitted; below it, the digital modes are exclusive.

There is no reduced power limitation on 17 (nor on 12, for that matter), and if you want to run the legal limit, you may. However, few stations on 17 run much more than 100–200 watts. In all likelihood, though, this is not because of any altruistic motivation! Until quite recently, most commercially available linear amplifiers either would not resonate on 17 meters, or would do so only very inefficiently. As the manufacturers redesign their gear to load up on 17, you can expect more

and more high power stations to appear there.

If you listen on 17, you are in for some real propagational surprises. One day the band may be filled with signals from both the United States and Europe; a few hours later, signals from half a world away may be the only ones you hear!

Just recently, the USSR Antarctic station, 4K1B, was heard here on the East Coast at 579–599 levels, while only a few kHz away the USSR Arctic counterpart, 4K2OIL, on Franz Josef Land, was coming through at equally good signal strengths. These stations were almost 12,000 miles apart, yet both were being worked by hams across the United States.

Another eye-opener on 17 is the strength of long-path signals. Stations in Australia and New Zealand generally come through on the short-path (i.e., direct path) into the United States during the early morning hours on 17 meters.

Later in the day, however, you can often work these same VK/ZL stations with even better results by using the long-path. The same phenomenon appears on 20 meters, at generally the same hours, but the long-path signals on 17 usually seem stronger than they do on 20.

DXing

Thus far, the IARU (International Amateur Radio Union) has banned contest operations on all three of the WARC bands. For those hams who do not care to engage in the RF mayhem of contesting, the WARC bands offer a respite on those winter weekends when it appears that the rest of the world's population is sending nothing but "CQ Test."

Little by little, however, DXpeditions are discovering the new bands, particularly 17 meters. This is a knife that cuts both ways. The presence of some of the more recent DXpeditions on 17 has allowed many hams to have a taste of working a really rare one. In some cases, the appearance of the expeditions on the WARC bands gave many an opportunity to work the DX they would not have had on the other bands because the pile-ups were smaller, and were far more disciplined.

This brings up another point about the WARC bands. Much of the raucous and discourteous operating habits found in such abundance on the established bands is generally nonexistent on the WARC frequencies, even in the midst of DX openings. Why this is the case would be a good topic for a sociologist or psychologist to explore. But so far, the vitriol and hostility which have marred our reputation around the world is simply absent on the WARC bands.

Antennas

For many (probably most) hams, the antennas of choice for the WARC bands seem to be the ones they already have! However, some time spent on putting up a good antenna for 30, 17 and 12 will pay off in huge dividends.

In preparation for writing this article, I recently spent several hours on 17 meters, listing the various antennas I heard in use. Far and away, the most-used antenna appeared to be either a 75 meter or 40 meter center-fed Zepp. Not far behind came the G5RV variation on the same theme, followed by loops of various configurations. Only a very few stations seemed to be using resonant, multi-element, rotatable antennas. The ones who were using them, though, "owned" their frequencies!

I expect my experiences with antennas for the WARC bands are typical. When I first used these bands, I loaded my "all-band Zepp" on 30 meters with a T-match tuner. The results were good, and I was satisfied. Then I heard a W8 who was using the same rig I was, but was feeding it into a 2-element rotary. He and I often worked the same DX stations back-to-back, but he usually got a 589 or 599 from the DX station, compared to my 569. Lesson learned!

A compromise antenna will work well on the WARC bands, but a dedicated, resonant antenna will work far better. There are several dual-band yagis now available commercially for 17 and 12. I can highly recommend the 2-element 12/17 beam available in kit form from Gary Nichols KD9SV, owner of SV Products, 4100 Fahlsing Rd., Woodburn IN 46797; but there are others available on the market that are probably just as good. Cushcraft now produces 3-element trapped 12/17 beams and monobanders for the WARC bands. Also, a number of manufacturers offer WARC add-on kits for their existing antennas.

Rolling your own for the WARC bands, especially for 17 or 12, would be a worthwhile project, too. Boom lengths are certainly reasonable (mine is only 8′) and aluminum tubing for the elements can be found in most hardware stores. And, there is certainly no reason not to use "thin wall" conduit (EMT tubing), which was the staple item for years for nearly all home-brewed beams of earlier times.

There have been several articles published in the amateur literature on yagi designs for 12 and 17 meters. One of the best of these appeared in the July 89 issue of *Radio Communication* (the journal of the Radio Society of Great Britain). This design uses three elements on a fairly short boom, with a split driven element. The advantage to this type of construction is that the driven element can be fed directly with the coax, so you won't need to build a gamma matching device.

I hope that this primer on WARC bands has piqued your curiosity, and that you'll be interested enough to give the new bands a try. As I've pointed out, each of them has its own appeal, especially as we look at deteriorating propagation on the established bands, and the increasing QRM as more and more stations "move down" because of the decline in sunspot activity. A good antenna for the WARC bands is in reach of every ham, and with one, you'll find a new world of operating pleasure awaiting you.

Why not hop on the WARC bandwagon now? 73

Contact Drayton Cooper N4LBJ at P.O. Box 5, Bowling Green SC 29703.

Number 16 on your Feedback card

HOMING IN

Radio Direction Finding

Joe Moell PE KØOV
PO Box 2508
Fullerton CA 92633

Hunting for the Gold

"This Time It's Our Turn!" That's the headline of the bulletin I received, describing what will probably be the first international amateur radio direction finding (DF) competition on US soil. It may also be a prelude to T-hunting becoming an event at the Olympics!

The bulletin was from the Friendship Amateur Radio Society (FARS). It came with a lengthy letter from John White K7RUN. I hurried to the phone and was soon speaking with him. The good news was that the upcoming contest was "for real." The bad news: There was little time to round up our best "world-class" DFers.

Sister Cities Starts It

Portland, Oregon, is a sister city to Khabarovsk, in Asian USSR. Khabarovsk has 650,000 residents and is 480 miles northwest of Sapporo, Japan. In the spring of 1989, the Portland Amateur Radio Club (PARC) was invited to send a team to the first Sister Cities Friendship Radiosport Games (SCFRG-89) in Khabarovsk, to begin September 25 of that year. The Soviets would have two teams competing. There would also be a team from Niigata, Japan, another sister city to Khabarovsk.

PARC was up to the challenge, and sent five locals to the Games. They were: Richard Fredrickson WAØDIM (Photo A), Dave Wright N7MYO, Kevin Hunt WA7VTD, John White K7RUN, and Rene Berblinger KX7Z.

In addition to the foxhunt, the Games included high speed CW and HF "round robin" DX events.

In the USA, we think of a T-hunt as an outing in the family car, van, or jeep, with perhaps a hundred feet of "sniffing" at the end.

Elsewhere in the world, however, the fox is a completely different "animal." In Europe and the Far East, foxhunting is an athletic event. Successful competitors are skilled at DFing and wilderness orienteering, plus they can withstand the rigors of a course that may take them several miles.

The PARC participants knew little of what lay ahead. They knew nothing about the DF gear they would be using to find the fox, because it was to be supplied to all the teams by the Soviet hosts. Talk about a home-court advantage!

Foxhunting, Soviet Style

There are no "appliance operators" in the USSR, because no commercial ham gear is made there. Russian hams "roll their own" or convert surplus military rigs. Evgeny Stavicky UWØCA, Chairman of the Khabarovsk Territorial Radiosport Federation (Photo B), built his own state-of-the-art HF transceiver, complete with LED readout, from salvaged parts. The Soviets cannot buy ham and DF gear from the US and Japan because the ruble is not an international currency.

K7RUN described his introduction to Soviet-style foxhunting: "The DF receivers were the only piece of manufactured ham equipment I saw in the whole stay there. They were quasi-military devices, with no S-meter. You had to listen in the earphones and judge the signal strength.

"The foxhunt was held on two meters. They have very little activity on that band in general there—no repeaters. Antennas were all four-element yagis, with a bit of a strange pattern. They were built to be collapsible. The elements were curved steel like a tape measure, which held shape when extended but could be folded up.

"The target transmitters put out MCW. The receiver was not a superhet design. It was the TRF type, solid-state, broad, and very difficult to tune. There was no BFO, but it had a quencher circuit that interrupted the received signal at an audio rate to create a tone.

"The five DF units for our team were not very uniform. The antennas tended to have two nulls on the back, one much deeper than the other."

As Murphy would have it, the day of the DF competition was the only day of rainy weather during the team's stay in Khabarovsk. "We all had the look of drowned rats," says K7RUN. By world radiosport standards, the event was held on an abbreviated course, with only three transmitters.

The total course was about a mile. The Soviet teams placed first and second, as expected. The PARC team came in third, followed closely by the team from Japan. Shortest individual time for the course was just under five minutes. Longest time was 44 minutes.

After the Games ended, there were visits to the homes of Soviet hams, a group boat ride on the Amur River, picnicking, and hours of happy ham and non-ham talk. Just as in the USA, hams in the USSR are a cross section of the country. UWØCA is a professor of music and a piano teacher in a girls' school by day. He runs a club ham station for his school.

The US hams were given Soviet ham tickets upon arrival. Some of the Russians wanted to get operating privileges for future visits to the USA. There were enough VEs in the US delegation to hold an exam session in Khabarovsk, but the exams had to be given in English. Nevertheless, Mikhail Zavarukhin UWØCN passed all the elements for his US Extra class license and is now AA7CH.

Photo A. Cameras flash as Dick Fredrickson WAØDIM leaves the foxhunt starting ramp at the first Sister Cities Friendship Radiosport Games in 1989.

Photo B. Piano teacher Evgeny Stavicky UWØCA sprints to the finish line after completing the foxhunt course in Khabarovsk, USSR.

Let's Have a Rematch

Soon it was time to go home. But the hams of Portland were not about to let it end there. They soon established FARS, a nonprofit corporation, in November 1989. A few months later, UWØCA and UWØCN visited Portland to help promote FARS, plan further events, and demonstrate radiosports (non-DF) in the Goodwill Games. Evgeny passed his Technician exam during his time in the USA.

That brings us to the present, and the Friendship Radio Games of 1991 (FRG-91). Under the leadership of WAØDIM, FARS is putting on a three-ring circus of ham radio competition beginning May 30: foxhunting, CW sending/receiving, and HF contesting.

The FRG-91 DF contest is being held in Forest Park, said to be the largest park in any city in the world. In keeping with world-class European competition rules, five hidden transmitters will be scattered around the park. Each contestant's score will be his or her time to find the five rigs, in order, and return to the starting point.

Transmitters will have CW identifiers, and be activated in sequence for one minute each. In addition, there will be a continuous homing transmitter on a separate frequency to guide the contestants back to the start/finish line. The complete course will be 3.75 miles or less.

FARS is providing DF equipment to entrants selected for the team competition. A limited number of individuals will be allowed to compete independently, but they must provide their own gear. Maps of the course will be provided in advance.

As you might expect, the Portland area will provide most of the US foxhunters for FRG-91, but the organizers want other areas of the country to be represented, too.

As of this writing, it looks like Albuquerque, New Mexico, and the Los Angeles area will be represented, at least.

The Soviets and Japanese will be present again, of course. A dozen hams from Khabarovsk will be there, along with Gene Shulgin UZ3AU, technical editor of *Radio*, a Soviet ham magazine. In addition, a team from Vancouver, Canada, may compete.

Foxhunting at the Olympics?

FARS has even bigger ideas for the future. K7RUN says, "We are pushing, as is Eastern Europe and the USSR, to make foxhunting an Olympic sport, at least as a demonstration. A set of games is being planned for Leningrad in several months that will be used as a springboard for this."

Hats off to the hams of Portland for bringing world-class woodland foxhunting to the USA! Watch future "Homing In" columns for the results of FRG-91. For more information about FARS and FRG-91, write to PO Box 13344, Portland OR 97213. 73

Number 17 on your Feedback card

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

Station Enhancement

Only 15 years ago most of the antennas and accessories in an amateur satellite station were home-brew or made from kits. Today the reverse is true. All the necessary gear can be purchased, but many amateurs prefer to build their own preamp and antenna-polarization control box.

Some satellite antennas come with polarization-control units, or can be purchased as an option. A few mast-mounted preamps come with control boxes, but most do not. In many cases, stations will have at least four individual control units for the antenna-mounted 2 meter and 70 cm preamps and the polarization relays on the antennas.

Newcomers may ask why mast-mounted preamps and polarization-control devices are necessary. Sometimes they are not, but amateurs who have worked with the satellites for a few years know the advantages of having them. Such systems are especially useful for the high-orbit satellites, like AMSAT-OSCAR-10 and AMSAT-OSCAR-13, where distances and signal attenuation are many times greater than for the low-orbit satellites.

The schematic in Figure 1 shows a simple control box that incorporates all the necessary control functions with the least number of parts. Most polarization relays and remote preamps operate from 12–14 volts DC, so any 12 VDC regulated supply capable of one to two amps will provide power. If the supply is home-brew, install a fuse with the appropriate current rating on the AC line. Commercial supplies should already have a fuse.

The purpose of the simple design is to give an easy-to-read and meaningful indication of relay or preamp operation. The first LED after the power supply is simply a power-on indicator, while the second shows that the 12 VDC in-line fuse is intact. The current meter provides the simplest means of monitoring the relays and preamps with a true indication that the correct current is being consumed by the device or devices that have been activated.

Most polarization relays draw about 100 mA. When a line is energized, the expected reading should show on the meter without change. Loose connections are immediately apparent if the reading varies. A short causes spikes and may even blow the fuse, but no power supply damage occurs and the problem can be quickly resolved by tracing the line to the antenna. Corrosion over a period of years is usually the problem.

Mast-mounted preamps can draw as little as 50 mA up to a few hundred mA. Before they are installed, each polarization relay and preamp in use should be tested, and the current measured, to characterize nominal consumption. Labels on the control box for each line are helpful. In a typical configuration with 100 mA polarization relays and 50 mA preamps, the current meter shows 300 mA when all the remote items are activated. The extra line could be used for a 10 meter preamp in the shack.

Cable to the remote relays and units should be good quality rotor cable or old coax runs. Avoid cheap rotor cable—it will deteriorate with outside exposure to the elements. Eight-conductor cable is the best since the extra conductors can be connected in parallel for the ground return. The 1,000 pF capacitors on the control box output lines keep stray RF energy out of the system. A terminal strip on the back of the box provides an easy way to disconnect lines for troubleshooting problems that can develop with time.

My control box has been in operation for over 10 years. In that time, I've installed several different antennas and tried as many preamps. I detected deteriorating cables, isolated faulty relays, and replaced the current consumption labels on the front of the box whenever a new remote device was installed. Of all the hamsat shack accessories, the control box has been one of the most useful.

What is AMSAT?

Created in 1969, AMSAT is a worldwide organization of amateur radio operators dedicated to educational and ham-related activities via satellite. The goal is to build and support satellites for open use by amateurs everywhere.

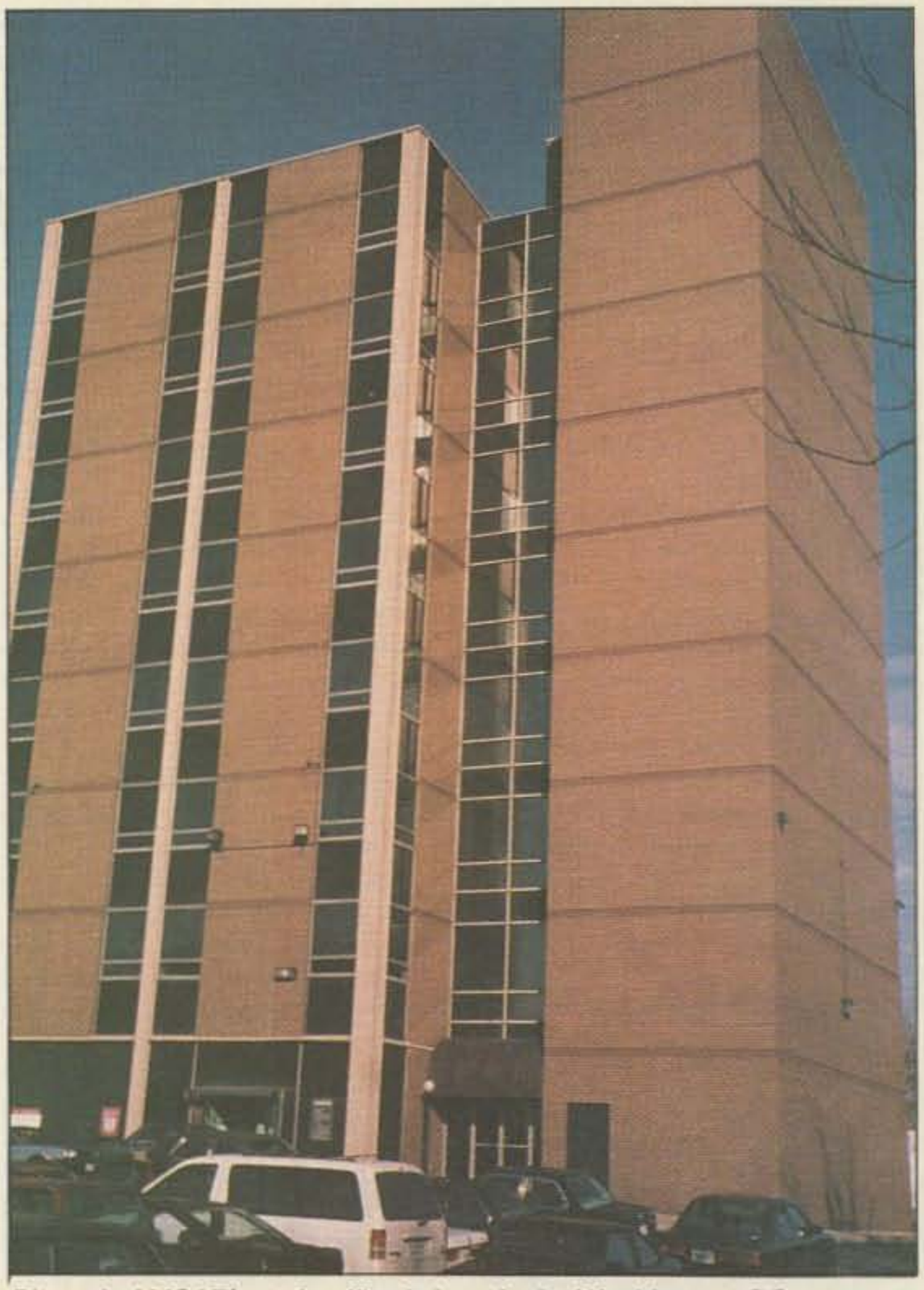


Photo A. AMSAT's main office is here in the Washington, DC, area.

Current operational amateur spacecraft include: AMSAT-OSCAR-10, UoSAT-OSCAR-11, AMSAT-OSCAR-13, UoSAT-OSCAR-14, AMSAT-OSCAR-16, DOVE-OSCAR-17, WEBER-OSCAR-18, LUSAT-OSCAR-19, FUJI-OSCAR-20, AMSAT-OSCAR-21 (also known as RS-14), RS-10/11 and RS-12/13.

Project OSCAR of California began the tradition in 1961 with the launch of OSCAR-1. (OSCAR stands for Orbiting Satellite Carrying Amateur Radio.) In recent years, international AMSAT groups have adopted location designators. For North America, this nonprofit educational organization is called AMSAT-NA.

Photo B. Martha Saragovitz, AMSAT Secretary, takes another call at (301) 589–6062.

Photo C. A Phase 3 Hamsat spaceframe greets visitors as they enter the AMSAT office.

Where is AMSAT?

The easiest way to answer the question, "Where is AMSAT?" is to point skyward to the incredible array of ham satellites.

AMSAT-NA is a volunteer association with very few paid employees. It has offices in Silver Spring, Maryland

Continued on page 58

HAMS WITH CLASS

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

Introduction to KF6PJ

There are so many teachers and instructors doing so many innovative and exciting things with amateur radio! Many school teachers and amateur radio instructors have written in to share their ideas with others. In upcoming columns, I'll feature schools where the creative uses of amateur radio are being used in the classroom, and I'll highlight successful recruiting methods used by amateur radio clubs across the country.

In April 1989, I had the pleasure of meeting a teacher, Dave Reeves KF6PJ, and his wife Bernadette, at a NASA Educator's Conference (for the Magellan launch at the Kennedy Space Center) in Orlando, Florida. Dave and I, being fellow hams, immediately found each other. We've been corresponding ever since, exchanging ideas and classroom experiences. It's a personal pleasure for me to showcase the wonderful work he's been doing with amateur radio at the Chaminade College Preparatory School in California. The following is the article Dave prepared with his students for this column.—WB2MGP

High School Club Station WA6BYE

Dave Reeves KF6PJ: Imagine a Space Age high school science classroom at Chaminade College Preparatory in West Hills, California. This week the space shuttle *Columbia* on mission STS-35 is in orbit, carrying the Astro-1 observatory and SAREX (Shuttle Amateur Radio EXperiment). A large TV screen in the classroom displays live video of the earth from the shuttle's payload bay via K6KMN's Mount Wilson ham TV repeater. Another large screen computer terminal displays the location of the space shuttle as it orbits the globe. Several students are studying plots of solar panel current and temperature data they have just obtained from the DOVE ham satellite.

The students at Chaminade became interested in space science when they participated in the 1985 SAREX experiment and got an SSTV picture from astronaut Tony England W0ORE on the space shuttle *Challenger*. With the help of physics teacher Dave Reeves KF6PJ and engineer Mike Tweedy KA6SPT, the students have maintained an ongoing space science program using the OSCAR amateur radio satellites.

Now, Ben DeWit and Keith Butler listen for the first sounds of the packet radio telemetry beacon as DOVE pops above the horizon. Their computers point the satellite antennas and capture today's telemetry data. On the NASA TV, an excited scientist in Huntsville reports data from a distant galaxy showing high energy radiation from matter "waving good-bye" just before being swept into a black hole. Chaminade senior Rima Mulokas looks up from a worksheet on the efficiency of the Microsat solar cell, gazes at the live pictures of earth from the shuttle, and says, "I don't believe this. This is blowing my mind!" Teacher Dave Reeves smiles in agreement.

Articles from *The Los Angeles Times* and *Daily News*, a stack of video tapes with no less than nine network and local TV news reports, and the ARRL SAREX video, tell the story of the past five years of the students' involvement with ham radio in space.

Encounter with Ron Parise WA4SIR

"Star Students—Students Tap Short-Wave for Long-Distance Reach to Shuttle." This *Times* headline reported the latest exciting SAREX event. The physics class, with the help of 11-year-old Jimmy O'Donnell N6VYA, talked with astronaut Ron Parise WA4SIR on the *Columbia*.

Because of the Astro-1 astronomy mission, the shuttle didn't pass over the United States during normal school hours; volunteer relay stations in Brazil and Australia helped out. The morning of our contact, Larry Etter N6MBJ used Frosty Oden N6ENV's "Valley Repeater" to call AMSAT so that we could listen in on Ron and a couple of students. The students were Jim Fonte KK9T in Indiana and Dan Blackburn K5ZCO in Texas. This session was relayed through PY2BJO Junior, in São Paulo, Brazil. Our students listened to the tape of the contact to try to anticipate what their own contact was going to be like.

On the evening of December 4, our students excitedly gathered on the lawn near their classroom to talk to Ron themselves. Adam Wahab used the computer display set up by Anthony Fredericks and Eric Sunde to show the 100 spectators and the press that the shuttle was now coming in over the Indian Ocean, and would soon be within range of the VK6IU tracking station in Western Australia.

Photo B. Nicole Newman displays the orbital gyrations of DOVE while John Fenger and Andy Casciato watch attentively. The Astro-1 BBXRT (the "trash can") is on the TV screen.

Photo C. SAREX team Dave Reeves KF6PJ, Jim O'Donnell N6OYF, Melissa Parker, Jimmy O'Donnell N6VYA, Robert Nomura, and Lori Jadon, after making contact with Ron Parise WA4SIR on board Columbia *on December 4, 1990.*

Jimmy O'Donnell accessed the phone number to the "bridge" in West Virginia. Bill Tynan W3XO, at the W5RRR club station at the Johnson Space Flight Center in Houston, was soon on the line. Three other schools also joined the bridge. Allen Miller N7NHM from Rigby Jr. High School in Idaho, Dale Harris WA5OAP from Las Cruces, New Mexico, and Ron Curry WA4GSS from Lawrence County, Kentucky, were checked in and ready. Three relay stations in Australia were clearly heard: Gorden VK6IU in Western Australia; Graham VK5AGR in Adelaide; and Art VK2AS in Sydney.

The shuttle popped above the horizon near the western AMSAT tracking station in Australia, and Ron Parise was ready for Jimmy O'Donnell's question: "If you saw aliens or a UFO, would you try to communicate with them, and if so, how?" Ron replied: "You know, we've been looking out the window for the Soviet space station *Mir*. They're up here with us, too. We have 12 people in orbit right now. They're not exactly a UFO. I don't know what I'd do if I saw a UFO out the window. Probably just wave." Alesia, another student asked: "How far in space can you see?" Ron: "Well, looking out in space we can see to the edge of the universe with our telescopes. That's a long, long way. With your eyes, looking down on the earth, we can see about 800 miles in any direction. We are just coming up across Shark Bay on the western edge of Australia. If I were looking out the window, I could see all the way to Central Australia, and all the way north to Java. We can see a big piece of the earth, and I'll tell you, it's really beautiful from up here."

Andy took the mike next, and asked: "What do you think might be beyond the quasars?" Ron: "That's an interesting question. Maybe we'll be able to shed some light on that with this mission. I'm not sure exactly what quasars are, but they appear to be very early prototypes of galaxies that we see now, but we're seeing them so far back in time because they're so far away. Their light took a long time to get here. And before that, before the beginning of the universe, we're not sure what happened."

At this point, Ron was passed to Wess VK5AGR in Adelaide. Wess asked: "How many stars can you see from orbit that are not visible from earth?" Ron: "It's not that we can see more stars, but that we can see ultra-violet light. UV light gets filtered out by the atmosphere, and we can't see it from the ground. So that's what's important to us here with these telescopes." Ron said that it is hard to see

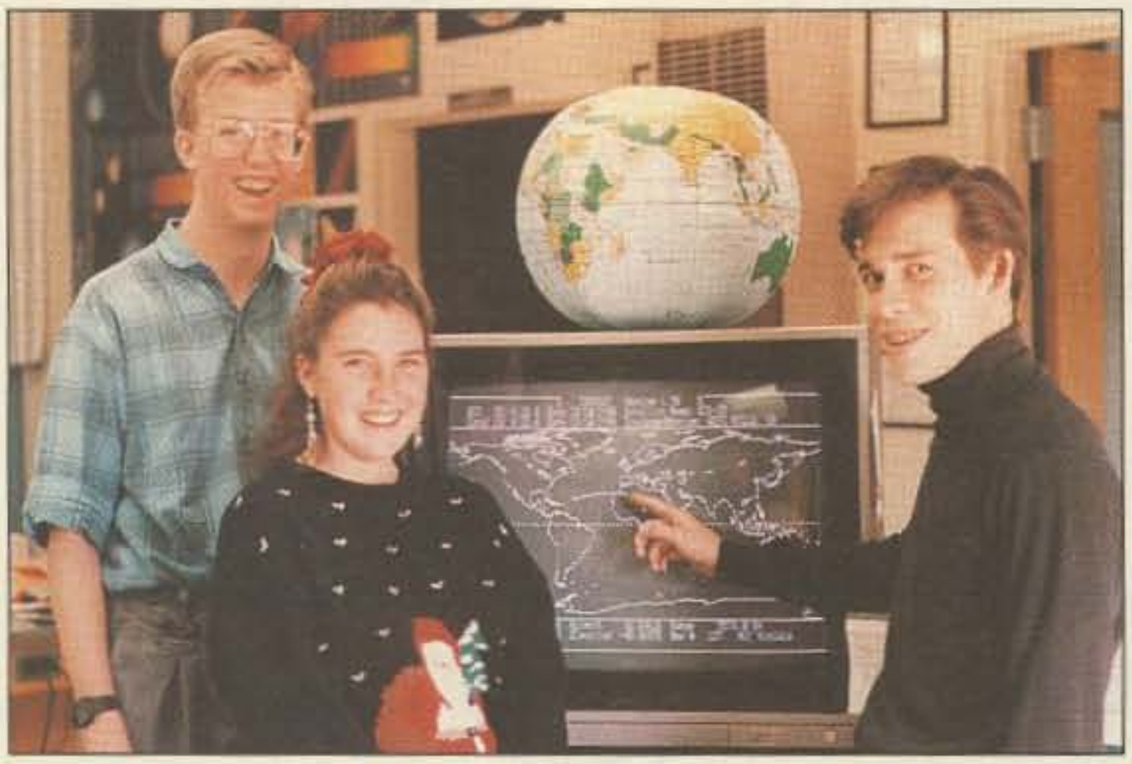


Photo A. Eric Sunde, Melissa Parker, and computer group leader Anthony Frederick watch Columbia's *progress on TRACKSAT.*

PC SWL $99.00

A Complete Digital Reception System

PC SWL contains the hardware, software, instructions and frequency lists needed to allow you to receive a vast variety of digital broadcasts transmitted over shortwave radio with any IBM PC or Compatible computer. The product consists of:

Demodulator
Digital Signal Processing Software
80 Page Tutorial Reference Manual
World Press Frequency List
Tutorial Audio Cassette with Samples

PC SWL automatically decodes Morse code, Radio Teletype, FEC (forward Error Correcting Code), SELCAL (Selective calling transmissions), and NAVTEX.

ADVANCED FEATURES:

Tuning Oscilloscope
Digital Waveform Presentation
Auto Calibration and Code Recognition
Continously Tunable Filter Frequencies
Variable Shift
Adjustable CW Filter Sensitivity
Farnsworth Code Compatibility
Unattended Capture and Printing

Software Systems Consulting
150 Avendia Cabrillo "C"
San Clemente, CA 92672
(714) 498-5784

CIRCLE 244 ON READER SERVICE CARD

MELCO Hi Pro Repeaters

MAGGIORE ELECTRONIC LAB.

Manufacturers of Quality Communications Equipment

- •Repeaters
- •Links
- •Remote Base
- •VHF, UHF
- •Receivers
- •Transmitters
- •Antennas

Hi Pro 'E'

EXPANDABLE REPEATER SYSTEM

- •Standard and Computerized Controllers
- •Standard and Computerized Auto Patches
- •Duplexers

•A NEW CONCEPT IN REPEATER DESIGN, THE Hi Pro "E" IS AN EXPANDABLE REPEATER WITH THE FOLLOWING FEATURES: A BASIC REPEATER WHICH WOULD INCLUDE A COMPLETE RECEIVER, TRANSMITTER, COR, FRONT PANEL CONTROLS AND INDICATORS, LOCAL SPEAKER AND MIC JACK AND CAPABLE OF FUTURE EXPANSION. ALL HOUSED IN AN EXTREMELY RUGGED, ENCLOSED, 19-INCH RACK MOUNTABLE CABINET.

•THIS SYSTEM CAN BE EXPANDED AT TIME OF PURCHASE OR CAN BE AN AFTER-PURCHASE ADD ON. THE ADD ONS ARE—HIGHER POWER, 110/220 VAC POWER SUPPLY, IDENTIFIER, AUTO PATCH, OR COMPUTER CONTROLLERS. IN ADDITION TO THESE ADD ONS AN ADDITIONAL RECEIVER AND TRANSMITTER CAN BE MOUNTED INTERNALLY FOR USE AS CONTROL LINKS, REMOTE BASE OR DUAL BAND OPERATION, ETC.

•AN EXTENSION PANEL IS AVAILABLE FOR LOCAL MONITORING OF THE REPEATER AND CONTAINS ALL NECESSARY METERING, STATUS LIGHTS AND INDICATORS. ALL ADD ONS ARE AVAILABLE FROM THE COMPANY AND ARE COMPLETE INCLUDING INSTRUCTIONS.

MAGGIORE ELECTRONIC LAB.

600 Westtown Rd. West Chester, PA 19382 Phone (215) 436-6051 FAX (215) 436-6268 Telex 499 0741 MELCO

WRITE OR CALL FOR OUR COMPLETE CATALOG

BATTERIES "R" US . . .

You've bought our replacement batteries before...
NOW YOU CAN BUY DIRECT FROM US, THE MANUFACTURER!

ICOM

CM2, PB2	7.2v @ 500 MAH
CM5, PB5	10.8v @ 500 MAH

SUPER

7S	13.2v @ 1200 MAH	$63.95
8S	9.6v @ 1200 MAH	$59.95

(base charge only–1" longer)

ICOM CHARGERS AVAILABLE

FOR THE MONTH OF JUNE ONLY

NEW

REPLACEMENT BATTERIES FOR **ALINCO**

WC-500-EBP-10N	7.2V @ 700 MAH	$31.95
WC-505-EBP-12N	12V @ 700 MAH	$39.95

LOOK FOR JULY'S SPECIAL OF THE MONTH

CUSTOM MADE BATTERY PACK & INSERTS
Made to your Specifications.
INTRODUCTORY OFFER!
KENWOOD INSERTS
PB-25—$20.00, PB-21—$13.75
PB-26—$20.00
ICOM INSERTS
BP-5—$23.00 BP-3—$17.45,
BP-7, BP-8

Prices subject to change without notice.

MasterCard and Visa cards accepted. NYS residents add 8¼% sales tax. Add $4.00 for postage and handling.

SOURCE FOR ALL YOUR COMMUNICATION BATTERY REPLACEMENT NEEDS.

W & W ASSOCIATES

29-11 Parsons Boulevard, Flushing, N.Y. 11354

WORLD WIDE DISTRIBUTORSHIPS AVAILABLE. PLEASE INQUIRE.

MADE IN THE U.S.A.
SEND FOR FREE CATALOG AND PRICE LIST

In U.S. & Canada Call Toll Free (800) 221-0732 • IN NYS (718) 961-2103 • Telex: 51060 16795 • FAX: (718) 461-1978

CIRCLE 191 ON READER SERVICE CARD

HAMSATS

Continued from page 54

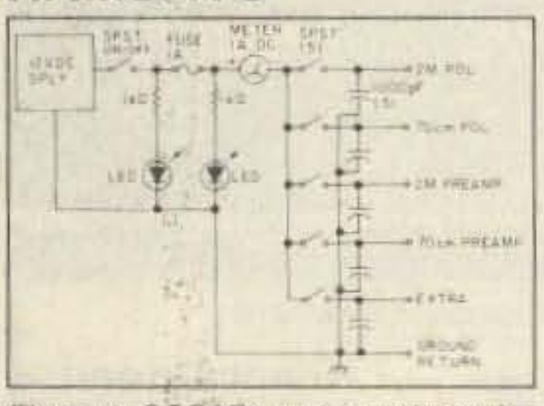


Figure 1. OSCAR antenna polarization and external preamp control.

on the north side of Washington, DC and Paris, Texas, northwest of Dallas, but the satellite construction and support programs are active wherever AMSAT volunteers live.

There is no well-defined central point for satellite work, although activity can always be found in the vicinity of AMSAT Vice President of Engineering Jan King W3GEY. Jan presently lives in the Boulder, Colorado, area.

A visit to the modest AMSAT office in Silver Spring, Maryland, hints at the broad activities of the organization. Here is where memberships and software orders are processed. A visitor can find satellite drawings, correspondence, and models dating back to the early days of the organization.

Several of the original organizers of AMSAT live within a few hundred miles of Washington, DC, but over the years members of the Board of Directors have come from most points within the U.S., as well as from Canada, England and Japan. Today's board members are from Colorado, Maryland, Michigan, New Jersey and Texas.

The success of this organization, with a satellite program that many governments cannot match, is due to the passionate dedication of the membership. The AMSAT field organization has over 130 Area Coordinators and Regional Coordinators around the country who volunteer their time to answer questions, give talks and present demonstrations at hamfests. Their "pay" is the satisfaction of helping others enter a truly remarkable facet of the amateur radio hobby.

So, the next time you're asked "what" or "where" is AMSAT, just point up. 73

Photo D. A model of AMSAT-OSCAR-5 sits quietly on an office cabinet.

Hams With Class

Continued from page 56

stars out the window with the lights on inside the shuttle.

Next, Michael in Dale Harris' group in Las Cruces, New Mexico, asked: "What are the benefits of the UV Telescope you are taking up, compared to the Hubble?" Ron explained that the Astro-1 UV has a wider field of view and a broader spectrum range than the Hubble. Heather, also in the group, asked: "What kind of emergency methods do you use in case of danger, such as lack of oxygen?" Ron said that even if a small hole were to be punctured in the shuttle, they would be able to maintain their oxygen supply long enough to get safely back to earth.

By now, control had been passed to VK2AS in Sydney, and Brian, in Ron Curry's group, asked the last question: "What do you expect to find concerning the super nova of 1987?" We are not sure of Ron's answer because our recorder ran out of tape at this point. Even so, the astronomy lesson and the SAREX contact were a smashing success for amateur radio!

There were lots of little problems during the contact. Signals were lost at both ends several times. We missed an important "over" and doubled with Ron, as our radio had accidentally been switched to low power, and our audio was scratchy into the repeater. Several other schools had trouble with audio feedback into the radio, and the keys on touch-tone got pushed once or twice. Once, Ron lost his footing and floated away from the radio for a moment. Yet the communication was exciting, and every school got a chance to speak with Ron. Many other repeaters across the country were able to call in, listen to the contact, and share it with hams interested in SAREX.

SAREX has brought space science alive at Chaminade College Preparatory and in many other schools across the country. Amateur radio can help capture the imagination of the new generation. There is no doubt that we will one day be using ham radios to talk to astronauts on the space station *Freedom*, the moon, Mars, and beyond!

Twenty-Five Years!

This brief description of the classroom events of the past week illustrate the benefits of getting teachers, kids, and schools involved in ham radio. For my students and me, ham radio has always played an important role. Our Chaminade High School Club Station, WA6BYE, has been on the air for 25 years.

The club's two stations use almost every mode and band available: HF, VHF, RTTY, SSTV, ATV, satellite, and packet. Mike Tweedy KA6SPT designed and built the club a computer-controlled satellite antenna rotor system. Our 105-foot HF tower can be seen for several miles.

My students and I have shared many memorable ham radio experiences. We have worked the entire globe on 20, 15, and 10 meter DX, worked military phone patch traffic during the Vietnam War, and emergency traffic during the Mexico City earthquake. We have been a Scout-o-Rama event station. We have worked with OSCARs-8/10/12/13/17/19 and RS-10/11. We've talked with students in Carole Perry and Joe Fairclough's classrooms in New York City.

Our most thrilling experiences have been the 1985 SAREX, when we obtained a great SSTV picture of Tony England W0ORE, and our 1990 SAREX conversation with Ron Parise WA4SIR.

Microsat—An Ongoing Experiment

With the launch of the four Microsat satellites, we had the opportunity to fully integrate ham radio into our physics classes. I asked Maria El-Zik, a senior in the physics class, to explain how the project works.

Maria El-Zik: "I am one of the seniors currently involved in a new experiment. We are tracking the Microsat satellites which have been orbiting the earth for about a year. We are currently focusing on DOVE, the most attainable and readable of the four Microsats. All the students in Dave Reeves' two physics classes have specific jobs related to tracking DOVE.

"Today, for example, the people in charge of predictions were at work first. They were in the lab early this morning in order to learn DOVE's passing times for today. This was done with two computer programs: TRACKSAT and ORBS. Then they charted the passing times on the blackboard in our physics room.

"The operators were at work next. People like Ben DeWit and Keith Butler track DOVE on the receiver during lunch. They obtained 15 pages of data from the pass today, a good average. Soon other operators will be tracking an evening pass.

"Joe Hafferty and Paul Brukiewa created a full-scale model of DOVE, complete with antennas that are white on one side, black on the other (made so the satellite rotates with the sun's natural power).

"The next group is vital to our experiment. They give meaning to the data obtained by the operators by analyzing it and plotting it on graphs. They do all this by using computers. This takes quite a while, but the results are impressive. We have been able to analyze DOVE's movements by studying their graphs. We would also like to learn something more about the greenhouse effect by comparing the infrared readings taken above land to those out on the ocean. We are all extremely interested in the result of the analysis because we believe the greenhouse effect is the major ecological problem of our day.

"Finally, it is our turn. As the public relations group, we write to various places, either obtaining information about the Microsats or telling the scientific community what we are doing.

"All of us enjoy tracking DOVE. It is so much more meaningful to learn physics in this way. And we are not only learning the standard science, we are learning about computers, data analysis, and writing skills. This is an experiment we will all remember for a long time." 73

RTTY LOOP

Amateur Radio Teletype

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

Number 19 on your Feedback card

Portable RTTY

With the approach of Field Day, I sat back and reflected on just how that impacts on RTTY. On the surface, I get this mental image of a Model 15 in a sedan chair, being transported to the wilds of the outback. When Field Day was conceived, that was *exactly* what portable RTTY was all about, unless you had a Mighty-Mite or the like. But not today!

Sure, the hardy among us might still lug along a conventional teleprinter, and there are those well-equipped clubs with vans sporting every conceivable mode of communication; but how about the ham wishing to operate on a digital mode without breaking his back?

For the purposes of this discussion, I would rather not concern myself with the transmitter, receiver, or antenna. Somehow I have confidence that these topics are adequately covered elsewhere in this magazine. Let's just direct our attention to the RTTY end of the table. To this end, I would like to examine:

- RTTY interfaces and terminal units
- Keyboard and control units
- Printer and hard copy devices

Decoding the RTTY Signal

Compared to the old tube-type terminal units that were popular when I started in RTTY, the RTTY/packet modems currently represented are marvels of miniaturization and power conservation. Sophisticated controllers, such as the AEA PK-232 and Kantronics KAM, are small enough to pack along, and will run on the same power supply as the radio.

For those who choose to roll their own, TNC or demodulator boards are available from a variety of sources, as well as some schematics presented in this column in the past, which would enable construction of a compact RTTY terminal unit.

Those whose intent is packet operations only, and who are in search of the ultimate in compactness, might do well to look at the Heath HK-21. This little marvel allows packet operation with a TNC about four by three inches, small enough to fit in a shirt pocket.

Packing the Keyboard

Here we have quite a variety of materials to choose from, but our latitude depends on one critical factor: the availability of AC power. If the portable station is run on conventional AC power, either from a generator or the utility company, available input/control devices range from dedicated RTTY terminals to power users' bit crunchers.

Considering space and weight, a case could be made for some of the simple, all-in-one style computers. Such widely used, inexpensive, compact devices as the Color Computer, Commodore C-64, and the like can make excellent interfaces, especially with a smart terminal unit providing much of the logic related to digital communication.

Where freedom from AC power is a must, notebook computers shine. While I have yet to caress one with my own hands, one hot computer in this market, by many experts' accounts, is marketed under three designations: the CompuAdd Companion, the Sharp PC-6220, and the Texas Instruments TravelMate 2000. A 80286 running at 12 MHz, with 1 meg of RAM, a 20 MB hard disk, and a VGA resolution LCD screen, this little wonder comes in under $3,000, a remarkable price. And at 4.3 pounds, and the same size as a sheet of bond paper, not too much to carry, either.

I might also mention the Zeos Notebook, a similar bargain. If you have access to an 8088 based portable, and want to use it, fine! But I, for one, might caution against investing in one at this time, with all the new technology on the horizon—and even in the foreground.

Hard Copy, Anyone?

Once again, let's put the big page printers, and even conventional computer printers, aside. Portable printers are available, and if you want one, quite a few will fill the bill.

Canon's BJ-10e is an ink jet that produces near laser quality print from a notebook sized box. Priced under $500, this four pound wonder comes with battery or AC power options, as well as a cut-sheet feeder.

For about the same money, Eastman Kodak produces the Diconix 150 Plus, which handles sheet or fanfold stock, in a compact 10.8" x 6.5" x 2" package. With a weight under four pounds, including batteries, it's hard to resist.

One other option to pack into your bonnet: There are several programs around which redirect all printer output to a disk file. With a big enough hard drive, such a program can provide a record equivalent to paper, without the need to carry around boxes of the stuff, plus a printer.

Tip Department

So, while you're doing all this setting up and the like, wouldn't you like a simple little tone generator for testing the setup? Well, if you have a PC type computer, and BASIC, you have an RY generator.

James Kretzschmar, DDS, N4HCJ, sent along this short little program which uses the BASIC SOUND statement to produce tones needed for alignment. The program, which may be entered into GW-BASIC or BASICA is:

```
10 FOR X = 1 TO 200
20 SOUND 2125,.5
30 SOUND 2550,.5
40 NEXT X
50 END
```

This program compiles directly into QuickBASIC as well, for those who want to potchsky (play with) such things. I invite translations of this simple program into other dialects of BASIC.

A few months ago I mentioned the new TRTY program, for PC compatibles, as one new program available for RTTY operation. With the file available on CompuServe and Delphi, I have been watching the downloads mount up, and it appears that many of you have enjoyed the program. I will continue to offer the program, at least through the summer, if you have no other source for it. Send me a 5" or 3.5" blank disk, a self-addressed *stamped* disk mailer, and $2 for handling, and I'll turn it around as soon as I can.

As always, I look forward to your input. Send it to me by mail, at the above address, or on CompuServe (ppn 75036,2501), or Delphi (username MARCWA3AJR). Watch out for the sun this summer (this is Dr. Leavey talking—not the ham), and use sunblock on the kids! 73

Number 20 on your Feedback card

NEW PRODUCTS

Compiled by Hope Currier

FIELDPIECE INSTRUMENTS

Fieldpiece Instruments has introduced a small (7¼ x 2" x 1") heavy-duty line of multimeters that integrates the functions of a digital multimeter, a voltage checker, and a current clamp meter in a drop-proof, contamination resistant housing. The fully sealed yellow Valox case allows the meter to withstand exposure to contaminants and drops of up to 10 feet. Superior overload protection enables the meters to withstand 1,000 VDC and transients up to 6,000V on any voltage range. Other ranges can withstand 500V. Metal oxide varistors, rather than lower cost spark gaps, are used for transient protection. The two standard "Fluke" style multimeter jacks come out the top to accept test leads, specially designed probe tips, and a specially designed current clamp head. All meters include a continuity beeper, a "Hold" button to lock the display, "Auto-off" to extend the battery life, one red probe tip, one black test lead, an operator's manual, and a rugged clear plastic carrying case. Model HS23 adds the dangerous red LED and beeper and the capacitance function; Model HS25 adds the logic probe.

Suggested list prices range from $79 to $119 for the meters, $24.95 for the Model ACH accessory current clamp head, $3.95 for a pair of standard probe tips, and $4.95 for a pair of insulated extended (2½") probe tips. For prices and more information, contact *Fieldpiece Instruments, Inc., 8322B Artesia Blvd., Buena Park CA 90621; (714) 992–1239 (telephone and FAX).* Or Circle Reader Service No. 201.

CERTIFIED PRODUCTS CORPORATION

The new RED ALERT multi-use meter from Certified Products Corporation will alert users to the sources and intensity of low frequency radiation, suspected of causing cancer, from computers, power lines and other electrical sources. It will locate hidden or buried electrical lines and help prevent accidental encounters by anyone digging holes, tearing out walls, remodeling or working near electrical lines. It is priced at $69.95, plus $2.95 S & H. Contact *Certified Products Corporation, 2816 East 51st Street, Tulsa OK 74105-1704; (918) 743–0269.* Or circle Reader Service No. 203.

NCG

NCG has introduced a new COMET dual-band 2m/70cm base/repeater antenna, the CA-2x4MAX, centered to the American amateur frequencies, 146 MHz/446 MHz. This new antenna incorporates COMET's exclusive SLC (Super Linear Converter) system, which uses parallel elements in order to maintain a stable resonant frequency over the life of the antenna. It also features a new jointing system made of durable ABS plastic to screw the sections together. The CA-2x4MAX is 17'8" long and has a UHF (SO-239) connector. The reported gain figures are 8.5 dB on 2 meters and 11.5 dB on 70cm.

For the price and more information, contact *NCG Company, 1275 N. Grove St., Anaheim CA 92806; (800) 962–2611, (714) 630–4541.* Or circle Reader Service No. 204.

A & A ENGINEERING

A & A Engineering has released two new products, 20m and 40m QRP portable transceivers. Features include: single-signal receiver with a narrow CW crystal filter; VFO main and fine tuning, which can be set to cover any 50 kHz of a band; audio derived AGC and two stages of audio filtering for listening comfort, 5 watts output when powered from a +13.8V source; semi-QSK T-R switching with adjustable delay; CW sidetone generator with adjustable delay; and CW sidetone generator with adjustable volume. Weighing only 27 ounces, this transceiver is perfect for backpacking.

The complete kit is priced at $159.95, plus $5 shipping. Contact *A & A Engineering, 2521 W. LaPalma Unit K, Anaheim CA 92801; (714) 952–2114, FAX (714) 952–3280.* Or circle Reader Service No. 202.

TOWNSEND ELECTRONICS

For those who must use an HT as a mobile rig, Townsend Electronics has introduced the "Rig Saver" universal hand-held/mobile radio mount. You can now safely mount your handheld or small mobile rig where you can see the rig's controls and digital display, and have maximum access to the controls. A vinyl-coated plate protects the rig from scratches while in use. Large knobs make it easy to adjust to any angle for nearly any HT or small mobile. This mount will fit on the console, center hump, engine enclosure or dash of virtually any vehicle.

The "Rig Saver" is available in two models: the Slimline ($24.95) and the Rough-Duty ($29.95). Add $3 S & H; Indiana residents add 5% sales tax. Contact *Townsend Electronics, Box 415, Pierceton IN 46562; (800) 338–1665.* Or circle Reader Service No. 205.

HAM JEWELRY COMPANY

HAM Jewelry is offering an excellent station clock, the World Time Clock. This clock lets users read at a glance not only their own local time but also the time anywhere in the world, without any conversions. The names of 65 cities and countries are displayed around the clock's periphery, and the local hour at those places is read by the adjacent number on the QTR ring. Minutes are read from the minute hand; GMT is read directly from the 12 o'clock position. There is also a polar projection map of the world on the clock's face, showing the world's time zones.

The World Time Clock comes in a brushed goldtone metal case with a bright, polished faceted bezel. It will run for approximately one year on a single "C" cell alkaline battery (not included). The price is $79.95, plus $5 for insured S & H. Contact *HAM Jewelry Company, 26 Edgecomb Road, Binghamton NY 13905; (607) 797–5458.* Or circle Reader Service No. 206.

AMPIRE INC.

Ampire Inc. is offering new and improved model 146, 146OS, and 440 RF switchable mast-mounted preamplifiers for 2m and 70cm, enclosed in extruded aluminum and irradiated to minimize oxidation. The plastic-coated circuit board repels moisture and corrosion. The preamplifiers have been designed to operate from +130°F to −30°F.

For more information and prices, contact *Ampire Inc., 10240 Nathan Lane, Maple Grove MN 55369; (612) 425–7709.* Or circle Reader Service No. 207.

Number 21 on your Feedback card

ABOVE AND BEYOND

VHF and Above Operation

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

Lasers and Amateur Communications

Does "laser" give you thoughts of some star war device, or just something you would like to experiment with? What can you do with a laser besides drive your neighbors crazy with mysterious spots of red light all over the neighborhood? How about using it as part of an amateur communications system? Many devices now incorporate a laser, which for the amateur means surplus availability, sooner or later. Supermarket checkout scanners are an example of this. Other sources are disc players, printers, and optical scanners. Look for them at swap meets.

What does it take to construct a grass roots laser system? I don't want to get into the fine details on lasers and light frequency relationships, only to give you enough information to get started. If you want more details, there are quite a few good books for the experimenter. One such book is *The Laser Cookbook*, by Gordon McComb. It costs about $18 from Tab Books, and it's well worth the price.

There will be three parts to this topic, the first covering basics and the power system, the second detailing the receiver system, and the third describing high sensitivity receiver modifications using photo-multiplier tubes.

Tube Testing

Surplus, a helium-neon (HeNe) laser with power supply should be less than $100. With only the plasma tube, cost should be quite a bit less. Watch out for used tubes; unless you can test them, you can't be sure they'll work. If they're bad, you can't fix them, unless you are into glass blowing and able to recharge the gas mixture under vacuum conditions.

Plasma tubes (uncased lasers), as well as heads (cased lasers with ballast resistors) have to be tested with a power supply to verify their condition. What happens to old laser tubes? Why will some of them not function? In time, the seals leak; they lose gas, and the helium-neon mixture won't ionize. However, the books I have read all state that the newer tubes have much better seals, and this is not such a problem with them.

An excellent supplier of lasers and laser equipment, both new and surplus, is MWK Industries. They also stock technical books on lasers. Their address is MWK Industries, 1296 W. Pomona, Building 110, Corona California 91720. Tel. (714) 278-0563. I can supply 10 kV 50 mA diodes, which you will need for the power supply, from my local surplus store for $7 for 6 diodes, postpaid U.S.A. I'll also keep a look out for 100 pF capacitors.

System Components

Component parts to gather for a laser communication system include a power supply (high voltage, for the laser), and a 12 VDC muffin fan for the system transmitter. The muffin fan "chops" the laser beam near a 1000 Hz rate; the spinning blades make a tone that can be detected on the system receiver. The receiver needs a large aperture lens, a photosensitive detector, and an audio amplifier to recover the 1000 Hz tone. The audio amplifier in this case is the system receiver. This month I will cover details of the high voltage power supply that you need in order to place a laser (HeNe) into operation.

Safety

Be very careful when working with a laser power supply. Don't be fooled; though it only delivers a few milliamperes at 3 kV, it can be lethal. Put the supply in an enclosure with a good ground system and use a 110 VAC 3-WIRE CORD. Protect yourself from accidental contact with the high voltage.

Also, the PC board you mount the rectifiers and other high voltage components on has to be elevated from the metal enclosure and chassis, and these from each other, to prevent high voltage leakage and accidental contact.

You can make a compact power supply by using a rubber type of potting mix to improve the breakdown insulation resistance. If you do not pot, you can coat some of the components with a Corona dope, a thick paint-on high voltage material that prevents high voltage leakage.

Inside the Tube

A starting pulse of about 10 kV must be impressed across each of two electrodes to ignite the gas in the HeNe tube into a high energy state. Usually 1500 to 3000 volts is needed to maintain this state. After the gas in the tube becomes ionized, it energizes the gas in the capillary tube, which produces a laser beam. Each end of the laser tube has two mirrors, one fully mirrored and the other partially mirrored. At the latter end, the beam exits the tube.

The laser is maintained in this high energy state by a lower power supply voltage of 1.8 to 2.5 kV. The supply must be capable of delivering several milliamperes of current at this voltage. The exact amount of current needed depends on the type and power output in milliwatts of your laser tube. This DC current could vary from about 3 to 7.5 mA for a 10 mW HeNe laser.

The first power supply I built used a 1 kV transformer (AC) with a voltage doubler providing about 2.5 kV to run the laser. I used a strobe transformer to provide the starting pulse. It worked, but was somewhat fussy. I wanted something better.

Our local surplus store had several high voltage ion generator PC boards (incomplete). Located on the board was a series circuit using high voltage capacitors and diodes, forming a voltage quadrupler. Parts were rated at 15 kV. I removed the unnecessary components and attached the quadrupler to the output of my 2.5 kV supply, and multiplied the 2.5 kV power supply output to just over 10 kV. It worked well the first time.

The quadrupler will not sustain high current operation. As soon as the gas is ionized, the tube starts to draw current and sort of disconnects the quadrupler from the circuit, then reverts to the 2.5 kV main power supply voltage. See Figure 1 for the power supply schematic.

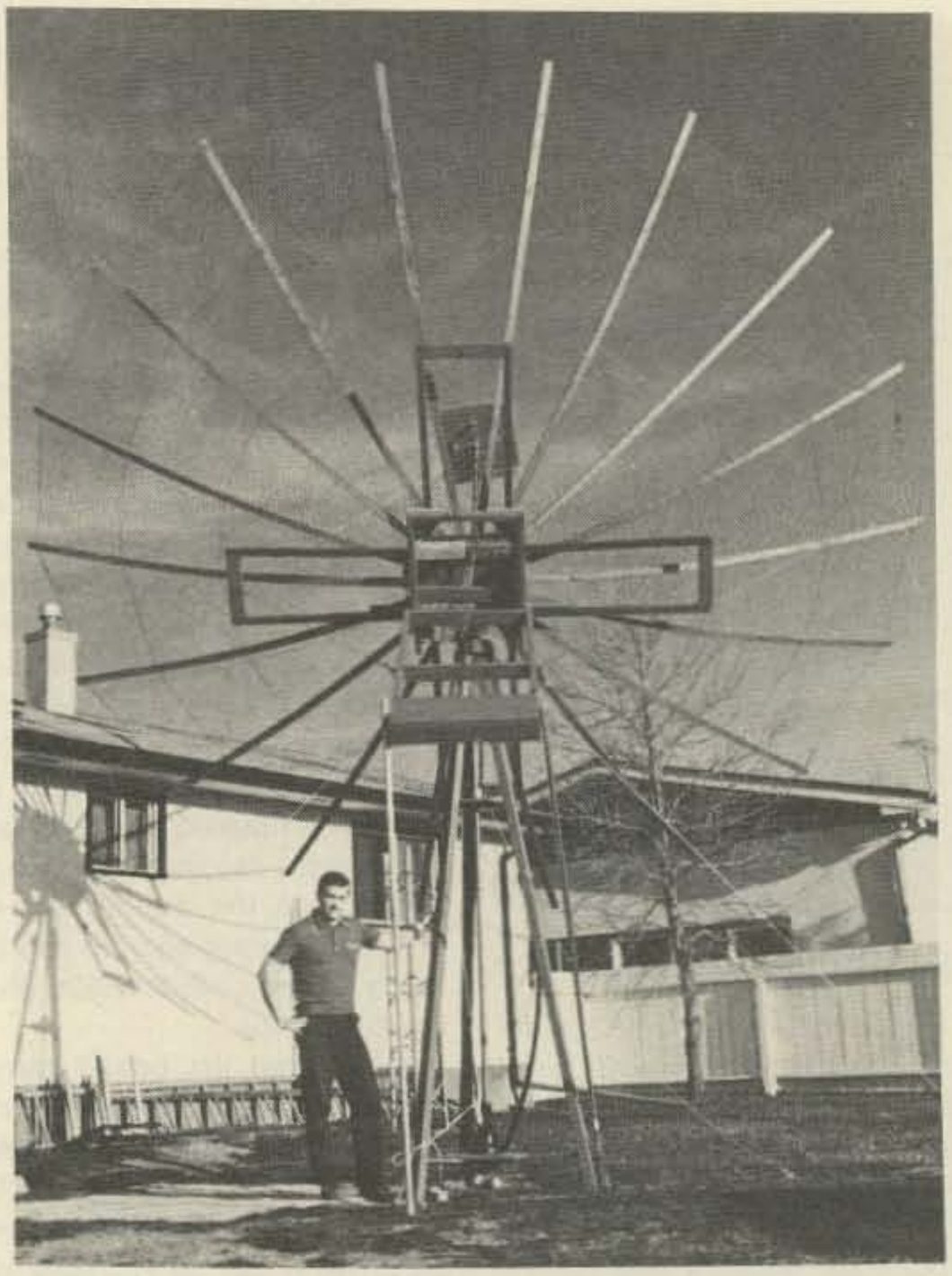


Photo. Jack Askew VE4JX and his home-built 20-foot 432 MHz EME dish antenna in Winnipeg, Manitoba, Canada.

The trick to this scheme is that the ion generator capacitors (100 pF) are not capable of much current, but they allow voltage multiplication. As this higher current flows through the quadrupler diodes, which are now just a series network, no multiplication takes place when the laser's current is drawn. See Figure 3 for details of the voltage quadrupler.

Test your power supply unloaded, then test it with a resistive load before you connect it to a laser tube. I use an RCA Senior VoltOhmist with a high voltage (15 kV) probe. I measured the power supply output voltage (starting voltage) unloaded, and it was just over 10 kV. With a resistive load, it dropped to 2.5 kV.

Limiting the Current

The next necessary item for a universal laser power supply is the ballast resistor, the only way to limit current to the laser tube. You have to realize that some power needs to be dissipated. 2.5 kV at a few mA are a couple of watts of power. The resistors must be highvalue, around 100k, in series, and be capable of dissipating the power. In my power supply, I used a large quantity of 100k 2W resistors; I paralleled two of them and made a string of 50k resistors. I put five similar resistors in my output stack. If power supply voltage is lower, near 1.8 kV, less ballast resistors will be required.

When applying power to an unknown laser tube, use as high a value of ballast resistor as you can. It's easier to cut the value of the resistor than to obtain a new tube. Some tubes require a critical value of ballast resistor for proper operation. Laser tubes are all different, even tubes from the same manufacturer.

If a tube "sputters" when power is applied, the ballast resistor must be trimmed. The current is either too great, causing discharges, or too little, causing the current to fold back and the tube to try to re-ignite itself. Sputtering sounds like a ticking inside the tube. Take care when trimming the resistor. *Too much current hastens the death of a laser.*

My 10 mW tube runs with 2.5 kV at 7.5 mA. I have a ballast resistor of 250k, five dual resistor assemblies of two 100k resistors each. Additionally, my laser "head," a tube mounted inside a metal assembly, has an internal 180k ballast resistor. A smaller rated laser, say 2 mW, would require less current. Best operation is when you get good turn-on at lowest tube current with reliable operation. Connect a

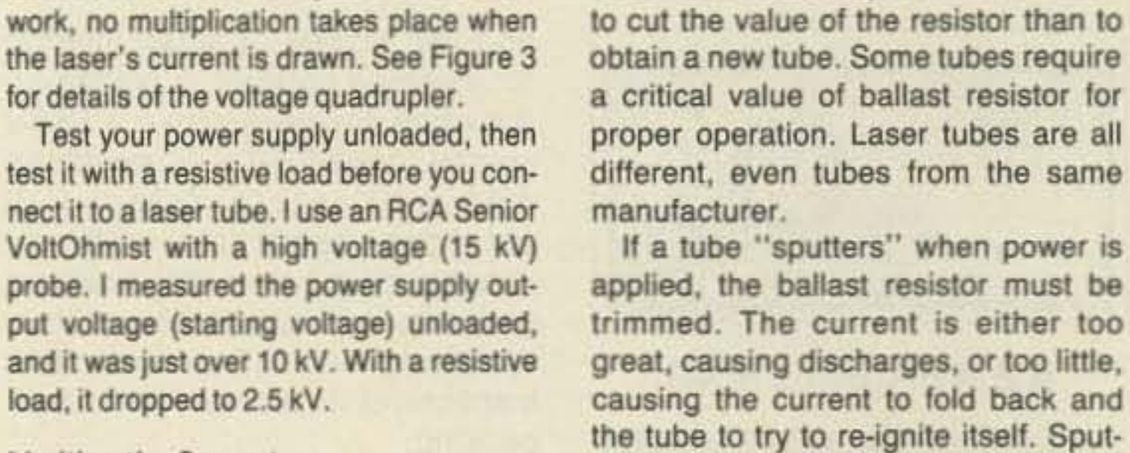
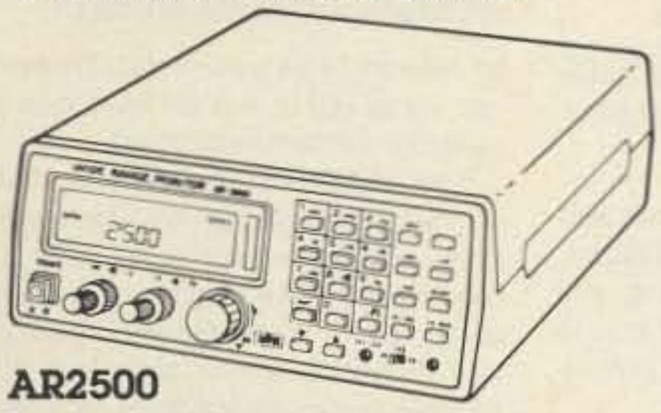


Figure 1. The laser power supply, an AC transformer 850V/1kV secondary. The voltage quadrupler provides the 10kV, low current starting pulse.

New AOR Receiver

2016 Channels. 1 MHz to 1500 MHz



AR2500

Total Price. Freight Prepaid (Express Shipping Optional)

$499

- Continuous coverage
- AM, FM, wide band FM, & BFO for SSB, CW.
- 64 Scan Banks.
- 16 Search Banks.
- RS232 port built in.
- 25 Day Satisfaction Guarantee. Full refund if not Satisfied.
- Includes AC/DC power cord, Antenna, and Mounting Barcket.
- Size: 2 1/4"H x 5 5/8"W x 6 1/2"D Wt. 1lb.

ACE COMMUNICATIONS

10707 E. 106th St. Fishers, IN 46038

Toll Free 800-445-7717

Visa and MasterCard (COD slightly higher)

In Indiana 317-849-2570 Collect FAX (317)849-8794

CIRCLE 164 ON READER SERVICE CARD

ICOM BATTERY INSERTS

BP-2	7.2v	500mah	$14.00
BP-3	8.4v	270mah	$15.00
BP-5	10.8v	500mah	$21.00
BP-7	13.2v	500mah	$23.00
BP-8	8.4v	800mah	$21.00
BP-22	8.4v	270mah	$22.00
BP-23	8.4v	600mah	$22.00
BP-24	10.8v	600mah	$26.00

KENWOOD BATTERY INSERTS

PB-21	7.2v	200mah	$12.00
PB-21H	7.2v	600mah	$15.00
PB24 Tabs	9.6v	600mah	$15.00
PB-25/26	8.4v	500mah	$18.00

YAESU BATTERY INSERTS

FNB-3/3A	10.8v	500mah	$28.00
FNB-4/4A	12v	500mah	$27.50
FNB-10	7.2v	600mah	$15.00
FNB-11	12v	600mah	$30.00
FNB-12	12v	500mah	$30.00

MORE BATTERY INSERTS

Tempo S1 Early	270mah	$19.95
Tempo S2/4/5 Late	500mah	$21.00
Standard BP-1	270mah	$19.95
Ten-Tec BP1	500mah	$19.95
San-Tec #142#144Tabs	600mah	$22.00
Azden 300 Tabs	600mah	$15.00
Bearcat	600mah	$20.00
Regency MT1000 Tabs	600mah	$15.00

VISA MasterCard

*Add $3.00 Shipping FREE Catalogue

TNR The Battery Store
279 Douglas Ave., Suite 1112
Altamonte Springs, FL 32714
1-800-346-0601

CIRCLE 62 ON READER SERVICE CARD

GORDON WEST RADIO SCHOOL

#04 21-DAY NOVICE $22.95

- 112-page textbook
- two stereo code learning tapes
- sample 5 wpm Novice code test
- over $50 in radio manufacturers' discount coupons.

#01 COMPLETE NOVICE . . . $62.95
2 theory tapes, 2 textbooks, FCC Rule Book, 4 code tapes, code oscillator set, examiner test packet, and over $50 in radio discount coupons.

#02 NOVICE CODE COURSE $32.95
6 cassette tapes make it easy to learn the code from scratch.

#07A 2-WEEK TECH $22.95
This Technician course includes 2 theory tapes and 1 illustrated textbook.

#05 COMPLETE GENERAL. . $62.95
6 code tapes, 4 theory tapes, and 2 textbooks. Ideal for upgrade from Novice to General.

#06 GEN. CODE COURSE . . $32.95
This General course includes 6 tapes for speed building from 5 to 13 wpm.

#08B COMPLETE ADVANCED $62.95
This Advanced course includes 4 theory tapes, 1 textbook, and 6 code tapes (13 to 22 wpm).

#09 ADV. THEORY COURSE $32.95
4 tapes and 1 illustrated textbook

#10 COMPLETE EXTRA. . . . $62.95
4 theory tapes, 1 textbook, and 6 code tapes (13 to 22 wpm).

#12 EXTRA THEORY COURSE $32.95
4 theory tapes and 1 illustrated textbook for Extra class theory.

#11 EXTRA CODE COURSE $32.95
6 tapes for speed building from 13 to 22 wpm for the Extra code exam.

#13 BRASS KEY & OSC. . . . $25.95

#15 PLASTIC KEY & OSC. . . $21.95

SINGLE CODE TAPES
$10.95 each including shipping

#19	5 wpm Novice QSO tests
#20	5 wpm Random Code
#21	5-7 wpm Speed Builder
#22	7-10 wpm Speed Builder
#23	10 wpm Plateau Breaker
#24	10-12 wpm Speed Builder
#25	12-15 wpm Calls & Numbers
#26	13 wpm Random Code
#27	13 wpm Test Preparation
#28	13 wpm Car Code
#29	13-15 wpm Speed Builder
#30	15-17 wpm Speed Builder
#31	17-19 wpm Speed Builder
#32	20 wpm Random Code
#33	20 wpm Test Preparation
#34	20 wpm Car Code
#43	3-15 wpm Code Review
#40	12-21 wpm Code Review

Prices include shipping & handling
IL residents add 6½%

VISA MasterCard

RADIO AMATEUR CALLBOOK INC.
925 Sherwood Dr., Lake Bluff, IL 60044
Mon.-Fri. 8-4pm (708) 234-6600

CIRCLE 31 ON READER SERVICE CARD

The power to overcome.

Easter Seals®

Budget QSLs
$39/1000

plus $3.75 Shipping in U.S.

★ RAISED PRINTED ★

BEAUTIFUL, GLOSSY INK!

Thought you couldn't afford really good QSLs? These high quality RAISED PRINTED cards can be in your hands for only **4¢** each! Your choice of 4 colors of 67 lb. bristol stock: Gray, Yellow, Blue, Ivory. We print in blue ink in the format shown. If you don't want the state outline, we can remove it and make the callsign larger to balance the card. NO EXTRA CHARGE for ARRL logo, or extra wording if we have the room. Order with confidence; these are the best value in Ham Radio today! Your satisfaction is guaranteed. Send your check or call us if you have MasterCard or Visa.

Need a custom card? Call (318) 443-7261.

DENNIS WA5QMM

NETWORK QSL CARDS

P.O. Box 13200 - Alexandria, LA 71315-3200 - (318) 443-7261
or FAX your order to: (318) 445-9940

CIRCLE 44 ON READER SERVICE CARD

HAM RADIO TOY STORE, Inc.

MasterCard VISA

UNCLE ELMER SAYS: Come in and operate our demo station featuring TEN-TEC radios.

CALL for low prices.

TEN-TEC

117 WEST WESLEY STREET - WHEATON, IL 60187 - (708) 668-9577

Number 29 on your Feedback card

DEALER DIRECTORY

DELAWARE

New Castle

Factory authorized dealer! Yaesu, ICOM, Kenwood, Ten-Tec, AEA, Kantronics, DR-SI Mfg., Ameritron, Cushcraft, HyGain, Heath Amateur Radio, Heil Sound. **DELAWARE AMATEUR SUPPLY, 71 Meadow Road, New Castle DE 19720. (302) 328–7728.**

IDAHO

Preston

Ross WB7BYZ has the largest stock of amateur gear in the intermountain West and the best prices. Over 9,000 ham related gear in stock. Call us for "all" your ham needs today. **ROSS DISTRIBUTING CO., 78 S. State, Preston ID 83263. (208) 852–0830.**

NEW JERSEY

Park Ridge

North Jersey's oldest and finest Shortwave and Ham Radio Dealer. 1½ miles from Garden State Parkway. Authorized Dealers for AEA, Kenwood, Japan Radio Company, ICOM, Yaesu, etc. Ham Sales, Lee WK2T. **GILFER SHORTWAVE, 52 Park Ave., Park Ridge NJ 07656. (201) 391-7887.**

NEW YORK

Jamestown

Western New York's finest amateur radio dealer featuring ICOM–Larsen–AEA–Hamtronics–Astron. New and used gear. 8 a.m. to 5:30 p.m., Sat. and Sun. by appointment. **VHF COMMUNICATIONS, 280 Tiffany Ave., Jamestown NY 14701. (716) 664–6345.** Circle Reader Service number 129 for more information.

Manhattan

Manhattan's largest and only ham and business Radio Store. Featuring MOTOROLA, ICOM, KENWOOD, YAESU, AEA, SONY, BIRD, TEN-TEC, etc. Full stock of radios and accessories. Repair lab on premises. Open 7 days M–F, 9–6 p.m.; Sat. & Sun., 10–5 p.m. We ship worldwide. **BARRY ELECTRONICS, 512 Broadway, New York NY 10012. (212) 925–7000. FAX (212) 925–7001.**

OHIO

Columbus

Central Ohio's full-line authorized dealer for Kenwood, ICOM, Yaesu, Alinco, Info-Tech, Japan Radio, AEA, Cushcraft, Hustler, and Butternut. New and used equipment on display and operational in our 4000 sq. ft. store. Large SWL department, too. **UNIVERSAL RADIO, 1280 Aida Drive, Reynoldsburg (Columbus) OH 43068. (614) 866–4267.**

PENNSYLVANIA

Trevose

Authorized factory sales and service. KENWOOD, ICOM, YAESU, featuring AMERITRON, B&W, MFJ, HYGAIN, KLM, CUSHCRAFT, HUSTLER, KANTRONICS, AEA, VIBROPLEX, HEIL, CALLBOOK, ARRL Publications, and much more. **HAMTRONICS, INC., 4033 Brownsville Road, Trevose PA 19047. (215) 357–1400. FAX (215) 355–8958. Sales Order 1-800-426–2820.** Circle Reader Service 379 for more information.

TEXAS

Dallas

In Dallas since 1960. We feature Kenwood, ICOM, Yaesu, AEA, Butternut, Rohn, amateur publications, and a full line of accessories. Facotry authorized Kenwood Service Center. **ELECTRONIC CENTER, INC., 2809 Ross Ave., Dallas TX 75201. (214) 969–1936.** Circle Reader Service 74 for more information.

DEALERS: Your company name and message can contain up to 50 words for as little as $420 yearly (prepaid), or $210 for six months (prepaid). No mention of mail-order business please. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the April '91 issue must be in our hands by February 1st. Mail to *73 Amateur Radio Today*, Box 278, Forest Road, Hancock NH 03449.

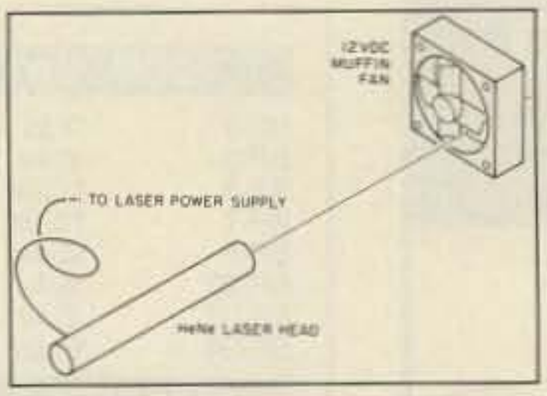


Figure 2. The laser transmitter. DC muffin fan blades chop the laser beam at approximately 1 kHz.

well-insulated current meter in series with your laser to determine the current drawn. *[Ed. Note: Do not look directly into any laser beam as it could be hazardous to your eyesight. Take appropriate precautions.]*

Mailbox Comments

Lyle K1HR of Littleton, New Hampshire, is getting ready for Field Day '91. He's building the FET switcher from the August '90 column. Lyle intends to use the switcher to provide AC power for his packet station remote. He'll also use the switcher in the laser power supply, and the 1 kV supply (to be covered in part 3 of this series). As he mentions, the switcher is versatile. Marion Brimberry of Alma, Illinois, writes that he made the FET switcher kit, and it worked great, powering from +12 volts to 110 AC, using the IRFP-140R transistor.

A couple of notes on using the switchers: I found that you can reduce a voltage spike on the FET's drain by placing a series 5 ohm resistor and A 0.1 µF capacitor on each drain to ground. If the spike is high enough (around 100 V), it can puncture and destroy the FET. The resistor-capacitor network helps prevent this. These values are for 60 Hz, and will have to be adjusted for different frequencies.

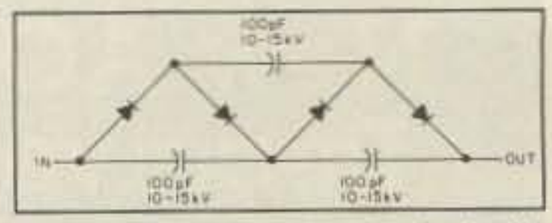


Figure 3. The voltage quadrupler details. All diodes are 8 kV at 130 mA. VARO H-1601-8 (surplus diodes). Capacitors, 100 pF; 50 pF to 200 pF should work OK.

Ross VK2ZRU of Forestville, Australia, working with Alan VK2AXA, used the San Diego Microwave booklet on 10 GHz to construct a small horn antenna and a signal source. He is about to etch a PC board for a 10 GHz transceiver, and is looking for microwave relays (SMA type). Microwave surplus is not plentiful in Australia, and I will try to assist Ross in locating some surplus postage stamp coax relays.

25th Central States VHF Conference

The 25th Central States VHF Conference will be held July 25–28 at the Sheraton Inn in Cedar Rapids, Iowa. It's open to everyone. This year Rod Blocksome K/0DAS and his staff are planning an excellent series of activities and technical presentations. They're looking for speakers and technical papers. All questions should be directed to Rod Blocksome KØDAS, 690 East View Drive, Robbins, Iowa 52328; (319) 393–8022. Or contact Ron Neyens NØCIH, 8616 C. Ave. Ext., Marion IA 52302-9524; (319) 377–3207.

As always I will be glad to answer questions pertaining to this and other microwave related subjects. Best 73's, Chuck WB6IGP. 73

Number 22 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.

JUN 1

KNOXVILLE, TN The RAC of Knoxville will host the 25th annual Amateur Radio/Computer Convention at the Knoxville Convention Center from 9 AM–5 PM. VE Exams on site. Advance tickets $4, $5 at the door. For advance tickets mail check and SASE to *R.A.C.K., PO Box 124, Knoxville TN 37901.* For tables and info contact *Steve Fritts WA4GZE, 400 Tobler Ln., Knoxville TN 37919. (615) 525–0801.*

ATHENS, GA The Athens RC will hold its annual Hamfest at VFW Post 2872, Sunset Dr., beginning at 8:30 AM. Admission $3, 15 and under free. Flea Market and Tailgating spaces $2 each. VE Exams. Talk-in on 146.745/–. Contact *Joe Londeree KC4EJY, (404) 353–8196.*

CLEVELAND, TN The Cleveland ARC will sponsor an event at the Bradley County High School from 9 AM–4 PM. VE Exams. Admission $1. Tables $4. Free outdoor tailgating with paid admission. Talk-in on 147.180. Contact *David Evans WD4EZC, (615) 472–1421.*

HERMON, ME The Pine State ARC will sponsor the Bangor Hamfest at Hermon Elementary School from 8 AM–2 PM. Free parking. Admission $2. VE Exams. Talk-in on 146.34/.94. Call *(207) 848–3846* day or night.

TEANECK, NJ Bergen ARA will host an event at Fairleigh Dickinson Univ., from 8 AM–2 PM. Admission: Buyers $2, sellers $8, children free. Free parking. VE Exams from 9 AM–noon, walk-in only. Exams contact: *Pete Adely K2MHP, 13-30 Edward St., Fairlawn NJ 07410. (201) 796–6622.* Talk-in on W2AKR 146.790. General contact: *Jim Joyce K2ZO, 286 Ridgewood Blvd. No., Westwood NJ 07675. (201) 664–6725.*

KITCHENER, ONT. The 17th annual Central Ontario Amateur Radio Flea Market, co-sponsored by The Guelph ARC and the Kitchener-Waterloo ARC, will be held at Bingeman Park from 8 AM–2 PM. Admission $5, children 12 and under free. Vendor tables $8 per 8' space (no outside vendors). Talk-in on KSR–146.37/.97, ZMG–144.61, 145.21; simplex 52/52. Make all checks payable to Central Ontario Amateur Radio Fleamarket, and send to *Fleamarket Chairman, Ray Jennings VE3CZE, 61 Ottawa Crescent, Guelph Ontario N1E 2A8. Phone: (519) 822–8342.*

ALAMOGORDO, NM The Alamogordo ARC will conduct VE Exams at the Alamogordo Mid High School, south entrance, beginning at 12 noon.

JUN 2

MANASSAS, VA The Ole Virginia Hams ARC will sponsor the Manassas Hamfest/Computer Show at the William County Fairgrounds. Open to tailgaters at 7 AM and to the general public at 8 AM. Admission $5, tailgating $5 additional per space. Wheelchair accessible. Talk-in on 146.37/.97 and 223.06/224.66 Commercial vendors contact *Jack KI4VP, (703) 361–5255.* For info call *Jim WD4OJY, (703) 369–3940.*

CHELSEA, MI The Chelsea ARC, Inc., will sponsor the 14th annual Chelsea Swap 'N Shop at the Chelsea Fair Grounds. Wheelchair accessible. Set-up at 6 AM. Donation $3. YL's, XYL's and kids under 12 free. Tables $9 per 8'. Trunk sale, $3 per space. Ladies tables welcome. For info, send SASE to *Robert Schantz, 416 Wilkinson St., Chelsea MI 48118,* or call *(313) 475–1795.*

NEWINGTON, CT The Newington ARL will hold its annual Amateur Radio/Computer Flea Market at the Newington High School from 9 AM–2 PM. Tailgating, weather permitting. Guided tours of ARRL HQ and W1AW. VE Exams by pre-registration only. Register with *Susan Fredrickson WM1B, PO Box 165, Pleasant Valley CT 06063.* General admission $3. Tables $12. For tables and info contact *Les Andrew KA1KRP, c/o NARL, 68 Wildermere Ave., Waterbury CT 06705. (203) 523–0453.* SASE for confirmation.

PRINCETON, IL The Starved Rock Radio Club Hamfest will be held at the Bureau County Fairgrounds beginning at 6 AM. Advance tickets are $4 before May 20th and $5 at the gate. Camping and outdoor Flea Market area is free. 8' indoor tables are $10 each. Talk-in on 146.355/.955. Contact *Bruce Burton KU9A, 1153 Union St., Marseilles IL 61341-1710. (815) 795–2201.*

QUEENS, NY The Hall of Science Hamfest will be held at the New York Hall of Science parking lot. Doors open at 9 AM. Set-up after 7:30 AM. Free parking. Donation for buyers, $4, sellers $6 per space. Talk-in on 445.175 repeater and 146.52 simplex. Contact (at night), *Steve nbaum WB2KDG, (718) 898–5599* or *Arnie Schiffman WB2YXB, (718) 343–0172.* (Rain date is June 9th.)

ROME, GA The NW Georgia ARC will celebrate its 60th Anniversary by hosting a big picnic at Floyd College, US 27. All hams invited! Bring one covered dish per family. Fishing and ball games. Talk-in on 146.94.

CONTOOCOOK, NH The annual Spring Flea Market, sponsored by the Contoocook Valley RC, will be held from 8 AM–3 PM. Tailgating. Directions: At Concord NH take I-89 North 14 miles to Exit 7 (Rte 103). East one half mile, on the left. From the West, take Rte 202/9 East to I-89 North, 5 miles to Exit 7, then East. Follow signs for parking. Admission: Sellers $5, buyers $1. Talk-in on 146.895 and 146.94 repeaters, and 52 simplex. Info: *K1OPQ @ pkt WA1WOK-2, or evenings (603) 746–5090.*

BUTLER, PA The Breezeshooters of Western Pennsylvania announce their 37th Annual Hamfest/Computerfest, to be held from 8 AM–4 PM at the Butler Farm Show Grounds. Mobile check-in on 28.495 and 146.520. Directions and Talk-in on 147.96/.36. Fly-in available at Roe Airport. Admission is $1 at the door. Free outdoor Flea Market space. Free parking. Wheelchair accessible. Indoor vendor space is available. Tables are $10 each in advance, on a first come first served basis. Overnight camping, hookups available. VEC Testing by pre-registration only. For info send SASE to *Rey Whanger W3BIS, Box 8, R.D. 2, Cheswick PA 15024, (412) 828–9393.* For reservations and info send check and SASE to *George Artnak N3FXW, 3350 Appel Rd., Bethel Park PA 15102. (412) 833–3395.*

JUN 7

CAMILLUS, NY VE Exams will be held at the Town of Camillus Municipal Bldg. beginning at 7 PM. Test fee for Technician through Extra class 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.*

JUN 9

LANCASTER, NY The Lancaster ARC will sponsor the Lancaster New York Hamfest at the Elks Club Hall (across from the Lancaster P.O.). Admission $4, includes 8' outdoor Flea Market space. Talk-In on 146.550 simplex or 224.640 repeater. Contact *Chairman Luke Calianno N2GDU, 1105 Ransom Rd., Lancaster NY 14086, (716) 683–8880; Nick WA2CJJ, 5645 Genesee St., Lancaster NY 14086, (716) 681–6410; George Ebert, (716) 894–0343.*

WINFIELD/CENTRAL, PA SVARC, Inc. and Milton ARC will sponsor an event at the Winfield Fireman's Grounds, 60 miles north of Harrisburg on US Route 15. VE Exams. Free parking. Admission $4. Tailgate and table space at $1 per 6'. Talk-In on 145.18/.78 and 146.82/.22. Write to *SVARC, Inc., Box 73, Hummels Wharf PA 17831. (717) 473–7050. Packet KD3KR @ NR3U.*

WILLOW SPRINGS, IL The 34th Annual Hamfest sponsored by the Six Meter Club of Chicago, Inc., will be held at Santa Fe Park. Tickets $3 in advance, $4 at the gate. Large Swapper's Row. Free parking. No overnight parking. Gates open at 6 AM. Talk-in on K9ONA 146.52 or K9ONA repeater 37–97. Get advance tickets from *Mike Corbett K9ENZ, 606 South Fenton Ave., Romeoville IL 60441,* or from any Club member.

ERLANGER, KY The Northern Kentucky ARC will sponsor "HAM-O-RAMA 91" at the Erlanger Kentucky Lions Park beginning at 8 AM. Flea Market set-up at 6 AM. Advance tickets are $4, $5 at the gate, with children under age 13 admitted free. Flea Market spaces are $2 each (tables NOT furnished). Indoor vendor space $15 per table (provided). For info, registration, contact *LC4FET c/o NKARC, PO Box 1062, Covington KY 41012. (606) 341–1213.* Talk-in on 147.855/.255 or 147.975/.375.

GRANITE CITY, IL The Egyptian Radio Club will host the annual EGYPTIANFEST at the club grounds on Chouteau Place Rd. beginning at 6 AM and ending with the main prize drawing about 2 PM. Advance tickets are $1 each or 6/$5; $2 each or 3/$5 at the door. License testing will be at the Sanford Brown Business College, 3237 W. Chain of Rocks Rd. Exam sign-up will be 8 AM–9:45 AM at the hamfest. Saturday night camping is available at the clubgrounds. Talk-in on the ERC-W9AIU 146.76 repeater. Contact *Jim Cleland K9RKU, PO Box 562, Granite City IL 62040. (618) 344–2401.*

NEAR AKRON, OH The Goodyear ARC will sponsor the 24th Annual Hamfest/Family Picnic at Wingfoot Lake Park. Family admission is $4 in advance, $5 at the gate. The Picnic and Flea Market will be from 8 AM–4 PM. Inside tables $6 in advance. Outside Flea Market $3 per vehicle. No overnight parking, no pets, no swimming. For info and advance tickets: *William F. Dunn W8IFM, 4730 Nottingham Lane, Stow OH 44224. (216) 673–8502.*

JUN 14–16

BURBANK, ALBERTA The Central ARL will hold their 19th Annual Picnic at the Burbank Campground, located at the confluence of Blindman and Red Deer River Valleys. Semi-private camp sites available by reservation. Registration starts Fri. afternoon. Camping fees: $15 per family unit, $10 per single unit; $10 for weekend private stall; Sat. evening barbecue/dance; $5, $3 for children under 12. $6 per weekend pass (no camping). Contact *Pat Wight VE6ALD, 886–3883* or look for a message on the *CARL BBS VE6BJH.* Talk-in on VE6UK 147.150+0.600 MHz, or 146.520 MHz simplex.

JUN 15

CORTLAND, NY The Skyline ARC will present the 9th annual Cortland International Hamfest from 7 AM–3 PM at the Cortland County Fairgrounds (breakfast at 6 AM). Outdoor Flea Market space $1. Indoor space available. Advance tickets $3, $4 at the gate, under 14 admitted free. SASE by June 1st to *S.A.R.C., Box 5241, Cortland NY 13045.* Talk-in on 147.825/.225.

CHERRY HILL, NJ The South Jersey Radio Assn., Inc., will host a gala Dinner at the Cherry Hill Inn to celebrate their Diamond Anniversary. An informal gathering will begin at 6 PM with a cash bar, followed by dinner at 7 PM. Tickets are $25 each and you may bring a guest. Arrangements have been made with Cherry Hill Inn for special room rates. For hotel reservations call *(609) 662–7200* and tell them you will be attending the SJRA Dinner on the 15th. The special room rates are $62 single, $65 double; includes use of all hotel facilities and a full breakfast on Sun. morning. For SJRA Dinner tickets, enclose SASE and check/money order ($25 for each ticket) and mail to *Frances Widmann WA2NBE, South Jersey Radio Assn., PO Box 1026, Haddonfield NJ 08033,* before the May 8th deadline.

JUN 15–16

GLENDIVE, MT The Lower Yellowstone AR System will host the 32nd Annual Fathers Day Hamfest Picnic at the Dawson County Fairgrounds. VE Exams Sat. at 1 PM. There will be a hosted breakfast on Sun. Sun. Pot-Luck Dinner at 1 PM. Adult registration $6 each, kids free.

JUN 16

SANTA MARIA, CA The Satellite ARC will hold its annual Santa Maria Radio Swapfest/Barbecue at the Union Oil Company Newlove Picnic Grounds south of Santa Maria, from 9 AM–4 PM. Tables are available at 7 AM for $5. Top Sirloin Barbecue at 1 PM, $8 for adults, $4 for children. Free parking. Talk-in on 146.94. Contact *Esther Miller, PO Box 2067, Orcutt CA 93457-2067. (805) 937–8878.*

CAMBRIDGE, MA TAILGATE Electronics, Computer and Amateur Radio FLEA MARKET, 9 AM–2 PM at Albany and Main St. Sponsored by the MIT Electronics Research Society, the MIT Radio Society, the MIT UHF Repeater Assn. and the Harvard Wireless Club. Admission $1.50. Free off-street parking. Covered tailgate area. Sellers $8 per space at the gate, $5 in advance–includes one admission. Set-up at 7 AM. Mail reservation payments before June 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.

STEVENS POINT, WI The Central WI Radio Amateurs, Ltd, will hold its 14th annual SWAPFEST at the University Center on the Univ. of Wisconsin-Stevens Point campus. Free parking. Wheelchair accessible. VE Exams. Tables and electricity will be available for commercial vendors. Contact *Art Wysocki N9BCA, CWRA Swapfest Chairman, 3356 April Lane, Stevens Point WI 54481. (715) 344–2984.*

FREDERICK, MD The Frederick ARC will hold its Annual Hamfest at the Frederick County Fairgrounds from 8 AM–4 PM. Admission $4, wives and children free with one paid admission. Tailgaters $5 for each 10' space. Indoor exhibitor tables $10. For info write to *Frederick Hamfest, PO Box 589, Mt. Airy MD 21771.*

JUN 22

COOKEVILLE, TN The Upper Cumberland ARS will host a free Tailgate event at the USDA Bldg., Farmers Market Section on Bunker Hill Rd., from 8 AM–3 PM. Set-up at 7 AM (CST). Talk-in on 145.11/.51. Contact *Ken Roberts, Rt. 4, Box 307, Cookeville TN 38501.*

LEMPSTER, NH The Connecticut Valley FM Assn. will sponsor a Hamfest/Fleamarket from 7 AM–2 PM at the Goshen-Lempster Coop School gym, Route 10 in Lempster. Free parking. Auction. Picnic. Admission $1. Table or space $5 each (plus 1 free admission). Talk-in 146.16/.76. Contact *Conrad Ekstrom WB1GXM, PO Box 1076, Claremont NH 03743–1076. (603) 543–1389.*

SPECIAL EVENT STATIONS

JUN 1

HACIENDA HEIGHTS, CA The Mercury ARA will participate in a community Emergency Preparedness Fair from 1800Z–2300Z. Members will operate using their own call signs. Third party traffic for Fair patrons will be encouraged. Frequencies: 28.3 to 28.5 on 10 meter phone band. For a certificate, send QSL and SASE to *MARA, Attn: WA6BZX, 2751 Montellano, Hacienda Heights CA 91745.*

JUN 1–2

TROY, OH Station W8FW will operate 1400Z–2200Z to commemorate "Strawberry Festival." Frequencies: 25 kHz up from the General 40 meter band and 10 meter Novice band. For certificate, send QSL and SASE to *KS8Z, 1408 Cornish Rd., Troy OH 45373–1212.*

MADISON, OH The Wireless Institute of Northern Ohio (WINO), sponsored by the Lake County ARA, will be on the air Sat. evening between 2330Z–0300Z on 7235 and 21315 kHz, and Sun. from 1500Z–1900Z on 21315 and 28490 kHz, to commemorate Ohio Wine Month. The station call is KO8O. A special 8½ x 11 QSL certificate will be available from *KO8O–WINO Weekend, 10418 Briar Hill, Kirtland OH 44094.* Send a legal sized SASE.

JUN 1–15

HADDONFIELD, NJ The South Jersey Radio Assn. will operate K2AA on all bands June 1–15 to celebrate 75 continuous years devoted to amateur radio. SJRA will offer an attractive QSL marking the event. To confirm contact send a QSL and a SASE to *South Jersey Radio Assn., PO Box 1026, Haddonfield NJ 08033.*

JUN 6–8

MENA, AR The Ouachita ARA will operate KG5QO from 1300Z–2400Z in conjunction with the annual "Lum and Abner Days" honoring Chet Lauck and Norris Goff of early Broadcast Radio fame. Operation will be in the lower 25 kHz of 40, 20, 15 meter General phone bands, and 28.350–400 MHz. For certificate send QSL and 9 x 12 SASE to *Jack Brewer KG5QO, Rt 1, Box 137, Hatfield AR 71945.*

JUN 9–16

AUBURN, WA The Academy ARC will operate K7AC during the week of June 9–16th, to commemorate Auburn's Centennial. Operation will be in the lower 25 kHz of the General bands as well as the 10 meter Novice phone band. There will be an informal net of U.S. Auburns (there are about 22 of them) held on June 16th at 2200 UTC, on 14.240 MHz. QSL via *WA7QCC, 3513 Orchard Place SE, Auburn WA 98002.*

JUN 17–21 & 24–28

JOPLIN, MO The Joplin ARC will operate K5ALU Mon. through Fri. from 2000Z–0200Z, from the Frank Childress Boy Scout Reservation, to encourage youth participation in ham radio. CW–7.050, 14.050; phone–lower 25 kHz of the General 40, 20 and 15 meter bands and the upper 50 kHz of the Novice 10 meter band. For QSL, send QSL, name of operator worked, and SASE to *Joplin ARC, PO Box 2983, Joplin MO 64803.*

JUN 22

LAKE KEYSTONE, OK Lake Keystone OK Masonic Dist. 12 Assn. will operate N5MBD/P from 1300Z–2200Z during the annual State-Wide Masonic Rally on the 10 meter Novice phone band. For certificate, send QSL and large SASE to *Masonic Dist. 12 Assn., PO Box 182, Owasso OK 74055.*

ASK KABOOM

The Tech Answer Man

Michael J. Geier KB1UM
WGE Center
Forest Road
Hancock NH 03449

Selectivity and Intermod: What Are They?

A recent letter to the *73* editor complaining about "poor selectivity" when using a Kenwood TH-27A HT with an outdoor antenna prompted me to think about intermod, selectivity and receiver characteristics in general. Let me share some of those thoughts with you.

The reader was picking up paging services and other transmissions which were not on the frequency to which he was tuned. He complained that his new HT suffered from this problem, but his older ICOM IC-2AT did not. Why should newer technology exhibit worse behavior?

The editor explained that such problems are in fact worse with the newer, wideband receiving rigs, and that it was not fair to single Kenwood out. He was quite correct, but the problem goes deeper than could be addressed on the letters page. In fact, the letter writer was not actually experiencing a selectivity problem per se. What he had was front-end overload and intermod. The two are quite different things.

Selectivity refers to the width and shape factor of the receiver's passband. The two are related concepts; the shape factor partly determines the overall width. So, the shape factor is perhaps the more important spec. The term simply refers to how steep the filtering curve appears when graphed on a dB-versus-frequency X-Y plot. If the "skirts" or edges of the response fall rapidly, then the shape factor is steep, meaning that signals outside the defined bandwidth will not be heard. If, however, the skirts fall off in a gentle slope, then the *effective* bandwidth is greater because signals appearing on the skirts will be passed. Obviously, the steeper the skirts, the better.

It is important to note that in today's synthesized receivers, essentially all of the selectivity is obtained in the IF stages. The front ends are usually quite broad. Let me explain.

Two Ways to Go

There are two ways to make a superheterodyne receiver. The old, tried-and-true method was to tune the front end to the desired signal and then greatly increase the selectivity in the IF stages. This system helps avoid interference because the tuned front end rejects signals on distant frequencies, but it requires that the local oscillator and front-end tuning components track each other. In other words, the front end must be resonant on the same frequency as the one which will be passed through the IFs after being mixed with the local oscillator! With a mechanical tuning arrangement, such as a variable capacitor, this is fairly easy to do.

But with a digital synthesizer, it is not as easy. The local oscillator is controlled by a phase locked loop system, driven from a digital reference. It is possible to derive a DC tuning voltage in the process (in fact, one is used to tune the VCO) and control a varactor (voltage-variable capacitor) to track the front end, but it becomes impractical over wide frequency bands. Thus, for many receivers, and especially for those which can cover large out-of-band frequency ranges, designers have turned to another technique.

Open Wide and Say Ahhhh

The obvious way to go is simply to use an untuned front end! After all, you can get all the selectivity you want in the IFs. In fact, most of today's walkies use this technique. The difference between the older units and the newer ones is that the old ones only had to cover four MHz, so there could be a broad bandpass filter ahead of the front-end amp. This very coarse tuned circuit at least kept the out-of-band garbage from getting in. Now that we all expect our pocket rigs to cover a 40 to 60 MHz spread, it just isn't practical. So, there may be no tuning at all.

So what? Why should this affect the operation of the receiver, and why does it matter what kind of antenna you use? Well, as long as the front-end amplifier stays linear, it doesn't. But, when enough signal power (generated by multiple transmitters on various frequencies) gets in, the amp is driven to clipping, just like an audio amp is when you turn the volume up too loud. At this point, the amp becomes a *mixer*. Or, if you prefer, a modulator; it's the same thing. Now, various incoming frequencies can affect each other, just as if they were two inputs to a mixer. This is called intermodulation distortion, or intermod. If the two incoming frequencies happen to add or subtract to or from the one you're tuned to, you will hear one or both of them! Also, if they mix to one of your IF frequencies, some of that resultant signal may leak through the first mixer to the IFs, causing the same effect. And, of course, there can be more than two. Sometimes, three or four signals can mix and cause trouble. Yuck, what a mess!

The reason the antenna matters is because it delivers tremendously more signal to the receiver than does the usual rubber duck. This greatly increases the likelihood of overload and intermod. Walkies are most prone to this problem because they are designed to be very sensitive in order to deliver reasonable performance with a poor antenna, which a rubber duck certainly is. The trade-off is that these ultra-sensitive front ends can't take too large a signal level before going into clipping. Also, many of the tuning elements, such as filter coils, which can help avoid intermod are just too darned big for pocket rigs. Many mobiles, however, have them and consequently exhibit fewer intermod problems. Such rigs usually do not have wide, out-of-band coverage.

By the way, the difference between a receiver's lowest discernible signal and its highest level before overloading is called its *dynamic range* and is expressed in dB. Obviously, the bigger the number the better. Ultimately, the dynamic range, selectivity and intermod rejection matter more than does simple sensitivity, especially in FM rigs. There usually is plenty of signal to work with—you just want to keep all the "junk" out of your passband!

Use the Right Rig for the Job

Walkies were never meant to be used with base station antennas, and most don't even perform well with mobile antennas, either. You just can't have it all in one tiny box! If you live in a small town without many radio services, you may have no trouble at all. If, however, you live in Boston, Miami or some other metropolitan area, good luck! I remember using my walkie in the car in Miami with a mobile antenna. It seemed as if my receiver had very poor sensitivity; I was getting into the repeater, but I could barely hear it. Then I tried using the rubber duck and, even inside the metal car, the repeater came in loud and clear. The receiver was being *blocked* by other signals' overloading the front end. Sometimes I could hear them, sometimes I could not.

There are few base station rigs sold anymore. If you are setting up a base, a mobile radio with a power supply makes a better choice than does a walkie.

TX Too?

What about transmitters? Can they suffer from intermod, too? Yes, they sure can! As a matter of fact, repeater operators have that problem quite a bit, because the repeater is often located on top of a hill or tower only a few feet away from other high-powered transmitting devices. But with no "front end," how does a transmitter get intermod?

The mixing occurs right in the transmit final amp! In FM transmitters, the final amp is not linear in the first place. Typically it is a pulse amp, with the pulses being converted to nice clean sine waves by the tank circuit (a resonant coil-cap circuit) and the low-pass filters at the output. The inherent nonlinearity (read "distortion") in these amps makes them ripe for intermod problems, because they are already being driven to clipping by design! So, if enough extraneous signal energy gets to the amps, it will cause mixing and the transmitter will then broadcast the intermod far and wide.

There's an easy way to tell if a repeater's intermod is on its receiver or transmitter: If it is still there after the receiver's squelch has dropped (but before the transmitter shuts down), then it is not coming from the receiver!

It is highly unlikely that you will ever generate your own intermod, even if you use your walkie as a base station, because it takes a substantial amount of unwanted signal energy to get past the transmitter's output filter and into the final amp. Unless you have another big transmitter with its antenna very close to your walkie's, you should be clean.

Are They All the Same?

I've used a fair number of walkies in my day, and I do feel that the "big three" manufacturers have different receiver design concepts. In my opinion (and this is only my opinion—go to a ham club meeting and you'll find people who will disagree), here's how they stack up in general.

ICOMs seem to have the best balance between sensitivity and selectivity, each being a little bit less than the best available separately from the other two, but both being extremely good.

Yaesus have the best selectivity. If you're off 5 kHz, the signal is barely listenable, and if you're 10 kHz away, it is practically gone. However, the rigs are not as sensitive as those from the other two. There have been some exceptions, though, such as the old "Memorizer" mobile rig, which was about the most sensitive 2 meter radio I've ever seen.

Kenwoods have extremely high sensitivity, and it holds up well outside the ham bands. The rigs are not terribly selective, though; it can be hard to tell whether or not you're 5 kHz off.

As far as intermod rejection is concerned, I can't offer any opinion because I haven't used the radios enough under adverse conditions to make a judgment. All I can say is this: No matter who makes them, walkies do not excel in this area. After all, everything has limitations.

Now, let's look at a letter:

Dear Kaboom,

What's the difference between a Class A and a Class B computer? I know it is in regard to the amount of RFI that the computer is allowed to generate, but what does it actually mean? Also, what measures can I take to ensure hash-free computer operation in my shack? **Signed, Classy**

Dear Classy,

Contrary to what one might think, a Class B computer is "cleaner" than a Class A unit. The A designation is for computers to be used in a business environment only. The RFI specs are somewhat looser than those for Class B, which is for home use. It is assumed that homes and apartments will have various susceptible devices, like TV sets, in close proximity to the computer. As long as the machine is in a metal box, most of the RFI will exit via the cables used to connect the keyboard, video monitor, printer, etc. There is no way to be sure you won't get any hash in your shack, but you can do a few things to lessen the severity of the situation. First, use shielded cable for everything you can, including on the computer and the rig. Second, ground the rig well. Third, try to keep the computer as far away as possible. Fourth, wrap computer cables through toroids if you can. Finally, consider going to a laptop if all else fails. These CMOS-based machines put out *far* less hash than the tabletop variety because they operate on much less power to begin with. By the way, some older computers, like my Apple II+, were not even shielded at all. Man, they are serious noise generators. Hmmm, I wonder if I could put a CW key in the micro's reset line and have a wideband QRP rig? Only kidding! 73

Number 24 on your Feedback card

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

W3BE: Radio Amateur of the Year

In case you have not already heard, I am honored—proud—elated—to report that the Dayton Amateur Radio Association has named one of the nation's best known and most respected "amateurs in public service" as the 1991 Radio Amateur of the Year. The person I speak of is someone whom I have been proud to call a friend for the past decade and a half. That ham and friend is John B. Johnston W3BE of Derwood, Maryland, and also of 1919 M Street N.E., Washington DC.

Many of you know W3BE as Johnny Johnston of the FCC, the Commission representative you meet at hamfests and conventions across the nation. His reserved yet knowledgeable approach to discussing matters of regulation has made John a friend to many of us, and a man who is respected by all.

Johnston was nominated by a coalition of amateurs from across the country. They felt that his two decades of dedication to the regulatory needs of the nation's amateurs deserved major recognition. In their letter of nomination, they cited John's almost single-handed re-write and reorganizaton of the Part 97 amateur rules as one of his major contributions. They noted that this was not a task assigned to him by his superiors in the Commission, but rather done at his own initiative. He used his unparalleled knowledge of the amateur service rules to address the problems that their ambiguities were causing to the amateur service. It was also noted that in his position as Chief of the FCC's Personal Radio Branch, he has always made himself available to help members of the amateur community to find solutions to their problems, while also working to ensure an appreciation of amateur radio within the structure of the FCC.

We have heard more than one person say that honoring W3BE for his years of service to the United States Amateur Radio Service is long overdue. John has become almost inseparable from the service regulations that his hand and mind helped create. Apparently, the D.A.R.A. Awards Committee heard the same call to honor him and his work. It is my opinion that John B. Johnston W3BE is the best friend we amateurs have in the ranks of the FCC.

220 Gone

John Johnston W3BE being named Radio Amateur of the Year was the good news this spring. Now here is the bad. John's superiors at the FCC—the Commissioners—say that hams will have to be off of the 220 to 222 MHz band by midsummer. While no exact date can be given, amateurs will have to vacate the band entirely 90 days after the effective date of the rules change, adopted on Thursday, March 14, that takes hams off the lower part of the 1-1/4 meter band and puts commercial services on. The NPRM was adopted pretty much as proposed, with the addition of a reserve of some channels for public safety use. Automatic vehicle monitoring will probably be available through the entire band.

The FCC rejected the ARRL's request for secondary access to 220–222 MHz. The American Red Cross lost in its request for special frequencies, as did Electronic Tracking Systems, Inc., for police tracking units. And regarding PELTS, the Personal Emergency Locator Transmitter System, no decision was made. *[For more information on PELTS, see the Nov. '90 "Homing In" column.]* Some hams say they won't leave the band. They believe that the FCC won't enforce the new rules. If these hams insist on staying, they may have to put their licenses, wallets, and possibly their personal freedom on the line. Isn't it time to let the matter stand? It was a good fight, but we lost!

13cm Offered to Business

Mind you, I am writing this column on April 1. I wish I could say, "April Fools!" but alas, I can't. And, as if the loss of 220-222 MHz was not a bad enough way to enter the spring season, now the 13cm amateur band appears to be up for grabs. In fact, it may be given away by the FCC at next year's World Administrative Radio Conference (WARC '92). The Commission is proposing that it be turned over to commercial use for digital audio broadcasting and satellite uplinks for worldwide mobile services.

Specifically, the FCC suggests that 2360–2410 MHz—including the 2360–2390 MHz slice of spectrum now off-limits to amateurs—be given to the satellite-based Digital Audio Service, and 2410-2450 MHz become an uplink band for mobile satellite services. This would leave hams with only 2300–2310 MHz, and this only on a secondary, totally noninterfering basis to any and all other users who might receive assignment at a later date. The FCC also proposes that hams be granted some limited, noninterfereing access to the entire band. The key word appears to be "noninterfereing," which could mean anything to anybody, since no designator for what constitutes "interference" has ever been determined for blanket application across the entire electromagnetic spectrum.

The proposal to reallocate 13cm is a part of the overall United State's position paper for next year's World Administrative Radio Conference. It should be noted that most countries in the world, especially the emerging third world countries, are already set against the Amateur Radio Service retaining its 20 and 40 meter bands. The FCC's offering the 13cm band up for grabs only strengthens the position of those seeking to gut amateur operations in all spectrum from DC to light.

Michigan—"Privating Out" OK

Let's close with these two items about FM and repeaters. Ever hear the term "privating out"? In the world of FM and repeaters, it means that a repeater owner has decided that he no longer wants the general amateur community to have access to his machine. So, he puts the word out that, as of a specified date, the repeater will only be available to selected users of his choice. In effect, he has evicted the overall amateur community. He has taken an "open" repeater and has "privated out."

Michigan has a long tradition of opposing any closed or private repeater operation. Now it will not only permit the establishment of closed and private repeaters, it will also permit existing systems to go private if they so choose. The Michigan Area Repeater Council made this new stand public in its February newsletter.

The question of whether or not to permit private repeater operation in this state came to a head several months ago. As noted, Michigan traditionally banned closed and private systems. Then, last fall several repeater trustees informed the council that they were changing to closed operation. Another refused to give the council some key system access information for its records. They decided it was time to discuss the privating-out issue.

In the discussion, which took place last December 1990, the Michigan Area Repeater Council determined that the issue of private versus open operation is strictly the province of the repeater owner, and not the business of the coordinating body.

However, the council also demanded that no matter which type of operation a repeater owner chooses, he must supply all data needed for the coordination body's technical database. The lack of this information, the Michigan Area Repeater Council says, will seriously detract from that organization's ability to coordinate spectrum usage.

The Big MACC

We can at least end with a story that reads like an April fool's joke, even though every word is true. Can you believe that a hungry "Big MACC" has eaten two more states? In this case, the Big MACC we are talking about is the giant Mid America Coordination Council.

Late word is that the Big MACC has become even larger, bringing Ohio and Indiana under its umbrella. This makes 13 the total number of states represented by the MACC. It also makes the Big MACC the largest coordination council in the United States, and the largest political representative of FM and repeater interests in the world. In matters of repeater coordination policy, it is probably more politically powerful than the ARRL! 73

Number 25 on your Feedback card

UPDATES

ROBO-COPy

See the above article in the Oct. '90 issue, page 28. *Important: See also the update in the Dec. '90 issue.* Mike Hansen WB9DYI, the author, has sent us the latest revision of ROBO-COPy, version 3. They are currently listed on the 73 BBS (in the 73Mag SIG) at (603) 525–4438. The file named **robo31.exe** is for COM1, and the file named **robo32.exe** is for COM2.

WB9DYI: "ROBO-COPy version 3 uses the RI input of the COM port, and is thus completely compatible with the interface circuitry of the **robo2.exe**. (The correct pin number for RI on the DB-25 connector is 22.)

"Version 3 is different from version 2 in two areas:

"1. A fix was installed in the routine that prevents the average from being skewed by a large number of repetitive dits or dahs.

"2. A correction factor was added into the the word-per-minute calculation to compensate for the different sampling filter settings. This yields more accurate wpm readings at the HI filter setting. Note that the wpm calculation is based strictly on the speed of the incoming dits and dahs, and does not actually count the number of "words" sent over a 60-second period, like an FCC code exam. On-the-air tests using W1AW show the new algorithm to be accurate to plus or minus 3 wpm.

"*Note:* Early models of the Tandy 1000 series of PCs do not have truly compatible COM port BIOS routines. They lock up when attempting to run ROBO-COPy.

"Well over 100 hams have contacted me about ROBO-COPy. I appreciate any feedback or recommendations. Please contact me via the 73 BBS under 'mch" or by mail at 1405 Tangle Wood Dr., Algonquin IL 60102." 73

QRP

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Field Day Success

With the June flowers, comes Field Day: both a contest and an emergency communication exercise many hams enjoy. Plans for a winning Field Day are developed all year long. The average QRPer can make a good showing when operating Field Day, and have a lot of fun to boot!

There are two things you must have to complete a successful Field Day operation: power and antennas. Last year I operated the full 24 hours of Field Day with a 6 amp/hour gel cell battery. A small Arco GP100 solar panel kept the battery charged. There was no need to have a charge controller connected to the battery, as a constant load was maintained by the Argonaut. The primary mode was CW, with a dash of SSB thrown in. While I didn't generate an earth-shaking score, I worked just about everyone I could hear.

The Expanded Voltmeter

I brought along with me a simple and very handy piece of test equipment: an expanded voltmeter. A dedicated state-of-charge meter for lead-acid and NiCd batteries can be built very easily with four basic components: a zener diode, a resistor, a potentiometer, and a 0–1 mA meter. This hand-held voltmeter will allow you to keep track of battery voltage without guessing. Of course, you could use one of the many inexpensive digital meters on the market, but this device is simple and costs very little to build. If you step on it and break it, you're not out a lot of money.

Here's how it works. The voltage across the zener diode is essentially constant with respect to the current passing through the zener. If the battery voltage moves around, which it will (that's why we are doing this in the first place), the zener voltage will remain fixed at 10 VDC. The design concept is to use a meter to measure the difference between the fixed zener voltage and the battery's positive terminal.

Because the really important voltages are between 10 and 15 VDC, that's what we'll measure. Since a fully charged lead-acid battery is nearly 15 VDC (in most cases, the voltage of a fully charged gel cell battery is 14.4 volts under charge) the meter will then need to cover a range of 0–5 volts, since we are referencing against the zener diode voltage.

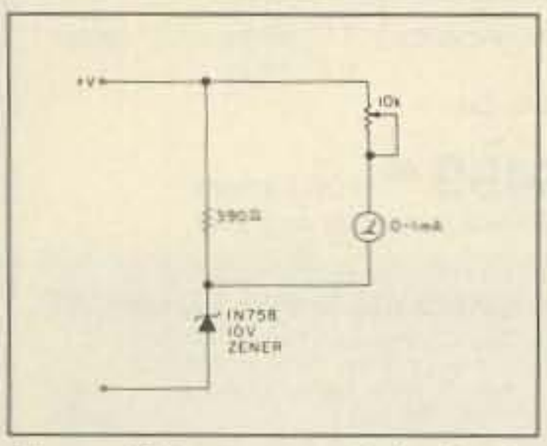


Figure. Make an expanded voltmeter for Field Day.

Easy to Build

Construction is, by design, simple. Only four components are needed. You'll need a 0–1 mA meter, a zener diode, a resistor, and a trimmer pot. Check the parts list on the schematic. A suitable meter is available from Radio Shack. The meter, as it comes from the package, is a basic 0–1 mA meter.

Remember, you *don't* have to use the meter from Radio Shack. Any 0–1 mA meter will work. I've used 0–50 microammeters and they've worked fine. I've even used old surplus 270 deg meters without trouble. Use what you have! If you want to use the Radio Shack meter, its catalog number is RS 270-1754.

In fact, you can get all the parts needed for this project from Radio Shack, with the exception of the 10 volt zener diode. I have a stock of these here in my junk box. If you can't find the zener diode called for, drop me a letter. I'll send one off to you for the price of two first class postage stamps. One for the diode, the other for the return postage.

Conversion of the meter is a simple matter of adding the extra components to a small piece of perf-board and changing the face of the meter. Since the meter's face already says "DC Volts," all we have to do is change the scale. You'll need a pair of steady hands, some small screwdrivers, and a dab of White Out™. A sheet of press-on letters will be needed to re-mark the meter's face. Of course, you could always re-mark the meter's face with a pencil or pen, too.

Place a soft cloth on your work area to prevent the meter's clear plastic face from being scratched. To remove the plastic face, hold the bottom of the meter in one hand, and pop the face off with the other hand. You'll find two parts to the meter's plastic face, the face itself and the black shield. Lay these aside.

Notice the two Phillips screws holding the scale to the body. With a small jeweler's screwdriver, carefully remove one screw. Be sure you don't drop the screw into the meter's hair spring or moving coil. Remove the other screw. Now, don't lift the metal scale off; rather, *slide* it off. Replace the two plastic parts and set the meter aside. This will protect the fragile needle and hair spring.

Lay the meter face down on a hard surface. You don't want to bend the metal plate. Since one end of the meter's scale is already marked 15 volts, you only have to change the zero at the other end to a 10. Use the White Out and cover the unneeded scale numbers. After the White Out has dried, use a press-on number to re-mark the scale, from 10 volts where the zero used to be, to 15 volts on the high end. The middle of the scale is 12.5 volts.

As a thought, some colored highlighters could be used to mark the scale in yellow, red, and green. If you don't want to go to all this trouble, use a pencil and remark the scale by hand. The first method is much more professional looking, though. Reassemble the meter and put it aside for mounting in an appropriate cabinet. A Radio Shack plastic project box works quite well. I used a Radio Shack #270-233.

The actual circuit may be assembled on perf-board or a simple PC board. Hard wiring may also be used. I assembled the circuit and used a piece of double-sided tape to hold the board to the inside of the plastic box holding the meter. Several feet of test lead wire and clip leads finish up the construction. A rubber grommet protects the wires from chaffing on the plastic box.

Calibration

To calibrate the meter, you'll need a variable power supply and a digital voltmeter. Using the digital voltmeter, set the power supply to read 15 volts, and adjust the 10k trimmer for a reading of 15 volts on the expanded meter. Change the voltage to 12.5 volts and note the reading. It should be in the middle of the scale. That's all there is to it.

Because of the tolerance of the analog meter and the zener diode, the expanded voltmeter may not track 100 percent with the digital voltmeter. Since we're interested in the range from 12 to 14 volts, adjust the trimmer for the most accurate reading between these two points. The expanded voltmeter will be accurate to within 0.1 volt. Button everything up and start using your expanded voltmeter.

Just one word of caution when using the meter: Don't measure the voltage at the load unless that is where you want to see the real voltage to the device. If you connect the voltmeter to the load, you'll see the voltage drop from the battery to the load.

The best place to put the voltmeter is right at the battery, not the load. You can use this to your advantage, however. If you measure 12.5 volts at the battery, and then only 11 at the load, you've got some serious trouble in your power connections. An easy fix is increasing the wire size between the load and the battery.

By using this expanded voltmeter on your battery-powered equipment, you'll always know their condition. This may keep your signals from chirping away on CW or FMing on SSB. You don't want to be known for a nasty signal in this year's Field Day.

The expanded voltmeter will be a welcome addition to your Field Day's war chest, right beside your death ray antenna. 73

Photo A. The completed, expanded voltmeter keeps an eye on the battery.

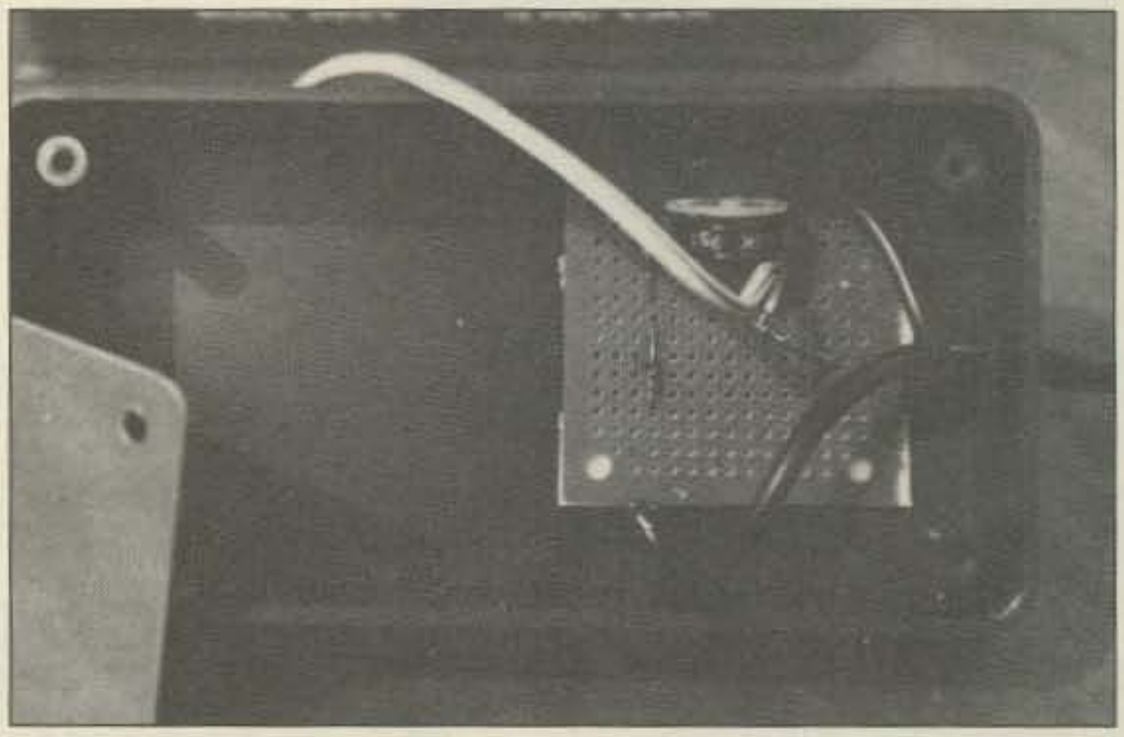


Photo B. Inside the expanded voltmeter: Only three components needed!

73 Amateur Radio Today • ICOM

READER SERVICE GIVE AWAY

Just fill out the Reader Service card and send it in. You'll receive free product information from our advertisers, and one lucky reader will win a great prize from ICOM.

THIS MONTH'S READER SERVICE PRIZE

ICOM IC-24AT Dual Bander

The dual bander of the future is here! ICOM's IC-24AT mini-handheld gives you full operation on the 2-meter and 440 MHz bands, while offering outstanding flexibility and performance.

- 40 memories
- 5 watts
- Programmable scanning
- Priority watch
- Battery saver
- DTMF pad

. . . and more!

ADVERTISERS

Bold listings are *73*'s new advertisers this month.

***Advertisers who have contributed to the National Advisory Committee (NIAC).**

Never Say Die

Continued from page 4

want to spring for the 12-second 4.5 kHz passband chips. Just what you need to make that 2" speaker sound good when you talk with someone.

If your message is longer than 20 seconds the chips work just fine in series. Talk as long as you like.

These are being made by Information Storage Devices of San Jose and samples are already being shipped. (See the "New Products" section of *73*, May 1991.)

Just think of how much time you'll save by being able to read *73* while in a QSO and only having to speak the other chap's call and name one time! Or play Nintendo, watch a ball game on TV, or whatever you do to fritter away your life.

What about the other chap's transmissions? Don't you have to waste time listening to them? Nah, just program in a cheery, "Okay on everything OM," and forget it. He's probably using a QSO machine too, right?

Think of how much aggravation you can save during contests by using one chip to call, "CQ contest" and another to give your contest number, automatically incremented. Chip 1: "XZ2AB." Chip 2: "This is W2NSD portable 1 in New Hampshire. QSL. Your number is five nine." Chip 3: "One six seven" (this one increments to give the three numbers in sequence). Back to chip 2: "Is that a roger?"

A sharp contest operator should be able to keep at least two rigs going simultaneously, one on each end of the band, thus doubling his score. I'd arrange for a cassette recording of all contacts so I wouldn't even have to log the received contest numbers until later.

Let's get cracking on some QSO machine designs. The winners will get their circuits published in *73* and probably find ten new companies (and five old ones) offering royalties to manufacture their invention. Put me down for 10% of your royalty or I'll sue.

Now, for those of you whose sense of humor rotted off years ago or was destroyed during puberty, while the chips are real and the applications will work, I'm not serious about suggesting totally automatic contacts.

For those of you who think I surely must be kidding, just wait until you see some QSO machine articles. And for those of you who are confused and aren't sure whether I'm serious or not, well, golly, me either. Now get started chipping away so I can fill my log and write editorials at the same time.

You can call Jim Oliphant N6OBM at (800) 825–4473 for more info on the ISD chips. Tell him Wayne sent you.

Crowded Two

I have a message for you to pass along, if you will. If you dare! I happen to think you are too chicken to speak up. Well, I'm not.

The next time you hear some old addle-brained idiot grousing that the no-coders shouldn't be allowed on two meters because the band is already crowded enough, please break in and tell him that Wayne has a message for him: He's a foolish fossil and should apply immediately for his Silent Key certificate for the brain-dead.

Two meters crowded? In what universe is that? Sure, maybe in Tokyo, where they have about five times as many hams as we do. Don't tell me about crowding; I get around too much and I listen. In the last year I have called in on every repeater I could reach while visiting Los Angeles, Denver, Las Vegas, Chicago, New York, Dallas, Nashville, Minneapolis, Boston, Kansas City, Dayton, Columbus, Mobile, New Orleans, San Diego, Portland (ME), Troy (NY), and a few more cities. Oh, I've made a few QSOs, but 99% of the time all I get is a kerchunk and silence. Not only are the repeaters not in use, no one is even listening to them.

Oh sure, every repeater channel is occupied. I can often raise a dozen or more repeaters. There just isn't anyone listening to them. So tell me all about how crowded two meters is and I'll tell you you're full of . . . er . . . baloney. From what I've experienced in every part of the country we could handle ten times as much activity on 2m without causing any problems.

I realize there's no way to get through the ceramic minds involved. They've never let facts or reason even remotely influence their strongly held, frequently expressed beliefs. These tend to be the same fuddy-duddies we hear sounding off about Jews, blacks, Japs, homos, wetbacks and so on.

There's nothing new about hatred and intolerance. Alas, I don't see any signs of the human race improving in this respect. No learning curve here. We see groups all around the world anxious to kill other groups for religious, racial or tribal reasons.

Unless you're married to them, you generally have to not know someone in order to hate them enough to want to kill them. Communications can make a big difference . . . even in marriage, where it's rarer even than on 2m.

Amateur radio is about the only medium where people can talk with people in other countries. Even tourists rarely get to talk to more than hotel employees or waiters. We have an enormous tool for helping the world to change, but we've been trashing it with idiocies such as the DXCC award.

We also have 125,000 Techs self-imprisoned up on 2m, where they can't talk much further than they can see. The world will get no help from them. It's a pity that in a time when people-to-people communications are so desperately needed, that so many of us are handcuffed to the VHF bands, imprisoned mainly by a terror of the code.

I've tried to push Techs to get their General licenses before. A few have reacted intelligently, but many have gotten angry. That damned Wayne Green! It's this sort of reaction which has probably prevented any other ham rags from even trying to write about such a delicate subject.

So okay, get mad at me, if that makes you feel any better. But the worst part of that is that you know I'm right. Your only out is to get even madder. Your alternative is to admit that, yes, I'm right and you have been taking the easy way out. Yes, it takes some work to get a higher license. Is work really that awful?

Techs and Novices, we need you down there on 15m and 20m. We need you there badly. The chaps who are there have made such a mess of those bands that they're like inner city slums. You're going to be absolutely disgusted when you hear how bad it is. You'll hear Extra Class hams chasing DX hams off the air any time they surface. You'll hear these roving gangs of terrorists assaulting rare DX with merciless pile-ups until they are battered and bruised and give up.

They don't have the slightest interest in talking with the chap in some rare country. All they want is a QSL card and they don't care what it takes to get it. I'm old enough to remember when "green QSLs" were dollar bills. Now they're $20 bills.

A few DX hams have gotten addicted to our green QSLs and it keeps 'em going, despite the treatment they get. If the value of the dollar keeps dropping, they're going to start demanding pictures of Grant's tomb instead of the Bush homestead.

We desperately need you Techs down there to introduce a whole new concept to amateur radio: actually talking with people in other countries. Making friends . . . not just for yourself, but for America too.

There's a destructive phenomenon that takes place when two groups (or even people, like husbands and wives) are not in good communication with each other. I've never seen anyone else write about this, but I've seen it in action and it's a corker.

When communication is limited between two groups, what communication there is tends to get blown all out of proportion. Paranoia sets in.

Techs, we need you to get off 2m, at least part of the time, and start talking with hams in France, Germany, Hungary, Estonia and so on. We need to let them know that we're interested in them . . . in what they do, what interests they have, what problems, what successes. Have they any questions about what America is really like? What's their perspective on the EC? What do they think about Bush, Gorby and Saddam? What ethnic problems do they have to cope with?

Look around for some African stations and start finding out how it is to live in Kenya these days. Uganda. Have you ever actually talked with a South African about what's going on down there? You'll find a completely different perspective from anything you've read in the papers or heard on PBS, I guarantee.

We need you to get down on our DX bands and start cleaning 'em up. Don't succumb to the DXing craze. Let's get together and force *QST* to isolate the DXers' band pollution they foment just to DX contests.

Now, am I bad-writing the League? If you call a constructive plan to help our hobby and our country bad, I suppose so. Let's see some Techs with guts getting their local clubs to start General study classes and moving cleanup squads into 20m. It wouldn't hurt to start at the top of 20m and clean up the awful messes on 14.313 and 14.275. Then get up some steam and charge down the band, leveling those rotten pile-ups as you go. Take no prisoners.

. . . de W2NSD/1

Golly, I almost missed our sked. I was busy sending some comments to the Candy Company on a recent petition intended to help solve the packet brouhaha. You know, where some idiot put a message into a packet system asking people to call a 900-number about some sort of stopping the war political baloney.

Sure enough, some ham got a wild hair and complained to the FCC, an action which should be punishable by death or worse, and the next thing you know official harassment was the order of the day. The foolish ham who started the chain reaction with his dumb message brought all the innocent relayers

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

whose stations automatically passed along the packet into the soup.

What should have happened is that when someone noticed the dumb message they should have let the originator know what they thought of him screwing up like that. When we ask the FCC to solve problems for us they almost invariably do it with an atom bomb, leaving us in shock and having to fight the fallout for years afterward.

Anyway, in case you're interested in my comments, here's what I wrote. If not, pour yourself a cuppa coffee and skip it.

Tom Blackwell N5GAR and Joe Jarrett K5FOG petitioned the FCC to put the responsibility for an "illegal" message on the originator.

Secretary FCC
Washington DC 20554

Re: RM-7649—Amending the repeater rules

Yo, Commissioners:

The amateur radio service can benefit our country only if it is permitted to develop new technologies with a minimum of interference. Indeed, amateur radio can be an enormously valuable resource.

It's well known that most scientific breakthroughs have been made by amateurs. Professionals normally can't afford to spend the time and money it takes to pursue technologies that have only a slight chance at success. Amateurs can. Most fail, but the few who succeed are worth all the failures and more.

Radio amateurs developed most of our present communications modes. Jack Babkes W2GDG developed and pioneered narrowband FM back in 1946. That's the primary communications mode for mobile VHF and UHF today. I was one of his helpers in this project.

The first practical single sideband communications system was developed and pioneered by an amateur (Don Noregaard)...as was slow-scan TV (Copthorne McDonald). W8JK invented the helical antenna. W1FZJ invented the practical parametric amplifier (on 6m) and I published the first articles on this discovery in 73.

Today's cellular telephone system would be unlikely if the technology hadn't been developed by amateurs in Chicago. I published the circuits for this system almost 20 years ago. Amateurs were the driving force that got microcomputers going. Today amateurs are developing packet communications systems. They need all the latitude possible to develop and pioneer this new system.

When the FCC formed the Long Range Planning Committee (LRPC), the group quickly decided that the only dependable emergency communications system we have in America is amateur radio. Since the high speed automatic relaying feature of packet radio is a key element in building emergency networks, the current FCC decision to block this is harmful to both the development of packet technology and to the long range interests of America. I was a member of the LRPC from its founding.

The rule change proposed in RM-7649 provides a simple solution to the problem that the FCC has caused. I recommend it be accepted until even less restrictive rules can be devised.

Amateur radio needs less rules and more latitude, not federal harassment. Technology is the key to the future, so the FCC should be working with the amateur radio industry to devise ways to increase the number of youngsters attracted to the hobby, not closing off experimental areas from development.

Sincerely, Wayne Green W2NSD/1

Naturally the Commissioners didn't allow enough time (a crummy 30 days from March 6th) for us to get the word out and get enough comments on this sore subject to have some weight.

Some Progress

The big problem we have in amateur radio today isn't the new no-code Techs, it's the old-timers who have their heels dug in and are fighting progress. The new Techs are getting high marks from every corner.

While I want to thank the many readers who've been crediting me with getting the no-code license accepted, I don't feel that a 33-year fight finally won is much to crow about. If we'd gone this route 30 years ago when I started pushing for it, I believe we could well have five million hams today instead of under a half million and that the U.S. might still have a consumer electronics industry.

I've recently been talking with some of the microcomputer pioneers. If you've got some old issues of *Microcomputing* or *80 Micro*, you can look back and see where, if Radio Shack had followed my urging, the whole world today might well be TRS-DOS instead of MS-DOS, and Radio Shack would probably be around $50 billion ahead of where they are now.

If Texas Instruments had paid attention, instead of dropping $635 million on their TI-44/A computer, they could have parlayed it into a $10 billion a year new business.

So many might-have-beens! With Sony now looking to acquire Apple, if only Jobs hadn't beaten Wozniak with his Lisa vs. Apple II battle we'd be way ahead of the present 80486 technology...and Jobs would be on top instead of a loser with his NeXT...and the Woz back teaching for a living.

Sigh, back to the present, our next goal is to not just welcome our new Techs, but to get hundreds of thousands of 'em in and on the ladder to General. If you hear any old-timers grousing, throw a pail of ice water on 'em and get 'em to cool that crapola. Tell 'em to get an enema and get aboard the world of the '90s.

We need to bring in a few million young hams. We need to get cracking on narrowband technologies. We need to go digital. There's plenty to do to clean up the mess we've made. We need less baloney on the bands. We need to get rid of pile-ups and other such intentional interference. We need several thousand new ham clubs. We need to encourage every active ham to spend at least an hour a week learning more about technology. Clubs can help here. Tech sessions over repeaters will help. Our new *Radio Fun* should help a lot.

We're beginning to make some progress. The VEC system I began pushing over 20 years ago got accepted and is working well. Ditto the repeater regs I urged almost 20 years ago. These were all fought tooth and nail by the ARRL, as were the RTTY regs I started pushing in 1951 with my first publication, *Amateur Radio Frontiers*. The League finally lost, as they always do, but only after having wasted years of our time.

Never mind my grousing about the League and their eternal politics. Their eye is on the money and that means the millions they make from ads in *QST*. My goals have always been to get things done...but not to lose enough money in the process to put me out of business.

I'm having fun today with my new recording studio. I'm working on some poetry CDs, some children's books on CD, promoting prerecorded DAT tapes, independent label distribution, and at least a half dozen new publications.

When I was young I loved to read the *Oz* books and the Ernest Thompson Seton wildlife books. I don't know if kids today will enjoy them as much as I did, but I'm going to read 'em and put 'em on CDs and see what can be done. And there's a bunch of fantastic poems by an old friend of mine that should be read and put out on CDs too.

I'm disappointed that in my 40 years of publishing ham magazines I haven't come across anyone who's been able to capture the excitement of our hobby in poetry. I guess we're too left brained to be artistic, eh? Yet we have Jean Shepherd K2ORS and his marvelous stories, so we're not all nuts, bolts and ICs.

Is there anything in our rules which says that our QSOs have to be boring and repetitious? I know our regs pretty well and I don't recall anything that prohibits us from being entertaining during a contact.

How many contacts have you had where someone read you a story or a poem? Has anyone even read you an interesting article? Even out of a ham magazine? Maybe we can break our 70-year-old pattern and start a new generation of hams who use our magical medium to actually communicate. Sigh, I suppose that's too much of a change to ask. Perhaps, in 30 years, if we've still got any frequencies, and long after I'm gone, perhaps we'll have a generation of amateurs who finally understand the concept of communications.

Exchanging trivia...even less than one would get at a cocktail party... isn't communicating. Sure, it's difficult to get into a deep conversation with someone you've never talked with before. But you're doing it with hams you've been talking with for years.

I'm finally beginning to get letters telling me about the most exciting times some of you have had in amateur radio. Great stuff! I'd love to hear from more of you. I really don't care what rig or antenna you're using as long as I can hear you. I want to talk with *you*! I want to know what you particularly enjoy about amateur radio. I want to know what other things you enjoy, if there are any. Heck, even if you enjoy sitting down to watch *The Simpsons* with a brew, at least you'll be telling me about yourself. Yes, I enjoy *The Simpsons*. It comes in on channel 25 here, so I finally gave up and got an antenna splitter so I could record the high channels. Recording programs makes it so I don't have to go to the fridge during commercials...part of my weight maintenance plan.

I love *Roseanne*, *Murphy Brown* and *Hunter*. *Law & Order* is usually good. *60 Minutes* is usually worth checking out, but my fast-forward button gets used a lot when they stretch things too much. So why is Wayne writing all this garbage? To give you some idea of things you can talk about. TV shows, movies, music or books, magazine articles...all are fodder.

I hadn't realized how much our welfare program was responsible for the mess in our inner cities...the single parent families...the teenage pregnancies...the crime and drugs. Once I read about it, it all made sense. If you'd contacted me after I read that you'd have gotten an earful.

If you're from around San Diego I'd ask if you know about the organ concerts every Sunday at 2–3 p.m. in Balboa Park. I've got a nice DAT of a concert sent by a reader. And I'd undoubtedly be able to work in a brag about being at the helm of a nuclear sub last year. Hey, when we have some coups we don't keep 'em too carefully hidden.

Now get down there on 2m and start talking with our new no-code Techs and get 'em on the right track. See if you can get 'em to try 6m too. And some Oscar contacts. And packet. Tell 'em how much fun you've been having with these.

Tell 'em how much fun you had going on a DXpedition to a Caribbean Island. Explain how little it cost and how big the pile-ups were. Tell 'em how it felt to be king of the hill for a change.Or did you pop up to St. Pierre? That's close and inexpensive to visit...and you couldn't find a more friendly people to visit.

Maybe you haven't DXpeditioned yet, but at least encourage the new Techs not to pass up this incredible part of our hobby. Explain that the code is simple when they use Uncle Wayne's system, so not to let that keep them away from the fun of talking with DX or even being DX.

If the concept of working DX being fun is alien to you, then it's time to wipe DXCC out of your mind and start actually talking with DX ops. A chap from

Spain sent me some flamenco CDs, so I sent him some ragtime CDs in exchange. Golly, I haven't visited Spain since 1976...I've got to make some time to get over there again. And it's been even longer for Sweden and Aland! Meanwhile I'll be talking with the friends I've visited when I hear them on the air.

If you run into Father Moran please say hello and tell him I'm hoping to get some time to visit again. Ditto any of my friends in Sabah.

Oh, I almost forgot, yes, I know what you mean about the new no-code Techs. And no, I don't think we're heading toward a CB-like problem. Heck, if you've listened to 20m in the last year you know the mess Herb KV4FZ and his gang have made there is as bad as anything we've ever heard on CB.

I'm not sure credit is due to Herb and his destruction crew, but they sure have totally destroyed any pride we amateurs have had about amateur radio as compared to CB. I used to do a lot of CB operating and never in my life have I heard anything like the mess Herb and Baxter, K1MAN, have generated.

Self Education

While lecturing to a graduate student (MBA) class I mentioned several things which I expected any reasonably intelligent group should understand. Faced with a room full of blank stares, I asked for a show of hands on how many of them were reading any news magazines. You know, like *Newsweek* and *Time*. A few raised their hands—most didn't.

Hmmm, no wonder so few youngsters today have heard about amateur radio. Few of them have heard about *anything*. If they don't teach it in school, then it must not be important, I guess.

This almost tends to bring up a question we should be asking: How can we get word of amateur radio to the kids? This isn't exactly a new question. We've been asking it ever since amateur radio growth dropped into the pits 25 years ago. We've been asking it, but no one has been answering.

Some ham industry people got together a few years ago and worried the question. Someone suggested, "How about getting kids interested in hamming via comic books?" This eventually ended up with the ARRL sending out *Archie* ham comics. Tens of thousands of these later we still haven't seen any significant response. Do you suppose it may take more than one mention of amateur radio to get kids' attention? I notice that MacDonalds doesn't rest their whole business on one mention. Nor Pepsi.

Before I get into some possible ways of getting our message across to youngsters, let's just mull over this situation where our kids aren't reading any more than is required for school. That's bad news for them and for our society as a whole.

Firstly, since they haven't been reading, they may not even be aware of how seriously they're being shortchanged on their education. They may not realize that they are getting one of the poorest educations in the civilized world. Or that this has resulted in America losing its competitive edge in one industry after another.

Not knowing that they are being shuffled through our schools with a minimum education, they have no way to know that how educated they are in life depends almost entirely on their own initiative and that they're unlikely to get much guidance from their "teachers."

I was fortunate in a couple of respects. First, our school system wasn't nearly as bad 50 years ago as it is now...though it was bad enough even then. I hated it. Second, I had the marvelous experience of attending the Navy Radio Materiel School. How the government managed to actually do something right is inexplicable. No doubt a first. That school was fantastic. I believe it contributed significantly to our winning WWII.

The down side was that it was so good it soured me even further on our socialized compulsory education system.

The Reading Habit

Though I read quite a bit when I was young, it was mostly fiction...Tarzan, Tom Swift, Oz, Benchley, Potter, H. Allen Smith, and the wonderful Ernest Thompson Seton books, for instance...it wasn't until I got deeply interested in clinical psychology that I began to go heavily into nonfiction.

Kids today have a big world to keep track of. That means reading. I'd recommend *Newsweek* for general news (forget the daily newspapers), *Insight* for more in-depth news, and *The New Yorker* for real depth. I also highly recommend *The Public Interest* and *Foreign Affairs* for a better understanding of current events.

Reading these will also give you an enormous number of things to talk about on the air. And you'll be able to talk intelligently, not just express uneducated opinion based on a shallow understanding. People who've taken the trouble to know what's going on get fed up listening to that baloney.

I recommend that kids also keep an oar in the water on technology, too. They should have an understanding of current events in genetics, cosmology, particle physics, chaos theory, fuzzy logic, and so on. Magazines such as *Popular Science*, *Discover*, *Omni*, and even the *Scientific American*, will help keep you abreast of science developments.

If the Arabs we watched screaming and yelling in support of Saddam Hussein had had much education, I believe the whole Middle-Eastern situation would have developed quite differently.

How many kids today have an understanding of the major world religions? Of how they started? What the people believe?

Antenna Height Restrictions

A Florida ham complained that they've got a restriction on antenna

height in his neighborhood and the local authorities have ignored the FCC on the matter. He wrote to the ARRL and got stiffed. He wanted to know what I'd suggest he do. The local hams are at their wits' end.

I wrote, saying, "Yes, the ARRL certainly should do something about your lousy situation. That's what a real national ham organization should be set up to help with. The fact is that the League has been very reluctant to tackle legal cases to help hams. When I mention this I get angry letters claiming I'm attacking the League. No one ever tries to tell me it isn't true; it's just that I shouldn't mention it.

"Now, what to do. First, I recommend you start a petition around and get signatures. Get hundreds. What should the petition say? How about pointing out that in times of emergency, such as hurricanes, which are not unknown in Florida, the *only* practical source for emergency communications is amateur radio. You can quote from my editorials about the FCC's Long Range Planning Committee, which determined this was an absolute fact.

"To provide the needed emergency communications infrastructure, a service must already be in daily use–and this means antennas and towers. The beauty of amateur radio as compared to any other communications service is (a) amateurs are everywhere; (b) they fund their own equipment; and (c) they can provide long, medium or short range communications, as needed. I'd include some pictures of ham club communications buses and vans.

"Then get the signatures at every hamfest and other event. Don't let one single ham get away from Dayton without getting a signature. Get the manufacturers and dealers to cooperate with petitions at their booths.

"Politicians react very positively to long lists of signatures. That's what I brought to the FCC in 1973 when I initiated the biggest set of rule changes in the FCC's history.

"Find out who your enemy is. Which specific politicians are doing this? Then do whatever it takes to get them unelected. Make their lives miserable. Organize public confrontations, complete with the media invited. Picket.

"Who is the chair of the Florida League of Cities? Go after this person where he or she lives. Get local hams to picket this person as not caring about lives and families. Cite discrimination against technology. When a hurricane comes and lives are lost, and medicine and food are not available, then will the people who are supporting this monster put on some pressure?

"How about getting a video camera and staging some Mike Wallace-type live interviews with the offending politicians? You'll drive 'em crazy and get wonderful material for club meeting showings.

"I hope that is enough to get you started."

When you're faced with a problem like that, be creative. There's *always* a way to solve problems. . . even when you're dealing with the government. Well, almost always. . . there's always the IRS. . .

Kids

Have you been doing your homework like I asked you. . . or have you been doping off again? Well, while you were sitting there with a cold 807 in one hand watching a ball game, I was out there in the trenches for you. . . facing the enemy.

Wait'll you stand there, facing a whole room full of 10-year-olds, trying to explain amateur radio to them. You're not going to try and tell me that your local school isn't going to let you come in and talk to (with) the kids, are you? Give me a break! They'll be delighted and you know it. It's just that you haven't *bothered*.

Well, I put off some meetings at what I smilingly call "work" and had at a bunch of the local kids. I worked 'em over and got 'em all fired up. Now they're anxious to set up a station so they can get on the air and talk. What are you going to do about it?

You know as well as I do that you've got an old rig in the closet somewhere that you aren't going to use again. Even if it doesn't work very well (or at all), the kids will go bananas if they can get it and fix it. This is a lot better use for it than lugging it to a flea market and getting a few bucks. The money will soon be wasted on food and you'll have nothing to show for it except a little extra poundage on the scales. Well, I'll get you a letter from the kids telling you how much you've helped them.

Coincidentally, the same day as I talked with the kids in Antrim (NH), I got a call from the nearby Crotched Mountain Foundation. This is a rehabilitation center and special school for handicapped children. They're going great guns in getting their kids interested in hamming and they desperately need some gear for their station.

Kenwood, ICOM and Yaesu get a hundred or so requests for free rigs a week, so that's not where you turn. The real ham gear mother lode lies in your house. There are tens of thousands of old rigs out there with their electrolytics drying up and their transformers rusting.

A good friend of mine got the idea of collecting old, no longer needed oscilloscopes from labs and getting them to schools. This has almost turned into a business for him.

Well, I've got a little room left in my barn to store a few rigs so we can get them to schools that need them. I haven't got much room because we just cleaned up the barn and made enough room to build a state-of-the-art recording studio and that's filled a lot of the back of the barn.

The best bet will be for you to drop me a note telling me what you've got available in old ham gear. I'm starting with two local schools that need rigs, but I'll bet I'll get a hundred letters from other schools when they read this. I'll try and match your gear with a school. That way you'll know where it's gone.

If you'll start giving talks about how much fun amateur radio is to your local school kids, you'll get a real kick. They love the idea of talking to the world. They're excited about packet and talking with *Mir* and via our other satellites. They can hardly wait to start building things.

One of the projects I've got scheduled for my new recording studio is to start reading some books onto tape so we can put out books for kids on CDs and cassettes. I was amazed to find that almost 100% of the kids I was talking with are avid readers. Yep, they're actually reading books!

They'd all heard about the "Wizard of Oz," but most of 'em didn't know there are 13 Oz books. I'm planning on recording 'em all. When I was their age I read 'em all and loved 'em.

None of the kids (or teachers) had heard of Ernest Thompson Seton, so they've got a fantastic surprise coming when they hear me reading his books. I read 'em all when I was a kid. Over and over. They're wild animal stories told from the perspective of the animals.

I was surprised, too, that so many of their parents take time to read to their kids. Perhaps New Hampshire parents are different, but half of the kids in the class said their parents regularly read to them. That's what got me interested in reading. When I was young my mother used to read to me every noon when I was home from school for lunch.

For older people (and kids, too) I'm going to start reading the Kai Lung books by Ernest Bramah. Too bad if you don't know how wonderful they are. Maybe I'll get you to try a CD or cassette.

I'll be reading some poetry, too. . . probably starting with Eugene Field and his "Poems of Childhood." I've been surprised to find that many people aren't familiar with Field. Tsk.

It's fun to share enthusiasms with people. That's mainly why I'm into publishing. I'm sharing my love of music, poetry, books and amateur radio. You can share your excitement over amateur radio with the kids in your local schools. Help 'em get a club going. I'll see if I can round up some equipment from *73* readers to help. Let's dig out some of those old rigs, dust 'em off and see if they're working.

Send me a note telling me what you've got available. . . send it to: Rigs for Kids, *73 Amateur Radio Today*, Forest Road, Hancock NH 03449. 73

Fluxgate Magnetometer

GENERAL:

The first low-cost portable hand-held fluxgate magnetometer with laboratory accuracy. For magnetic measurement from 1 gamma (0.01 milligauss) to 2 gauss with an absolute accuracy of ± 0.5% traceable to NIST (previously NBS). Analog output DC to 100 Hz.

TYPICAL APPLICATIONS:

Earth's field vector measurements, air shipment inspection, mapping and recording field perturbations, etc.

WALKER SCIENTIFIC INC.

Rockdale Street
Worcester, MA 01606 U.S.A.
Telephone: (508) 852-3674 / 853-3232
Toll Free: 1-800-962-4638
Telex: 9102508517 / FAX (508) 856-9931
Code Name: "WALKER SCI"

CIRCLE 292 ON READER SERVICE CARD

Tick. Tick. Tick.

That familiar adage, time is money, means just that at CIE. CIE makes it possible for students who can study at an accelerated pace to realize significant savings off the cost of an Associate Degree in Electronics. CIE places a restriction only on the maximum time you are allowed to successfully complete your studies in our A.A.S. program (8 six-month terms). If you complete the entire program in two terms, three terms...or seven terms you'll only be charged for those terms... no additional charges for books, lab equipment, or lesson programs.

At CIE, the world leader in electronics home-study, you'll learn from the best and you'll learn at your own pace in your own home at a very affordable price (even more affordable at an accelerated pace). No income interruptions, no conflicting class schedules, no traffic, no hassles, just the academic curriculum to prepare you for a richly rewarding career in electronics.

❒ **Yes! Send me CIE's Free School Catalog.** AAR04

Name _____

Address _____

City _____ State _____ Zip _____

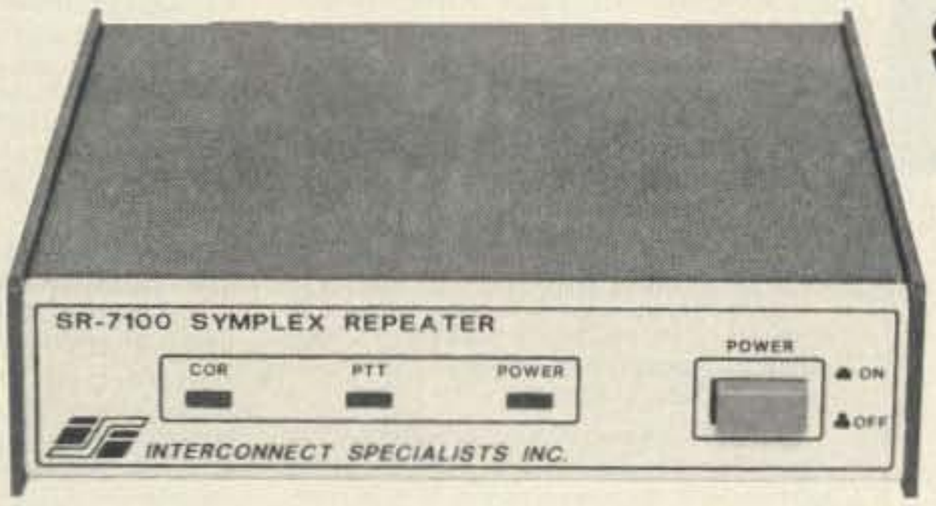
Phone (_____) _____

Check box for G.I. Bulletin on Educational Benefits:

❒ Veteran ❒ Active Duty

Mail to:

CLEVELAND INSTITUTE OF ELECTRONICS
1776 East 17th Street
Cleveland, Ohio 44114
(216) 781-9400



SYMPLEX REPEATER

SR-7100

CONVERT ANY TRANSCEIVER INTO A FIXED, MOBILE, OR PORTABLE SIMPLEX REPEATER

The SR-7100 is a store-and-forward simplex repeater. It can store up to sixteen seconds of audio in electronic storage. When carrier is received, the repeater starts recording. When carrier drops, recording stops and a timer is started. This timer can be set for 1, 2, or 3 seconds. If carrier returns before the timer times out, the previous message is erased and recording begins again. If at any time the timer times out, the current recorded message is repeated.

The assumption is that if carrier returns before the time-out, the two parties are communicating without the need for the repeater. If either party cannot hear the other, the timer will time out and the message will be repeated. Available with a built-in PL decoder which provides easier installation, and allows use of the frequency without the repeater by simply not transmitting PL tone. Applications include low cost repeaters, portable or mobile repeaters, and repeaters for emergency use.

SR-7100 STANDARD MODEL	$200.00	SR-7100 WITH PL DECODER	$275.00

INTERCONNECT SPECIALISTS INC.

Phone (407) 332-0533 • Toll Free 800-633-3750
1215 N. CR 427 • Suite 105 • Longwood, Florida 32750
FAX NO. (407) 332-4912

CIRCLE 100 ON READER SERVICE CARD

HAM HELP

Your Bulletin Board

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

Wanted: Instruction manual for operating EICO Model 232 VTVM. *Meyer Minchen AG5G, 4635 SW Fwy., Houston TX 77027. (713) 622-6161.*

A Kenwood TS-140S was stolen from the Towson State University ARC on Nov. 25, 1990. Its serial number is 9100556 and it has a TSU property tag #144378. It had no optional filters and was about a year old. The TS-140S was our only piece of high-quality modern gear and it will be extremely difficult to replace. Anyone with information should contact *John Egger K3GHH, Towson State Dept. of Economics, (301) 830-2954.*

Calling all Vietnam-era MARS Operators! MARS officials have asked Dr. Paul Scipione AA2AV (MARS callsign AAA9PR) to write a book about the history of MARS operations during the Vietnam War (1964-1975). Scipione has developed a database of more than 200 Nam MARS ops, but estimates there are several thousand more. If you are one, or know one, please contact Scipione for a MARS Nam questionnaire. His book (to be published in 1992) will have a section with the names and current callsigns and QTHs of MARS Nam ops, to help reunite old friends. Write *Scipione AA2AV, 5 Burr Drive, Metuchen NJ 08840*, or call *(908) 548-8096*.

Please help. I need some crystals for Heath HW-16 to get a new Novice on the air. I will pay the postage. Send info to *Jim Clark WD5HMM, Rt. 1, Box 468, Cleburne TX 76031*. Thanks.

I am a veteran of the Afghanistan conflict, and would like to organize a meeting with American ham Vietnam veterans to discuss world peace. Last summer nearly 80 Soviet vets got together and worked with the special call, R3AFG (Russia 3 Afghanistan). Their goal is to invite American vets to the Soviet Union during the summer of 1991. If interested please write to *Alex Marchenko UAØCT, P.O. Box 1, Garovka-2, Khabarovsk 682305, USSR*.

Wanted: A copy of the manual for Collins 516E-1 or 2 mobile power supply. I will pay costs. *J. Orgnero, Box 32, Site 7, SS 1, Calgary AB T2M 4N3, Canada*.

I am a Novice and would like to obtain info about equipment for fox-hunt sniffing. I need to know what companies sell it, what is commonly used, and how small the transmitters can be made. *Bob Walker, Box 65, Galiano Island BC, Canada*.

I need a copy of the schematics or booklets on the SBE-33 transceiver, the Hallicrafters SX-101 receiver, and the Hallicrafters HT-34 transmitter. If anyone knows of any upgrades or improvements to these, please let me know. I will pay reasonable copying costs. *Paul Christie ex K2UKT, 208-27 15th Road, Bayside NY 11360*.

Needed: Manuals for Regency MT-15 and MT-25 marine 12-channel, commercial BTH 201/301/204 etc., 1, 2 and 4 channel, and some UHF. Please send me a post/QSL card stating what you have, copy fee, or whether you are willing to lend for me to copy. Many thanks. *David J. Brown W9CGI, 14670 N. Cumberland Rd., Noblesville IN 46060*, or FAX via *Jim Adams WA9BHF, (317) 253-8384*.

I am looking for two books. One is the MCS-85 Users Manual for the 8085 microprocessor. The other is published by Zilog for its Z-80 series microprocessors, explaining pin functions and machine language instructions. Thanks, in advance, to all who can help! *Scott A. Littfin NØEDV, P.O. Box 1215, Hayward WI 54843*.

I need documentation and/or software/hardware supporting the RS Model III and a Sanyo "Silver Fox" MBC 550-2. Any help appreciated. *M.M. Barrette N1GPV, 21 Breton Ave., Sanford ME 04073-3236.*

I am 14, and working on my Novice ticket. I would like to ask all the hams out there if they have any extra stuff just collecting dust which could get me started towards my Extra license. I would also like to ask if any ham in the Modesto, California, area has any interest in helping me get my Novice license. I'm having a lot of trouble with the code. *Brandon Wilson, 920 Briggs Ave., Modesto CA 95351.*

Wanted: Literature for Cushcraft antenna models A-147-11, 124-WB and Ten-3. Also, schematic for Heath HWS-2 hand-held transceiver. *Glenn Torres KB5AYO, Rt. 1 Box 580-B, Reserve LA 70084.*

Law student gathering info for thesis. If you feel the FCC has ever violated your constitutional rights, please send a brief summary to *George F. Arsics, Jr., 2571 Bethany Ln., Powder Springs GA 30073.*

Needed: Diagram for a Bear-Cat BC-250 scanner and any info on modifications. Also need manual and diagram for Tempo One or FT-200 Yaesu transceiver. Any one have programs for RS Model 4 computer for ham radio? Need also diagram for CW/filter/enhancer that appeared in *QST* a few years ago. Will pay copying and shipping. Send quote to *Patrick Benesch KN4MA, Gen. Del., Loyall KY 40854.*

Please send me names and addresses of people or companies who supply communications software for the Atari 520/1040 STE computers. Also, systems to send and receive CW, RTTY (Baudot & ASCII), modified ASCII, etc. *Leonard Saddler, 1420 Reeve Ave., Bakersfield CA 93307.*

I need copies of any and all available documentation (manuals, software, schematics, etc.) for the Seequa "Chameleon" portable computer. This machine, circa 1984-85, had both 8088 & Z-80 CPUs, and could run MS-DOS & CP/M software. Will supply disks and pay costs. *T. Mark Long, 901 Chalk Level Rd. Apt. V-11, Durham NC 27704. (919) 471-3147. Evenings & weekends.*

DESPERATE!! I need an inexpensive tranceiver and/or antenna for any band 6 meters thru 440 MHz. Have my license but not a lot of cash to buy equipment. I hope someone out there can help me, I'm dying to get on the air. I'm not fussy. Please write me if you have a spare rig you would like to sell to someone who would greatly appreciate it. *Dave WB1FDZ, P.O. Box 892, Northboro MA 01532.*

I am in desperate need of an owner's manual for an IC-730. Will pay all expenses for good copy. Call collect between 8 a.m. and 1 p.m. CST. *(501) 898-6716.*

I am helping John Allen Phillips, 424 W. Cedar, Durant OK 74701 to become a ham. He has been blind since 1977. He has no equipment except a code practice oscillator I built for him. Any used ham gear would surely be appreciated. Thanks. *Randy E. Cassels KA5JTX, P.O. Box 11, Atoka OK 74525. Mr. Phillips' phone number is (405) 924-2386.*

I am looking for any information on any Wilson tribander 3-element beam antenna. I will pay any cost involved. *Don Lloyd KN5QQ, 810 Wolf Trail, Casselberry FL 32707.*

Old-timer, since 1929, desperately needs used HF transceiver, preferably small, like IC-735, FT-757, Argosy II, etc., in good working condition. Many thanks in advance and best 73. *Zbigniew M. Rybka SP8HR, u1.Radzynska 18 m.66, 20-851, Lublin 57, POLAND.*

Wanted: Manual/schematics for Scott Instrument Laboratories telemetry FM receivers, models 1312-1 through ? More than happy to pay for originals or copies. *W6HNI, P.O. Box 1017, Carpinteria CA 93014.*

I have a Kenwood TR-2500. I am looking for the TU-1 tone unit. Please contact me. *Ken Chaffee KK6VU, 36983 Oak Glen Rd., Yucaipa CA 92399.*

I am looking for the Ludvigson Tonegen, reviewed in the Feb. '88 issue of *73*. The address has changed and is not in the directory. Does anyone have a copy they could share? I will gladly pay postage and expense. *Gary Sherard WA5FLV, 700 D St. SE, Miami OK 74354, phone (918) 542-7142.*

Wanted: Digital readout. Modification kit for Ten-Tec Century 21 (Model 570). Thanks. *NØLHJ, 493 Ironwood Dr., Ballwin MO 63011.*

Commodore™ REPAIRABLE POWER SUPPLIES™

1.8 AMP Output $24.95*	Your Choice of C-64	4.3 AMP Output $37.95*

SAME OUTSTANDING FEATURES

- 1 Year Warranty
- Completely Repairable
- External Fuse
- Schematic included
- UL Approved
- A MUST for all Commodore owners
- Utilizes Large Transformer
- Does Not Run Hot
- Plugs Directly into Any C64 Commodore Unit
- 4.3 AMP Unit Used For Add-Ons, Peripherals, Multiple Drives, or Packet Radio.

•This Will Be the Last C64 Power Supply You Will Ever Purchase•
•Over 52% of C64 Failures Were Due to Power Supply Malfunctions•
(The C128 Version Power Supply Costs $45.50, Plus UPS)

•NEW SPRING CATALOG JUST OUT•

Call for your NEW FREE 36 page catalog of specialty items for Amiga, Commodore and IBM. The catalog contains low cost replacement chips, parts, upgrades, 34 diagnostic products, tutorial VHS tapes, interfaces, complete power supply line and other worldwide products YOU WON'T find anywhere else.

We stock all Commodore replacement/upgrade chips. (including Amiga)

THE GRAPEVINE GROUP, INC.
3 Chestnut St.
Suffern, NY 10901

914-357-2424 — We Ship Worldwide — 1-800-292-7445 — FAX 914-357-6243 — Prices Subject to Change

CIRCLE 192 ON READER SERVICE CARD

SMILE . . . YOU'RE NOT ON TV . . .
CALL 1-800-KILL-TVI
TO ORDER
RFI FILTERS THAT REALLY WORK
BX-2S Screws On to tv/vcr input
Now used by FCC during investigations

TP-12 KW-1 BX-2P

The World Famous BX cable-TV filter $24.95
TP-12 Effective standard telephone filter .. $16.95

30 DAY RETURN-FOR-REFUND GUARANTEE

Replace Unfilterable Electronic Telephones With Our NEW TP-XL Filtered Touch-Tone Telephone ... **$49.95.**
Prices subject to change without notice.
Shipping and handling extra.

800 number for orders only...
For engineering help, (512) 599-9420
or (512) 656-3635

Tom Coffee, W4PSC (R & D Eng.)

TCE LABORATORIES
14309 Toepperwein Suite 204
San Antonio, Texas 78233
DEALER INQUIRIES ARE NOW INVITED

CIRCLE 87 ON READER SERVICE CARD

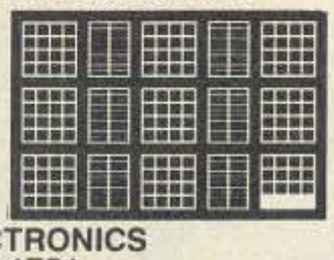
Quality Microwave TV Antennas
WIRELESS CABLE - IFTS - MMDS - Amateur TV
Ultra High Gain 50db(+) • Tuneable 1.9 to 2.7 Ghz.
- 36-Channel System Complete $149.95
- 12-Channel System Complete $114.95
- Call or write (SASE) for "**FREE**" Catalog

PHILLIPS-TECH ELECTRONICS
P.O. Box 8533 • Scottsdale, AZ 85252
(602) 947-7700 ($3.00 Credit all phone orders)
MasterCard • Visa • COD's • Quantity Pricing

LIFETIME WARRANTY

CIRCLE 249 ON READER SERVICE CARD

RF/AF PROTOTYPE/BREADBOARDS
(DC thru VHF)



- 4" x 6"
- Lots of Ground Trace
- Components may be mounted on foil or dielectric side
- Roll-tinned for good solderability

$7.95 each or send SASE for info and layout planning guide

GARDEI ELECTRONICS
P.O. BOX 1751
WEST CHESTER, PA 19380

CIRCLE 80 ON READER SERVICE CARD

CABLE TV CONVERTERS
Why Pay A High Monthly Fee?
Save $100's A Year

- All Jerrold, Oak, Hamlin, Zenith, Scientific Atlanta, and more.
- 60 Day Money Back Guarantee
- Shipment within 24 hours
- Visa/MC and C.O.D.

WE WILL BEAT ANYONE'S PRICE
No Illinois Orders Accepted

Electronic Engineering
P.O. Box 337, Barrington, IL 60011
FREE CATALOG
1-800-542-9425
INFORMATION
1-708-540-1106

CIRCLE 185 ON READER SERVICE CARD

Silent Solar Power

The $319.95 Bullet-Tested QRV Solar Power Supply keeps your repeater on the air 'round the clock or powers your 100w HF station 60 hrs a month. Control circuit speeds charge, protects gel cells & sealed batteries. Fully assembled, QRV, portable. Easily expanded.
Add $10 S&H Info $1
(801)373-8425 — *AntennasWest* Box 50062 Provo UT 84605

CIRCLE 236 ON READER SERVICE CARD

C.A.T.S.
Rotors, Parts and Repair Service
Reconditioning Large or Small
American Made Rotors
Repairs-$20.00*
Rebuilds-$40.00*
All parts in stock for immediate delivery.
New units for sale. Trade-ins welcome.

ROTORS — PARTS

C.A.T.S.
7368 S.R. 105 Pemberville, OH 43450
Call N8DJB at (419) 352-4465 10AM–5PM
LABOR ONLY • PARTS & SHIPPING ADDITIONAL

CIRCLE 116 ON READER SERVICE CARD

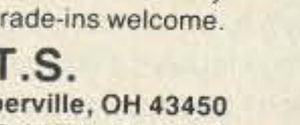
DISTINCTIVE RING SWITCH
Add additional phone numbers to a single line with the new Distinctive Ringing service from the phone company. RingDirector detects ring patterns and routes calls to phones, answering machines, FAX's or modems. 2-port $89. 4-port $149. S/H $5.
1-800-677-7969 FAX 516-676-9225
EXCELLENT TECHNOLOGY
69 Smith Street, Glen Head, NY 11545

CIRCLE 280 ON READER SERVICE CARD

THIS MONTH'S GOODIE FROM THE CANDY STORE

RDC

MFJ 815-B UNDER $50.00



Similar Savings On Kenwood, Astron, Yaesu, Hy-Gain, Alinco, Etc. All L.T.O.

KENWOOD TS-940SAT UNDER $2020.00

Over 9034 Ham Items in Stock, all Prices, Cash FOB Preston
More Specials in HAM-ADS. Looking for Something not Listed?
Call or Write
ROSS DISTRIBUTING COMPANY
78 S. State Street, Preston, Id. 83263 - Telephone (208) 852-0830
Hours Tue.-Fri. 9-6 - 9-2 Mondays. Closed Sat. & Sun.

CIRCLE 254 ON READER SERVICE CARD

QUICK, EASY, & COMPACT
Flash cards *NOVICE thru EXTRA* theory Key words underlined. Over 1600 sets in use! For beginner, OMs, XYLs & kids.

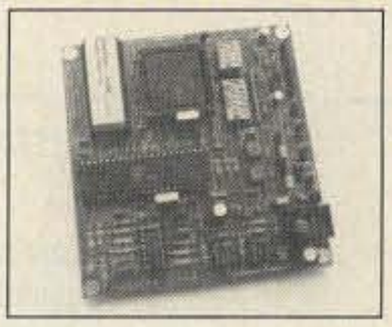
NOVICE	$11.95
TECHNICIAN	$10.95
GENERAL	$ 9.95
ADVANCED	$15.95
EXTRA	$14.45
Shipping 1 —	$ 3.00
2 or more —	$ 4.00
CLUB DISCOUNTS	

Order Today! from

VIS STUDY CARDS
P.O. BOX 16646
HATTIESBURG, MS 39404

CIRCLE 104 ON READER SERVICE CARD

Natural Voice Products



- Repeater Identifiers
- Contest Stations
- Site Alarms
- Remote Telemetry
- Weather Stations
- Multiple Languages
- Emergency Announcements

DataVoice - DV-64

Add a *Recorded Natural Voice* to your system or equipment. Voice vocabularies or multiple phrases up to 1 minute in a Natural Voice is saved in Non-Volatile E-Prom memory.(If power is removed, the recordings will not be lost). We'll record your message(s) in a male or female voice - or - you can record the library by using the optional SDS-1000 development board on an IBM or compatible computer.

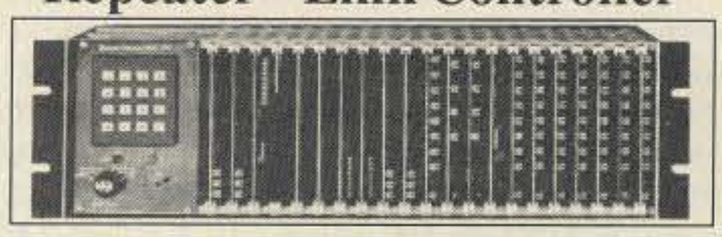
Parallel Input Word Select	8 ohm Audio output
500 ma Keyline Output	600 ohm Audio output
32 Kb sampling rate	+9v to +14v Supply
Multiple Modes	Size : 4.00" x 4.25"
Selectable Timing	Connectors Included

Price $ 169.00 Single Qty (programmed)

Palomar Telecom, Inc.
2250 N. Iris Lane - Escondido, Ca. 92026
(619) 746-7998

CIRCLE 264 ON READER SERVICE CARD

Repeater - Link Controller



RBC-700 Controller

The RBC-700 represents the latest generation of advanced repeater controllers. These series of controllers can connect up to 7 independent receivers and transmitters. 24 different configurations are available that supports up to 5 fully duplexed link radios, 4 independent remote base radios, and multiple repeaters simultaneously. Card-cage design allows expansion by simply adding cards and firmware. A true 7 position cross-point switch is utilized that allows each receiver / transmitter to independently connect to other Rx/Tx combinations as desired. Multiple independent Rx/Tx paths are supported.

Multiple Repeater control	Easy servicing
Up to 5 Duplexed Links	Intergrated Autopatch
Up to 4 different Remotes	+10v to +14v Supply
Natural Speech Telemetry	Size : 5.25" x 19" x9"
Card-Cage design	Expand at any time

Call for further details

Palomar Telecom, Inc.
2250 N. Iris Lane - Escondido, Ca. 92026
(619) 746-7998

CIRCLE 264 ON READER SERVICE CARD

THE RF CONNECTION
"SPECIALIST IN RF CONNECTORS AND COAX"

Part No.	Description	Price
PL-259/USA	UHF Male Phenolic, USA made	$ .70
83-1SP-1050	PL-259 Phenolic, Amphenol	.89
83-822	PL-259 Teflon, Amphenol	1.75
PL-259/ST	UHF Male Silver Teflon, USA	1.50
UG-175	Reducer for RG-58	.20
UG-176	Reducer for RG-59 & MINI 8	.20
UG-21B/U	N Male RG-8, 213, 214, large body	5.00
9913/PIN (now in gold)	N Male Pin for 9913, 9086, 8214 fits UG-21D/U & UG-21B/U N's	1.50
UG-21D/9913	N Male for RG-8 with 9913 Pin	3.95
UG-21B/9913	N Male for RG-8 with 9913 Pin	5.75
UG-146A/U	N Male to SO-239, Teflon USA	6.00
UG-83B/U	N Female to PL-259, Teflon USA	6.00

"THIS LIST REPRESENTS ONLY A FRACTION OF OUR HUGE INVENTORY"

(SEE US IN DAYTON AT BOOTHS 156 & 157)

THE R.F. CONNECTION
213 North Frederick Ave. #11W
Gaithersburg, MD 20877

ORDERS 1-800-783-2666
INFO 301-840-5477 FAX 301-869-3680

PRICES DO NOT INCLUDE SHIPPING
PRICES SUBJECT TO CHANGE
VISA, MASTERCARD, ADD 4%
UPS C.O.D. ADD $4.00 PER ORDER

CIRCLE 115 ON READER SERVICE CARD

Dx

Number 30 on your Feedback card

Hams Around the World

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

QRP DX?

I did something this year that I never intended to do. I've been telling people for years that I wouldn't do it, no way! But I did it anyway—I operated QRP!

I operated QRP during the early hours of the ARRL International DX CW Contest. I don't know what caused me to do this, excessive sunspots or middle-age crazies (my XYL suggests it is over-the-hill crazies). Whatever it was, I just sat down in front of my 100 watt transceiver/kW amplifier station and "unloaded" my transceiver to 5 watts and proceeded to work stations.

It was easy (uh, relatively easy), and within the first hour of the contest I had worked enough stations to qualify for the Worked All Continents Award. After that, with WAC under my belt, I was really hooked. The adrenalin was pumping, and I was having fun.

I started working on DXCC/QRP. It seemed to be as easy as working stations on a kW, but then I realized that it wasn't. It took a few more calls to work each station. I had to use good DX operating techniques; I was stalking new countries, aiming correctly, and hitting the target. One hundred QRP countries were within sight.

This brings us to this month's column, and the topic of champions—DXing techniques. We'll begin a series of discussions that may be of benefit to all DXers.

DXing Techniques

Though it helps, you don't have to have high power and big antennas to successfully work DX. In most cases, technique is more important than power. Most stations outside of the U.S. run 100 watts or less, but they are still successful.

What are good DXing techniques?

Almost anything you do that yields another notch in your country count is a good technique, as long as your behavior in the pile-ups is reasonable and ethical. You should not cause undue interference, call out of turn, call the DX station long distance to arrange a QSO, etc.

If you spend 15 hours in the same pile-up to work a station, your technique—if it can be called that—is faulty. *The secret to successfully working a DX station is to put your signal on the frequency where the DX station is listening.* It is that simple. But, of course, it helps if your signal is the only one on that frequency, and the DX operator is cooperating!

The DX Operator vs Technique

The best technique in the world, even coupled with high power and big antennas, is often of little use if the DX operator is a poor operator. Here are a few examples. A DX operator who sends CW at 50 wpm often creates confusion, because many calling operators cannot understand his instructions (such as JA only, Europe only, UP 10, etc.). A DX operator who asks for USA only, then proceeds to work Europe is asking for trouble, confuses the callers and makes your job more difficult. A DX operator who states "UP 10," but who in fact is working stations 5 kHz below or 40 kHz above his frequency is difficult to work.

Practical Techniques

Okay, let's discuss techniques. There are only a handful, but with numerous variations. Each one may be modified to suit your needs or the situation.

First: *Listen, listen, listen!* You must listen to the DX operator and understand how he is working other stations. It is usually foolish to jump into a pile-up without first understanding what the DX operator is doing, where he is listening, and whether he is working split or on his own frequency.

After listening to the DX station for a few minutes, confirm his identity. Then note whether he is taking full callsigns only, parts of callsigns, or repeatedly "QRZeding" when he cannot pick out a callsign. How fast is he working stations? Is he working stations on or near his own frequency? Is he announcing where he is listening? Is there a distinct break between each station he works?

Second: *Listen to the policemen.* The policemen on the frequency can often provide clues about the DX operator's operating pattern. If they continually say "UP 10, DWN 5," or such, the DX operator is working in split frequency mode, or "split" operation. That is, he's listening on one frequency and answering on another. His listening frequency may be either above or below his transmit frequency. In split operation, the separation from his frequency will usually be from 2 to 10 kHz on CW. On SSB, separations of 5, 50, 100 kHz or more are not unusual.

Third: *Listen to the stations he is working.* Listening is the name of the game. If you cannot hear these stations, try rotating your antenna to see if you can find them.

If he is working stations on or near his own frequency, determine how close to his frequency they are. And, is there a pattern? Always a 100 Hz higher? 200 Hz? Does he work stations farther away from his own frequency each time, but never more than a half kHz or so?

If the stations he is working are on his own frequency, your task is simpler in one respect, but more difficult in another. You'll be sharing the frequency with all of the other callers.

If you have determined that he is not working stations on his own frequency, your task is to find the pile-up of stations who are calling and working him. He is working "split," and he may be listening almost anywhere, but hopefully not too far from his transmit frequency.

The DX operator may specify where he is listening, or the policemen may offer a clue (as explained above). If not, then you must hunt for the group of stations calling him. This task is more difficult if more than one popular DX station is active in the same area on the band.

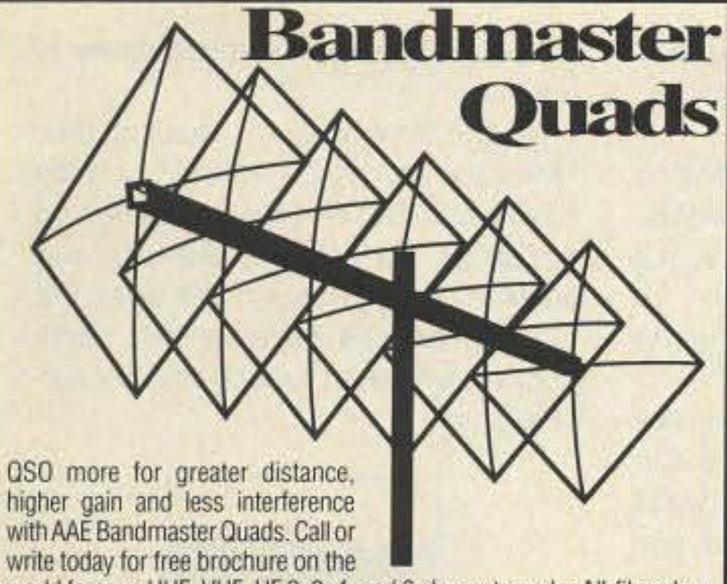
Finding the pile-up on SSB is easier if the DX operator is operating on what we call "the usual DX frequencies": 14145, 14195, 21295, etc. In this case, "the usual calling frequencies" are: 14150–160, 14200–210, 21300–310, or some reasonable variation. Don't forget to check below his frequency, too.

Until next month: listen, listen, listen, and try to understand what each DX operator is doing before you call and call. Next month, we'll discuss how to put your signal right where the DX operator is listening. 73

QSL Routes

3D2XV	via VK2BCH, direct only
3X1AU	via ON6BV
3X1US	Arnold Olivo, US Embassy, Box 603, Conakry, Guinea
4F3BAA	via NR8Y
4K1ADQ	via UA1ADQ
4K1F	via UA1AFM
5W1JC	via W9GW
7Q7MS	via FD1LRQ
8P9FF	via WB2UYM
8P9X	via K4FJ
9J2HN	via JK1UWY
9L9DXG	Box 10, Freetown, Sierra Leone
A35DJ	via DL3MDJ
BV2AL	via OZ1LGF
BV2DJ	P.O. Box 91, Yungho Taipei, Taiwan
BZ4RBC	P.O. Box 538, Nanjing, People's Republic of China
CO4QH	P.O. Box 1529, Isle of Pines, Cuba
D68KN	via JL3UIX
D68YD	via JL3UIX
D68YH	via JL3UIX
EI7M	via EI5FT
F6EWE	Gerard Aurieres, 10 Ch Le Tintoret Apt. 294, F-31100 Toulouse, France
FG5R	via W7EJ
FW0BX	via ZL1AMO
IT8A	via IK8HVH
JY9WF	via HB9ARP
N3JT/HK0	via W2GHK
ON9CRJ	via JP1TRJ
P29AC	via VK8AC
P43DO	via W4WSZ
PJ4/K2NG	via WA2NHA
PJ7/K2KTT	via K2KTT
RA2FM	Box 888, Kaliningrad 236016, USSR
RO6/RB5FF	via UO5WU
RJ0J	via UJ8JMM
T22XX	via DL2GBT
T22YL	via DL5UF
T32PG	via NH6UY
TA2ZA	Operator Robert: Robert W. Kipling And Sokak 2/16, 06680 Cankaya, Ankara, Turkey
TO6REF	via F1DBT
TW3M	via FE1JCG
UA0KAP/A	via KL7HBC
UT8U/RB5AA	Box 8, Sumy 244014, USSR
V29A	via W4FRU
V29M	via KQ2M
VP5VDV	via WD4JNS

Bandmaster Quads



QSO more for greater distance, higher gain and less interference with AAE Bandmaster Quads. Call or write today for free brochure on the world famous UHF, VHF, HF 2, 3, 4, and 6 element quads.•All-fiberglass construction•Rugged engineering•All weather•Highly directional •Excellent F/B •Packet powerhouse •Tool-free assembly •1 year replacement warranty •VISA or Mastercard welcome •Custom orders. **Alabama Amateur Electronics**•3164 Cahaba Heights Road•B'ham, AL 35243

205 967-6122

CIRCLE 253 ON READER SERVICE CARD

Enjoy NEVER CLIMBING YOUR TOWER AGAIN

Are you too scared or too old to climb? Never climb again with this tower and elevator tram system. Voyager towers are 13 and 18 inch triangular structures stackable to any height in 7 1/2', 8 3/4' or 10' section lengths. Easy to install hinge base, walk up erection. Next plumb tower with leveling bolts in base. Mount rotor and large heavy beams on Hazer tram and with one hand winch to top of tower for normal operating position. Safety lock system operates while raising or lowering. At last a cheap, convenient and safe way to install and maintain your beam. This is a deluxe tower system that you can enjoy today.

SPECIAL TOWER PACKAGE: 50 ft. high by 18" face tower kit, concrete footing section, hinged base, HAZER kit, Phillystran guy wires, turnbuckles, earth screw anchors, 10' mast, thrust bearing, tool kit, ground rod and clamp, rated at 15 sq. ft. antenna load @ 100 MPH, **$1974.95.**

50' by 13" wide tower, same pkg as above	**$1670.95**
HAZER 2 for Rohn 25-hvy duty alum 12 sq ft wind ld	**324.95**
HAZER 3 for Rohn 25-std alum 8 sq ft wind load	**232.95**
HAZER 4 for Rohn 25-hvy galv stl 16 sq ft wind ld	**303.95**
TB-25 Ball thrust bearing, 2½" max mast dia.	**74.95**
NEW NEW NEW NEW NEW NEW	
HAZER VH-8 Transit System for Rohn 45, 22 sq ft wind load	**860.00**
HAZER VH-9 Transit System for Rohn 55, 22 sq ft wind load	**895.00**

Satisfaction guaranteed. Call today and order by Visa, M/C or mail check. Immediate delivery.

Glen Martin Engineering, Inc.
Dept. A
RR 3, Box 322,
Boonville, MO 65233
816-882-2734
FAX: 816-882-7200

GLEN MARTIN ENGINEERING

CIRCLE 72 ON READER SERVICE CARD

Packet-GOLD v1.2

More Features, easier to run. Simply the best!

Packet-GOLD is still the best software for AEA TNCs, (pk232, pk88) and your IBM Compatible.

More features: Direct maildrop access, Conference bridge for roundtables and emergencies, Automatic session control (with manual override) makes multi-connects a snap, Continuous monitoring even while connected means no more wondering "what's going on" DOS shell, Huge scroll back buffers including previous sessions, cut and paste text between sessions (also between modes on pk232). Brag files, quick connects, name log, session text saved and/or printed, tactical callsigns supported using our quick-connects, multi-hop NET/ROM usage a snap, manual or automatic.

Easy to run! Clearly, we have many more features, but our software is also easy to learn and use. You'll be on the air in 5 minutes with our quick start guide. Comes with a 75-page reference manual & step-by-step tutorial. Our users call us to say how great it is. We agree!

Ordering: For PK88, PK232, HK232, and IBM compatible computer, $59.95 (CA res add 6.25%) plus $5 S&H. InterFlex Systems Design Corp., P.O. Box 6418, Laguna Niguel, CA 92607-6418 Phone: (714) 496-6639 — Call or write today. VISA & MasterCard welcome.

CIRCLE 77 ON READER SERVICE CARD

Azden Service Center

Is Your Azden Not Operating Properly?? Does It Turn Off When It Should Turn On?? If You Have Any Problem With Your Azden Transceiver Send It To The **Specialists** At The Azden Service Center. **Quick Turn Around!!**

Hourly Rate: $35.00
Your Problem Is Our Solution.

Aztech is not an authorized service center for Azden.
Authorized service center is:

Amateur Wholesale Electronics
1040 Industrial Dr.
P.O. Box 224
Watkinsville, GA 30677 404-769-8706

We Accept: VISA, Mastercard, Personal Checks And Send C.O.D.

CIRCLE 289 ON READER SERVICE CARD

AMP MULTIPLIERS

Used, gov't surplus transmitter FM power amp plug-ins with the addition of your power supply, make for low-cost P-A. Requires +750 V, 200-350 V screen, 6.3 V fil. Controls for Grid and Plate TUNE and Output Coupling. 12x6x14, 25 lbs sh.

AM-1180, 50-100 MHz; 4x150A tube **$65.00**
AM-912, 100-225 MHz; 4x150A tube **$59.50**
AM-915, 225-400 MHz; 4x150A, 4x150G **$85.00**
AM-1178, 400-600 MHz; 4x150A, 4x150G **$75.00**
AM-2537, 790-915 & 840-925 MHz; 2/5876 .. **$95.00**

COLLINS #410-193-60 SPDT 1 KW RELAY with auxiliary contact and 28 VDC coil. "T" style with three N connections; 3x3.5x1.8, 1#. **Used** **$24.95**

Prices F.O.B. Lima, O.• VISA, MASTERCARD Accepted.
Allow for Shipping • Write for latest Catalog
Address Dept. 73 • Phone 419/227-6573

FAIR RADIO SALES
1016 E. EUREKA • Box 1105 • LIMA, OHIO • 45802

CIRCLE 75 ON READER SERVICE CARD

COMTELCO INDUSTRIES

Take Your H.T. Mobile!

MAGNET MOUNT

19.95

Dual Band Mobile
140 mhz, 440 mhz
or
Multi-Whip Mobile
140 mhz, 220 mhz, 440 mhz

150 Watt Power Rating
Supplied with 12ft of RG58 Coax
Choice of BNC or PL259 Connector

1-800-634-4622
Quality products Made in the U.S.A.
COMTELCO INDUSTRIES INC.
501 Mitchell Rd., Glendale Hts., IL 60139

CIRCLE 15 ON READER SERVICE CARD

Ampire

Mastmounted RF or Coax switched GaAsFET Low Noise Preamplifiers.

HELICAL FILTERED PREAMPS FOR OUT-OF-BAND INTERMOD

Model 146 covers the entire 2 meter band • RF switched 20dB Gain • 75dB Noise Figure • Handles 160 Watts

Model 146OS has a 3dB bandpass of 1.3MHz

Model 160 covers 149–174MHz • 10MHz bandpass

Model 440 covers 420–450MHz • 10MHz bandpass • 17dB gain • .75dB Noise Figure • Handles 100 Watts transmitted power

All models also come in the CP version • coax powered 12VDC

All models are factory tuned per customer request. All non-coax powered models are powered with external 13–20VDC and are voltage regulated for stability

Models 146's and 160 $179
Model 440's $199

Shipping for 1 devise—$5.50
Each additional devise—$3.50

MMIC's—Monolithic Microwave Amplifier components

WIDE BAND • 1MHz–2GHz • Build your own RF amplifiers EASY!!!

Call or write for construction info

Low Noise GaAsFET microwave transistors
Low prices!!!
shipping & handling

Ampire Inc.
10240 Nathan Lane • Maple Grove, MN 55369
(612) 425–7709

SCARED OF THE CODE?

IT'S A SNAP WITH THE ELEGANTLY SIMPLE MORSE TUTOR ADVANCED EDITION FOR BEGINNERS TO EXPERTS—AND BEYOND

Morse Code teaching software from GGTE is the most popular in the world—and for good reason. You'll learn quickest with the most modern teaching methods—including Farnsworth or standard code, on-screen flashcards, random characters, words and billions of conversations guaranteed to contain every required character every time—in 12 easy lessons.

Sneak through bothersome plateaus in one tenth of a word per minute steps. Or, create your own drills and play them, print them and save them to disk. Import, analyze and convert text to code for additional drills.

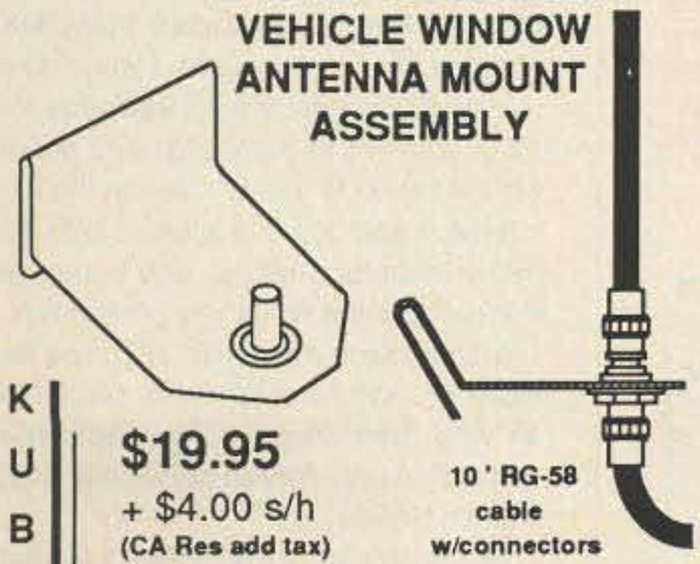
Get the software the ARRL sells and uses to create their practice and test tapes. Morse Tutor Advanced Edition is approved for VE exams at all levels. Morse Tutor is great—Morse Tutor Advanced Edition is even better—and it's in user selectable color. Order yours today.

For all MS-DOS computers (including laptops). Available at dealers, thru *QST* or *73* or send $29.95 + $2 S&H (CA residents add 6% tax) to:
GGTE, P.O. Box 3405, Dept. MS, Newport Beach, CA 92659
Specify 5¼ or 3½ inch disk
(price includes 1 year of free upgrades)

73

CIRCLE 193 ON READER SERVICE CARD

BNC HT & SCANNER VEHICLE WINDOW ANTENNA MOUNT ASSEMBLY



$19.95
+ $4.00 s/h
(CA Res add tax)

10 ' RG-58 cable w/connectors

KUBY KOMMUNICATIONS
19254 Tranbarger St., Rowland Hts, CA 91748
(818) 964 - 1188 No credit card orders

CIRCLE 61 ON READER SERVICE CARD

Number 31 on your Feedback card

73 INTERNATIONAL

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

Notes from FN42

One of the great things about working for 73 is that I have access to many international electronics and ham radio magazines. Some of these magazines are published in English, and others are not. And I only speak, read, and write in one language, English.

I have a few of these magazines sitting on my desk right now. They represent the Soviet Union, Czechoslovakia, Switzerland, Italy, Germany, and Australia, each in its native language. What can I do except look at the pretty pictures?

Well, I can read the schematics to a great extent. Circuit layout, and the symbols for values and most components, are universal. In some countries, the convention is to use a comma instead of a period to represent a decimal, but that's not too hard to figure out. The only difficulty I might have is with some of the labels; inputs and outputs, for example, are in the native language.

In the text, the callsigns are in letters and Arabic numerals. I can see similarities among the languages, though I'm no linguist. Certainly, what's most important is that all these magazines were developed with the love of electronics and amateur radio as the focus. Regardless of the language, they convey that love, and also the desire to further our knowledge of the world around us.

I am sorry I don't understand all these languages, as I know I would learn a lot more about this hobby that I love. I had to put my desire to learn basic Russian on the back burner, as we say, because I had too many irons in the fire. Hopefully, I will be able to resume my attempt in the fall. Even a little learning makes the world a better place; though people speak different languages, we all have much in common.

A couple of items regarding the April column: The name of one of the members of the 4X9ØBS crew (Photo E, April 1991) was left out. He is Motti 4X4PE, 4th from the left on the top row between 4X6YY and 4X6EA. Next, look at Photo C. A new prefix for you prefix hunters? No; the photo was unintentionally reversed during production and printing. Sorry, Tino. At least we got the callsign right in the photo caption.—Arnie, N1BAC.

Roundup

Japan From the JARL News: The annual JARL-sponsored Ham Fair, one of the biggest events of its kind, will be held at the New Hall of the Tokyo International Trade Center at Harumi, Tokyo, as last year. Ham Fair '91 will run from Friday, August 23 through Sunday, August 25, 1991. Last year this fair attracted a total of 59,000 visitors.

On the first floor will be various events, including a much-waited special commemorative radio station, 8J1HAM. Not to be forgotten will be the JAIA Fair (sponsored by Japan Amateur Industries Association) displaying their tempting array of various updated and sophisticated equipment.

On the second floor, many amateur radio clubs will be giving a full account of their activities and selling heaps of "junk" at their own booths, midst a friendly and exciting atmosphere.

Next in *The JARL News*, the All Asian DX Contest Schedule has been changed so as not to coincide with the annual Ham Fair. Effective this year, the schedule is as follows: PHONE: The first Saturday of September, from 00:00 UTC through 24:00 of the following day (instead of the third Saturday of June); CW: The third Saturday of June, from 00:00 UTC through 24:00 of the following day, instead of the fourth Saturday of August.

Included in the JARL newsletter were "Rules of ARDF Competition Amended" and "Extension of the 'WARC '79' Award." Both provided lengthy information and will be placed in the 73INTL Special Interest Group portion of the 73 BBS (connect info provided on the "Table of Contents" page of the magazine).

U.S.A. Although most hams were aware that the April STS-37 shuttle mission had an all-ham crew, much of the public didn't know. Thanks to *The Wall Street Journal*, many more will now know. Featured on the front page of its March 28, 1991 issue was "Hams in Space," informing the reader that all five astronauts on the coming *Atlantis* shuttle flight are licensed amateur radio operators. Also, it stated that the first all-ham crew was inspired by its pilot, Ken Cameron, who's active in radio education.

U.S.S.R. Andy Fyodorov RW3AH writes: "Big Circle" is a unique undertaking that includes several dog sled expeditions to northern regions of Asia, America, and Europe.

In 1990, the "Big Circle" expedition passed across the Chukot Peninsula, and ended on Wrangel Island in the Arctic Ocean.

In 1991, there will be an expedition to the North Pole.

In the 1992–1995 period there will be expeditions in the "Super-Arctic Circle" series through the snow and ice of the Chukot and Alaska peninsulas, and the arctic regions of Canada, Greenland, and Scandinavia. Americans, Russians, and representatives of other northern nations will take part in these expeditions.

[Andy sent his QSL card which depicts the friendship that has developed between the U.S.S.R. and the U.S.A. Just think what might happen if more common ventures are started between countries throughout the world. Amateur radio has been doing these things for many years.—Arnie]

ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
D.N. Hanagev 85530
Israel
Packet: 4X1MK@4Z4SV.ISR.EU

Israel gets 6 meters! I'm happy to report that since the beginning of February, a sliver of the 50 MHz band has been made available to Israeli radio amateurs. It should be noted that this band is not an amateur allocation here in ITU Region I, yet due to the interest shown by amateurs in Europe and Asia in the band, certain countries have been opening up some of the spectrum. Happily, Israel has now joined them, and 4X/4Z will be a sought-after prefix on 50 MHz.

Operating conditions are somewhat restricted: Only Class A licensees may operate on 6 meters and from 50.100 to 50.150 MHz with a maximum output power of 25 watts. Nonetheless, when the band is open, as it is now quite often here at the peak of Sunspot Cycle 22, you don't need too much power to get out!

By the time you are reading this, hopefully Morel 4X1AD will already have his SSB/CW station operating on the band. Six meter enthusiasts are advised to listen as well for weak FM signals, as it is possible that some stations will be activating military surplus gear.

LITHUANIA

Jonas Paskauskas LY2ZZ
PO Box 71
Siauliai 235400
Lithuania

Lithuanian Amateur Radio Conference. By now, many of you have already made your plans for the Lithuanian Amateur Radio Conference scheduled for the first week in June in Vilnius, Lithuania. Even though we are still experiencing some political problems, conference plans are still continuing.

We are not the only ones that are continuing with our plans. Other organizations are holding conferences and group meetings, including an international folk dance festival. Come and have a good time with us.

REPUBLIC OF KOREA (SOUTH)

Byong-Joo Cho HL5AP
PO Box 4, Haeundae
Pusan
Republic of Korea 612-600

Commemorating the 30th Anniversary of Amateur Radio Operation. Thank you very much, everyone of the world, for your contacts on the air under the special callsign of HL3ØAP from September 1 to December 31, 1991. It has been 30 years since I began operating under the callsign of HM1AP *[the second first class amateur radio operator license issued after HM1AD]* when Korean nationals began operating in 1960.

I started up with a home-brew rig, using an 807 tube in the final and running 15 watts. I contacted many DX stations all over the world. I would like to express my sincere appreciation for all of your warm friendship and goodwill extended to me. I'll cherish the excitement and joy I've shared with so many amateur stations, and hope our mutual ham-life continues prosperous.

I have made a special QSL card for HL3ØAP, and I would like to send it to all who have made contact with me under that call. Please send your QSL with an SASE.

During March 9–12, 1991, I visited Taipei, Taiwan, for the inaugural meeting of the Chinese Taipei Amatuer Radio League (CTART). At the general

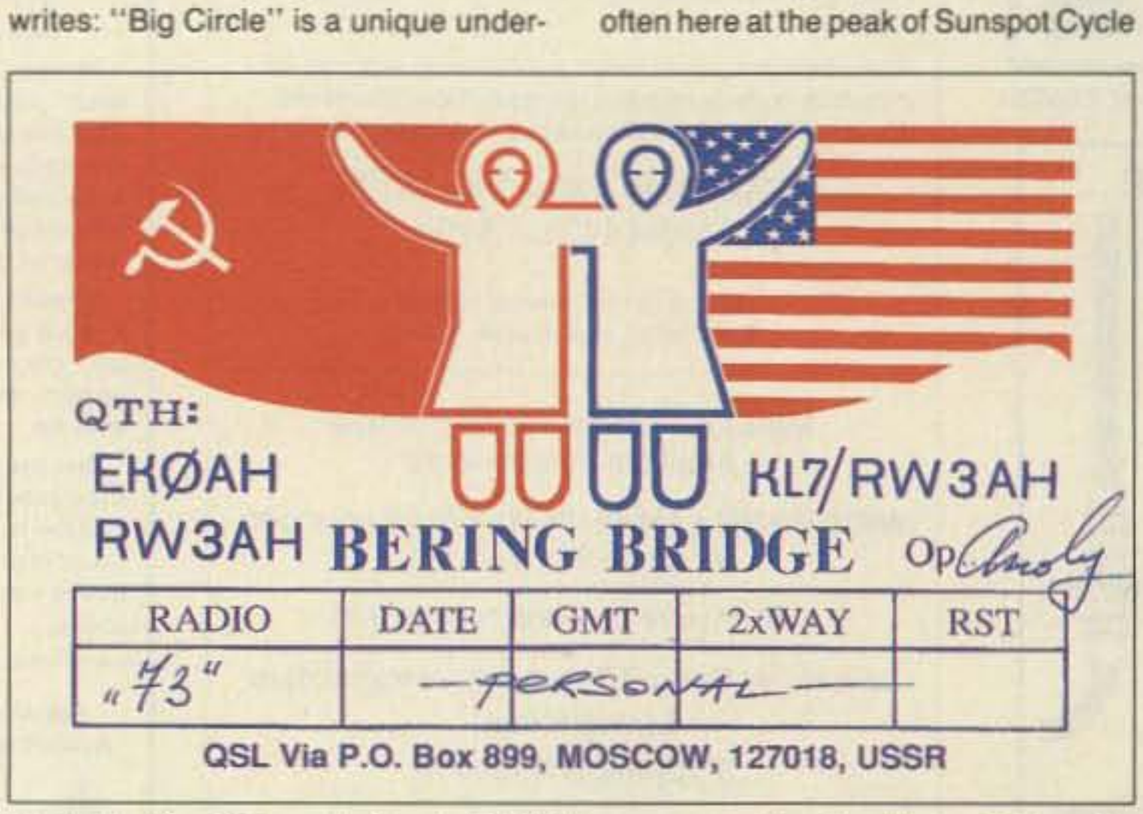


Photo A. The QSL card of Andy RW3AH commemorating the Bering Bridge, the bridge between the U.S.S.R. and the U.S.A.

Photo B. The special QSL card of Byong-Joo Cho HL3ØAP/HL5AP commemorating 30 years of amateur radio operation. Clockwise, beginning at the callsign, the photos show: 1961, 1970, 1975, and 1990.

meeting there were many guests, including Mr. Rankin 9V1RH/VK3QV, chairman of IARU Region 3; Mr. Hara JA1AN, president of the JARL; Mr. Song HL1CG, on behalf of the KARL president; and Mr. Uchibori JA1IRT, editor of *CQ Ham Radio* (Japan). I attended as a guest of the KARL as an elder statesman (charter member). Some Okinawan hams and about 300 members of the CTARL attended. During this celebration, they operated their league station BV0ARL.

If you need a contact from anyone in BV-land, I can introduce you to one of my friends who is very active on SSB and CW from Taipei. He is also a keen award hunter. 73 for now.

SWEDEN

Rune Wande SMØCOP
Frejavagen 10
S-155 00 Nykvarn
Sweden

YL World '91. Last year a group of Swedish YLs attended a YL convention in Hawaii, and decided to arrange a YL meeting in Sweden in 1991. This event, called "YL World '91," will take place in Stockholm, Sweden, during the midsummer festivities. By the time this is in print, the deadline for registration is probably past, but if you are going to be in the Stockholm area around June 20–23, you may call Kerstin SM5EUU, phone +46 21 33 04 85, for information. SKØYL will be active during this event.

International CW traffic net. The Scandinavian CW Activity Group (SCAG) was formed in 1974. The idea was to practice message handling. Some difficulties were encountered in the beginning because of different thoughts about third-party traffic. Our thinking was that handling messages about amateur radio matters between licensed radio amateurs could not violate any third-party traffic restrictions. Why wouldn't you be allowed to send a message to a ham operator through another ham operator? If you can talk with him or her directly, why shouldn't you be allowed to have a message passed to him or her? However, to forward a message to a person outside the ham ranks is not allowed here. *[Maybe changes will happen—Arnie.]* SCAG is running an international CW traffic net every Saturday at 1100 UTC on 14.065 MHz. Net control station is SK7SSK. See you there. 73

ATV

Ham Television

Photo A. The W8BJN HAMCAM ready for action.

Bill Brown WB8ELK
%73 Magazine
Forest Road
Hancock NH 03449

Take to the Road

Now that Field Day is approaching, you might think about taking your ATV station on the road. Each year a number of ATVers set up at Field Day sites and have fun exchanging pictures.

If you plan to operate ATV during Field Day, alert the locals and rack up a few new points. It's also a lot of fun to show those who decided to stay home just how much fun you're having (mosquitos don't show up well on video). Who knows, maybe a close-up camera shot of some of that fantastic food may convince some more folks to come out and operate! The ATV crew at last year's Nashua (New Hampshire) Amateur Radio Club (NARC) site spent a lot of time filming their complete on-site kitchen. That way they were close by when the next batch of goodies appeared. Not only did they have a full-sized electric range (they even baked cookies!), but they brought along a refrigerator stocked with ice cream. I understand that next year they'll include a kitchen sink!

A Field Day site is also a great place to demonstrate ATV to your club members and any visitors. A couple of years ago, we encouraged a number of area groups to bring out ATV to their Field Day locations. To ensure that they had something to watch, Mel Alberty KA8LWR and myself went up in his Cessna 172 to about 10,000 feet. We had a blast working several sites across Ohio and Michigan.

Portable Demos

You don't have to wait for Field Day to set up an ATV demonstration. Summer is a great time to put on a show at your local county fair or special event. Rod Fritz WB9KMO did an interesting demo for the Brooks Institute of Photography in Santa Barbara, California. He set up a link from the institute down to a nearby shopping mall via 434 MHz ATV. One of the students at the institute put on a skit about repairing appliances. Down at the mall, people crowded around the TV set to watch "Mr. Fix-It Man." Little did they realize that the fix-it man could see them via a 10 GHz link back up to the Institute. In the middle of his spiel he'd point at one of the audience and ask them a question. You can imagine the shocked reaction. Some pretty lively exchanges resulted, all done via a full-duplex ATV link.

If you plan to do a number of "road shows," you may want to organize your equipment to allow for a quick setup. Members of the Bayonne Emergency Management Amateur Radio Club (BEMARC) in Bayonne, New Jersey, have been giving demos to a number of area radio clubs. John WA2QYX, Danny N2EHN and Mike KB2EQQ have modified Danny's van for some portable ATV action. When they arrive for a club demo, they usually set up the van at a nearby interesting location, such as a busy intersection or shopping area.

Photo B. The ATV operating position inside of the HAMCAM.

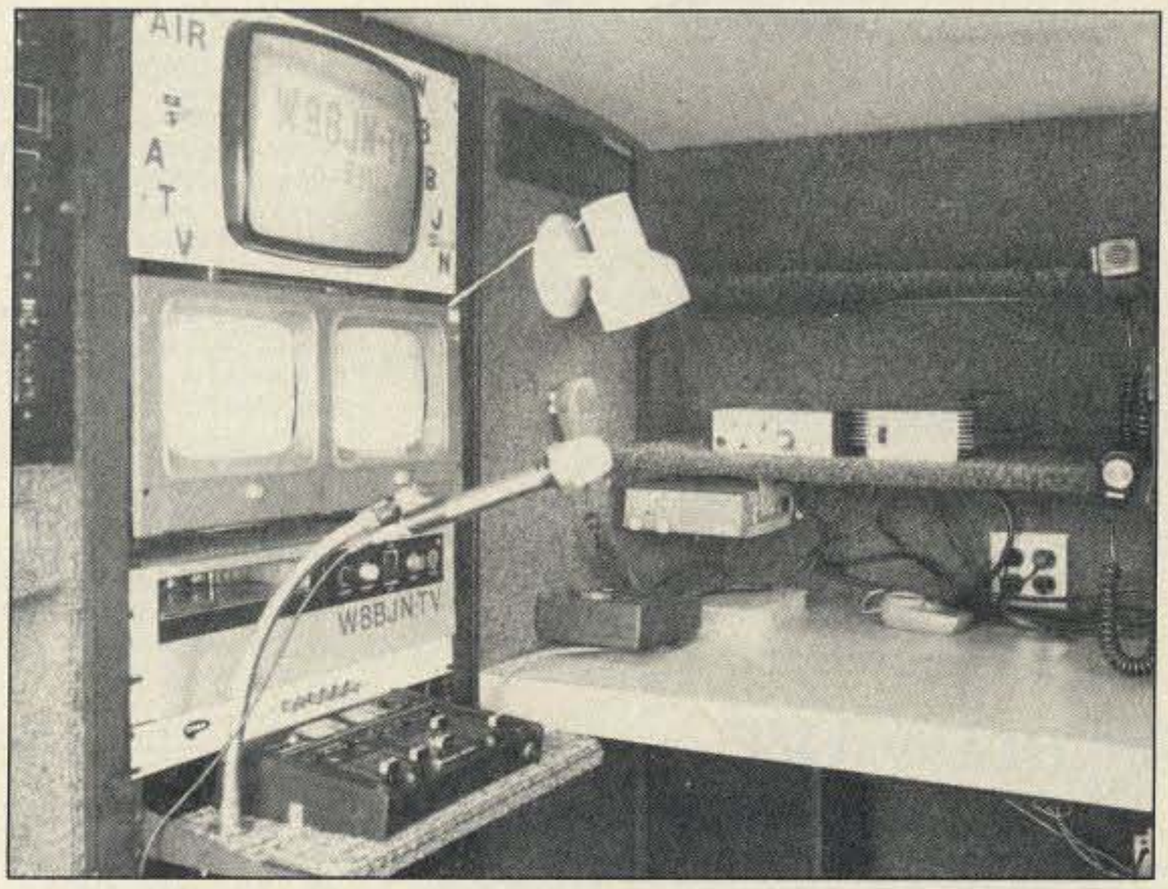


Photo C. Inside of the HAMCAM showing the ATV transceiver and 2m station nestled on shelves in the back of the van.

Mike KB2EQQ usually starts the ATV program inside the club and then has Danny and John transmit an outside view back into the clubhouse. Usually a few of the club members come out to be momentary TV stars. A few random interviews of innocent pedestrians may have the potential of a "David Letterman" style show. See "Hams with Class" in the February issue of *73* for more on the BEMARC club's activities.

If you plan on doing a lot of ATV road shows, you may want to build up your own dedicated minicam truck just like the commercial TV stations. Amateurs in central Ohio have done just that!

The HAMCAM

Gene Kirby W8BJN received an interesting offer back in July of 1989. A fellow ham who worked at a nearby commercial TV station (WBNS) explained that their station was retiring one of their RAPIDCAM remote TV trucks and wanted to offer it to the Union County Amateur Radio Club (Marysville, Ohio).

The club jumped at the chance, and proceeded to refurbish the aging vehicle. After a little body work and some fresh paint, they were ready to put in the radio equipment.

They installed a PC Electronics ATV transceiver (TC70-1) and beam antenna, video switcher, three rack-mounted video monitors, sound board, tape deck, VCR, amplifier and two video cameras. Next they installed a KWM-2 for HF, a 2 meter FM rig, a CB and a Civil Defense radio. They had a little room left over, so they threw in a scanner to monitor emergency service frequencies as well.

The completed HAMCAM has two operating positions. One is dedicated to HF communications and the other operates on ATV and 2 meter FM. Each position is designed for easy access to the equipment and is quite comforable for extended sessions due to the large plush chairs and air-conditioning (a heater is available during the winter).

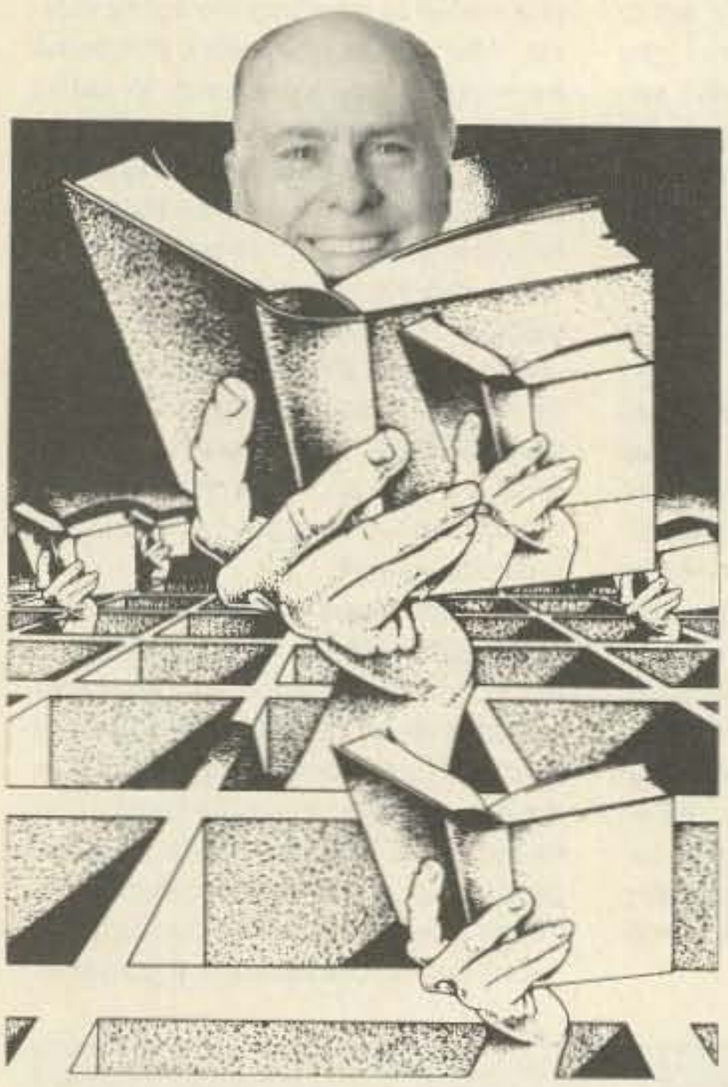
Once at their destination, it just takes a few minutes to swing the antennas up to their operating position, set up the two TV cameras on tripods and put the HAMCAM on-the-air. After that, the operator uses his video switch panel to select between the two camera views and to watch any incoming ATV signals. The two camera views are continuously displayed on two of the monitors. The third monitor is used to receive ATV from a remote site or command center. They even have big floodlights installed on top of the van for night duty!

Emergencies/Demonstrations

The Union County club plans to use the HAMCAM to help out in emergencies, demonstrations, parades, fairs or anywhere a portable command station is needed.

You don't need an actual TV minicam truck to build your own HAMCAM. Good-sized vans can be obtained fairly reasonably if you're willing to do a little maintenance. It sure makes a good club project and can really help out your community in an emergency. 73

Uncle Wayne's BookShelf



Wayne's Pix

22C33 **How to Work the Competition into the Ground & Have Fun Doing It** *by John T. Molley* America's top consultant reveals his proven techniques for dramatically increasing how much work you do . . . in half the time! **$9.95**

20N098 **Electromagnetic Man** *by Cyril W. Smith & Simon Best* examines the mounting evidence of harmful biological effects from LF electromagnetic fields. Full of utterly fascinating material in many areas. **$29.95**

NEW BOOKS

20N099 **Digital Electronics Projects for beginners** *by Owen Bishop* contains 12 digital electronics projects suitable for the beginner to build with the minimum of equipment. 128 pp., 56 line drawings. **$12.50**

20N100 **Electronics Build and Learn (2nd edition)** *by RA Penfold* combines theory and practice so that you can 'learn by doing.' Full construction details of a circuit demonstrator unit that is used in subsequent chapters to introduce common electronic components. Describes how these components are built up into useful circuits, oscillators, multivibrators, bistables, and logic circuits. 128 pp., 18 photos, 72 line drawings. **$12.50**

20N101 **Everyday Electronics Data Book** *by Mike Tooley BA.* Information is presented in the form of a basic electronic recipe book with numerous examples showing how theory can be put into practice using a range of commonly available 'industry standard' components and devices. 256 pp. 134 line drawings. **$18.00**

20N102 **Practical Digital Electronics Handbook** *by Mike Tooley* contains nine digital test gear projects, CMOS, and TTL pinouts and tables or reference data. Introduces digital circuits, logic gates, bistables and timers, microprocessors, memory and input/output devices, before looking at the RS-232C interface and the IEEE-488 and IEEE-1000 microprocessors buses. 208 pp., 100 line drawings. **$14.50**

20N091 **Most-Often-Needed Radio Diagrams and Servicing Information, 1926-1938, Volume One** *compiled by M.N. Beitman* An invaluable reference for anyone involved in Vintage Radio restoration. Hundreds of schematics, writing diagrams and parts lists, all from the original sources. **$11.95**

20N092 **The Wonderful World of Ham Radio** *by Richard Skolnik, KB4LCS* This book addresses the plea that something simple, clear, and fun be written to introduce young people to amateur radio. Pick-up one for the new ham in your life. **$7.95**

20N093 **Vintage Radio 1887-1929** *by Morgan E. McMahon* Recaptures the excitement of the early days. The authoritative reference book for historians and collectors. **$8.95**

20N094 **A Flick of the Switch, 1930-1950** *by Morgan E. McMahon* Here's your chance to recapture the thrill of old-time radio and television. Browse through a thousand photos and fascinating old ads. Discover the fast-growing hobby of radio collecting, and perhaps find a treasure in your own attic or cellar. **$8.95**

20N103 **Electronic Power Supply Handbook** *by Ian R. Sinclair* covers many types of supplies—batteries, simple AC supplies, switch mode supplies and inverters. All types of supplies used for electronics purposes are covered in detail, starting with cells and batteries and extending by way of rectified supplies and linear stabilizers to modern switch - mode systems, IC switch - mode regulators, DC-DC converters and inverters. 144 pp., 90 line drawings. **$16.25**

20N104 **Electronic Test Equipment Handbook** *by Steve Money* is a guide to electronic test equipment for the engineer, technician, student and home enthusiast. Provides a practical guide to widely used electronics instruments and the techniques of measuring a wide range of parameters in electronics systems. 216 pp., 123 line drawings. **$18.00**

20N105 **Digital Logic Gates and Flip-flops** *by Ian R. Sinclair*, what they do and how to use them. Seeks to establish a firm foundation in digital electronics by treating the topics of gates and flip-flops thoroughly and from the beginning. For the user who wants to design and troubleshoot digital circuitry with considerably more understanding of principles than the constructor, and who wants to know more than a few rules of thumb about digital circuits. 204 pp., 168 line drawings. **$18.00**

20N095 **World Broadcast Station Address Book** *by Gerry L. Dexter* A must for the serious shortwave listener. Hundreds of addresses for shortwave broadcast stations. Special sections with helpful information to increase your QSL percentage. **$8.95**

20N096 **How To Read Schematics (4th edition)** *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. This book is your key to unlocking the mysteries of schematics, beginning with a general discussion of electronic diagrams. **$14.95**

20N097 **Radio Operator's World Atlas** *by Walt Stinson, W0CP* This is a compact (5x7), detailed, and comprehensive world atlas designed as a constant desk top companion for radio operators, and as a replacement for the traditional bulky and outdated atlases. Also included are 42 pages of vital statistics about each country. Popular with DXers worldwide. **$17.95**

SHORTWAVE

06S57 • **1991 Passport to World Band Radio** *by International Broadcasting Services, Ltd.* You can have the world at your fingertips. You'll get the latest station and time grids, the 1991 Buyer's Guide and more. 384 pages. **$16.50**

07D91 **DXer's Directory, 1990-91 Edition** *compiled by Fred Osterman* Most complete list of radio listeners ever! Features over 1800 listeners from over 75 countries. Also included is full information on over 100 radio clubs worldwide. **$4.95**

15A002 **Scanner and Shortwave Answer Book** *by Bob Grove* Whether you have difficulty calculating world time zones, converting kilohertz to megahertz, or frequencies to meters, this book will provide the answers. **$13.95**

03S11 **Shortwave Receivers Past and Present** *edited by Fred J. Osterman* Concise guide to 200+ shortwave receivers manufactured in the last 20 years. Gives key information on each model including coverage, display, circuit type, performance, new value, used value, etc. Photos on most models. The Blue Book of shortwave radio value. 1987, 104 pages, 8½ x 11. **$6.95**

07R25 **The RTTY Listener** *by Fred Osterman* Compiles issues 1 through 20 of the RTTY Listener Newsletter. Contains up-to-date, hard-to-find information on advance RTTY and FAX monitoring techniques and frequencies. 156 pp. **$19.95**

01A87 **Shortwave Listener's Antenna Handbook** *by Robert J. Traister* Beef up shortwave reception capacity and increase listening enjoyment easily and inexpensively. **$12.00**

03C09 **Shortwave Clandestine Confidential** *by Gerry L. Dexter* Covers all clandestine broadcasting, country by country: tells frequencies, other unpublished information: spy, insurgents, freedom fighters, rebel, anarchist radio, secret radio. Current publication. 84 pages. **$8.50**

03M221 **US Military Communications (Part 1)** Deals with US Military communication channels on shortwave. Covers frequencies, background on point to point frequencies for the Philippines, Japan and Korea, Indian and Pacific Oceans, and more. 102 pages. **$12.95**

03M222 **US Military Communications (Part 2)** Covers US Coastguard, NASA, CAP, FAA, Dept. of Energy, Federal Emergency Management Agency, Disaster Communications, FCC, Dept. of Justice. From 14 KC to 9073 KC. 79 pages. **$12.95**

03M223 **US Military Communications (Part 3)** This part completes the vast overall frequency list of US Military services, from 8993 KC to 27,944 KC. 78 pages. **$12.95**

09S42 **The Scanner Listener's Handbook** *by Edward Soomre N2BFF* Get the most out of your scanner radio. Covers getting started, scanners and receivers, antennas, coaxial cable, accessories, computer controlled monitoring, more. **$14.95**

03S208 **Radioteletype Press Broadcasts** *by Michael Schaay* Covers schedules of Press Services by time, frequency, and country broadcasting in English, French, German, Spanish, and Portuguese. Detailed Press Agency Portraits. 120 pp. **$12.95**

11T88 **Tune in on Telephone Calls** *by Tom Kneitel K2AES* Formatted as a frequency list with detailed description of each service and its location in RF spectrum. Provides basic information for casual listeners getting started and details for ardent enthusiasts. **$12.95**

09P33 **The Pirate Radio Directory 1990 Edition** *by George Zeller* Contains data on some 100 pirate stations active during 1989. How to tune in pirate broadcasts and get QSLs from the stations. **$7.95**

03K205 **Guide to Radioteletype (RTTY) Stations** *by J. Klingenfuss* Updated book covers all RTTY stations from 3MHz-30MHz. Press, Military, Commercial, Meteo, PTTs, embassies, and more. 105 pp. **$12.95**

15S003 **Communications Satellites (3rd Edition)** *by Larry Van Horn* Chapters on channelization band plans, transponder identification, international satellites, more. **$7.00**

11AS10 **Air Scan Guide to Aeronautical Communications (5th Edition)** *by Tom Kneitel K2AES* Most comprehensive guide to monitoring aeronautical communication in the US. Expanded to cover all Canadian land airports and seaplane bases, plus listings for Central America, the Caribbean, North Atlantic, and the Pacific Territories. **$14.95**

07A66 **Aeronautical Communications Handbook** *by Robert E. Evans* Exhaustive, scholarly treatment of shortwave aeronautical listening. Well organized, up-to-date. 266 pp. **$19.95**

07R20 **A Radio Journal 1912-1940** *by Russ Rennaker W9CRC* A fascinating trip through time. Easy to read and informative, educational and entertaining. A trip down memory lane to the early days of radio. **$7.95**

11RF13 **The "Top Secret" Registry of US Government Radio Frequencies (7th Ed.)** *by Tom Kneitel K2AES* This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. 25 to 470 MHz. **$19.95**

03S04 **The Hidden Signals on Satellite TV** *by Thomas P. Harrington and Bob Cooper Jr.* Tune in thousands of telephone, data, telex, teletype, facsimile signals on most of the TV Satellites; plus all subcarriers. Covers equipment, hookups, where to tune. 234 pages. **$19.50**

01P68 **Pirate Radio Stations: Tuning Into Underground Broadcasts** *by Andrew R. Yoder* Comprehensive guide to tuning in, identifying, and contacting the most unpredictable stations on the radio spectrum. 192 pp. **$12.50**

11F52 **Ferrell's Confidential Frequency List** *compiled by A.G. Halligey* All frequencies from 4MHz-28MHz covering ship, embassy, areo, Volmet, Interpol, numbers, Air Force One/Two, more 376 pp. **$19.50**

11SR97 **National Directory of Survival Radio Frequencies** *by Tom Kneitel K2AES* Handy and concise reference guide to high interest communications frequencies required by survivalists. Includes chapter on building emergency communications antenna systems. **$8.95**

11SM11 **Scanner Modification Handbook** *by Bill Creek* Provides straight forward step-by-step instructions for expanding the operating capabilities of VHF scanners. Filled with interesting text, helpful photos, tables, and figures. **$17.95**

11EE06 **Guide to Embassy Espionage Communications** *by Tom Kneitel K2AES* Candid and probing examination of worldwide embassy and (alleged) espionage communication systems and networks. Extensive nation-by-nation directory of embassy stations is included. **$10.95**

15D91 **1991 Shortwave Directory (7th ed.)** *by Bob Grove* Extensively revised, the new 1991 Shortwave Directory is the consummate DXer's bible for the first 30 MHz of radio spectrum, including up-to-date and accurate VLF information as well. 270 information-packed and illustrated pages in convenient 8½ x 11 format professionally bound. **$21.95**

VIS Study Cards Advance the easy way with VIS Study Cards. Compact, Up-to date Flash Cards with Key-words, Underlined, Quiz on back. Formulas worked out. Schematics at your fingertips. Used SUCCESSFULLY by ages 6 to 81!

NOVICE	VIS01	**$11.95**
TECH	VIS02	**10.95**
GENERAL	VIS03	**9.95**
ADVANCED	VIS04	**15.95**
EXTRA	VIS05	**14.95**

Lanze Code Programs—(Available on 5¼" disk.) Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, multiple choice answers, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

	IBM Part#	Commodore Part#	Price
Novice	IBM01	COM01	**$14.95**
Tech	IBM02	COM02	**$14.95**
General	IBM03	COM03	**$14.95**
Advance	IBM04	COM04	**$19.95**
Extra (New Pool)	IBM05	COM05	**$19.95**

IBM97 **Amateur Radio Part 97 Rules** (includes updated, revised Commission's Rules, September 30, 1989) 5¼" disk IBM compatible only. **$9.95**

ARRL BOOKS

AR1991 **ARRL 1991 Handbook (68th ed.)** 39 chapters, featuring 2,100 tables, figures and charts. The most comprehensive, well organized and affordable source of amateur radio reference material. 1232 pages. **$25.00**

AR2065 **ARRL Antenna Book** Represents the best and most highly regarded information on antenna fundamentals, transmission lines, design, and construction of wire antennas. **$18.00**

AR1086 **ARRL Operating Manual** Packed with information on how to make the best use of your station, including: interfacing home computers, OSCAR, VHF-UHF, contesting. **$15.00**

AR0194 **Antenna Compendium Vol. 1** Materials on verticals, quads, loops, yagis, reduced size antennas, baluns, Smith Charts, antenna polarization, and other interesting subjects. **$10.00**

AR2545 **Antenna Compendium Vol. 2** 42 papers covering verticals, yagis, quads, multiband and broadband systems, antenna selection, and much more. **$12.00**

AR2626 **Companion Software for Antenna Compendium Vol. 2** 51/4" MS-DOS floppy. **$10.00**

AR2472 **Tune In the World with Ham Radio Kit (8th ed.)** Complete Novice course in one, easy to understand package. Code-teaching and code-practice cassettes included in the kit. **$19.00**

AR2464 **Tune In the World** Book only **$14.00**

AR0488 **W1FB's Antenna Notebook** *by Doug DeMaw W1FB* Get the best performance out of unobtrusive wire antennas and verticals. Build tuners and SWR bridges. **$8.00**

AR2073 **Novice Antenna Notebook** A beginners guide to easy and effective antennas and tuners you can build. **$8.00**

AR0348 **QRP Notebook** *by Doug DeMaw W1FB* Presents construction projects for the QRP operator, from a simple 1 watt crystal-controlled transmitter to more complex transceiver designs. **$6.00**

AR4141 **W1FB's Design Notebook** *by Doug DeMaw W1FB* This plain language book is filled with simple practical projects that can be built using readily-available components and common hand tools. **$10.00**

AR2871 **W1FB's Help for New Hams** *by Doug DeMaw W1FB* Complete for the newcomer. Put together a station and get on the air. **$10.00**

AR2200 **Antenna Impedance Matching** *by Wilfred N. Caron* Most comprehensive book written on using Smith Charts in solving impedance matching problems. **$15.00**

AR0402 **Solid State Design** Chock full of good, basic information, circuit designs and applications; descriptions of receivers, transmitters, power supplies, and test equipment. **$12.00**

AR3193 **Weather Satellite Handbook (4th ed.)** *by Dr. Ralph Taggart* WB8DQT Hot off the press! Expanded and revised to reflect today's weather-fax satellite technology. **$20.00**

AR3290 **Companion Software for Weather Satellite Handbook** 51/4" MS-DOS Floppy. **$10.00**

AR1033 **The DXCC Companion** *by Jim Kearman KR1S* spells out in simple, straightforward terms what you need to be a successful DXer. **$6.00**

AR1250 **Log Book**—Spiral **$3.50**

ARA341 **Interference Handbook** Written from an RFI sleuth's perspective. His experience in solving interference problems. **$12.00**

AR2197 **Data Book** Valuable aid to the RF design engineer, technician, radio amateur, and experimenter. Commonly used tables, charts, and those hard-to-remember formulas. **$12.00**

AR2960 **Transmission Line Transformers (2nd ed.)** *by Dr. Jerry Sevick W2FMI* Practical designs and specific information on construction techniques and sources of material. More designs for antenna tuners, hybrids, and for the VHF and UHF bands. 272 pp. **$20.00**

AR2286 **First Steps in Radio** *by Doug DeMaw W1FB* Series of *QST* articles. See components assembled into practical circuits and how the circuits make up your radio gear. **$5.00**

ARRL **License Manuals** All the theory you need to pass your test. Complete FCC question pools with answers.

AR2375 **Technician Class**	**$6.00**
AR2383 **General Class**	**$6.00**
AR0166 **Advanced Class**	**$6.00**
AR2391 **Extra Class**	**$8.00**

AR0410 **Yagi Antenna Design**
Originally published as a series in *Ham Radio*, polished and expanded by Dr. Lawson. **$15.00**

AR0437 **ARRL Repeater Directory 1990-1991** Almost 18,000 listings with over 2200 digipeaters. Band plans, CTCSS (PL™) Tone Chart, compilation of frequency coordinators, ARRL Special Service Clubs, and beacon listing from 12MHz to 24GHz. **$6.00**

AR2171 **Hints and Kinks** Find the answer to that tricky problem. Ideas for setting up your gear for comfortable, efficient operation. **$8.00**

AR3169 **QRP Classics** Collection of articles from last 15 years of ARRL publications on building receivers, transmitters, transceiver, accessories, 288 pp. **$12.00**

AR3185 **The Satellite Experimenter's Handbook, (2nd Ed.)** *by Martin Davidoff K2UBC* Expanded and revised, this 2nd edition of "The Satellite Experimenter's Handbook" is your guide to using and designing satellites, focusing on those built by and for the international radio amateur community. **$20.00**

AR0477 **Low Band Dxing** How to meet the challenges of the different forms of 160, 80, and 40 meter propagation with effective antennas, equipment, and operating strategies. **$10.00**

AR2030 **Your Gateway to Packet Radio (2nd ed.)** Tells everything you need to know about this popular new mode; how to get started, equipment you need, and more. **$12.00**

AR2456 **FCC Rule Book (8th ed.)** A must for every active radio amateur. **$9.00**

AR2103 **Satellite Anthology** The latest information on OSCARs 9 through 13 as well as the RS satellites. Information on the use of digital modes, tracking antennas, RUDAK, microcomputer, and more! **$5.00**

AR2898 **Space Almanac** *by Anthony R. Curtis K3KXK* Captures the breathtaking recent news from space. Includes information on Amateur Radio satellites. Find almost everything about man's trip to the stars. 960 pp. **$20.00**

AR2083 **Complete DX'er (2nd ed.)** *by Bob Locker W9KNI* Learn how to hunt DX and obtain hard-to-get QSL cards. **$12.00**

REFERENCE

02C30 **The Commodore Ham's Companion** *by Jim Grubbs K9EI* 160 pages of useful information on selecting a Commodore computer for the ham shack, where to find specialized programs, the Commodore-packet connection, and more! **$9.50**

10M44 **World Atlas** *by Radio Amateur Callbook Inc.* 20 pp. of full color, 8¾" x 10⅞", contains North Polar projection of the world; maps of all seven continents, West Indies/Caribbean area, and Pacific Ocean. **$5.00**

01C80 **Master Handbook of 1001 Circuits—Solid-State Ed.** *by Kendall Webster Sessions* With this outstanding reference in hand, electronics hobbyists and professionals will never have to search for schematics again. Completely updated, the book is thoroughly indexed and all 1001 circuits are clearly illustrated. 420 pp. **$19.50 soft cover**

09D22 **The World Ham Net Directory** *by Mike Witkowski* New—second edition now over 600 net listings. This book introduces the special interest ham radio networks and shows you when and where you can tune them in. **$9.50**

10F091 **1991 International Callbook** The new 1991 International Callbook lists 500,000 licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). **$29.95**

10D091 **1991 North American Callbook** The 1991 North American Callbook lists the calls, names, and address information for over 500,000 licensed radio amateurs in all countries of North America, from Panama to Canada including Greenland, Bermuda, and the Caribbean islands plus Hawaii and U.S. possessions. **$29.95**

05H24 **Radio Handbook, 23rd Ed.** *by William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. Indepth study of AC/DC fundamentals, SSB, antennas, amplifiers, power supplies, and more. **$29.50 hard cover only**

01B65 **The Beginner's Handbook of Amateur Radio—2nd Editon** *by Clay Laster* Combines theory and practice in an easy-to-understand format, and provides information for choosing and installing radio receivers and transmitters, antennas, transmission lines, and test equipment. 400 pages, 291 illustrations. **$18.50**

12E76 **Basic Electronics** *Prepared by the Bureau of Naval Personnel* Thoroughly revised in 1972. Covers the important aspects of applied electronics and electronics communications. 567 pp. **$10.95**

01D45 **The Illustrated Dictionary of Electronics, 5th Ed.** *by Rufus P. Turner and Stan Gibilisco* Featuring more than 27,000 entries, an exhaustive list of abbreviations, and appendices packed with schematic symbols and conversion tables, this is by far the most comprehensive dictionary of practical electronics and computer terms available. 720 pages **$26.95**

04M54 **GGTE Morse Tutor** From beginner to Extra class in easy self-paced lessons. Code speeds from 1 to over 100 words per minute. Standard or Farnsworth mode. Adjustable tone frequency. Create your own drills, practice or actual exams. Exams conform to FCC requirements. 5¼ floppy for IBM PC, XT, AT, PS/2 or compatibles **$19.50**

04M55 **Advanced Edition $29.95**

01T01 **Transmitter Hunting: Radio Direction Finding Simplified** *by Joseph D. Moell K0OV/Thomas N. Curlee WB6UZZ* 336 pps, 248 illusts. **$17.50**

CODE TAPES

One answer to the no-code brou-ha-ha is to make the code so simple to learn that it's a non-problem. Herewith the world's easiest code course—tens of thousands of hams have gotten their licenses this amazing new shortcut way. It's failure-proof. Most people are able to whip through the Novice test after spending less than three hours each on Genesis and The Stickler. People who have given up on other code courses find this one does the job in a jiffy. Going after your General? It's about time. Use the Back Breaker and you'll be there before you know it. A week should do it. Warning, 20wpm code almost invariably appears to cause irreparable, irreversible, permanent brain damage. Uncle Wayne accepts no responsibility whatever for anything that happens to those who are foolish enough to use the Courageous 20wpm tape.

73T05 **"Genesis"** **$5.95**
5 wpm—This is the beginning tape, taking you through the 26 letters, 10 numbers, and necessary punctuation, complete with practice every step of the way. The ease of learning gives confidence even to the faint of heart.

73T13 **"Back Breaker"** **$5.95**
13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language code at only 13 per. You'll need this extra margin to overcome the sheer panic universal in most test situations. You've come this far, so don't get code shy now!

73T06 **"The Stickler"** **$5.95**
6+ wpm—This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are sent at 13 wpm and spaced at 5 wpm. Code groups are entirely random characters sent in groups of five—definitely not memorizable!

73T20 **"Courageous"** **$5.95**
20+ wpm—Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the extra class license. We send the code faster than 20 per. It's like wearing lead weights on your feet when you run: You'll wonder why the examiner is sending so slowly!

ANTENNAS

05A95 • **Easy-up Antennas for Radio Listeners and Hams** *by Edward M. Noll* Like to learn how to construct low-cost, easy-to-erect antennas? *Easy-up Antennas* will help you. **$16.50**

10A345 • **Beam Antenna Handbook** *by William Orr W6SAI/Stuart Cowan W2LX* Yagi beam theory, construction, operation. Wire beams. SWR curves. Matching systems. A "must" for serious DXers. **$11.95**

10A343 • **All About Cubical Quad Antennas** *by William Orr W6SAI/Stuart Cowan W2LX* The "Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **$9.50**

10A344 • **The Radio Amateur Antenna Handbook** *by William Orr W6SAI/Stuart Cowan W2LX* Yagi beam theory, construction, operation. Wire beams. SWR curves. Matching systems. A "must" for serious DXers. **$11.50**

10A346 • **Simple, Low-cost Wire Antennas for Radio Amateurs** *by William Orr W6SAI/Stuart Cowan W2LX* All New! Low-cost, multi-band antennas; inexpensive beams. "Invisible" antennas for hams in "tough" locations! New data. **$11.50**

10A342 • **All About Vertical Antennas** *by William Orr W6SAI/Stuart Cowan W2LX* Effective, low-cost verticals 10–160 m. -DX, multiband; compact verticals for small spaces; grounding; test equipment; lightning. **$10.50**

01A70 • **Practical Antenna Handbook** *by Joseph J. Carr* Design, build, modify, and install your own antennas. Carr, a 20-year veteran of technical writing, has a unique ability to present complex technical concepts in an easy-to-understand way. 416 pp. **$21.50**

PACKET

10A347 **All About VHF Amateur Radio** *by William Orr W6SAI* DX propagation, VHF yagi and quad beams, repeaters and how they work, OSCAR satellites and how to use them. **$11.95**

03R02 **RTTY Today** *by Dave Ingram K4TWJ* Only up-to-date RTTY book in existence. Covers all facets of RTTY. Most comprehensive RTTY guide ever published. Fully illustrated. 112 pages. **$8.50**

09V11 **The Basic Guide to VHF/UHF Ham Radio** *by Edward M. Noll* This book provides a first rate introduction to life on the 2.6 and 1.25 meter bands as well as 23, 33, and 70cm. **$6.50**

16PB6 **Packet User's Notebook** *by Buck Rogers K4ABT* Over 90 diagrams show tried and true connections for popular TNCs, transceivers, and computers. A genuine nuts-and bolts how-to-do manual. **$9.95**

01P22 **The Packet Radio Handbook** *by Jonathan L. Mayo KR3T* "...an excellent piece of work. Well worth reading for both the experienced and the new packeteer...the definitive guide to amateur packet operation." —Gwyn Reedy W1BEL **Only $14.50**

Uncle Wayne's Bookshelf Order Form

You may order by mail, telephone, or fax. All payments are to be in US funds. Allow 3 weeks for delivery.

Item #	Title	Qty.	Price	Total
			SHIPPING	
			TOTAL	

SHIPPING
U.S. add $3.00 mail, $4.00 UPS.
Canada add $4.00 mail.
U.P.S. to Canada and all foreign orders FOB Peterborough, NH.

Name _____

Street _____

City _____ State _____ Zip _____

TOTAL $ _____ ☐AE ☐MC ☐VISA ☐Check/Money Order

Card # _____ Expiration Date _____

Telephone: (603) 924-4196 (800) 234-8458 FAX: (603) 924-8613

Mail: *73 Magazine*, Attn. Uncle Wayne, PO Box 3080, Peterborough, NH 03458

UW0691

Number 33 on your Feedback card

RANDOM OUTPUT

David Cassidy N1GPH

I didn't think this topic would come up again, but it seems the debate over no-code is STILL raging. Can you believe it? Here we are, over four months after the first no-code Technicians received their licenses, and a large group of Neanderthals within our midst continue to bitch, moan, argue and predict the doom and demise of amateur radio.

Today I received a copy of a letter, sent to the FCC by an amateur radio club in California (I won't embarrass the members of this club by revealing their name), signed by the president of said club, listing all of the reasons why this particular group of geriatric amateurs was opposed to the no-code license. If these folks wanted to have their opinions heard on the matter, why did they wait until April to do it? Kinda' late now, boys.

To be sure, there are plenty of intelligent amateurs out there who have a problem with eliminating the code requirement. Some of the more interesting QSOs I've had in the last few months have been lively discussions of this issue. But having a well-formed opinion and expressing it with intelligence is worlds away from what I'm hearing on the bands—the same old stupidity, parroted over and over, by a bunch of old men who probably haven't touched their code keys in 20 years and couldn't pass a 13 wpm code test if their lives depended on it.

One more time, for the brain-dead, let's examine the major objections to no-code. Pay attention. This is the last time we are going to go over this.

"Having a code requirement maintains the quality of amateur radio licensees. If we eliminate the code, ham radio will become like CB." Anyone who has this opinion obviously hasn't spent any time on the bands lately. The goofballs on 14.313 MHz, the illegal and shameful behavior of many trying to contact the Bouvet Island DXpedition (or any even slightly rare DX spot, for that matter), 10 meters during a contest weekend, AMers on 40 meters with 20 kHz bandwidths (I have nothing against AM, but I have a lot of problems with 20 kHz bandwidths)...All of these folks (and these are but a few of dozens of examples) are licensed amateurs who have passed a code test. If you're a rude and obnoxious jerk, a code test is not going to change that. If you're a courteous and thoughtful operator, the lack of a code test will not turn you into a net-jammer.

"We must maintain the code requirement because code gets through when other modes don't. It's vital in times of emergency." This argument may have had some validity 50 years ago, but with modern communication modes and equipment it is simply no longer true. You can put up a dipole, pump less than 100 watts of packet into it and get an error-free message, anywhere in the world, delivered in less than 24 hours. And you don't even have to be in your shack to do it. You could send a message to yourself before you got on a plane from New York to Los Angeles, and the message would be waiting for you before your plane landed. If I had an important message to send, CW is the last mode I would choose. It's slow, inefficient and more prone to operator error than any other mode.

"Morse code is a radio tradition that should be saved. It's a useful skill that all radio operators should know." This is the dumbest argument yet, but you'd be surprised how many times I've heard it. Being able to shoe a horse is a useful skill, but I don't think it should be a requirement for obtaining a driver's license.

"The no-code license was pushed through the FCC by the major equipment manufacturers, so they could make millions of dollars in new equipment sales." Oh, how I wish this were the case. I have a very large streak of 1960s' "angry young man" in me, and this kind of a scandal would be perfect. Unfortunately, it just isn't true. I speak with the marketing managers of every major amateur equipment manufacturer on a regular basis—some of them I consider friends—and not once has any of them even brought up the subject of no-code. For most of these companies, amateur radio is a small sideline to their commercial electronics business. They are not sitting around waiting to make their fortunes off of amateur radio. The only people getting rich off of amateur radio are the ARRL (sorry...I couldn't resist).

"Unless you give these no-code Technicians special callsigns, how can we make sure they're not operating illegally?" Boy, the dopiness just keeps on comin'. I have a 1 x 3 callsign. If you hear me calling "CQ" on 15 meter SSB, how do you know that I'm not a Technician? You can look me up in the *Callbook*, but that information is at least four months old. I could have upgraded since the last edition was published. How do we know that any of us are really licensed to be transmitting where we do? I'm sure that hundreds of amateurs operate out of their allocated frequency privileges. I've even heard a few that I KNOW were operating illegally. So what? Most amateurs are like you and me. They respect the FCC regulations and operate according to their license class. Does passing a code test guarantee that you will only operate within your assigned frequency limits? No, of course not.

When you come across someone on your local repeater, or when the regular group of crotchety old farts on 40m starts up again about no-code, please do us all a favor and tell them to shut up. Amateur radio has changed. The rule passed. The no-code license is here. Get over it.

I've received dozens of letters from no-code licensees. Some have told stories of friendly local hams, welcoming them to the hobby. Others have had stories of rude and obnoxious idiots refusing to talk to them because they haven't passed a code test (no great loss—these dopes aren't worth talking to anyway). Most of these new licensees have mentioned that they are continuing to study the code, so they can get on HF.

Those of you who were around when the Novice license was first instituted will see a big similarity. Novices were shunned. The Novice class was going to be the demise of amateur radio. The same thing happened with Novice enhancement. Letting the Novices on 10m was going to be the end of amateur radio. Hell, the same thing happened when SSB was introduced...or 2m repeaters...or pick any change since the days of spark gap.

How you or I feel about no-code is a mute point. It happened. It's done. Now, let's all move forward and start addressing the real problems in amateur radio. If you insist on clinging to this non-issue, then the least you can do is keep it to yourself. The rest of us have more important things to do. 73

Number 34 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 E. Chateau Circle
Payson AZ 85541

Not Great, But Not Bad

Overall, June will be a fair month for DX, but not as spectacular as spring and fall. Sunspot Cycle 22 has begun to decline from its estimated peak in June 1989, and is now in its second downward year of an approximately six-year period when the sunspot minimum is expected (1995–96). DX will continue to be good to fair for the next couple of years, but you'll need more skill and information to maximize your success because opportunities will be fewer and farther between.

June always centers on the "DX Doldrums" because it marks the summer solstice, halfway between the spring and fall equinoxes when DX is best. The higher summer sun angle in the Northern Hemisphere heats the F2 layer, reducing ionization of the upper atmosphere. With the atmospheric noise levels and reduced ionization, DX opportunities are consequently reduced.

Although daytime DX will generally be poorer in June compared to winter, late evening DX may be better because of the longer hours of daylight. There are also VHF/UHF possibilities in June, and it's a good idea to look for sudden ionospheric and atmospheric disturbances that can promote them.

The expected poor days for this month will center around the 11th and the 22nd. The rest of June is expected to have poor to fair DX propagation conditions; but don't expect the results you get in spring and fall.

The charts may be used in two ways: To find an appropriate time and band to work the countries you need, or to take advantage of the operating hours you have available, and work those countries most likely to be open at those times. Then, consulting the daily calendar forecast, you can choose the days most likely to be best for success.

For more information about shortwave radio propagation, I recommend the *Shortwave Propagation Handbook*, by Jacobs and Cohen. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	—	—	—	—	—	20	20	—	—	—	—	15/17
ARGENTINA	15/17	15/17	20	20	—	—	—	—	—	15/12	15/12	15/13
AUSTRALIA	15/17	15/17	—	20	20	—	20	20	—	—	—	—
CANAL ZONE	20	20	20	20	20	20	20	15/17	15/17	15/17	15/12	15/17
ENGLAND	20	20	15	—	—	—	—	15/17	15/17	—	15/17	20
HAWAII	15/17	15/17	20	20	20	20	20	—	—	—	—	15/12
INDIA	20(1)	20(1)	—	20(1)	20(1)	—	—	—	—	—	—	15/17(1)
JAPAN	—	—	—	—	—	20	20	—	—	—	—	15/17(1)
MEXICO	20	20	20	20	20	20	20	15/17	15/17	15/17	15/12	15/17
PHILIPPINES	—	—	20	—	—	20(1)	20(1)	15/17(1)	15/17(1)	—	—	—
PUERTO RICO	20	20	20	20	20	20	20	15/17	15/17	15/17	15/12	15/17
SOUTH AFRICA	—	40(1)	20	20	20	—	—	15/17	15/17	20	—	—
U.S.S.R.	20	20	15	—	—	—	—	—	—	15/17	15/17	20
WEST COAST	15/17	15/17	40/30	40/30	40	40	40	—	20	15/17	15/17	15/17

CENTRAL UNITED STATES TO:

ALASKA	15/17(1)	—	—	—	—	20	20	20	—	—	—	15/17(1)
ARGENTINA	15/17	15/17	20	—	—	20(1)	—	—	—	—	15/12	15/12
AUSTRALIA	15/17	15/17	—	20	20	—	20	—	—	—	15/17(1)	15/17(1)
CANAL ZONE	15/17	20	20	20	—	20	20	15/17	15/17	15/17(1)	15/12	15/17(1)
ENGLAND	20	20	—	—	—	20(1)	—	—	—	—	15/17(1)	15/17(1)
HAWAII	—	—	20	20	20/18	—	20	—	15/17	15/17	15/17(1)	15/12(1)
INDIA	15/17(1)	20(1)	—	—	—	20(1)	20(1)	—	—	—	—	15/17(1)
JAPAN	15/17(1)	—	—	—	—	20	20	20	—	—	—	15/17(1)
MEXICO	15/17	20	20	20	—	20	20	15/17	15/17	15/12(1)	15/12	15/12
PHILIPPINES	15/17(1)	—	20(1)	—	—	—	20(1)	20(1)	—	—	—	—
PUERTO RICO	15/17	20	20	20	—	20	20	20	15/17	15/17(1)	15/12	15/12
SOUTH AFRICA	—	—	20/15	20(1)	—	—	—	15/17(1)	15/17(1)	20(1)	—	—
U.S.S.R.	20	20	20	20	—	20(1)	—	—	15/17(1)	15/17(1)	15/17(1)	20

WESTERN UNITED STATES TO:

ALASKA	15/17	20	20	20	20	20	—	20	15/17(1)	15/17(1)	15/17(1)	15/17
ARGENTINA	15/12	15/17	15/17	20	20	—	—	—	—	—	15/12	15/12
AUSTRALIA	15/17(1)	15/17	15/17	20	20	20/18	20/18	20	—	—	—	15/17(1)
CANAL ZONE	15/17	15/17	20	20	20	—	—	—	—	15/12(1)	15/17	15/17
ENGLAND	20	20	20	20	—	20(1)	—	15/17(1)	15/17(1)	—	—	20
HAWAII	15/17(1)	15/17	20	20	40	40	20	20	—	15/17	15/17(1)	15/17(1)
INDIA	—	15/17(1)	15/17	—	—	—	20(1)	20(1)	15/17(1)	15/17(1)	—	—
JAPAN	15/17	20	20	20	20	20	—	20	15/17(1)	15/17(1)	15/17(1)	15/17
MEXICO	15/17	15/17	20	20	20	—	—	—	—	15/12(1)	15/17	15/17
PHILIPPINES	—	15/17(1)	15/17(1)	—	—	20	20	20	15/17(1)	—	—	—
PUERTO RICO	15/17	15/17	20	20	20	—	—	—	—	15/17(1)	15/17	15/17
SOUTH AFRICA	—	—	—	20(1)	—	—	—	20(1)	15/17(1)	15/17(1)	—	—
U.S.S.R.	20	20(1)	20(1)	20(1)	—	—	—	—	—	—	—	20
EAST COAST	15/17	15/17	40/30	40/30	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.

JUNE 1991

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

Yaesu Announces
One Year Limited Warranty
on all Amateur Radio Products

The Tradition Continues...
FT-990 HF All-Mode Transceiver

The benchmark from which all other HF all-mode transceivers are judged was set with the introduction of the FT-1000. Now, the tradition continues.

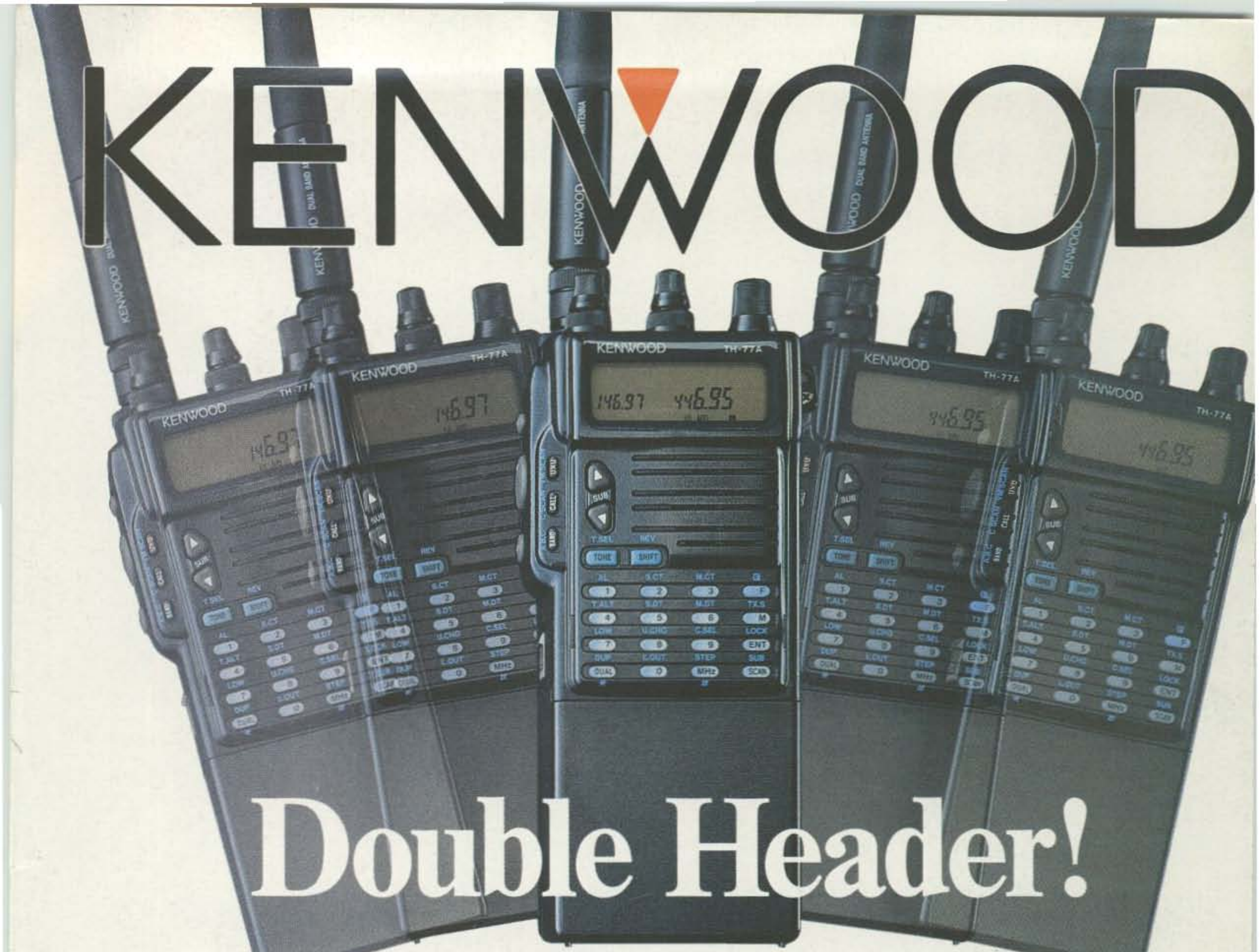
Features and Options:

- **High Dynamic Range:** Unsurpassed RF circuit design with quad FET first mixer similar to the FT-1000.
- **Dual Digital Switched Capacitance Filter:** The FT-990 is the **only** HF transceiver to feature a SCF with independent hi/lo-cut controls for skirt selectivity providing unmatched audio reception as never before attained.
- **Built-in Convenience:** Unlike the competition's extras the FT-990 was designed as a true self-contained base station. A switching AC power supply is built-in.
- **CPU Controlled RF FSP (RF Frequency-Shifted Speech Processor):** The RF FSP shifts the SSB carrier point by programming a CPU to change audio frequency response and provide optimum speech processing effect.
- **Dual-VFO's with Direct Digital Synthesis (DDS)**
- **Full and Semi Break-in CW Operation**
- **6 Function Multimeter**
- **Adjustable RF Power**
- **Adjustable Level Noise Blanker**
- **90 Memories**
- **Multimode Selection on Packet/ RTTY**
- **Front Panel RX Antenna Selection**
- **Digital Voice Storage DVS-2 Option**
- **Band Stacking VFO System**
- **Accessories/Options:** TCXO-2 (Temperature Compensated Crystal Oscillator), XF-10.9M-202-01 (2nd IF SSB Narrow 2.0kHz), XF-445C-251-01 (3rd IF CW Narrow 250Hz), SP-6 (External Speaker), MD1C8 (Desk Microphone), YH-77ST (Headphones), LL-5 (Phone Patch Module).

YAESU

Performance without compromise.℠

KENWOOD



Double Header!

TH-77A

Compact 2m/70cm Dual Band HT

Here's a radio that deserves a double-take! The TH-77A is a feature-packed dual band radio compressed into an HT package. The accessories are compatible with our TH-75, TH-25, and TH-26 Series radios. Repeater and remote base users will appreciate the DTMF memory that can store *all* of the DTMF characters (*, #, A, B, C, and D) that are usually required for repeater functions!

- **Wide band receiver coverage.** 136–165 (118–165 [AM mode 118–136] MHz after modification) and 438–449.995 MHz. TX on Amateur bands only. (Two meter section is modifiable for MARS/CAP. Permits required.)
- **Dual receive/dual LCD display.** Separate volume and squelch controls for each band. Audio output can be mixed or separated by using an external speaker.
- **Cross band repeat function.**
- **Dual Tone Squelch System (DTSS).** Uses standard DTMF to open squelch.
- **CTCSS encode/decode built-in.**
- **Forty-two memory channels.** All channels odd split capable.
- **DTMF memory/autodialer.** Ten 15-digit codes can be stored.
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **Multi-function, dual scanning.** Time or carrier operated channel or band scanning.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Two watts (1.5 W on UHF) with supplied battery pack.** Five watts output with PB-8 battery pack or 13.8 volts. Low power is 500 mW.
- **DC direct-in operation** from 6.3–16 VDC with the PG-2W.
- **T-Alert with elapsed time indicator.**
- **Automatic repeater offset on 2 m.**
- **Battery-saving features.** Auto battery saver, auto power off function, and economy power mode.
- **Supplied accessories:** Flex antenna, PB-6 battery pack (7.2 V, 600 mAH), wall charger, belt hook, wrist strap, keyboard cover.

Optional accessories:

• **BC-10:** Compact charger • **BC-11:** Rapid charger • **BH-6:** Swivel mount • **BT-6:** AAA battery case • **DC-1/PG-2V:** DC adapter • **DC-4:** Mobile charger for PB-10 • **DC-5:** Mobile charger for PB-6, 7, 9 • **PB-5:** 7.2 V, 200 mAh NiCd pack for 2.5 W output • **PB-6:** 7.2 V, 600 mAh NiCd pack • **PB-7:** 7.2 V, 1100 mAh NiCd pack • **PB-8:** 12 V, 600 mAh NiCd for 5 W output • **PB-9:** 7.2 V, 600 mAh NiCd with built-in charger • **PB-11:** 12 V, 600 mAh OR 6 V, 1200 mAh, for 5 W OR 2 W • **HMC-2:** Headset with VOX and PTT • **PG-2W:** DC cable w/fuse • **PG-3F:** DC cable with filter and cigarette lighter plug • **SC-28, 29:** Soft case • **SMC-30/31:** Speaker mics. • **SMC-33:** Speaker mic. w/remote control • **WR-1:** Water resistant bag.

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

KENWOOD

...pacesetter in Amateur Radio

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications and features are subject to change without notice or obligation.