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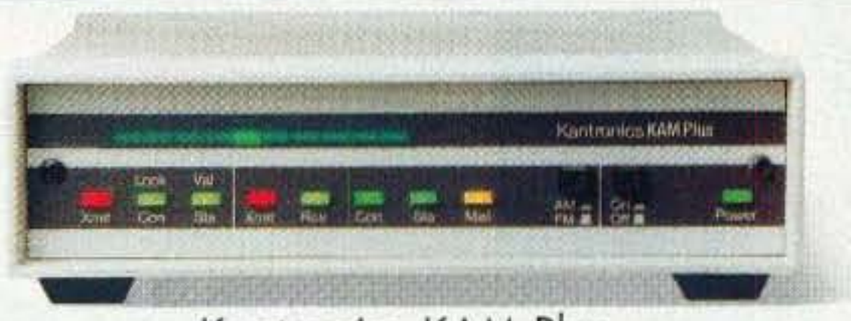

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FEEDBACK... FEEDBACK!

It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK list 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.

On the cover: "What is he, an agent for the UFOs?" Actually, he's Dave Hess KD6LZA, and you can find out what he does with this outfit in "Homing In" on page 62.

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Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

Money Ideas

There are good solid money-making ideas going by you every day. That's not important if you have all the money you need, and your wife does, too (which is highly unlikely). I think the complaint I hear the most from readers has to do with money. Hey, it's out there; all you have to do is keep your eyes, ears, and mind open for opportunities.

For instance, I was reading an article in Forbes about the popularity of low-powered FM transmitters. The article mentioned an FM transmitter kit available from Pan-Com International by mail order for $130. It also mentioned a 20-watt amplifier kit from Ramsey for $100. So I checked the Ramsey ad in *73* and found that they also have a nice little FM transmitter kit for $35. For another $15 you can get a case for it and an antenna. Hey, for $50 you're on the air with a few milliwatts. Not legally, of course. And it's even worse if you invest the extra hundred in an amplifier and start broadcasting your own call-in talk show to your neighborhood. Watch out, Rush!

The chances of being caught seem remote, unless you irritate your listening audience enough so they complain to the Candy Company. The FCC's response, when irritated enough to track down FM band pirates, is usually to confiscate the station. Of course, if you have a ham ticket, they will probably lift that, too, so I'm not even remotely suggesting that you set up an FM station, start broadcasting, and sell advertising. But, as a ham, and presumably with some radio smarts, you might be able to help people who want to be able to play music around their home or business without having to install a bunch of wires. I know I'd like to be able to listen to my CDs when I'm out digging up dandelions or picking raspberries. My lawn produced over 500 pounds of dandelions this spring.

The public, with few exceptions, are panicked by anything electrical. Our schools have, for the most part, stopped bothering to teach science, so most people haven't a clue as to how electricity or radio equipment works. Thus, when faced with a desire to use something radioish, they turn in frustration to anyone they can find for help.

If you were to advertise that you can install a miniature FM transmitter for people to play music around their home or office for $249.95, you might be able to make some money. I know I could. Anyone who has a hi-fi system would be a good target for a sale. Imagine being able to load your CD player with a stack of CDs and listen to the music you want while you do yard work.

The circuit for the blood purifier I've been writing about is dirt simple for any ham to construct. It's little more than a small radio battery with a relay to reverse the polarity and apply a low voltage to the ankles in order to pass about 50 microamperes of current through the blood going through the leg arteries. This is reported by the Albert Einstein School of Medicine as a way to wipe out HIV, herpes, and a few other miseries caused by bugs in the blood. I've had calls from people with AIDS who are desperate to make a unit, but who are completely unable to deal with the simple circuit. They've visited their neighborhood Radio Shack, and found no help there. So I tell 'em to find a local ham. Knowing the power of the FDA, et al., which seem dedicated to keeping AIDS an incurable disease, I'm afraid to get involved any more closely.

If you have been living in a cave and aren't aware of what the FDA, the medical establishment, and the drug and insurance companies are up to, then it's time for you to come out of the cave and start reading a little. There's no shortage of books and newsletters to educate you. I'll have to review the Christopher Bird book on Gaston Naesens for you, for starters. Then you'll want to read about Royal Rife, Wilhelm Reich, and a few others who've been their victims. It's almost enough to make a person think.

Lots of New Ideas

For instance, at the Monaco cold fusion conference I met Jerome Drexler, who's making LaserCards. This credit-card-sized card can optically store up to six megabytes of data. That's around 2,400 typewritten pages of information. Now, how many applications can you think of for this beaut?

Hospitals are using it for health records their patients can carry with them. Imagine being able to carry around your complete life medical history! The Army is using them to eliminate tons of paperwork when handling or shipping supplies. Shipping lines are using them to keep track of cargoes in detail, thus eliminating paperwork and the filling out of forms. The shipments are marked by bar-codes and the record sent along on the LaserCard. No more typing. Plus it speeds up dealing with customs in other countries.

Other applications might be a color photo where identification is important. Maybe a voiceprint or a fingerprint? This could help eliminate credit-card fraud, which is costing us credit-card users billions a year.

The company also makes a smart card with a built-in microprocessor, which has room for 1.5 megabytes of data. The cards can be used to store data, pictures, software, PINS, your signature, and so forth

So where do you come in? Hey, someone has to go out there and start selling the product. How many potential users are there within easy driving distance of you? The odds are that most companies haven't heard of the product, nor even thought about the potential benefits it could provide.

Let's suppose that a major retailer wants to keep track of what their customers are buying and how often. A card like this could let me as a customer buy anything I want and the store would automatically charge my Master Card account without any need for further identification. It would keep track of my purchases and issue me credit when they reached certain targets—like frequent flier miles.

Sony/Philips gets a nickel royalty on every CD made. With around a billion CDs being made a year, that kinda mounts up, doesn't it? If, as a sales agent for the card, you could get 5¢ each, it wouldn't be long before you could afford to renew your *73* subscription. And buy a Porsche.

But there are endless new products and services which need to be sold or manufactured. Your success in life is limited only by your imagination and ability actually to follow through with a project.

Computer Service

It doesn't take a world of smarts to fix computers, but if you get into the business you'll find that hundreds of local small businesses are going to be interested. Small companies can't afford to hire a computer guru to set up their system and keep it running. And, as a ham, presumably you are not afraid to take the lid off the box and see what's gone wrong inside. It's probably the disk drive. Or a loose connection in the monitor.

Operating out of your basement, spare room, or garage will give you the low overhead you need to compete with the big boys and build your customer list. Then, visit them every week or so and see how things are doing. Find out if they are happy. Tell them about new hardware or software that might benefit their business. Maybe you can get them onto the Internet and sell them a 28kbps modem to speed things up.

I don't want to hear how you don't have the money for a subscription. I want to hear from you when I suggest we make a ham and scuba diving trip to Truk, and you tell me you have the money and are raring to go. If you're making plenty of money, what do you care if the new Kenwood or Icom rig is $1,000 or $5,000? And if you aren't making money, why the heck not? It's out there in big gobs. But you do have to work for it. Well, actually, it's more like funning for it, if you enjoy what you're doing. If you're not having fun making money, it's time to reorient your life, even if you have to start over and build new skills.

Missed Opportunity?

A letter from Harley W9ALU included a newspaper article about a

Continued on page 74

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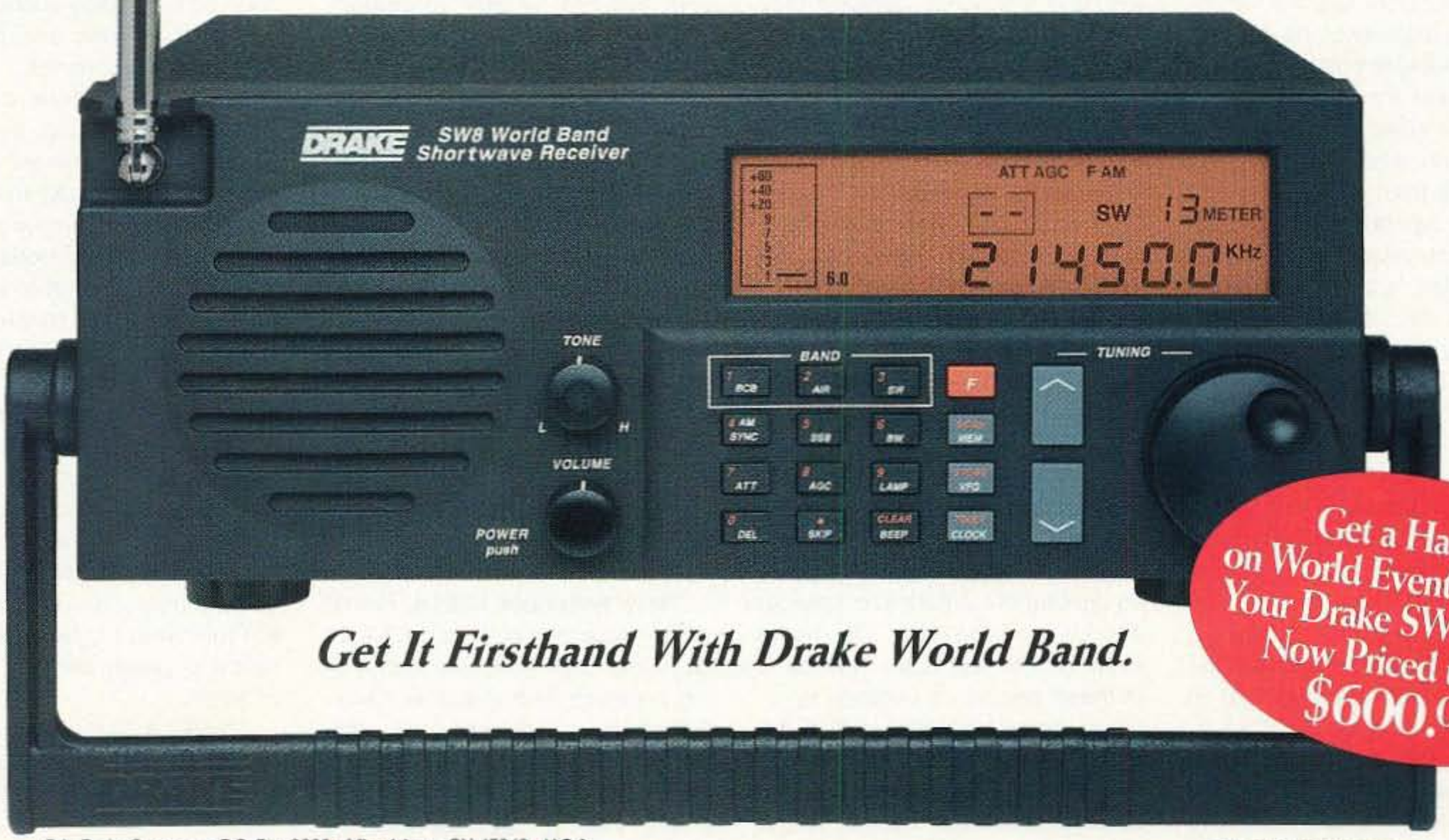

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LETTERS

Number 2 on your Feedback card

From the Ham Shack

Bob Davis N3OYA Well, Uncle Wayne, you've been pestering me to write, so here goes. Thanks for bugging the heck out of complacent hams like me and getting us out there doing something. As per your instructions, I have started my own business (in my spare time, at least, until it takes off and I can quit the broadcasting business), making and selling custom-made drums. I also am involved with teaching young drummers and percussionists the ethereal art of drumming.

There's more: My business, called RPD Consulting, also advises various organizations in the field of sound reinforcement, such as churches, parks, etc. This stuff keeps me busy, as you can imagine, and it doesn't pay very well (yet), but I find the time for more musical undertakings, such as local community bands and my own band, Royal Disaster, which plays all manner of music, from The Beatles to the Allman Bros. I even get a little time in for hamming with my local club and casual operation hunting special-event stations. Boy, do I love those colorful bits of paper!

I enjoy your editorials; don't ever stop raising a ruckus. I have even dared (gasp!) to research the basics of cold fusion, and have been deluged with so-called educated people who insist that the concept is rubbish. Oh, did I mention that the majority of the non-believers have never bothered to find out the tiniest modicum of background? For instance, a very good friend of mine, who happens to be as far away from science as one can be (he has degrees in history and classics), insists that the idea of cold fusion is bunk. I even let him read a few of your editorials on the subject, but he remains unswayed. He did, however, enjoy the rest of the content.

Hey, Unk, let me tell ya a story. When I first began reading *73* and saw your editorials decrying smoking, drinking, and all those other supposedly nasty things, I said to myself, "Stuffy old codger—he don't know what he's missing." Well, let me tell you this: I was the one missing out. With the help of my girlfriend and Uncle Wayne, I've been smoke-free for 5 months now, and plan to remain so. As you're probably aware—and you can let your readers know this—quitting the habit is not a cold-turkey undertaking! It's something one lives with day by day. Even today, not waking up with a craving for Philip Morris is a small victory, and you should see me when I walk past that ever-present rack on the way to the gas station's counter! As that wise man, Mel Brooks, says: "Oy!" If you ever need a session drummer for your recording studio, let me know. *Six years after the Wright Brothers flew, Edison was still insisting that man would never fly . . . Wayne.*

Scott Robbins KY2PI I read with interest your pontificating on the state of the ham radio business in the July issue of *73*. As an employee of a major retailer of ham radio equipment for the last year, I'd like to share a few observations.

First, you're right about the no-code licensees not buying all-band HF rigs and not upgrading their licenses. There are a couple of good reasons for this. The average person who gets a no-code license has just wanted to get a step up from CB radio. They've tired of the yelling and all the other nonsense you hear all day on 27 MHz, and see 2 meters as their salvation from this mess. There are also a significant minority of no-coders who are getting involved in the hobby because they see the autopatch systems as a substitute for cellular telephones and are not in the slightest interested in anything else to do with ham radio.

Secondly, as a ham of 13 years, I am absolutely appalled at the lack of technical knowledge the new ham community has. Very, very basic stuff, like how much current your new mobile rig will draw or why an 11" tall antenna has no gain is beyond the grasp of many new licensees and, what's more, they really don't care! All that technical "crap" is in the way of doing what they want, which is to get their mobile rig set up (with an unobtrusive antenna, of course) and hit the repeaters. The ripple effect of this has been that many of these people *do* upgrade in order to get on HF SSB and then are absolutely clueless about basics like proper grounding, antenna construction, even how to solder on a PL-259! The 90s are the age of the solderless ham, believe me.

The next comment I'd like to make is about the profit margin involved in selling ham radio gear. Twenty-five percent?! You can't be serious if you think we're making 25% profit selling ham gear; 5% to 10% is the standard these days, and often it's even lower. Why? The yen/dollar issue is certainly part of it, because prices are so high that it's putting good gear out of reach, but really it's because the competition is incredible. We keep track of our competition's pricing, we know what the rigs cost, and we're all taking a bath for the most part. I'm not cooing for sympathy with that statement—it's fact. You know as well as I do that even having a five dollar better price on the competition on a $2,000 HF rig can mean you get the sale, and that sale will be made by whoever has the lowest price, period. Saw a great price on a rig in the ads today? Probably a slow moving item that a dealer is dumping at or near cost to get his capital invested somewhere else. In the meantime, we're not able to match that price and can't move inventory. Amateur radio sales is a highly competitive business and I challenge your assertion that there are "so few" ham dealers now. There are too many, selling gear at such a low profit margin that it makes it really tough to keep our heads above water. Also, (to the public) don't you think for a minute that the salesman answering the phone is making a killing off of you. For the amount of information you need to have in your head to be able to competently sell items from many, many companies, not to mention the technical aspect, we don't take home as much as that from a comparable job, at least in my city.

In my opinion, the only thing driving sales in the ham business right now is the no-code Tech license. Without it a lot of us would be looking for work right now rather than dogging the 800 lives. The only way the ham business is going to survive in the cut-throat 90s is for these new hams to be instilled with technical knowledge, upgraded licenses, and cheaper gear. The prognosis: We'll see.

Terry Weinhold N3EUL Permit me to voice my opinions on "Never Say Die," July 95 issue, concerning codeless Techs, and an "artificial and new irrelevant code barrier. . . . " I am currently a General class operator, licensed over 11 years, with my main interests being HF, CW, and phone as well as 2m FM, I am a very active amateur, and my age is 40. Trying to look at codeless licenses objectively, I believe it was a mistake to form this license class because, after being active for years, I have seen a degeneration in, shall I say, the intellect of 2m operators. Without prior knowledge of their license class, I can reliably pick out who has the no-code Tech license due to their on-the-air speech and manners. I'm sure you have heard this before, but 2m sounds just like the CB band does, and when we had a code requirement, I noted a higher-quality operator. "The ham population is declining, so we had to form a codeless license to attract more people." Really? Sir, I will say, and perhaps I speak for the majority, if the code requirement for HF is eliminated in this country, I fear the bands will be one gigantic CB band. At this time, all the good operators will say its time to sell the gear and get out. Then they *will* have a declining amateur population!

I would be pleased to see the amateur population grow, especially among young people, but *please*, lets not sacrifice quality for quantity.

By the way, I did enjoy your portion on weight control, and my congratulations to your wife and yourself. I have recently lost 10 pounds, and your article was an inspiration to me.

Pete Theiller KI4KN I always enjoy reading your editorials and, based on your recommendations, have been reading about the influences of electric and magnetic fields on life processes.

Years ago a friend of mine in Europe used a device that passed a minute electric current (in the order of 50 to 200µA) through the body. This was simply a battery, meter, pot, and electrodes. In fact, I think it was a commercially available device. This friend suffered from fainting spells and other disorders. He swore that this device helped him by stimulating his blood circulation and that it could also speed up healing. I had not taken any of this too seriously until I began reading *Cross Currents* by Robert O. Becker, M.D. and decided that there may be something to it. From what I have read the current is probably still way too much at 50 µA.

Thanks for your help and keep giving us hell in your editorials; most of us are just too complacent. 73

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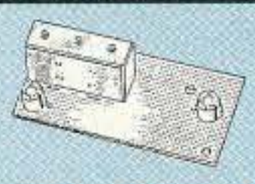

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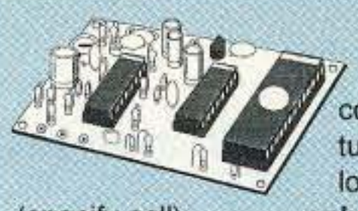
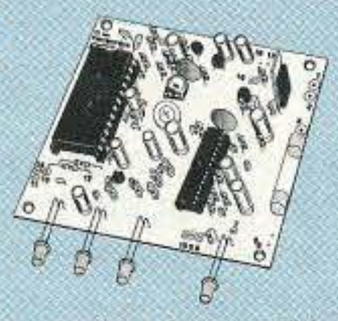


NEW **CWID-2.** Eprom-controlled, miniature, easy to build, low power CMOS, (specify call) ..... **only $54 kit, $79 w/t**



COR-6. COR & Real Voice ID on one board. Digital ic records up to 20 seconds of your voice. Can record multiple id messages. Tail and time-out timers, courtesy beep, solid-state relay to key transmitter. ..... **kit $99, w&t $149**

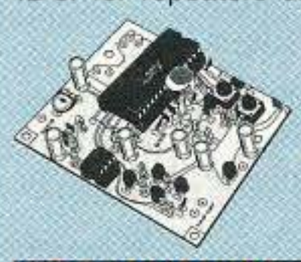
COR-3. COR, timers, court.beep .... **kit $49**

CWID. Diode programmable ..... **kit $59**

COR-4. Complete COR and CWID all on one board. CMOS logic for low power consumption. EPROM programmed; (specify call) ..... **kit $99, w&t $149**

ACCESSORIES

DVR-1 DIGITAL VOICE RECORDER. Records up to 20 sec. of your voice with built-in mic. or external mic. Terrific as voice ID'er for repeaters or fox hunt xmtr, contest caller, radio notepad, etc. Extensive manual tells how to use multiple messages adapt to many applications. ..... **kit $59, w&t $99**



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

TD-3 CTCSS (SUBAUDIBLE TONE) DECODER/ ENCODER ..... **kit $29, w/t $59**

AUTOPATCHES

AP-3 REPEATER AUTOPATCH. Reverse patch and phone line remote control. ..... **kit $89, wired & tested $139**

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

TD-2 DTMF DECODER/CONTROLLER. 16 digits, jumper-programmable, toll-call restrictor. Can turn 5 functions on/off. ..... **kit $79, wired & tested $129**

DATA MODEMS

MO-202 FSK DATA MODULATOR & DE-202 DEMODULATOR. Run up to 1200 baud digital signals through any fm transmitter & receiver ..... **kits $49, w&t $79**

9600 BAUD DIGITAL RF LINKS. Call for info on low-cost packet networking system: MO-96 Modem and special versions of our 144, 220, or 450 MHz fm xmtrs and rcvrs. Use directly with most TNC's. Fast, diode-switched PA's output 15 or 50W.

WWV RECEIVER

Get time and freq checks without buying expensive hf rcvr. Very sensitive and selective xtal controlled superhet, dedicated to listening to WWV on 10.000 MHz. ... **only $59 kit, $99 w/t**

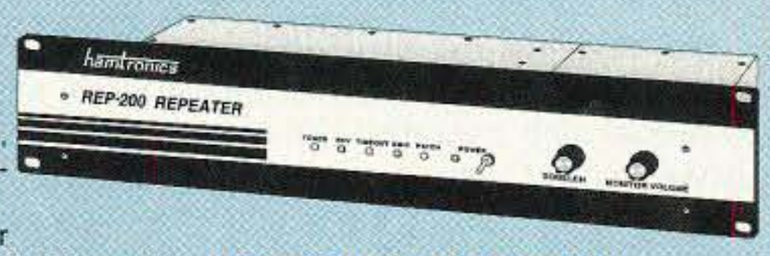
NEW

You get more features for your dollar with our

REP-200 REPEATER

A fully microprocessor-controlled repeater with autopatch and many versatile dtmf control features at less than you might pay for a bare-bones repeater or controller alone!

Kit still only $1095
w&t still only $1295
50 & 900 MHz bands slightly higher



- Available for the 50-54, 143-174, 213-233, 420-475, 902-928 MHz bands.
- **FCC type accepted** for commercial service in150 & 450 bands. *(Request catalog for details.)*

REP-200T Voice Message Repeater. As above, except includes Digital Voice Recorder. Allows message up to 20 sec. to be **remotely recorded off the air.** Play back at user request by DTMF command, or as a periodical voice id, or both. **Great for making club announcements!** ..... **adds only $100!**

REP-200C Economy Repeater. Uses COR-6 Controller (no DTMF control or autopatch). Features **real-voice ID.** ..... **Kit only $795, w&t $1195**

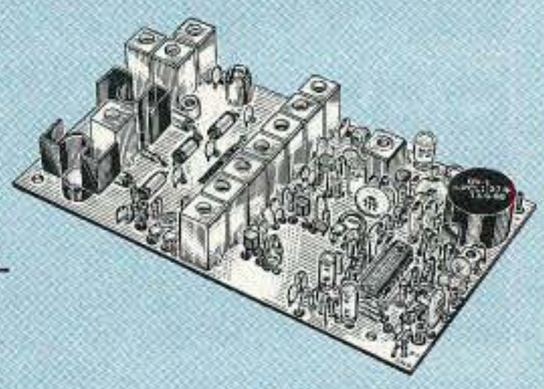
REP-200N Repeater. Want to use your own controller? No problem! We'll make you a repeater with rf modules only. ..... **Kit only $695, w&t $995**

XMTRS & RCVRS FOR REPEATERS, AUDIO & DIGITAL LINKS, TELEMETRY, ETC.

Also available in rf-tight enclosures, and with data modems.

FM EXCITERS: 2W continuous duty.
FCC type accepted for com'l bands.
- **TA51**: 50-54, 143-174, or 213-233MHz.
- **TA451**: 420-475 MHz . *New low price!*

Either model: ..... **kit $99, w/t $169.**
- **TA901**: 902-928 MHz, (0.5W out); *New low price!* ..... **w/t $199.**



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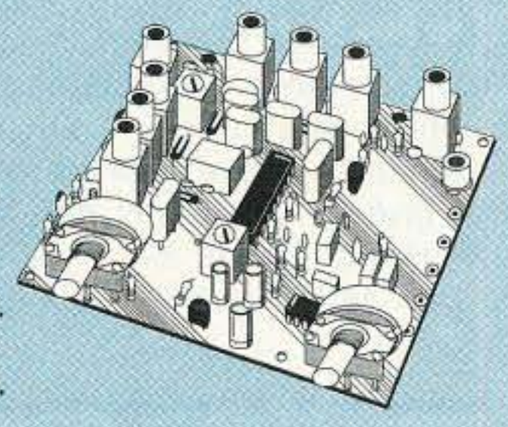
FM RECEIVERS:

NEW **R100 FM RECEIVERS** for 46-54, 72-76, 140-175, or 216-225 MHz. **Very sensitive** – 0.15uV, **exceptional selectivity** – both crystal & ceramic if filters for >100dB at ±12kHz (best available anywhere), **flutter-proof** squelch. ..... *New low price!* **kit $129, w/t $189.**



- **R451 FM RCVR,** for 420-475 MHz. Similar to above. *New low price!* **kit $129, w/t $189.**
- **R901 FM RCVR,** for 902-928MHz. Triple-conversion. *New low price* .... **$159, w/t $219.**

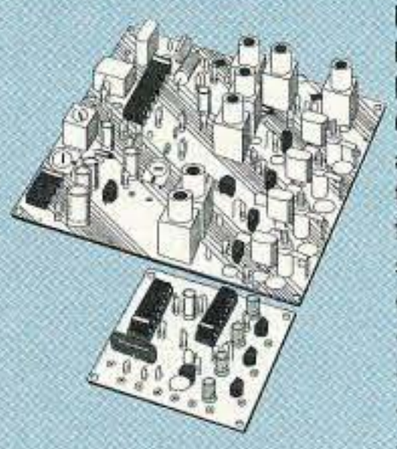
NEW **R150 MONITOR RCVR** for 143-164 or 216-225 MHz. 4-channels. Great for monitoring repeaters, amateur calling frequencies, packet radio, commercial two-way radio, police/fire frequencies, or weather forecasts. **Good starter kit,** easy to assemble and align ..... **kit only $99, w/t $189.**

- **R120 AIRCRAFT RCVR** for 110-136 MHz ..... **kit only $99, w/t $219.**

WEATHER SATELLITE RECEIVER

NEW **Our R138 Is The Most Affordable WeFax Receiver!**

We used our 30+ years of experience in designing high-quality vhf receivers to bring you this enhanced version of our long-popular WeFax Receiver, a very sensitive wideband fm receiver especially for amateur reception of NOAA and Meteosat weather facsimile images on the 137 MHz band. Use with demodulators and software from MultiFax, S.S.C., A&A Eng., and others. Features 0.2µV sensitivity, wideband filters for low distortion, and four crystal controlled channels at a fraction of the cost and complexity of synthesized units. Optional Scan Adapter allows you to automatically search for and record signals as satellites pass overhead while you are away from the shack.



- **R138 Receiver ..... $129 kit, $189 w/t**
- **AS138 Scan Adapter ..... $39 kit, $69 w/t**
- **Channel Crystals ..... $12 ea**
- **ARRL Weather Satellite Handbook $20**

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The Ham Arundel News

We have just experienced two of the highlights of the year. I'd rate our annual picnic an overwhelming success. John N3MNM, and Sylvia Poulhaus did an outstanding job planning and coordinating the event. The weather man cooperated, and the day turned out to be exquisite in all respects. The coordinators had much help with setting up, cooking, and cleaning. The food was great and the company was exceptional. We even had entertainment: a magic show and a clown. Thanks to all who made this the best picnic yet.

This past weekend the weather was not quite as cooperative for our annual Field Day. Lois Turner KA3VVQ and Bob Baltz N3MNT coordinated a very successful event. Lois worked out preliminary details and prepared a great dinner for those present on Saturday. I have always been amazed by the enthusiasm exhibited by Lois. She is definitely Ms. Field Day. Bob, in his usual efficient manner, supervised the setup, operation, and takedown of the event. Bob is surely one of AARC's greatest assets. He never hesitates to help or participate in our club activities.

Thanks again to all those who worked to make this a very successful Field Day weekend. It will be interesting to see our score for the event. Our intent was to enjoy the weekend with our friends, to learn more about radio, and, finally, to make contacts and score points. I think that all of our stations fared quite well. We are indeed fortunate to have members who give up so much of their time to produce events that benefit all of the members. TNX *to Dick McKelvie KE3HQ, and* Ham Arundel News

Recording Pioneer Dies

Marvin Camras, a pioneer of modern magnetic sound recording, died Friday, June 23, at Evanston Hospital. He was 79.

Mr. Camras, who lived in Glencoe for 40 years, was a senior scientific advisor and a professor of electrical engineering at the Illinois Institute of Technology.

Mr. Camras helped develop multitrack tape recording, magnetic sound for motion pictures, and stereophonic sound reproduction. He is credited with discovering high frequency bias. His patents, numbering more than 500, have been licensed to more than 100 manufacturers, including IBM, Sony, and Kodak, and include several for magnetic and electronic storage on videotape and floppy disks.

He was referred to as "the father of modern magnetic recording." In addition to being inducted into the National Inventors Hall of Fame in 1985, Mr. Camras was awarded in 1990 a National Medal of Technology, the nation's highest award for technological achievement, by President George Bush,

He was named "Inventor of the Year" in 1979 by the Chicago Patent Law Association. As a hobby, he crafted violins and violas.

Mr. Camras never officially retired from IIT, where he was a popular instructor, but took a leave of absence two years ago due to failing health.

Born in Chicago, he received his bachelor's degree in 1940 from Armour Institute of Technology, now IIT. He received his master's degree in 1942 from IIT. In 1978 IIT awarded him an honorary doctorate.

"He was one of the really major figures in the development of electronics in the U.S.," said Lew Collens, president of the Illinois Institute of Technology, where Mr. Camras worked and taught for more than 50 years.

"He moved us from wire recording to magnetic recording. All of the video electronics we have today, as well as the audio, all that traces back to what Marvin did."

Mr. Camras began building electrical devices when he was a child. At age 4, he built a flashlight, and at age 7, a transmitter.

At age 22, in 1938, Mr. Camras developed magnetic tape, so his cousin, an aspiring opera singer, could record his singing in the shower. Magnetic recording was more precise than wire recording and paved the way for audio and video tape.

Mike Wolfe N9CHQ said, "Marvin Camras W9CSX attended a number of NSRC meetings after giving a talk about his association with magnetic recording at a meeting in the early 1990s."

"I was Vice President at the time, and Art Appel, who knew Marvin, told me that he would make a good speaker for a club meeting. Art helped arrange for the talk. It was a very highly attended meeting, as it is rare to get such a highly respected inventor to speak at a club meeting. He demonstrated a wire recorder and played us a recording that was made many decades ago."

Art Appel adds that Marv was licensed since the 1920s. Art knew him 53 years and had worked with him 7 years. Marv received the Franklin Medal and an award from the Society of Motion Picture Engineers. He wrote *Handbook of Magnetic Recording,* which is still read today. He designed and built his own house in Glencoe. TNX *to the* NSRC Transmitter

Three Hams Die in LA Shooting

Three Los Angeles-area amateurs are dead following a shooting rampage at a city facility.

A disgruntled radio repairman for the City of Los Angeles on July 19 is charged with killing four men, all supervisors at the city's Piper Tech Center. The three amateurs killed were Marty Wakefield N6BZ, 57, of Venice; Neil Carpenter KA6QIB, 61, of Palmdale; and Anthony Gain W6KFN, 78, of Montebello. A fourth supervisor who was killed in the attack, James Walton, was not a ham.

Gain, an Advanced class licensee, was trustee for a repeater operated by the city. He had chosen to continue to work rather than retire, said a coworker, Rob Hanson AA6BN. Wakefield was an active DXer and until May had been an ARRL volunteer examiner. Carpenter held an Advanced class license. All four shooting victims also held FCC General Radiotelephone licenses.

All three amateur-licensed victims were active in the Los Angeles City Amateur Radio Volunteers, a club aimed at helping city employees become licensed, with an eye toward emergency preparedness functions, Hanson said.

The alleged killer has been charged with four counts of murder. TNX *ARRL*

Repeater Map Book

The new ARRL North American Repeater Atlas is out. The publication is not to be confused with the pocket-sized repeater directory. The Atlas features repeater maps for every US state and Canadian province, plus Mexico, Central America, and the Caribbean. Contact League headquarters for pricing and availability.

Also, the ARRL will produce a handout aimed at new hams, explaining the concept of band planning. The publication will include a listing of ARRL approved plans. TNX *Newsline*

ARRL Honors Hams

The ARRL Board of Directors has honored several hams for their contributions to Amateur Radio. Dick Jansson WD4FAB has been named recipient of the ARRL Technical Merit Award for his work on amateur satellites. Philip A. Downes N1IFP is the ARRL Professional Educator of the Year for 1994, with Charles Ward KJ4RV tabbed as the ARRL Professional Instructor of the Year for 1994. Chris Townsend NU7V won honors as the Herb S. Brier Instructor of the Year. Karl Lambert KB4DCR won the Excellence in Recruiting Award and the Board selected Dr. Ulrich L Rohde KA21WEU to receive the Technical Excellence Award for his series of articles on Key Components of Modern Receiver Design, which appeared in the May, June, July, and December 1994 issues of *QST.* Joseph Phillips K8QOE and Michael Karp AF2L are the co-recipients of the Philip J. McGan Silver Antenna Award for 1994. TNX *Newsline*

A Winner

Long Island, New York, Packet sysop Rick Lapp KC2FD, who turned 46 on July 18, has won his third pentathlon title at the Masters U.S.A. Track and Field Championship in East Lansing, Michigan. The event is for amateur athletes 30 years or older. The pentathlon consists of the long jump, discus, javelin, and 200- and 1500-meter runs. His wife Linda is also a ham with the callsign N2MUP. Rick is an honorary member of the Suffolk Police Amateur Radio Club. Despite putting in long hours as a packet BBS sysop, he somehow finds time to compete in regional, national, and international U.S.A. and AAU-sanctioned track and field events. TNX *Newsline* 73

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TS-950SDX
Digital Signal Processing

The ***NEW KENWOOD TS-950SDX (DX-CLUSIVE)*** is the talk of the new generation HF transceivers. Continuous research, development, engineering, and production of superior products make Kenwood the recognized leader in Amateur Radio. Utilizing the most advanced technology available, our products offer the highest level of quality and reliability. The ***KENWOOD TS-950SDX*** includes ***advanced digital signal processing (DSP)*** while remaining user-oriented. It also includes digital AF VBT, IF notch filter, Dual-Mode Noise Blanker, IF VBT, SSB IF SLOPE tuning, selectable IF filter with Memory, Switchable AGC, All-Mode Squelch, High Stability TCXO, QSK or Semi break-in, built-in keyer, 100 memories, cw pitch control, adjustable scanning speed, 150 watts of power output, built-in speech processor, built-in Computer interface, programmable tone encoder for FM mode, and ***DUAL RECEIVE*** in a single band making it the ultimate for DX. Also available is the ***NEW SM-230 Monitor Scope ($1019.00).*** It also functions as a band scope, tone generator, and monitor for supporting and calibrating radio stations.

TS-850S/AT
Direct digital Synthesis HF Transceiver

The ***Kenwood TS-850S*** features 160-10 amateur band operation with 100kHZ to 30 MHZ General Coverage Receiver. Its superior receiver dynamic range ***(utilizes Direct Digital Synthesizer)*** with the Kenwood **NEW AIP SYSTEM (Advanced Intercept Point)** provides excellent intermodulation performance and suppresses unnecessary radiation. Two selective RF amplifiers, one with large gain (12DB), are used to enhance sensitivity and another with a small gain (ØDB/source floor circuit) which improves intermodulation characteristics. It also features a IF notch filter, IF slope tuning, CW variable pitch control & CW reverse mode. It also has a dual-mode noise blanker, 4 step RF attenuator, Switchable AGC, All-Mode squelch, microprocessorcontrolled automatic antenna tuner (160-10), QSK, 100 memories, and adjustable power. Options include ***DRU-2 Digital Recording Unit, VS-2 voice synthesizer, SO-2 TCXO high stability oscillator, and the DSP-100 (Digital Signal Processor).*** **DSP-100 $599.95**

TS-450S/AT
Compact Mobile

Kenwood's goal is to always offer our customers the most sophisticated achievements in technology. So, when it came time to enhance our best selling TS-440S transceiver we didn't hesitate. The Kenwood TS-450S includes **Advanced Intercept Point (AIP)** which greatly improves the receiver's dynamic range to an incredible 108db. An optional **Digital Signal Processor (DSP-100)** offers even further sound clarity by tailoring the incoming and outgoing audio passband signals. ***Other refinements include convenient split frequency operation, advanced filter functions, optional automatic antenna tuner, and 100 memory channels with flexible scanning selections.*** It provides 100 watts of continuous power and **DDS (Direct Digital Synthesis)** for optimum operation. An optional **TCXO (SO-2)** provides the utmost in stability.

TS-50S
Compact Mobile HF TRANSCEIVER

HF is going places – thanks to Kenwood's new TS-50S, the smallest transceiver of its kind in the world. Providing high-performance communications with go-anywhere convenience, the TS-50S is your passport to freedom. And whether used for mobile operations and DX-peditions, or in a fixed installation, this rig packs a powerful punch. Maximum output is 100W, and there's a full range of advanced features — including 100 memory channels, DDS with innovative "fuzzy" control, and AIP for superior dynamic range IF shift and CW reverse mode help reduce interference, while a noise blanker improves clarity. For user-friendly operation on the move, there's a multi-function microphone and powerful menu system. And the TS-50S is fully equipped for split frequency operation.

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We give TOP TRADE ALLOWANCES!
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The QRP Delight

A full-featured antenna tuner with built-in SWR meter.

by Phil Salas AD5X

How would you like a full-featured antenna tuner with a built-in SWR meter for your QRP station? And I'm talking about an instrument that fits in the palm of your hand (see Photo A), operates even on 160 meters, works up to a power level of about 10 watts, and has a total cost of less than $25! Well, I needed something like this to complete my compact QRP station. The QRP Delight was the result of my efforts. The QRP Delight combines a very effective SWR meter with a wide-range antenna tuner, which is perfect for matching random wires thrown out of hotel windows. Interested? Read on!

The SWR Meter

The SWR meter is a variation of a resistive bridge popularized by the late George Grammer W1DF (circuit shown in *QRP Notebook* by W1FB). This circuit has the advantage of providing high sensitivity at low power inputs. Its disadvantage is that the maximum power that can be applied to the circuit is limited by the power dissipation of the 50-ohm bridge resistors because 75% of the transmit power is absorbed by these resistors under perfectly matched conditions. In the original W1DF circuit, the two 1k resistors shown in Figure 1 are replaced by two 50-ohm resistors; no 100-ohm resistor is used, and you must use a 2P-3T switch for OPERATE, CALIBRATE, and SWR. In the OPERATE position the entire SWR circuit is bypassed, so there is no metering of relative power. In this circuit I use a DPDT switch to add in a 100-ohm resistor only for SWR readings, allowing the circuit to provide a reasonable SWR for your transmitter even during severe tune-up conditions. Additionally, you have minimum insertion loss in the FORWARD position because the 1k bridge resistors permit you to always indicate forward relative power and calibrate the full-scale reading for SWR measurements.

The Tuner

The antenna tuner itself is a standard T-type tuner utilizing a pair of 335 pF miniature transistor radio variable capacitors and a toroidal inductor, tapped as shown in Figure 1. To actually make the taps, I simply wound the toroid with 40 turns of #24 wire, and then scraped the outer surface of the appropriate turn with a hobby knife to clean off the enamel insulation. I then tinned each wire turn, and tacked soldered tap wires to them.

Construction

The actual layout of the parts in the QRP Delight is a function of the sizes of the components you wind up with. Try to find the smallest parts you can—especially for the DPDT switch, the potentiometer, and the meter. From Photo B you can get a pretty good idea of how mine is laid out. I used Radio Shack variable capacitors which had no means of mounting them to the front panel. To mount them, I used a dab of hot glue to hold the capacitors in place while I applied epoxy and waited for it to cure. If you use the Mouser variables, you can purchase mounting screws for them (see the Parts List). I also used hot glue to hold the meter in place. To mount the inductor on the rotary switch, first bend the switch solder tabs out away from the center of the switch. Then you can position the inductor tap wires so that they easily drop into the solder tabs. Finally, use some miniature microphone cable to connect the BNC connectors to the

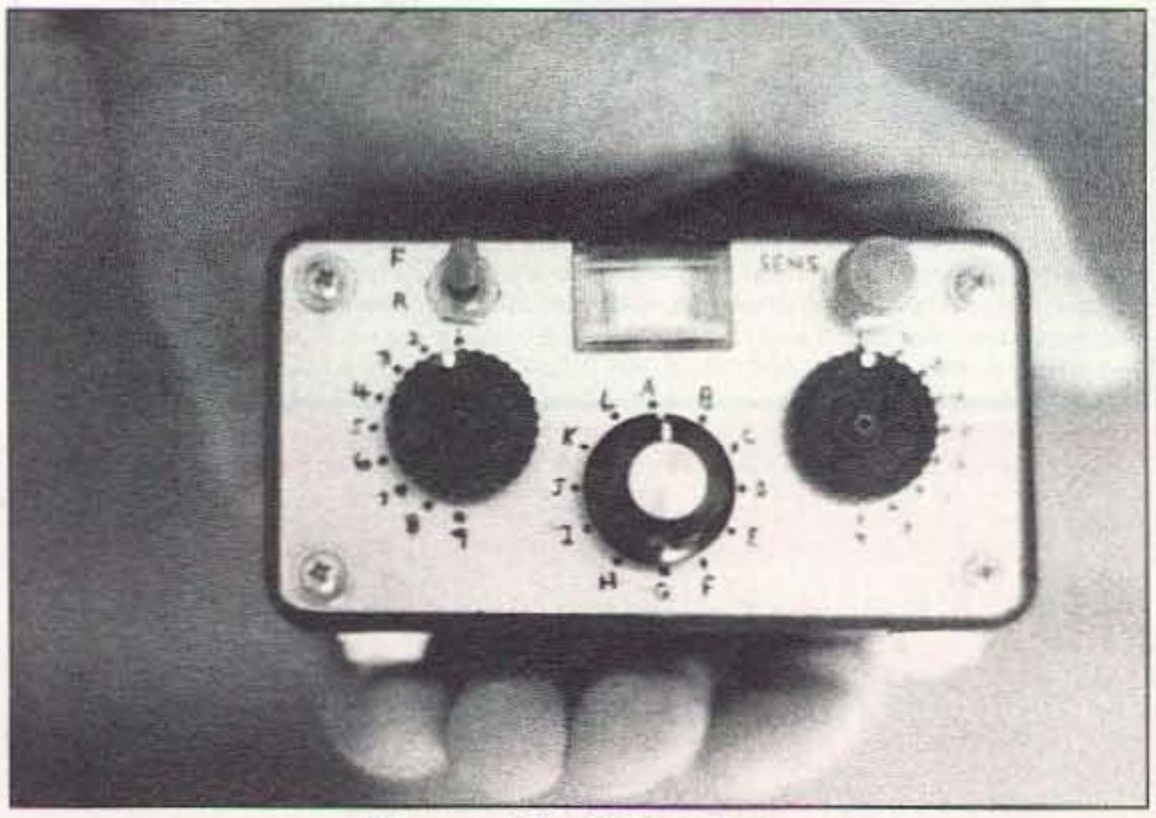

Photo A. The QRP Delight.

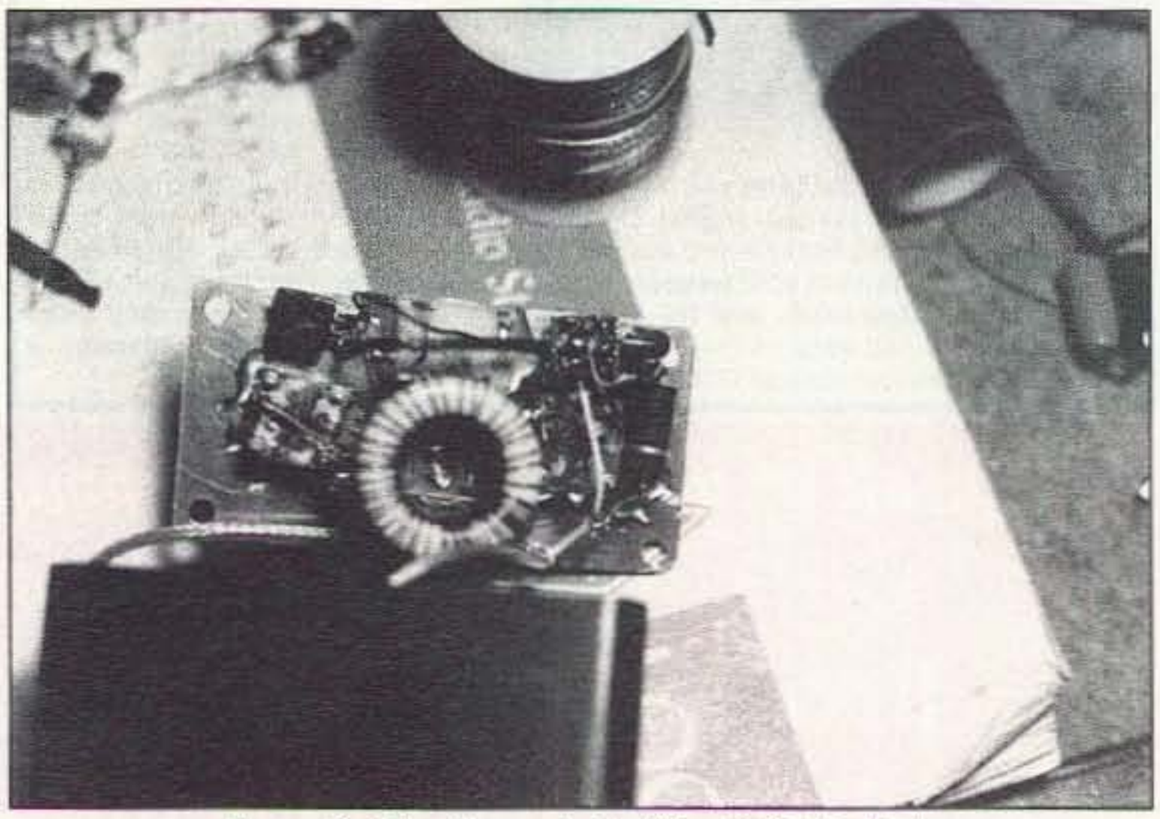

Photo B. The "innards" of the QRP Delight.

MFJ *HF/VHF* SWR Analyzer™ with RF Resistance Meter

Read your antenna SWR from 1.8-170 MHz . . . 10-digit LCD frequency counter . . . RF Resistance Meter™ . . . smooth reduction-drive tuning . . . simple-to-use . . .

MFJ-259 **$229.95** If you work with antennas, MFJ's revolutionary new *SWR Analyzer™* is the best investment you'll ever make! Now you can diagnose a wide range of antenna problems instantly with one easy-to-use instrument.

What the MFJ-259 Does

The MFJ-259 gives you a complete picture of your antenna's performance anywhere between 1.8 and 170 MHz -- you can even check SWR outside the ham bands without violating FCC rules. Set the bandswitch and tune the dial--just like your transceiver. SWR is displayed instantly!

RF Resistance Meter™

Does 2:1 SWR mean 25 ohms or 100 ohms? *The new MFJ-259 tells you at a glance!*

Now you can measure RF resistance up to 500 ohms at minimum SWR -- instantly -- on MFJ's *exclusive* side-by-side RF Resistance and SWR Meters!

Take the guesswork out of building matching networks and baluns for your antennas.

Watch the effects of spacing on radiation resistance as you adjust your antenna.

Here's What You Can Do . . .

Find your antenna's true resonant frequency from the shack.

Tune the antennas on your tower and watch SWR change instantly as you make each adjustment. You'll know exactly what to do by simply watching the display.

Tune critical HF mobile antennas in seconds -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on a single band, or analyze multiband performance over the entire spectrum from1.8 to 170 MHz!

Measure inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/impedance/loss.Test RF chokes, transformers, baluns.

Adjust your tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259 is really *four* test instruments in one: an accurate RF signal generator, a high resolution 170 MHz frequency counter, *RF Resistance Meter™* and an *SWR Analyzer™*.

Free Manual

MFJ comprehensive 18 page instruction manual is packed with useful applications -- all explained in simple language you can understand! **For** free manual write or call MFJ.

Take It Anywhere

The MFJ-259 is fully portable, powered internally by 8 AA batteries or 110 VAC with MFJ-1312B, $12.95. It's in a rugged all metal cabinet that's a compact 4x2½x6¾ inches. Take it to remote sites, up towers, on DX-peditions -- anywhere your antennas are located.

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How Good is the MFJ-259?

MFJ SWR Analyzers™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Professional installers and technicians use them worldwide.

Get More by Paying Less

With the MFJ-259, you get full 1.8 to 170 MHz coverage, simple operation, instantaneous readings, a high accuracy frequency counter and MFJ's exclusive *RF Resistance Meter™*-- all for a low $229.95.

1.8-170 MHz *SWR Analyzers™*

MFJ-249 **$209.95** **MFJ-249** *HF/VHF SWR Analyzer™* has all the features of MFJ-259 but less RF resistance meter. Includes 1.8-170 MHz *continuous* coverage, 10-digit LCD frequency counter and smooth vernier tuning.

MFJ-209 **$109.95** **MFJ-209** *HF/VHF SWR Analyzer™* is same as MFJ-259 without LCD frequency counter and RF resistance meter. Has jack for external frequency counter. MFJ-249/MFJ-209 are 4x2½x6¾ inches and uses 8 AA cells or 110 VAC with MFJ-1312B, $12.95.

Carrying Pouch with Window

MFJ-29B **$24.95** **Tote** your MFJ-259/249/209 *SWR Analyzer™* anywhere with this custom Carrying Pouch.

Made with a special foam-filled fabric, it cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Clear protective frequency display window and cutouts for knobs let you use it without taking it out of pouch. Fully-adjustable webbed fabric carrying strap has snap hooks on both ends. Wear around waist or over shoulder.

Keep your analyzer safe and looking new!

MFJ-29, $19.95, no window or cutouts.

Dip Meter Adapter

MFJ-66 **$19.95** **Plug** a dip meter coupling coil into your *MFJ SWR Analyzer™* and turn it into a sensitive and accurate bandswitched dip meter.

With a dip meter you'll save time and take the guesswork out of winding coils, measuring inductance and capacitance, measuring velocity factor and electrical lengths of coax. Determine resonant frequency of tuned circuits and measure Q of coils. Set of two coils cover 1.8-170 MHz depending on your *MFJ SWR Analyzer™*.

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MFJ-203 **$99.95** **The** MFJ-203 is a sensitive *Bandswitched Dip Meter™* that covers all ham bands from 160-10 Meters. There are no plug-in tuning coils to keep up with or break.

Has detachable coupling coil, dual FET oscillator, op-amp meter amplifier and jack for external frequency counter. 7½x2½x2¼ in.

2 Meter *SWR Analyzer™*

MFJ-208 **$79.95** **MFJ-208** 2 Meter *VHF SWR Analyzer™* finds the SWR of any antenna from 138-156 MHz. Jack for external frequency counter. 7½x2½x2¼ inches.

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Same as MFJ-208 but for commercial VHF. **MFJ-217**, $79.95, covers 30-50 MHz and **MFJ-218**, $79.95, covers 150-170 MHz.

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MFJ-204B **$79.95** **Great** for determining feedpoint resistance of antennas and for designing impedance matching networks. Measure RF resistance up to 500 ohm. Covers all ham bands 160-10 Meters. Built-in resistance bridge, null meter, tunable oscillator-driver, frequency counter jack. 7½x2½x2¼ inches. Use 9 volt battery or 110 VAC with MFJ-1312, $12.95.

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Photo C. The random wire adapter.

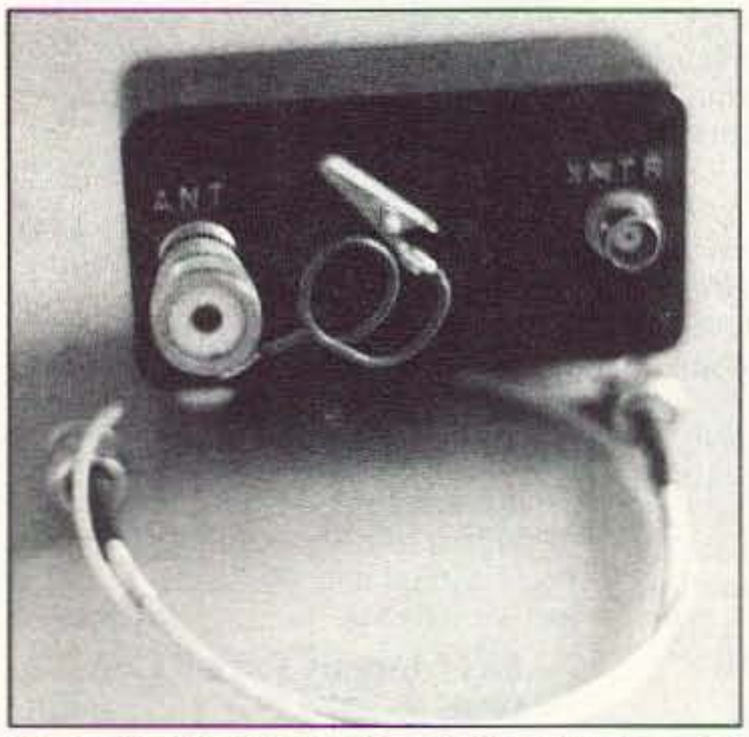

Photo D. The back of the QRP Delight, with the random wire adapter.

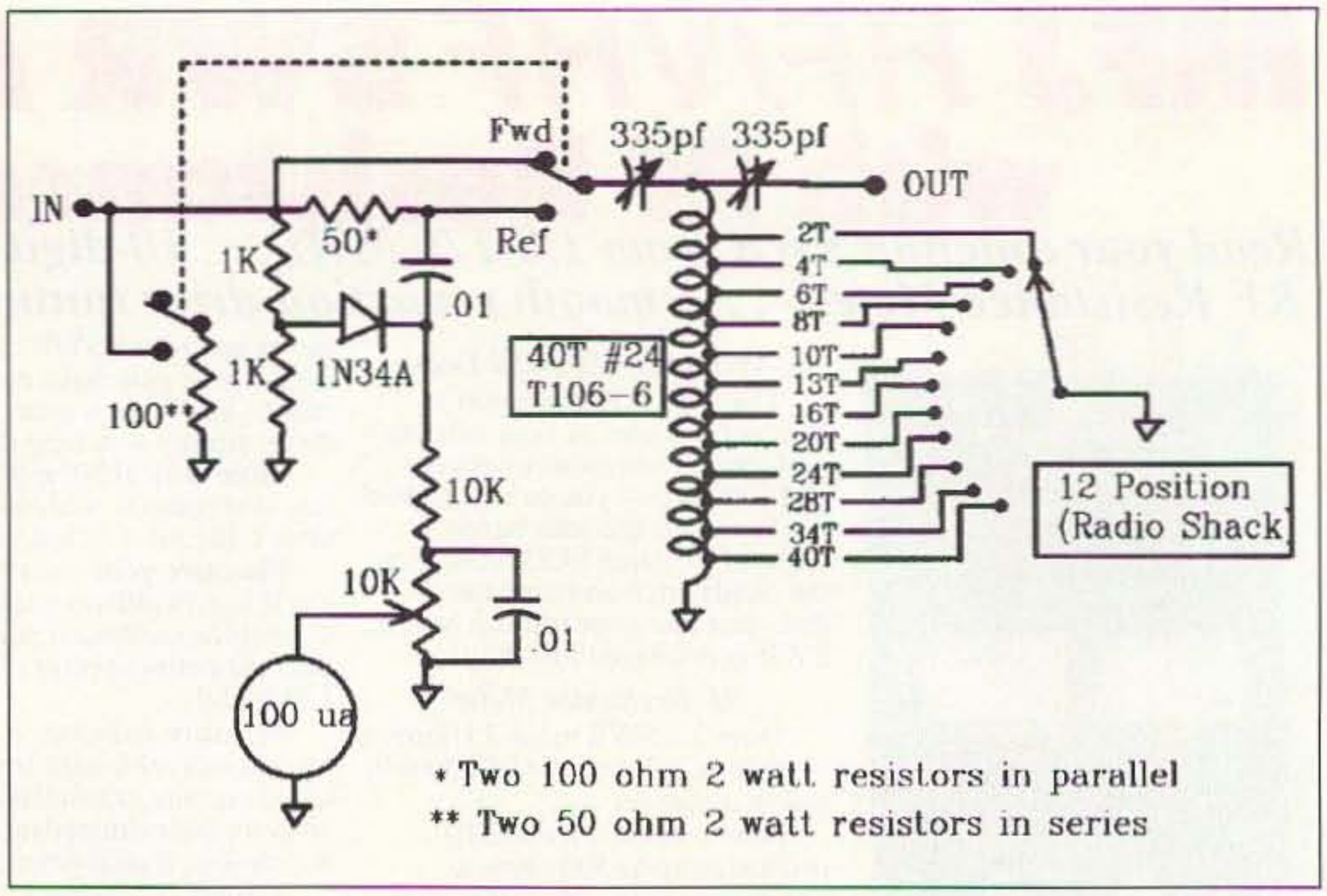

Figure 1. QRP SWR meter and antenna tuner.

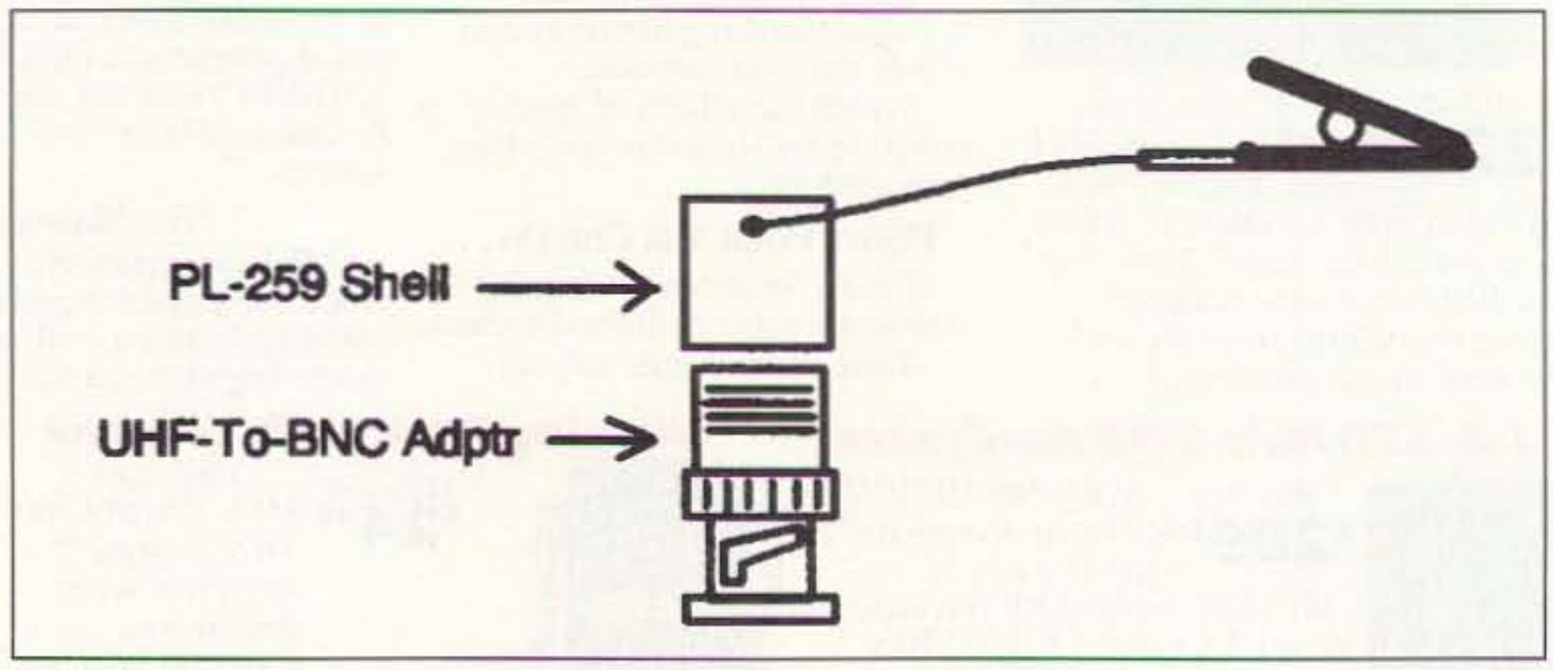

Figure 2. Random wire adapter.

QRP/tuner circuitry. A black permanent marking pen and a steady hand provided the front panel lettering.

Random Wire Adapter

For most applications, I use random wires for an antenna—not a coax-fed antenna. My normal travel antenna is made from a 50-foot roll of 24-guage, two-conductor stranded speaker wire (RS 278-1301). I split the two conductors apart and terminated one end of each wire with a banana plug (RS 274-721) to provide a 100-foot dipole. To connect this dipole or any random wires to the QRP Delight, I built a random wire adapter (see Photo C) which plugs onto the output BNC connector (see

Photo E. Everything fits in a child's lunch box: 12 V 1.2 Ah gel cell, cables, charger, QRP Delight, home-brew keyer, HT-750 CW/SSB rig with a microphone and antennas.

Figure 2). This adapter consists of a SO-239-to-BNC male adapter (Radio Shack 278-120). A standard banana plug connects nicely to the SO-239 center conductor. For the ground, or counterpoise wire connection, I soldered a short wire terminated with an alligator clip to the outside screw-on shell of a PL-259 connector. Then I screwed the shell over the adapter. You can probably solder the wire/alligator clip directly to the adapter; however, I was not sure that I wouldn't melt the center dielectric of the adapter.

Parts List

1	3-15/16" x 2-1/16" x 1-5/8" plastic box	Radio Shack 220-231
2	335 pF variable capacitors	Radio Shack 272-1337 or Mouser
24TR218	w/two 48SS003 mtg screws	
1	One-pole 12-position rotary switch	Radio Shack 275-1385
1	DPDT toggle switch	Radio Shack 275-614
1	T130-6 (yellow core) toroid	Amidon Associates
2 feet	#24 enameled wire	
2	BNC chassis mount jacks	Radio Shack 278-105
1	100 µA miniature meter	Hosfelt Electronics, Marlin P. Jones & Associates, etc.
2	1k-ohm 1/4-watt resistors	
2	51-ohm 2-watt resistors	
2	100-ohm 2-watt resistors	
1	10k resistor	
1	10k miniature potentiometer	
1	1N34A germanium diode	
	Miniature microphone cable (Radio Shack 278-752) or RG-174 coax	

Note: Radio Shack no longer shows the variable capacitors in their catalog but some stores still have them in stock. The Mouser variable capacitor has two 266 pF sections. Just use one section of each variable capacitor for this application.

Conclusion

I operate QRP with two different rigs: a TS-50S at 10 watts output (OK—not really QRP!), and a Tokyo Hy-Power HT-750 at 3 watts output. The HT-750 is the most used since I can put a complete station in a child's plastic lunchbox (donated by my daughter—see Photo E), making it convenient for my business trips.

And how does the QRP Delight work? Great! I seem to be able to match anything I want to with it—even on 160 meters! I normally operate with the dipole described earlier, with each end of the dipole dangling from opposite sides of a hotel window. If my hotel room has a large floor-mounted air conditioner unit in it, I only dangle a single wire from the window and clip the alligator clip on the random wire adapter to the air conditioner. I have never used the QRP Delight above the 10-watt level due to the power resistor dissipation limits and the undoubtably low breakdown voltage rating of the variable capacitors. Build up a QRP Delight for the ultimate in low power size and flexibility.

DDS Dream VFO

Yes, you can build your own synthesizer!

by Steven Weber KD1JV

At last, here it is. The VFO QRPers and home-brewers have been dreaming of—a compact, standalone, Direct Digital Frequency Synthesizer VFO with LCD readout and push-button operation (see Photo A). Finally, your QRP rig with the frequency accuracy, stability, and features of your "BIG RIG." Before you wake up, take a look at these features:

- 0.0 to 25.000,000 MHz operation using Analog Devices' new AD7008 DDS chip
- Thirty character (16 x 2) liquid crystal display, back lighted
- Push-button control
- Frequency steps of 10 Hz, 100 Hz, and 5 kHz
- Direct frequency entry mode . . . to 1 Hertz
- Preprogrammed QRP frequencies for 80, 40, 30, and 20 M
- Ten user memories (stored in EEPROM)
- A/B MEMO memory
- Programmable receiver local oscillator with RIT
- Ten- to 30-WPM paddle keyer (2-wpm increments)
- Decodes and displays your outgoing Morse code
- FSK keying mode possible

Compact (4" X 4" X 1" module)

Photo A. The DDS Dream VFO.

Operation

It will only take a few minutes to learn how to use all the functions of this unit. Most operations involve pushing only one button. Storing or recalling a user memory takes two buttons. DFE (Direct Frequency Entry) takes up to 10 pushes of the buttons.

Programmable Offset Frequency

An offset frequency can be programmed to be used as a receiver local oscillator or for FSK keying. This offset is automatically added (or subtracted if the result is over 25 MHz) to the currently displayed (operating) frequency while in the receive mode (T/R line high). The offset can be any frequency up to 25 MHz. With the T/R line low, the output frequency is that which is displayed on the LCD.

For FSK operation, program the offset to the frequency shift needed. The T/R line is used to shift the output frequency. Since the offset is normally added to the transmit frequency, a high on the T/R input is the high frequency and a low is the low frequency. The FSK keying rate is limited only by the switching speed of the optoisolator. In this mode, the unit can only be used as an exciter.

Built-in Keyer!

The Paddle works automatically. As you start to key, the frequency output of the synthesizer shifts from receive to transmit and then keys your transmitter. The Morse you key in will be decoded and displayed in the first eight places on

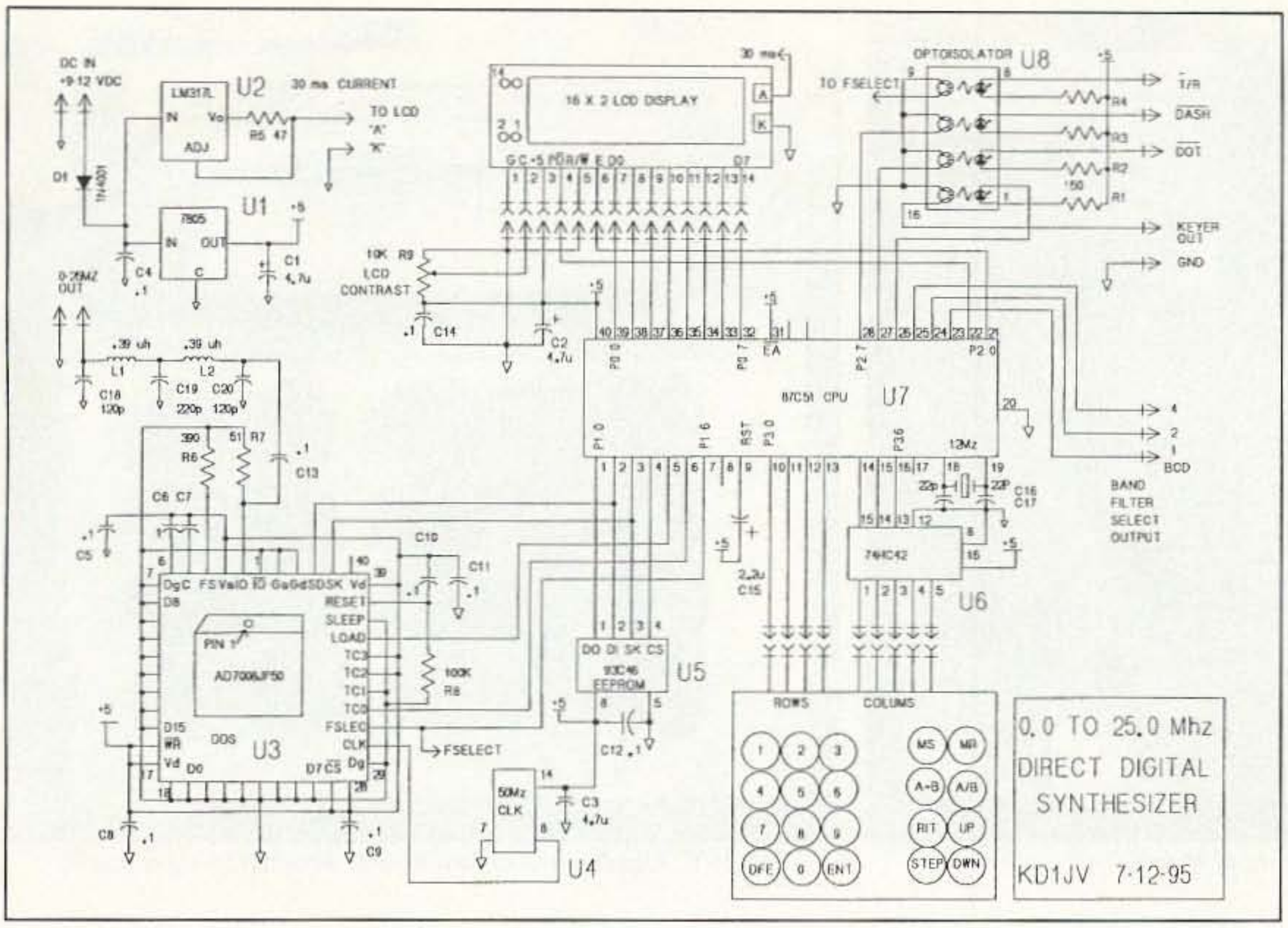

Figure 1. Direct Digital Synthesizer schematic.

the bottom line of the LCD. The VFO frequency will shift back to receive after a word space is detected, and the (Morse) display will clear after three word spaces.

I'll skip giving a detailed description of how all the buttons work. Operation, programming, expanded construction details, and mechanical drawings are supplied along with the programmed CPU chip.

Still dreaming? Lets find out more about this great new DDS chip from Analog Devices.

How It Works

Analog Devices really outdid themselves with this one. Completely integrated, enter 32-bit binary frequency data serially or with a 16-bit parallel data bus and get a sine wave of the desired frequency out of it. The chip includes a 10-bit DAC. It also includes two frequency registers that you can use to shift the output frequency in one clock period. To top it all off, the chip also includes two modulation registers that you can use to modulate directly AM or FM (phase) the output. Although the serial port can be used to load these registers, best performance (modulation rates up to 16.5 MHz) is obtained using the parallel data inputs. Put this chip on a card for your PC, modulate with digitized speech from Sound Blaster, and look out.

Because of the integrated 10-bit DAC, the spectral output of this chip is outstanding. Frequency spurs are typically 60 to 70 dBm down from the fundamental, and all are down at least 50 dBm. The signal output level is set to 1 V p-p. A simple 5-pole low-pass filter helps take the edges off of the stepped sine wave produced by the DAC. Because of the 0.1 µF cap used to couple the chips' output to the filter, the lowest audio frequency out into a 10k load is about 1000 cycles.

The frequency accuracy and stability of the output is solely determined by the DDS clock. The clock I used is CMOS and has a rated .005% frequency tolerance and a 100 ppm/C tempo. Typically, these parts perform much better than their specs imply. Frequency error and drift will be most noticeable at high frequencies. Below 10 MHz, drift and error will be almost nonexistent.

At a 50-MHz clock rate, this chip is fairly power hungry, drawing about 125 mA. It is also very expensive. Expect to pay about $60 for one.

A single-chip DDS deserves to be controlled by a single-chip MPU. I choose the 87C51 as it is readily available and easy to use.

A 93C46 serial EEPROM is used to store the frequency data. This little eight-pin dip can be written to at least 100,000 times and remember data for 40 years.

The "row" switches on the keypad are

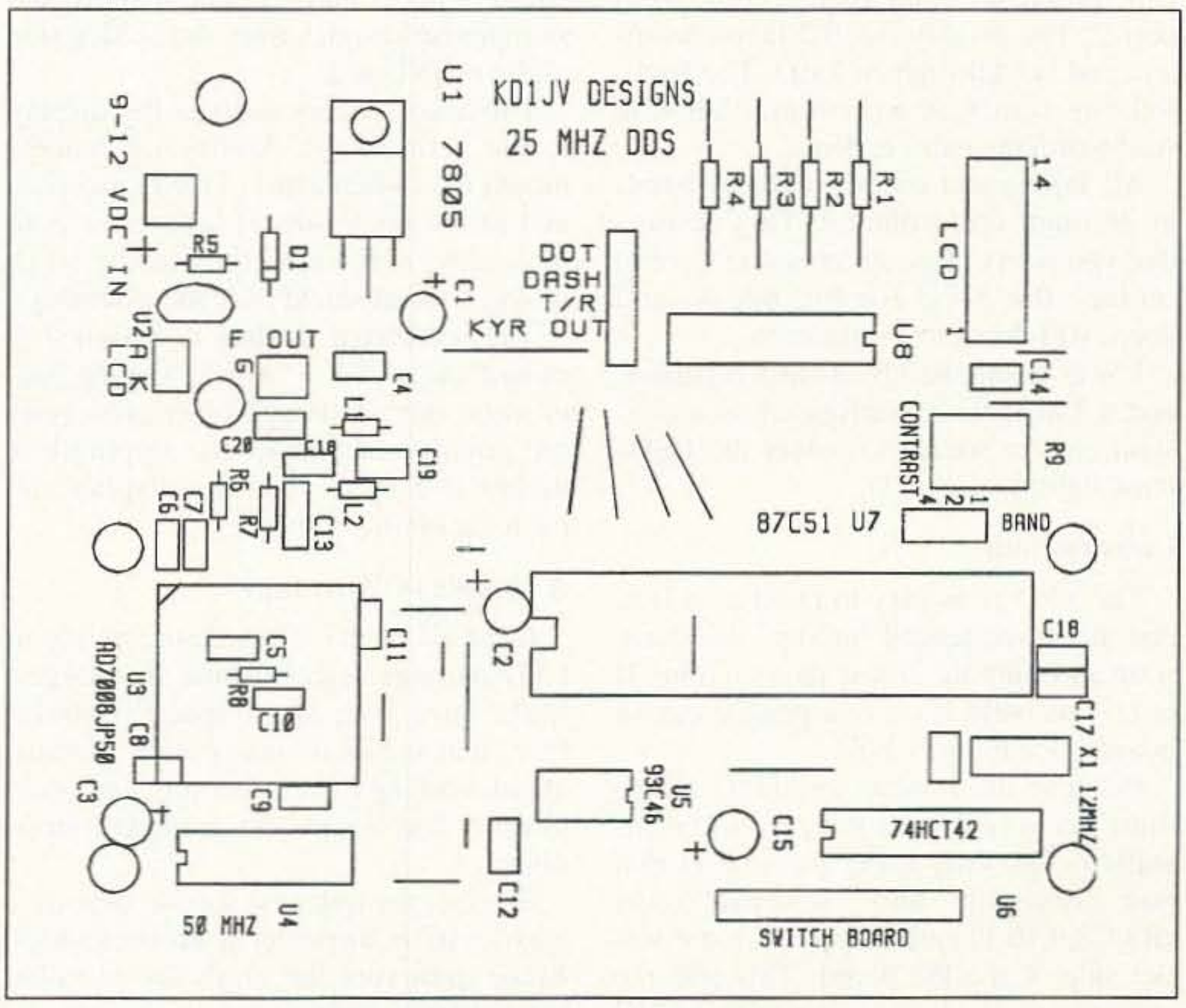

Figure 2. The main board, component screen.

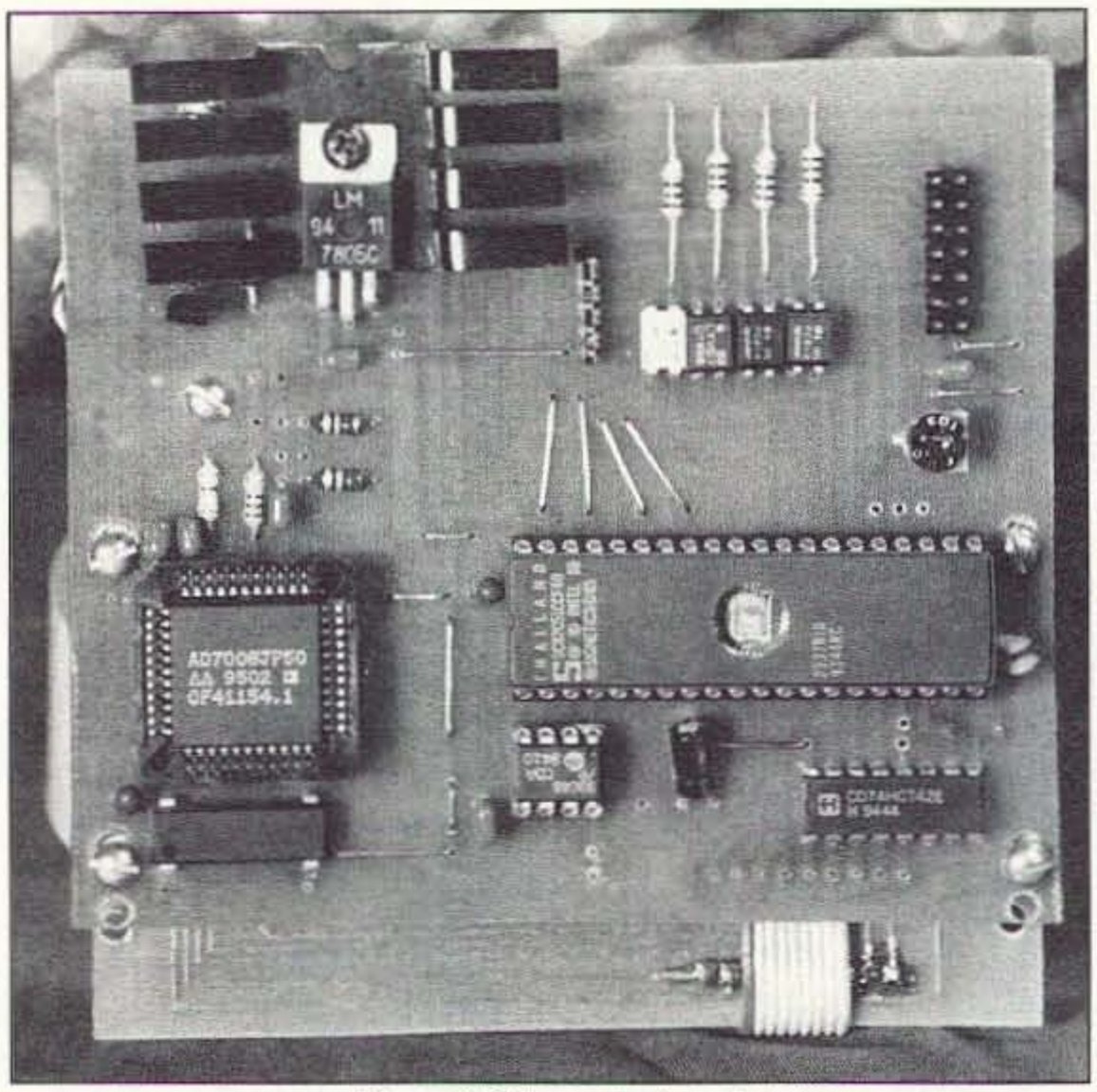

Photo B. The main board.

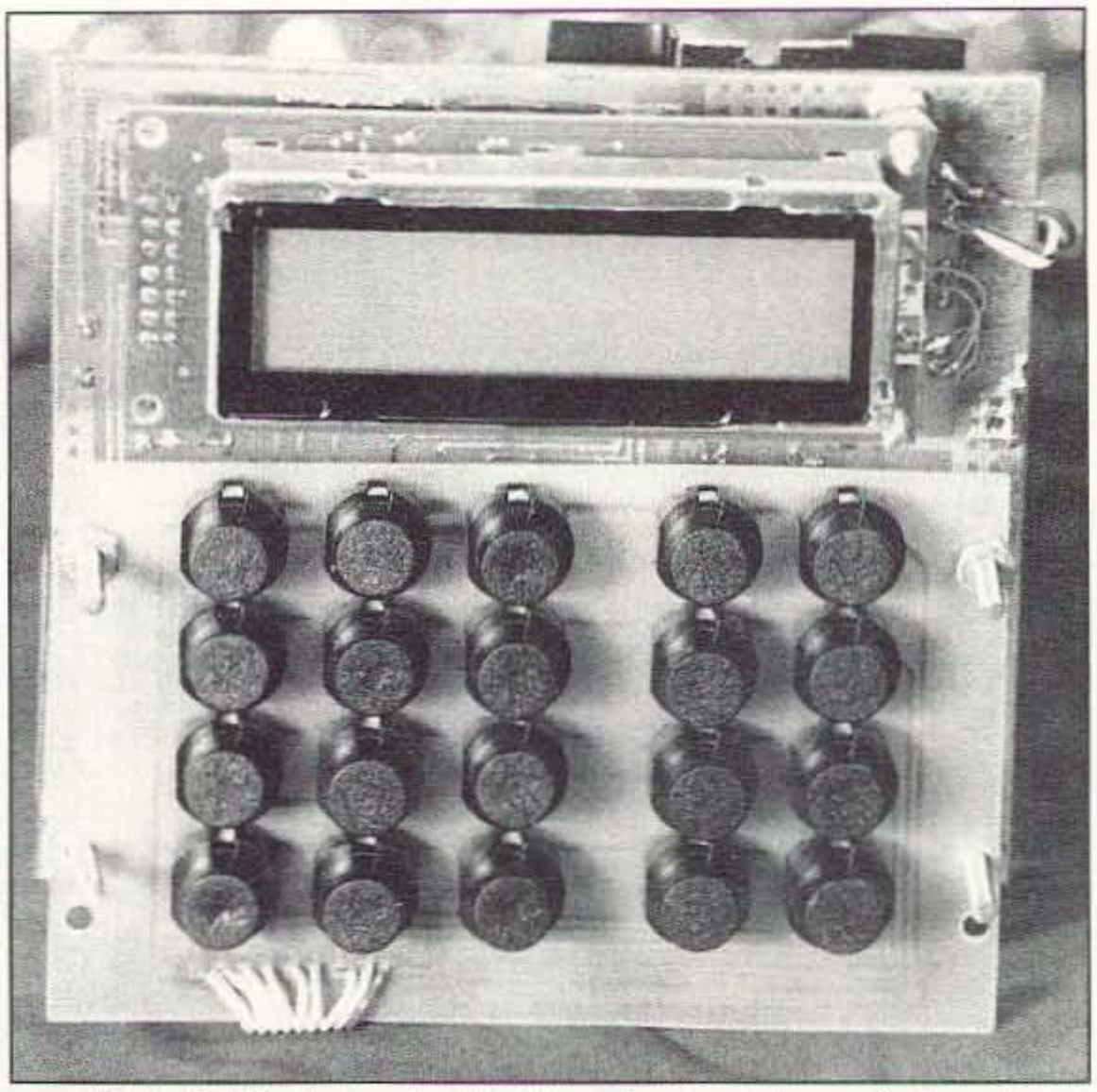

Photo C. Display and switch board, mounted to main board.

connected to port 3 of the MPU. The "columns" are scanned by using a 74HC42 binary-to-decimal decoder. This saves a few I/O lines.

Three outputs from port 2 contain band select information in BCD for automatically selecting a proper xmit or rcv filter on your rig for the current operating frequency.

The LCD data lines are connected to port 0 of the MPU. Enable (write) and P/D (program / data) control come from port 2. The display has 0.2-inch characters and is back-lighted LED. The back-lighting comes at a premium, but it is well worth the extra expense.

All inputs and outputs (except band) go through optoisolators. This ensures that you won't blow an input and have to replace the MPU for big bucks, and keeps RFI down to a minimum.

Power is supplied by a 7805 regulator, and a LM317L is configured as a constant current source to power the LEDs back-lighting the LCD.

Construction

The VFO is as easy to build as it is to operate. Experienced builders will have it up and running in less than an hour. It is best to build it on two printed circuit boards. See Figures 1–5.

Because the boards are single sided, there are a few wire jumpers to be installed. The only thing unusual is that one resistor and several caps (R8,C8,9,10,11) are installed on the solder side of the PC board. This was the only practical place to locate them and provide effective decoupling of the AD7008's supply leads. The AD7008, 87C51 and 93C46 are socketed. SIP pins and sockets are used to connect the LCD to the main board. The SIP pins mount with the long pins sticking out of the bottom (etch side) of the main board. The SIP socket is mounted on the bottom (component) side of the display.

The switchboard connects to the main board with a short length of ribbon cable (see Photos B and C). The display and switchboard mount over the solder side of the main board.

Threaded spacers support the display to the main board. Additional spacers mount the switchboard to the main board and to the enclosure. If a receiver is to be located in the same box as the VFO, mount a metal shield over the assembly.

The completed module is designed to mount into a 7" X 5" X 2.5" sloping panel metal box. Although other enclosures are possible of course, the sloping box makes it easy to read the display and push the tuning buttons.

A Couple of Warnings

Most all of the ICs are susceptible to ESD damage (electrostatic discharge). Make sure your work space is static-free; that is, wear only cotton clothes, avoid working on a nylon rug, and occasionally touch an earth-grounded metal object.

Second, the quickest way to destroy a CMOS IC is to power it up backwards. Make darn sure the chips are installed the right way before applying power. Also, once the DDS chip is pushed into its socket, a special tool is required to remove it (available at Radio Shack, thankfully). So try to get it right the first time!

Power up and Test

Once you are sure all the parts are installed correctly and have inspected for solder shorts or opens (especially around the plcc socket), it's time to "fire 'er up." You will need a 9–12 Volt @ 200 mA supply. The only adjustment is for LCD contrast. After power is applied, simply adjust the control for the best readability of the display. Ground the T/R input. In the transmit mode, the output frequency should be exactly the same as that which is displayed on the LCD. The VFO powers up set to 40 meters. The display should read "A 7.040,000 MHz" on the top line. The keyer speed "20" will be in the lower left corner. You should be able to hear this frequency on your station receiver or read it on a frequency counter. Now check out all the functions to ensure that they all work. Then program an offset frequency. All zeros will negate the effect of the T/R input. Connect the VFO up to your QRP rig and have fun!

If you have any problems getting the unit to work, suspect solder shorts. Inspect the board with a magnifying glass to be sure. Cracks in the copper PC tracks can also cause all kinds of weird problems.

Continued on page 18

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. Please rate each feature or column as "Great," "OK," or "No Way." Mail your responses to: 73 Magazine Feedback, 70 Route 202N, Peterborough, New Hampshire 03458.

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2 Letters
3 QRX
4 The QRP Delight
5 DDS Dream VFO
6 Portable Solar Electric Power Generator
7 Armstrong Updated
8 Link it All!
9 Boring Beacons!
10 Senior Citizens Upgrade
11 QRP Mini-Tuner
12 The Ramsey Electronics SX-20 QRP SSB/CW 20m Transceiver
13 The Maggiore Hi Pro R1 Repeater
14 Carr's Corner
15 Ask Kaboom
16 Hamsats
17 RTTY Loop
18 QRP
19 Homing In
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CIRCLE 56 ON READER SERVICE CARD

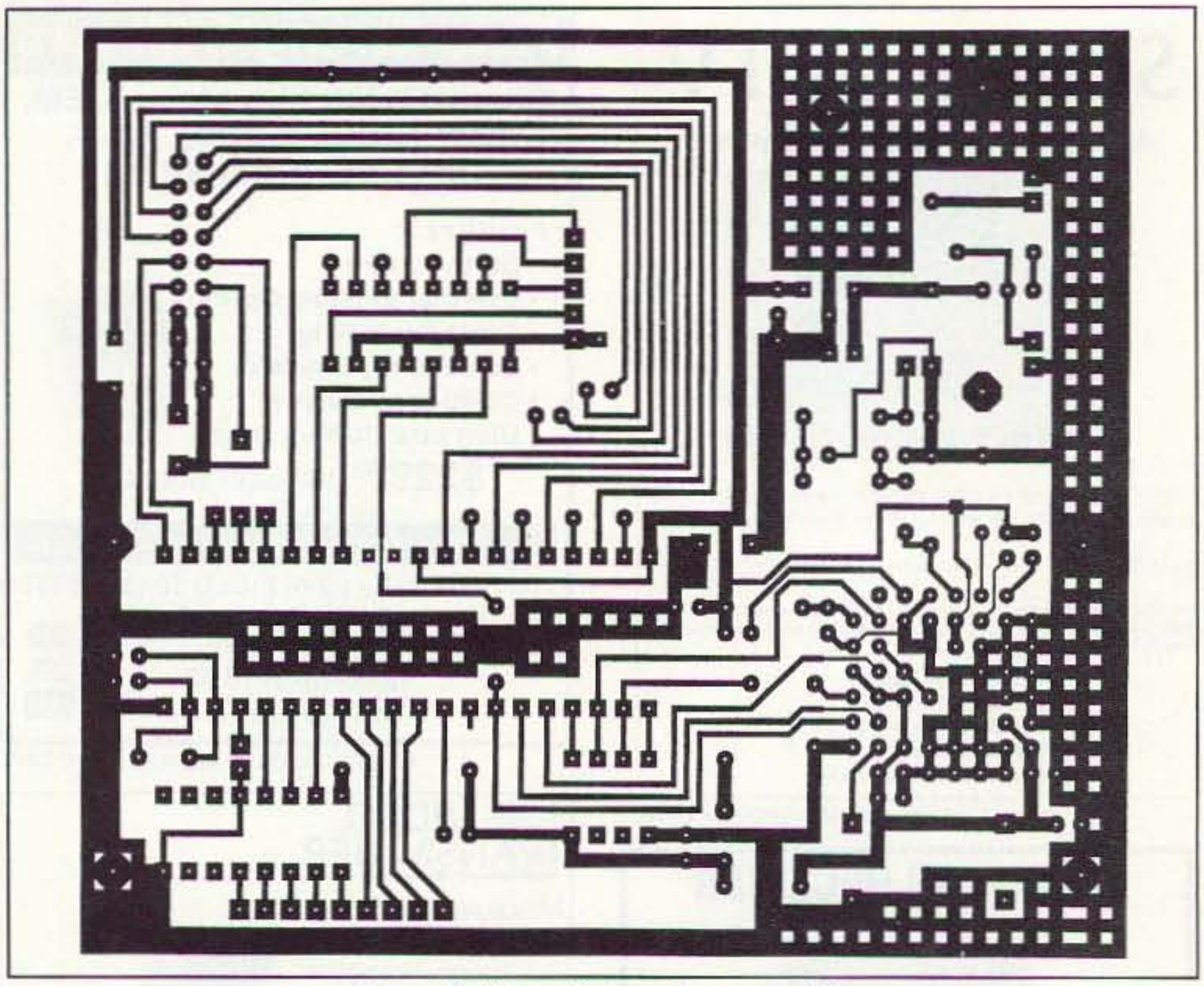

Figure 3. The main board, copper side.

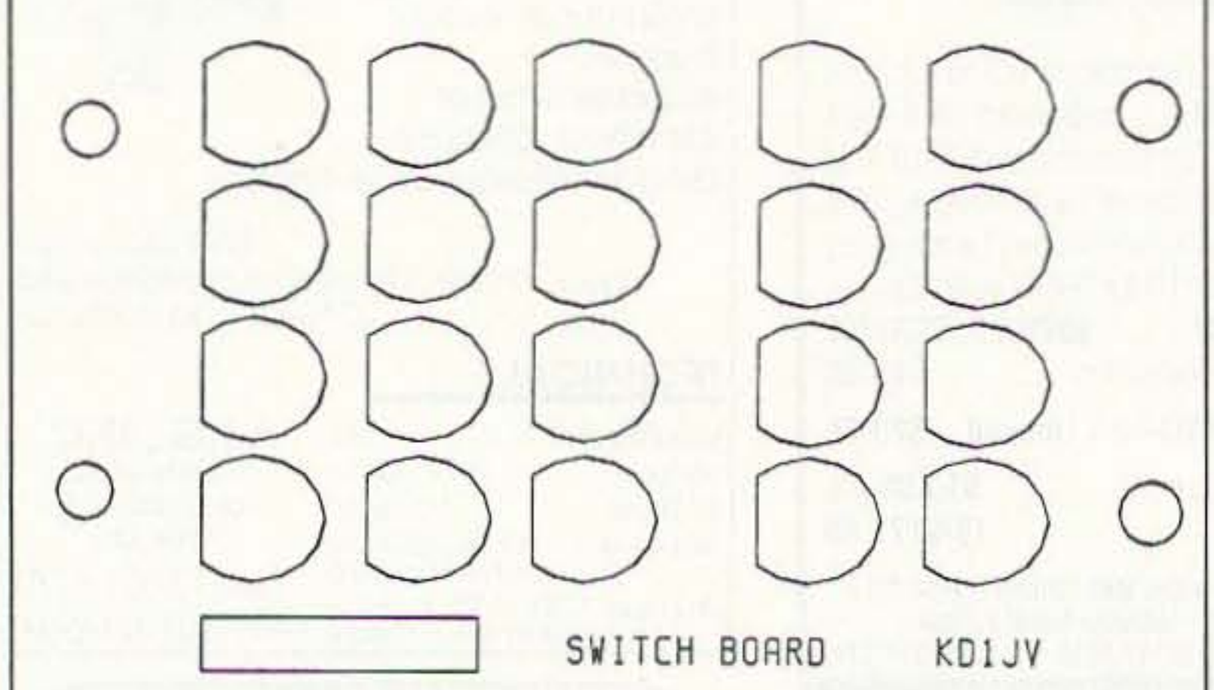

Figure 4. The switchboard, component screen.

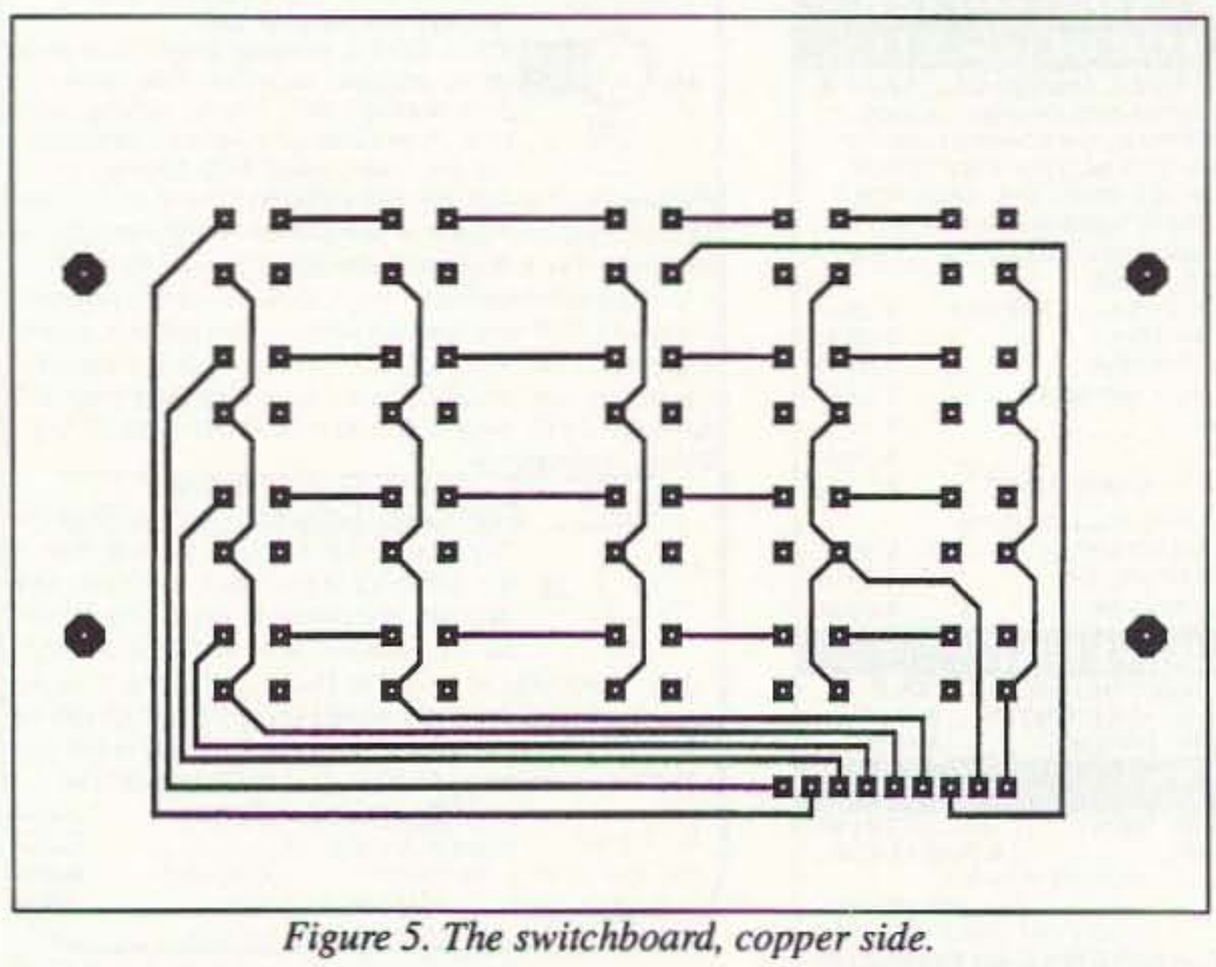

Figure 5. The switchboard, copper side.

DDS Dream VFO

Continued from page 16

Getting the parts.

Except for the DDS chip, all the parts are available from a combination of JDR Micro Devices, Digi-Key, and Mouser. I used Newark Electronics for the AD7008. They will ship COD. I can supply a programmed 87C51, the drilled and etched PC boards, as well as detailed operating and construction instructions for $50.00 pp. For a mere $225.00, get a complete kit with drilled and painted box. [Box 140, Gorham NH 03581]

Conclusion

Having all the controls for my rig on the desk next to my paddle has been an operating dream. Hope I never wake up. By the way, I'm developing a companion four-band, 5-watt transmitter and general coverage receiver (AM and CW). 73

Parts List

U1	7805	5-volt regulator
U2	LM317L	TO-92 adjustable voltage regular
U3	AD7008JP50	CMOS DDS MODULATOR
U4	SG-51KH50.0000	EPSON 50 MHz CMOS clock
U5	93C46	1K serial EEPROM
U6	74HCT42	bcd to decimal decoder
U7	87C51	4K MPU (must be programmed)
U8	551-PS2501-4	Quad Optoisolator (MOUSER)
LCD	509-GMD1620ALY	(MOUSER)
D1	1N4001	1-amp rectifier
C1-3	4.7 µF/10 V	Tantalum cap
C4-14	0.1 µF	ceramic mono cap .1" LS
C15	2.2 µF/25 V	Aluminum electrolytic radial
C16,17	22 pF	ceramic disk
C18,20	120 pF	ceramic disk, NPO
C19	220 pF	ceramic disk, NPO
R1-4	150 ohm	all resistors, 1/4-W, 5%
R5	47 ohm	carbon film
R6	390 ohm	
R7	51 ohm	
R8	100K ohm	
R9	10K	trimmer potentiometer Bourns 3316F series
L1,2	0.39 µH	molded miniature choke
SIP pins		
SIP socket		
Printed circuit boards		
20 Push-button switches		E-SWITCH, 520 series EG1411
X1 12 MHz crystal HC-49/US case		

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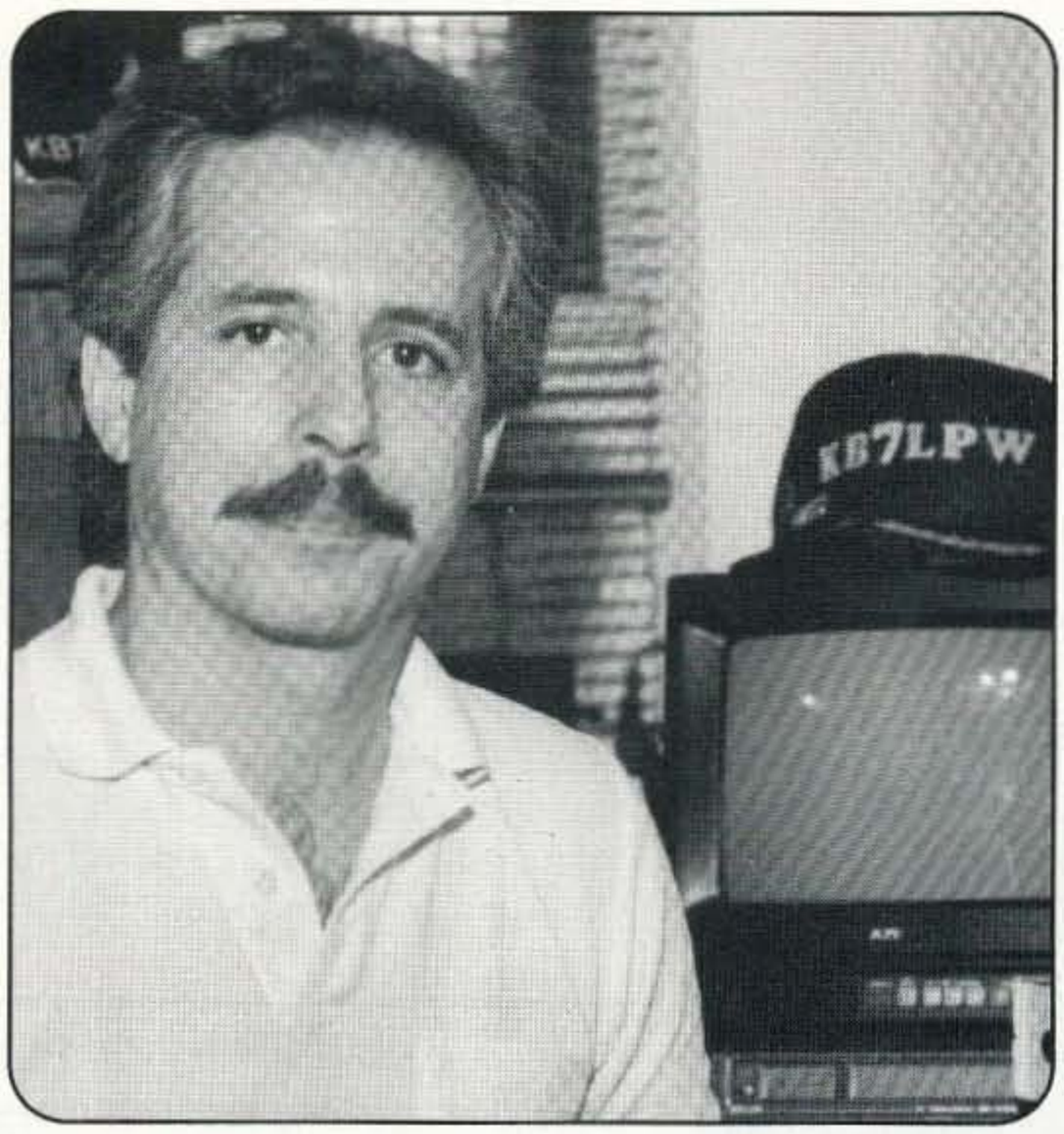
National Talk Radio Show With Len Winkler, KB7LPW



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	WKEI	1450	KEWANEE
IN:	WPDJ	1300	HUNTINGTON
IO:	WKEI	1450	DAVENPORT
IO:	WKEI	1550	WICHITA/WINFIELD
KY:	WMTA	1380	CENTRAL CITY
	WTTL	1310	MADISONVILLE
LA:	KGGM	93.5FM	MONROE
	KEEL	710	SHREVEPORT 50,000 WATTS!!
MA:	WNBH	1340	NEW BEDFORD/PROVIDENCE
	BOSTON CABLE CHANNEL 38B		
MI:	WMKT	1270	TRAVERSE CITY/CADILLAC
	WABJ	1490	ADRIAN/TOLEDO
MO:	WBGZ	1570	ST.LOUIS
	KSLQ	1350	WASHINGTON
	KNWA	1600	SPRINGFIELD
	KSWM	940	AURORA
MS:	WSUH	1420	MEMPHIS, TN./OXFORD, MS
MT:	KDRG	1400	BUTTE/DEER/LODGE
NC:	WSKY	1230	GREENVILLE/SPARTENBURG.
	WEEB	990	FAYETTEEVILLE
	WCRY	1460	RALEIGH
	WHKY	1290	HICKORY
NE:	KICS	1550	LINCOLN/HASTINGS
NM:	KICA	980	CLOVIS
OH:	WIOI	1010	CHARLESTON/HUNTINGTON/NEW BOSTON
OK:	KTMC	1400	MCALESTER
	KADS	1240	OKLAHOMA CITY
OR:	KBNP	1410	PORTLAND
PA:	WJMW	550	SCRANTON/WILKES-BARRE
SC:	WPCC	1410	CLINTON
	WJMX	970	MYRTLE BEACH/FLORENCE
	WDAR	1350	DARLINGTON
TN:	WRWB	740	KNOXVILLE
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Portable Solar Electric Power Generator

by Everett James K4SYU

Have you ever had the urge to get on the air and operate without having to plug the rig into a commercial, mechanical, or battery electrical power source? Well, if you would like to go this route for fun, or for Field Day, then try direct solar electric power. Here in sunny Florida, direct electric solar power works like a charm most of the time. And when it rains, who wants to be outside?

I built this solar power setup about two years ago and have used it many times at Ballard Park in Melbourne, Florida, and in my back yard in Satellite Beach. The solar panel has been used for battery-charging purposes. It has also been used to power my Heathkit HW-8 QRP Transceiver directly without a battery, and has provided electric power for many successful QSOs.

After I have described how this panel is built, maybe you would like to mount your solar panel in a similar fashion. The design goals that I tried to achieve with this project were portability, protection from breakage, and ease of operation. This solar panel was manufactured by Chronar Corp., P.O. Box 177, Princeton, NJ 08542. The specifications state that it is a solar amorphous glass panel with an output of 14.5 volts in full sun at 750 mA (500 mA is guaranteed). The size of the panel is 1' x 3' x 0.125". I purchased it at a local Hamfest. My electrical measurements indicate about 20 volts output with no load. The voltage is about 14.5 to 15 volts with a load of about 650 mA.

". . . if you plan to use it in a portable manner only in fair weather, as I do, then make a wooden frame as I have done."

The panel, when purchased, was like a large pane of glass and just as fragile. Simply getting it home without breaking it was quite a chore. The vendor furnished a set of instructions, a small amount of solder, and two metal pigtails. Soldering the tinned copper pigtails to the panel was quite difficult. There were instructions for soldering, but the process is quite frus-

Photo A. The author with solar panel and HW-8 transceiver. Note the handle and the front cover on the panel.

trating. My suggestion is to use a small electric soldering iron and sort of tin or puddle the solder on each of the edge plated strips at the top and bottom of the rear of the panel on one end. When you have a nice little puddle of solder built up on the plated strip, introduce the pigtail and solder it to the solder puddle. Set the panel in full sunlight and check the continuity by using a 10-watt, 25-ohm load. You should be able to measure approximately 14.5 volts and the resistor will get quite warm. If this checks out okay, then put a little epoxy over each of the solder connections in order to make a stronger mechanical bond. If you plan to leave the panel out in the weather, it is necessary to make a frame that is weather tight, using electrical-grade silicone sealant on the back with a Plexiglas rear cover, like a sandwich. But if you plan to use it in a portable manner only in fair weather, as I do, then make a wooden frame as I have done.

I used oak in constructing the frame, but pine would have been acceptable. The top and bottom rails and the crosspieces are 1.5" x .75". There are crosspieces at the center and at both ends. The area between the crosspieces is covered with ordinary 1/4" plywood on the back. I cut a 3/16" x 3/16" groove along one edge of the top and bottom frames. This groove is what holds the solar panel within the frame. The groove should be large enough to allow the solar panel to be slid in from the end, but should hold it securely. A little movement is okay as this allowed for expansion of the glass as the panel gets quite warm out in the sun. The wooden crosspieces are bolted to the top and bottom rails using 1/4-20 carriage bolts with nuts and washers on the back. The length of the top and bottom rails is 3 feet, which is the same length as the solar panel. All that is needed to keep the panel from sliding out of the groove in the rails is a wooden 1-1/4 by 1/4 wooden slat fastened on each end by wood screws that tie it to the end crosspieces. A carrying handle is attached to the top rail by wood screws. The output terminals, the voltage regulator, and the diode are attached to the right-hand end of the top rail. A heat sink is used with the voltage regulator and the wires to the panel go under the right-hand end slat and attach to the pigtails. A plywood front cover is mounted by two hinges to the bottom rail. A

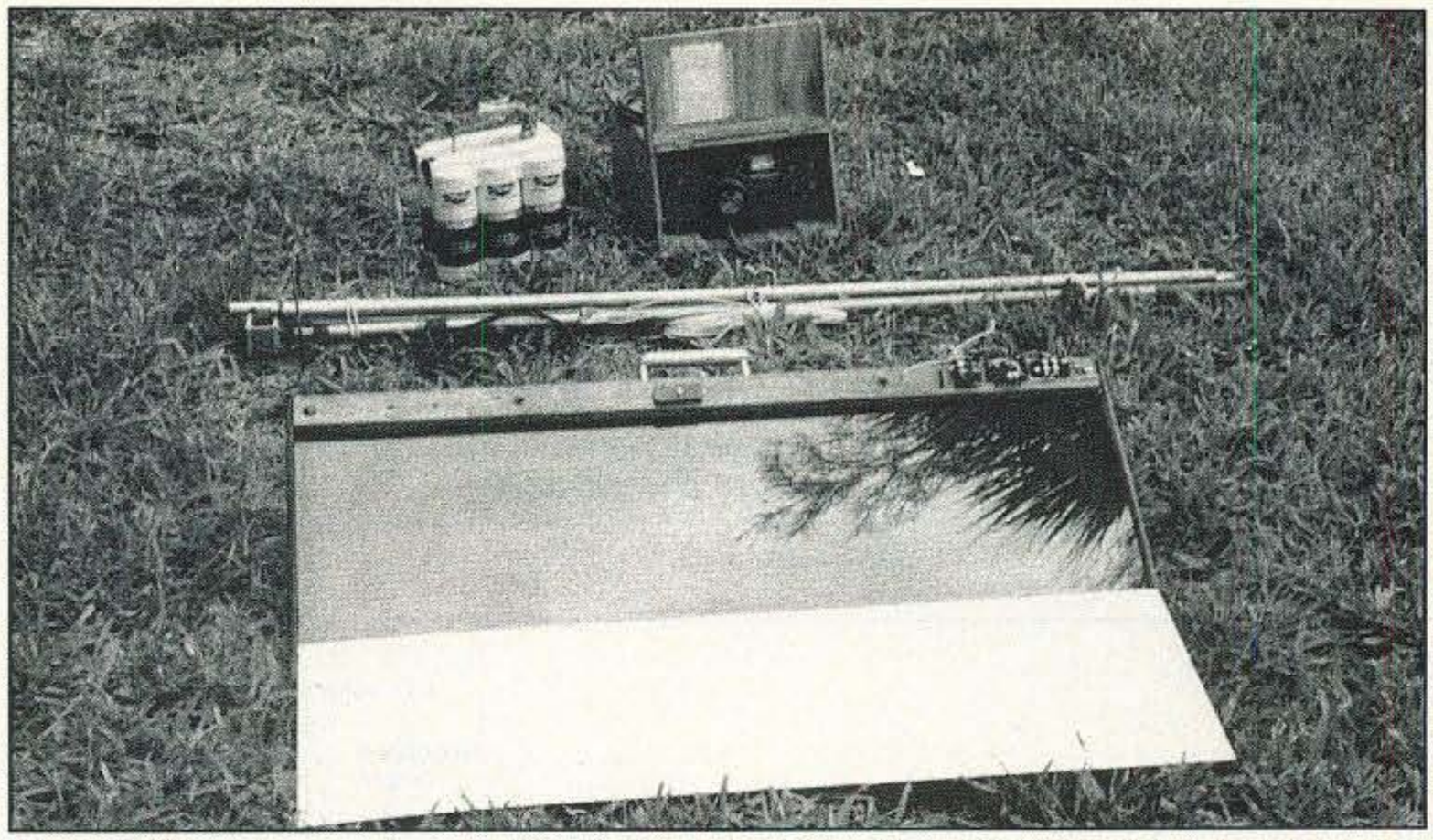

Photo B. The solar panel as used for battery charging. Shown is the panel, a portable quarter-wave vertical antenna, a lead-acid gel cell battery, and a Ten-Tec Argosy transceiver in its portable case.

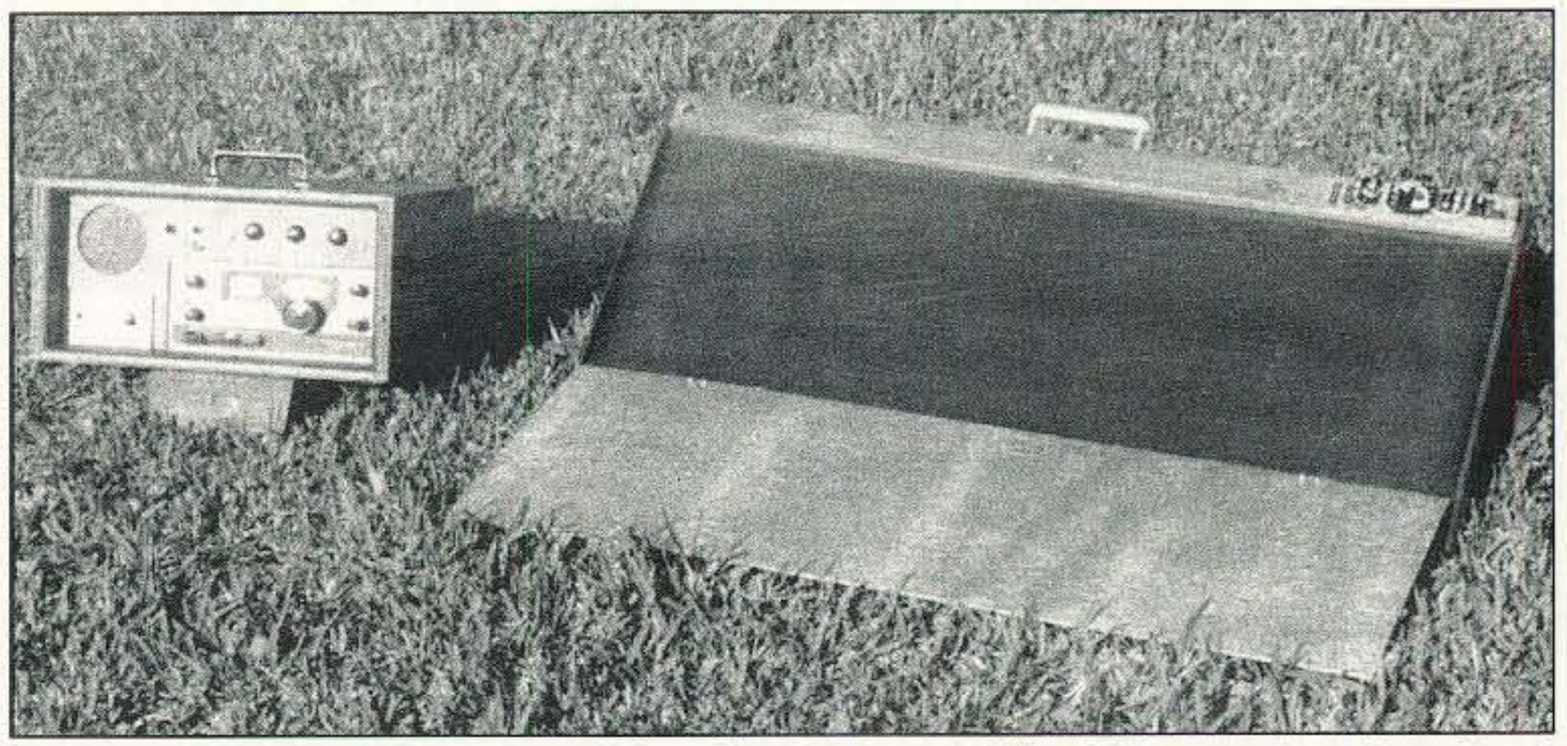

Photo C. The HW-8 transceiver and the solar panel as used for QRP operations. Note the absence of a storage battery.

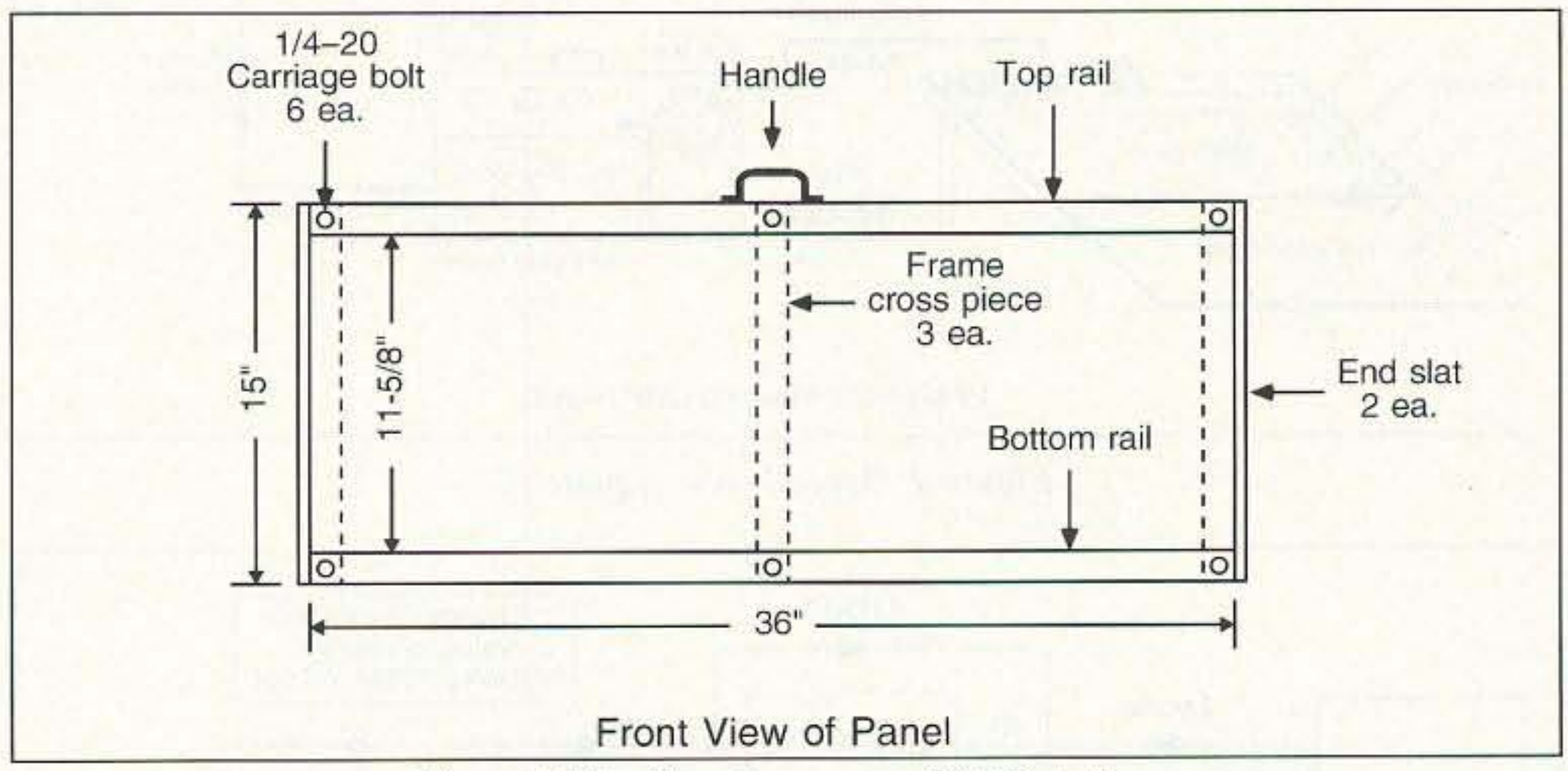

Figure 1. Totally solar-powered QRP station.

Parts List

10 feet of 1-1/2- by 3/4-inch hard wood
7 square feet of 1/4-inch plywood
6 carriage bolts 1/4-20 and 2 inches long
2 machine bolts 1/4-20 and 2 inches long
6 hex nuts, flat washers, and lock washers for carriage bolts.
2 wing nuts with lock washers for machine bolts.
1 handle home-made aluminum
2 "U" shaped brackets from pipe hanger material.
2 aluminum pipe legs 8 to 10 inches long.
2 silicon diodes type 1N4002 or equivalent, 1 amp, 50 to 100 piv.
1 voltage regulator LM 340T-12 or LM 317T as available.
1 heat sink, aluminum, about 9 sq. inches.
1 resistor, 370 ohms, 1/2 watt.
1 resistor, approximately 50 ohms * 1/2 watt.
2 terminal strips with 2 screws each.
1 ceramic capacitor 0.1 uF.

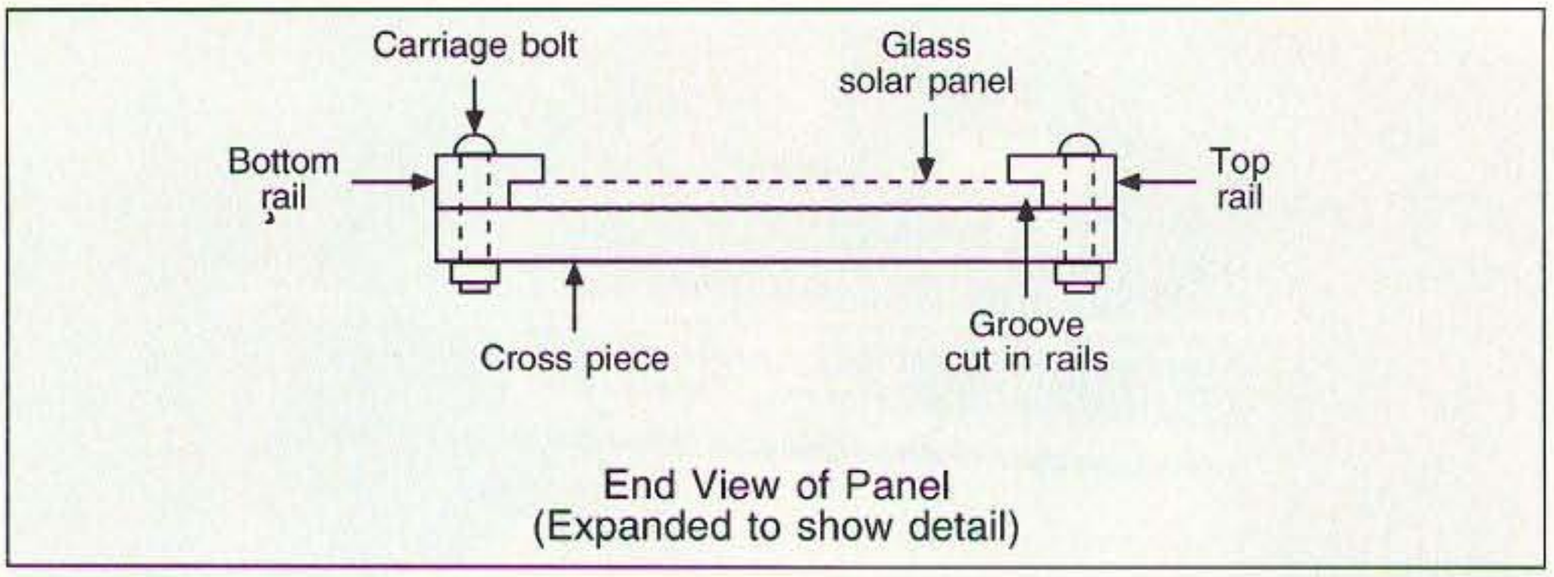

Figure 2. Front view of panel.

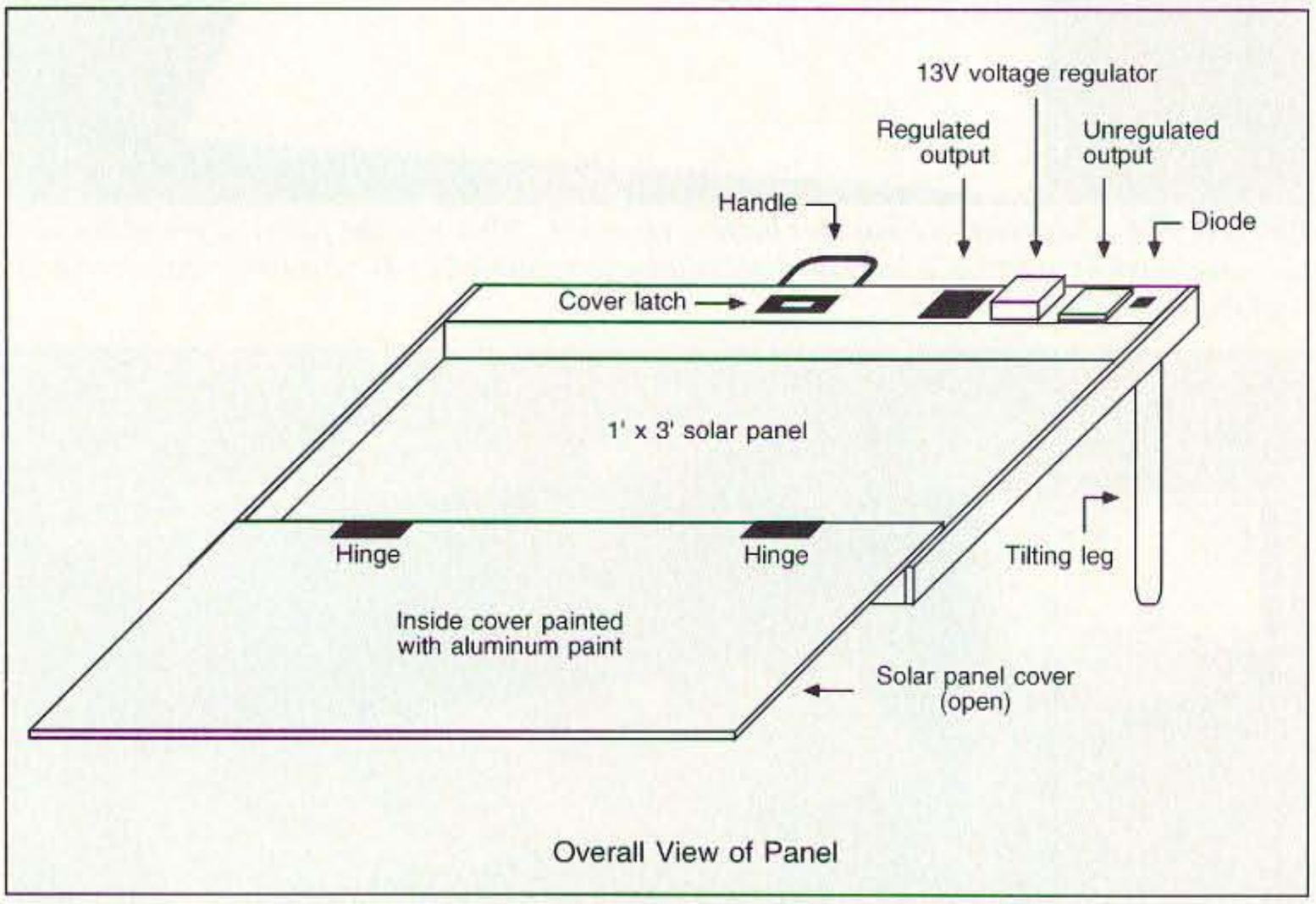

Figure 3. End view of panel (expanded to show detail).

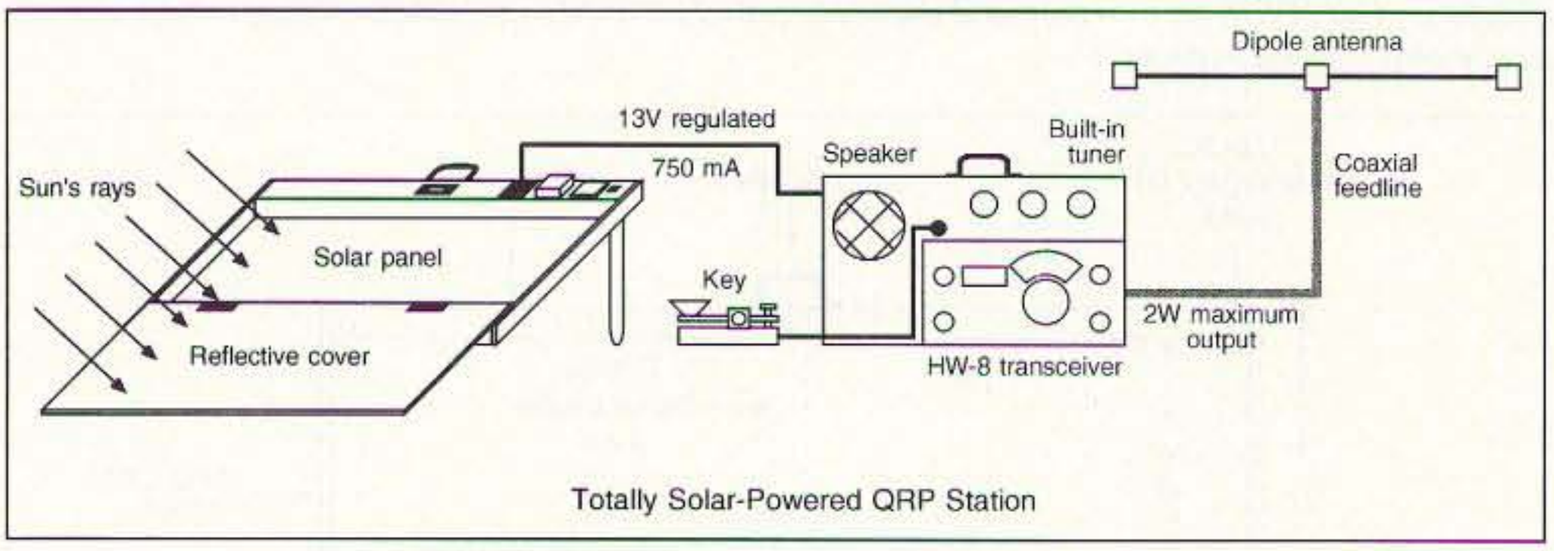

Figure 4. Overall view of panel.

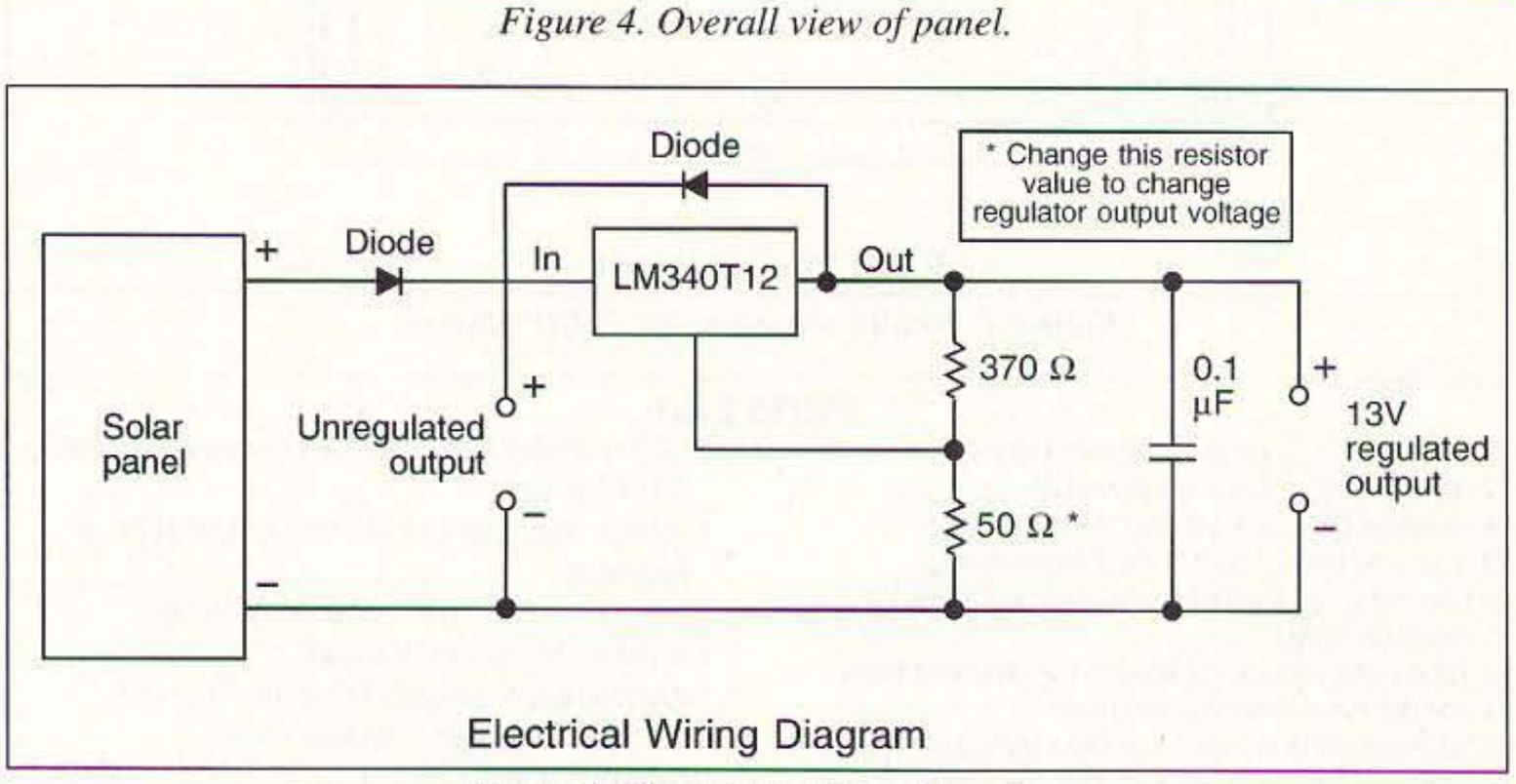

Figure 5. Electrical wiring diagram.

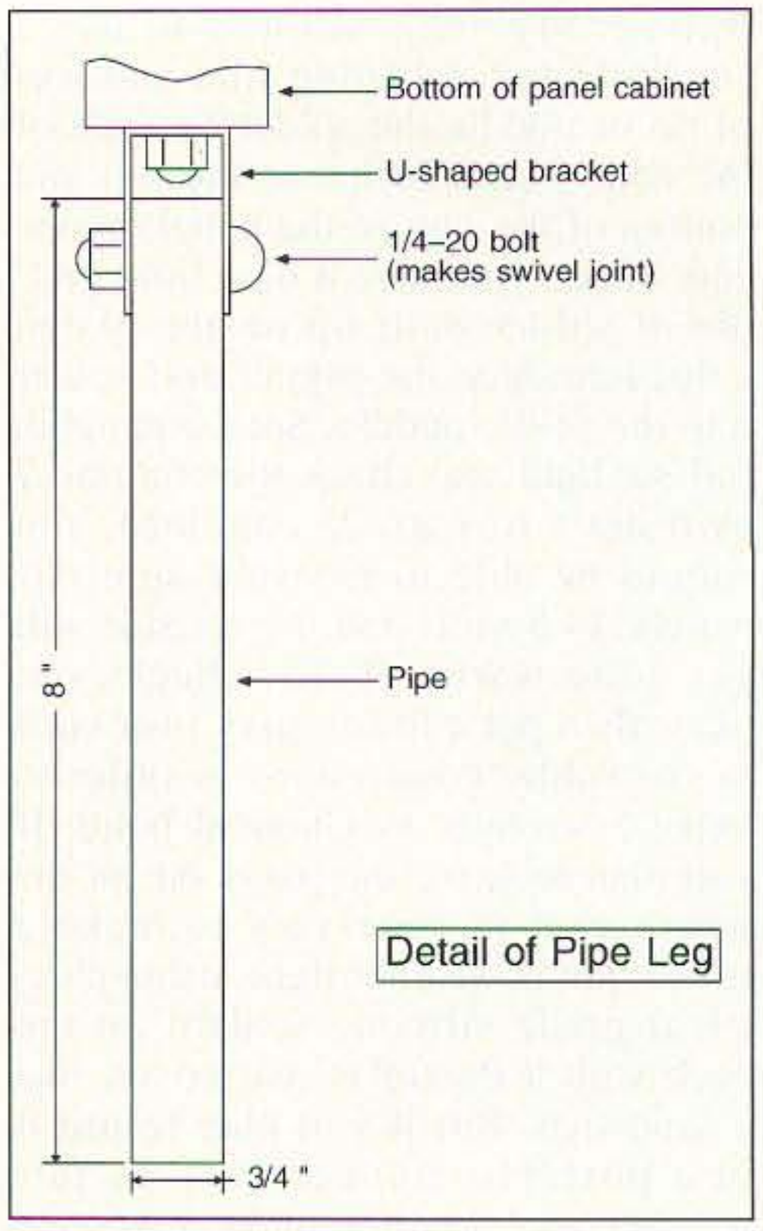

Figure 6. Detail of pipe leg.

simple latch is attached to the top rail in order to lock the cover in place while in transit. The inside of this cover is coated with bright aluminum paint. The cover not only protects the fragile panel, but also increases the efficiency of the panel by reflecting additional sunlight into the panel when the cover is open.

One additional item is needed. The panel must be tilted when it is set up for use in order to gather maximum

"A LM 317T regulator could be used instead of the one I used."

sunlight. A pair of folding pipe legs are made of aluminum and attached to the rear cross pieces where the carriage bolts are attached. These legs are attached by home made "U" brackets and are about 8 inches long, and, when they are extended, the tilt of the panel is about 30 degrees from horizontal. The legs fold back when not in use.

The electrical hookup is as shown in the diagram. I used a type LM 340T12 three-terminal regulator and, by lifting the ground terminal and using a resistor network, I am able to get about 13 volts regulated output. I also placed a protective diode between input and output terminals in order to

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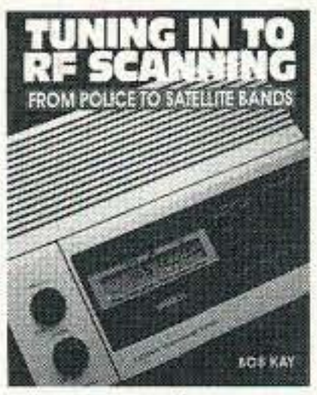

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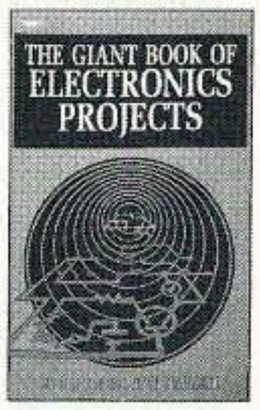

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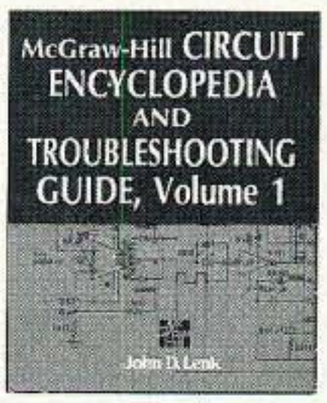

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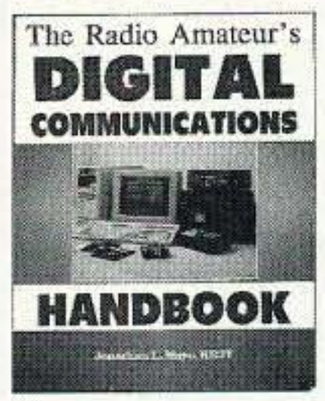

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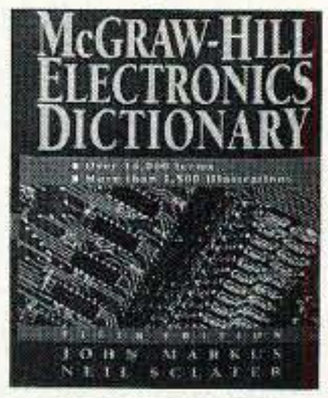

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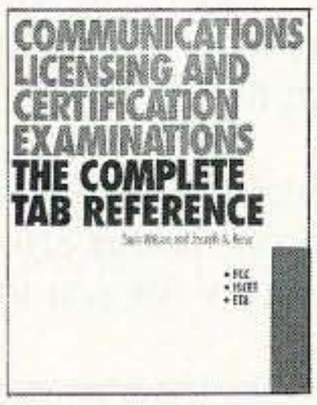

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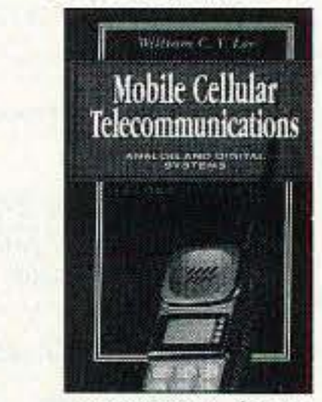

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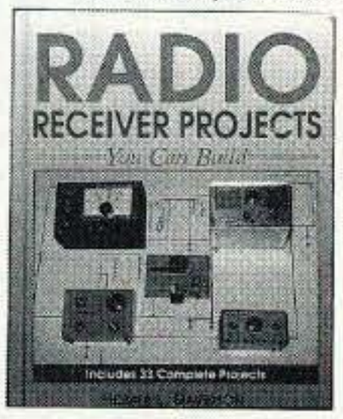

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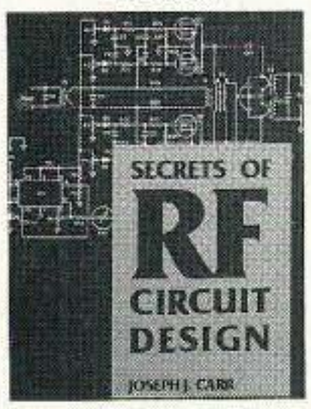

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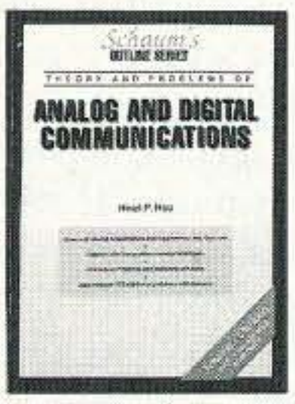

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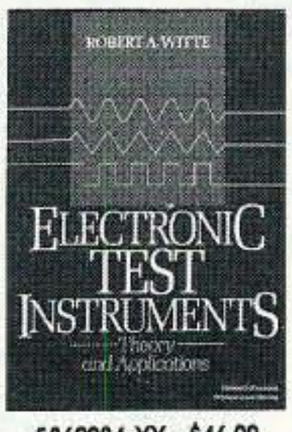

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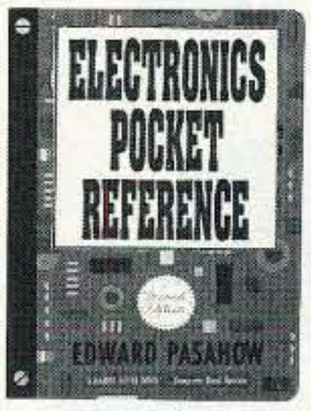

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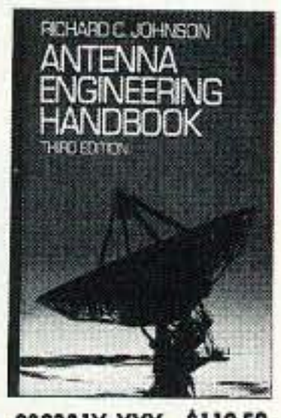

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protect the regulator while the battery is charging.

A LM 317T regulator could be used instead of the one I used. The diode between the regulator and solar panel prevents the storage battery from discharging back through the panel when the battery terminal voltage is higher than the output from the solar panel. The bypass capacitor is used to help keep RF energy from causing problems with the regulator and the solar panel. Furthermore, you could employ a lead-acid storage battery at either the unregulated or the regulated output terminals. The unregulated output charges quickly but could overcharge the battery. The regulated output charges more slowly, thus preventing overcharge, because as the battery voltage approaches 13 volts the charge rate slows down and finally almost stops.

Note: If your solar panel is larger or smaller than the one shown in this article, then it will be necessary for you to change the size of the rails and crosspieces to accommodate your panel.

"This setup is ideal for Field Day operations with a small lead-acid storage battery to store the surplus electric power."

This solar panel powers the HW-8 transceiver very nicely. as the current requirements for the HW-8 are 90 mA in receive mode, and 430 mA in transmit mode. It will probably power other similar QRP transceivers.

I find that QSOs can continue even though light clouds tend to obscure the sun. The power will start to drop off slightly but there is no sign of frequency instability or chirp, as the VFO in the HW-8 is stabilized at 9.1 volts. I have made many successful QSOs using just the solar panel, the HW-8, and a dipole antenna. When I tell the operator on the other end that I am solar powered, I am sure he does not realize that the signal he is hearing is generated by power directly from the sun at that very moment. This setup is ideal for Field Day operations with a small lead-acid storage battery to store the surplus electric power. Please do not use NiCds with this setup, as the charging current is not compatible with that type of battery.

I guess you know that if you operate as I do, without a battery, you automatically become a fair-weather ham. 73

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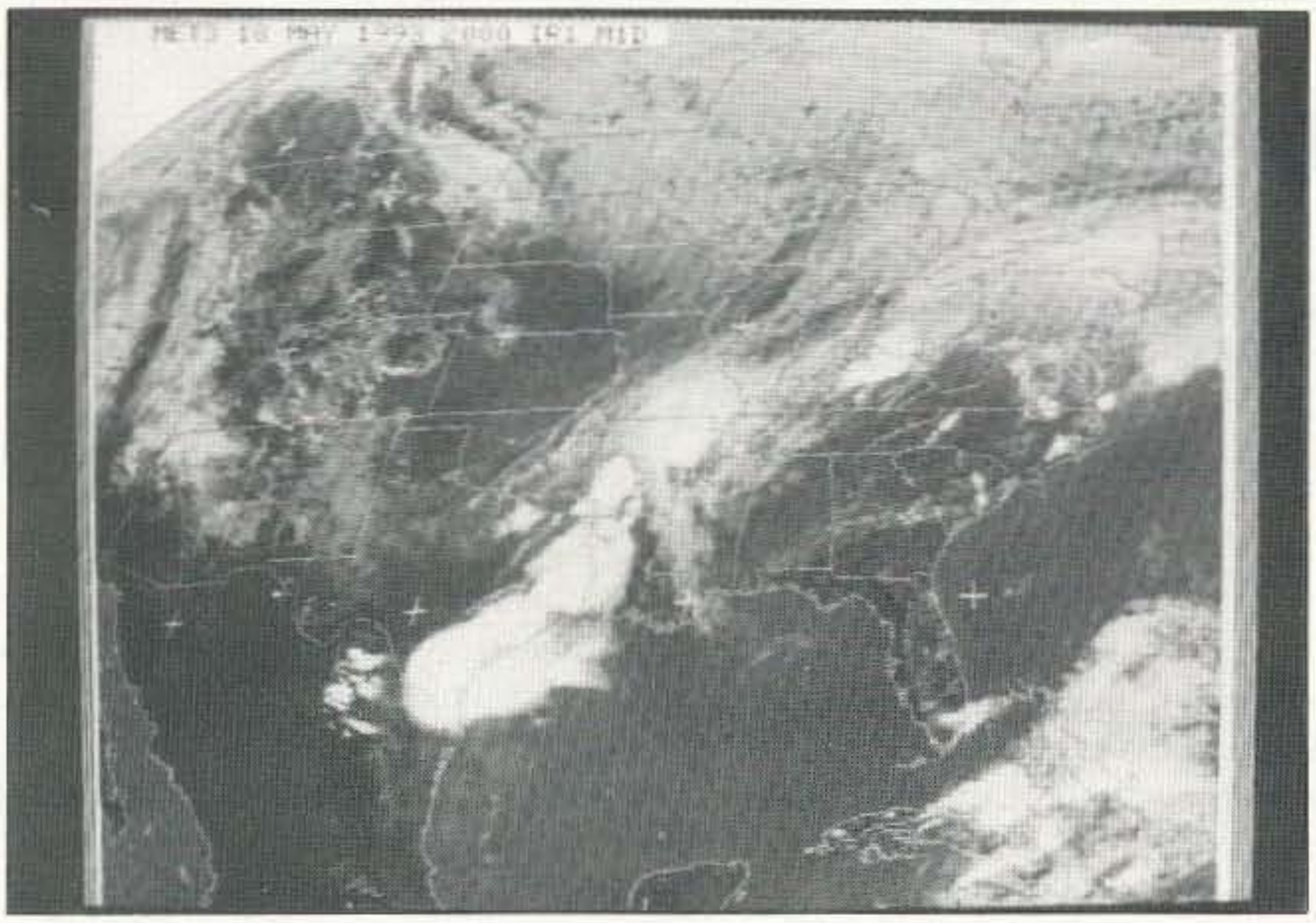

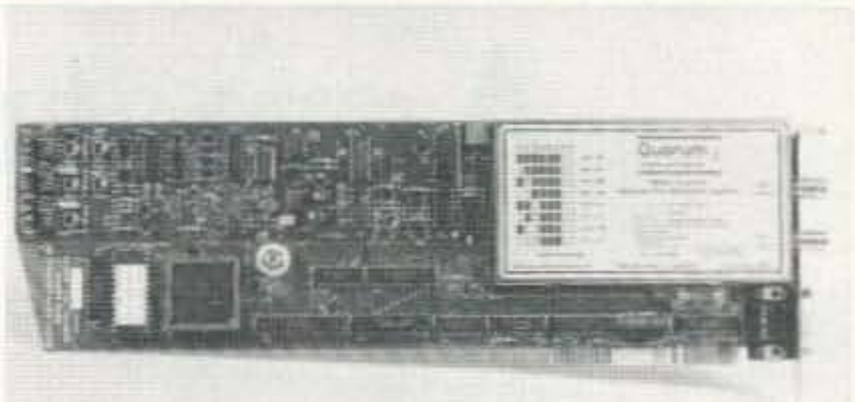

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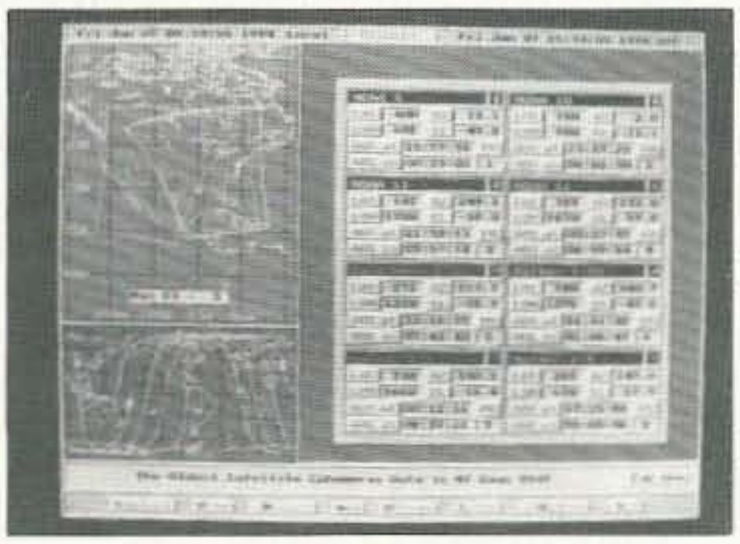

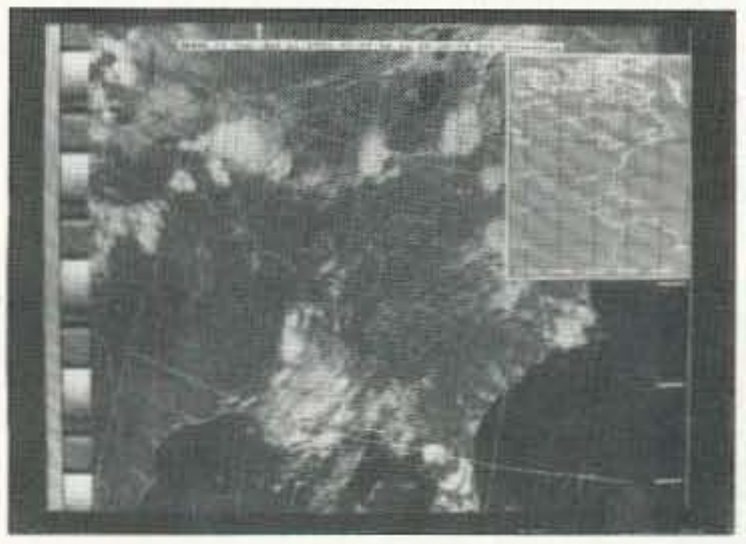

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Armstrong Updated

A high-performance, regenerative short-wave receiver.

by David Cripe KC3ZQ

I have happily noticed that in recent years there has been quite a resurgence of interest in regenerative receiver circuits. It is not altogether surprising because it is one of the aims of any home-brew enthusiast to build equipment with performance close to that of commercial gear, but at a much lower cost. Regenerative shortwave receivers have been a perennial favorite project of hams, as they are one of the few projects in which a simple home-brew rig can approach the performance of a store-bought receiver.

Plenty of old-timers can remember that as late as the mid-1960s the *ARRL Handbook* and ham magazines contained numerous plans for regenerative sets intended for construction by the beginning ham or SWL. There are plenty of others (myself included) who got their start in radio by building simple regenerative rigs. The regenerative receiver, invented by Howard Armstrong back in the early part of this century, is a good choice for kit builders and home-brewers, as it is possible to obtain reasonably good receiver performance from a circuit that is simple enough for most folks to build for themselves.

History

A regenerative detector is nothing more than an antenna coupled to the resonant inductor-capacitor circuit of an RF oscillator. The oscillator serves as an RF amplifier, bandpass filter, and detector. By adjusting the amount of RF feedback within the circuit so that it is at the threshold of oscillation, you can render the sensitivity and selectivity of a regenerative receiver equal to that of a superhet receiver. Plus, the regenerative oscillator acts analogously to the BFO in a superhet, allowing reception of CW and SSB signals, in addition to AM.

So why aren't regeneratives more popular today? Well, regenerative receivers are not without their problems. My first regenerative set, as I recall, suffered from the shortcomings that have plagued most other regenerative receivers. The receiver had an annoying audio oscillation that would occur at some settings of regeneration. It was very sensitive to hand capacitance; once you removed your hand from the tuning knob, it would shift the tuning frequency off station. Also the regeneration control was not smooth. While being adjusted, it would pop abruptly in or out of oscillation, making it difficult to find the "sweetspot" of maximum sensitivity at the threshold of oscillation. The circuit would not regenerate at all positions on the band. And had there been any other hams in my neighborhood at that time, they would have reported another problem with my receiver. Most regenerative receivers radiate an RF signal at the frequency to which they are tuned, creating QRM for anybody else listening on that frequency. As a result of these phenomena, the regenerative receiver, which was the preferred technology for AM broadcast receivers through the 1920s, lost out in favor of one of Howard Armstrong's other inventions: the more expensive and complicated superheterodyne.

Correcting the Flaws

I have always thought that if these problems with Armstrong's regenerative receiver could be corrected, a portable regenerative shortwave receiver would make a great home-brew project. In the past dozen or so years, I've probably breadboarded 10 different experimental designs, some of them frankly quite horrible, but each providing new insight into the causes and cures of these problems. I finally arrived at a design that performs nicely, is well behaved, and is not overly complicated to construct (see Photo A).

Figure 2 shows the schematic of the circuit. There are a number of unique features in this design that give it its trouble-free performance. The tendency for regenerative receivers to radiate oscillator-frequency signals is eliminated here by placing a transistor buffer Q1 between the antenna preselector circuit L1-C1a and the regenerative oscillator-tuned circuit L2-C1b. This buffer also nearly eliminates hand-capacitance effects.

This design is also unique in that it uses an IC for the regenerative detector. U1, an LM1496 double-balanced mixer, is used here in a somewhat unorthodox manner. The differential "Signal Input" amplifier transistors internal to the IC are used as a Hartley oscillator in conjunction with L2

Photo A. The completed Armstrong Updated regenerative receiver.

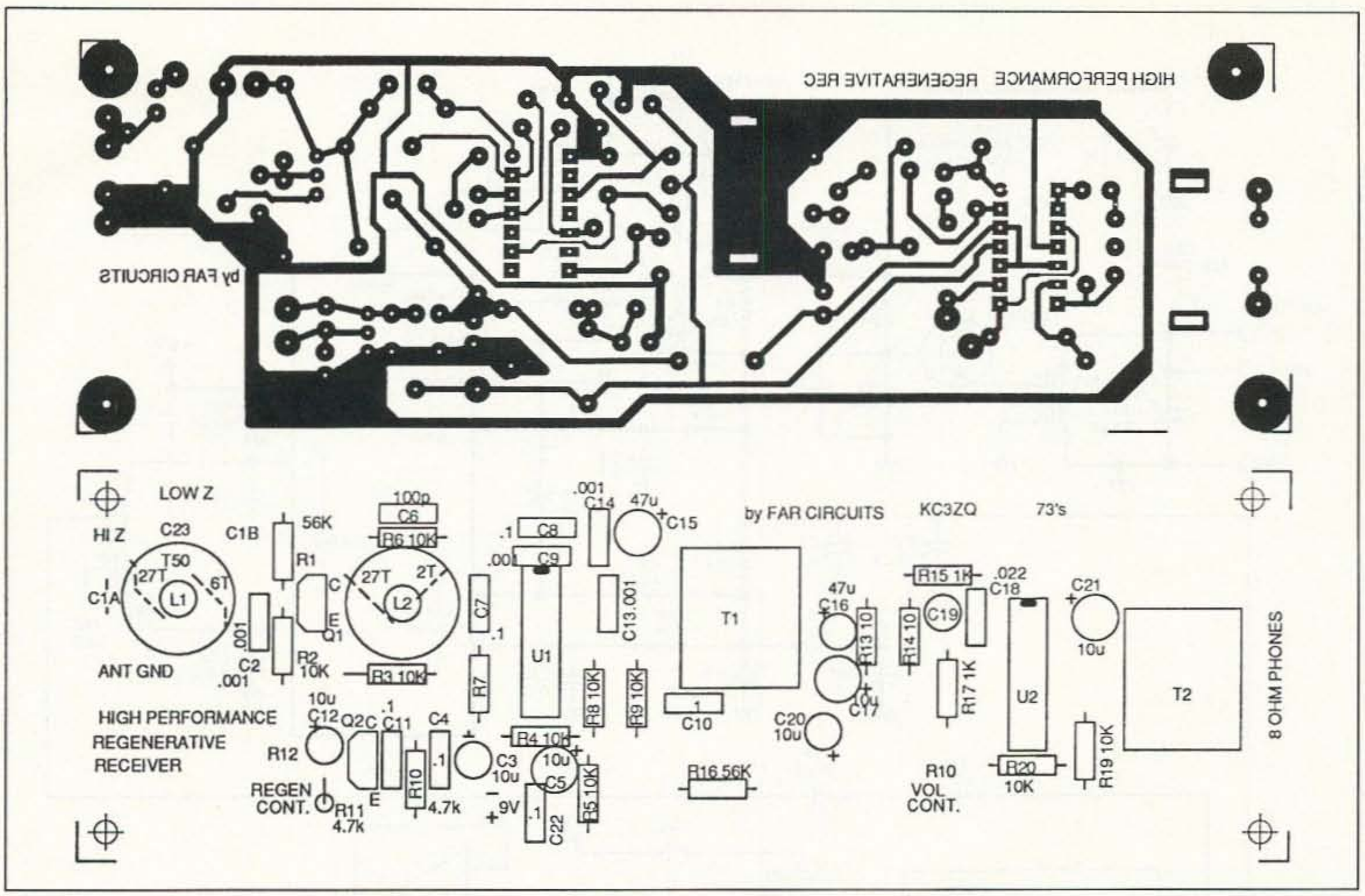

Figure 1. Printed circuit board layout (FAR Circuits).

and C1b. The regenerative feedback for this oscillator is supplied by the output of the "Gain Adjust" pins of the LM1496. Some of the oscillator output is coupled to one of the "Carrier Input" pins via C9, which allows the mixer section of U1 to act as asynchronous detector, greatly improving the RF detection sensitivity over that of other regenerative circuits. The regeneration level is controlled by the voltage level applied to the "Bias" pin of U1. The circuit containing R12 and transistor Q2 is used as a variable voltage source, providing the regeneration level immunity from supply voltage ripple. This bias level controls the quiescent current level through the "Signal Input" amplifier transistors, which in turn determines the emitter-output-impedance of these transistors, controlling the amount of power delivered to the feedback winding of L2. This results in a very smooth and predictable regeneration control.

The outputs of U1 are coupled through audio transformer T1 into the first section of U2, an LM324 op amp. This first section is configured as an audio bandpass filter, rolling off the audio response below 300 and above 3,000 Hz. Volume control is achieved through U2d and variable resistor R18. The output of U2d is buffered by U2b and U2c, which provide a push-pull output for audio transformer T2, giving us headphone-level audio into 8-ohm phones. The audio oscillation encountered in many other regenerative receiver designs is due to supply voltage ripple coupling into their high-gain discrete-transistor audio amplifiers. Op amps have very high rejection of supply voltage ripple effects, so they have much better immunity to this oscillation phenomenon. Using a push-pull audio output stage, as is done here, also reduces susceptibility to audio oscillation.

The only compromise in this design was the choice to make it a single-band receiver. Although the use of switched or plug-in coils could have allowed multiband reception, in the interest of simplicity this was not done. However, the values of L1 and L2 allow coverage of 5 to 15 MHz, where much of the shortwave action occurs.

Construction

There are two antenna terminals provided. The "Hi Z" connection is for short an-

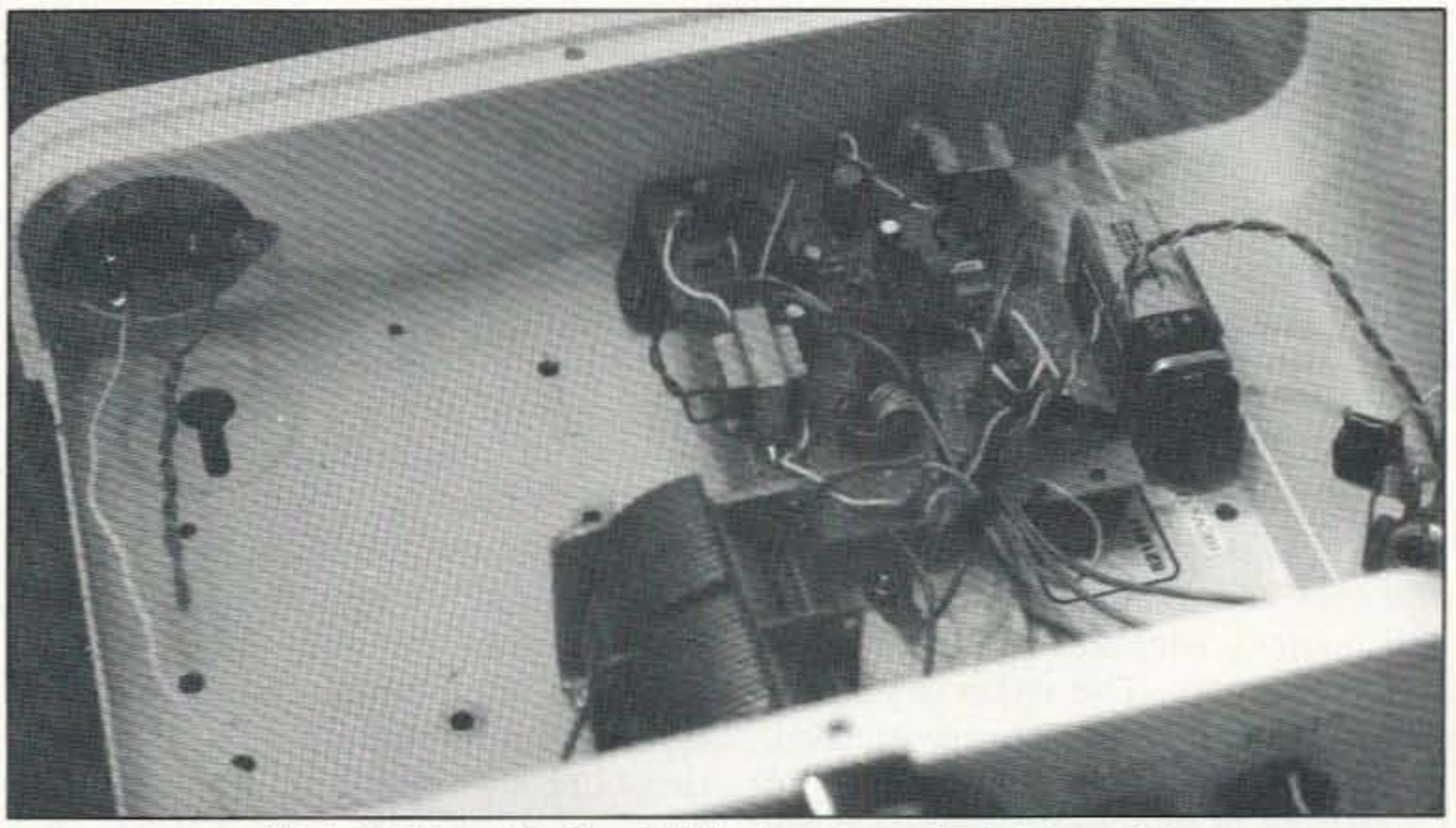

Photo B. Under the hood of the Armstrong Updated receiver.

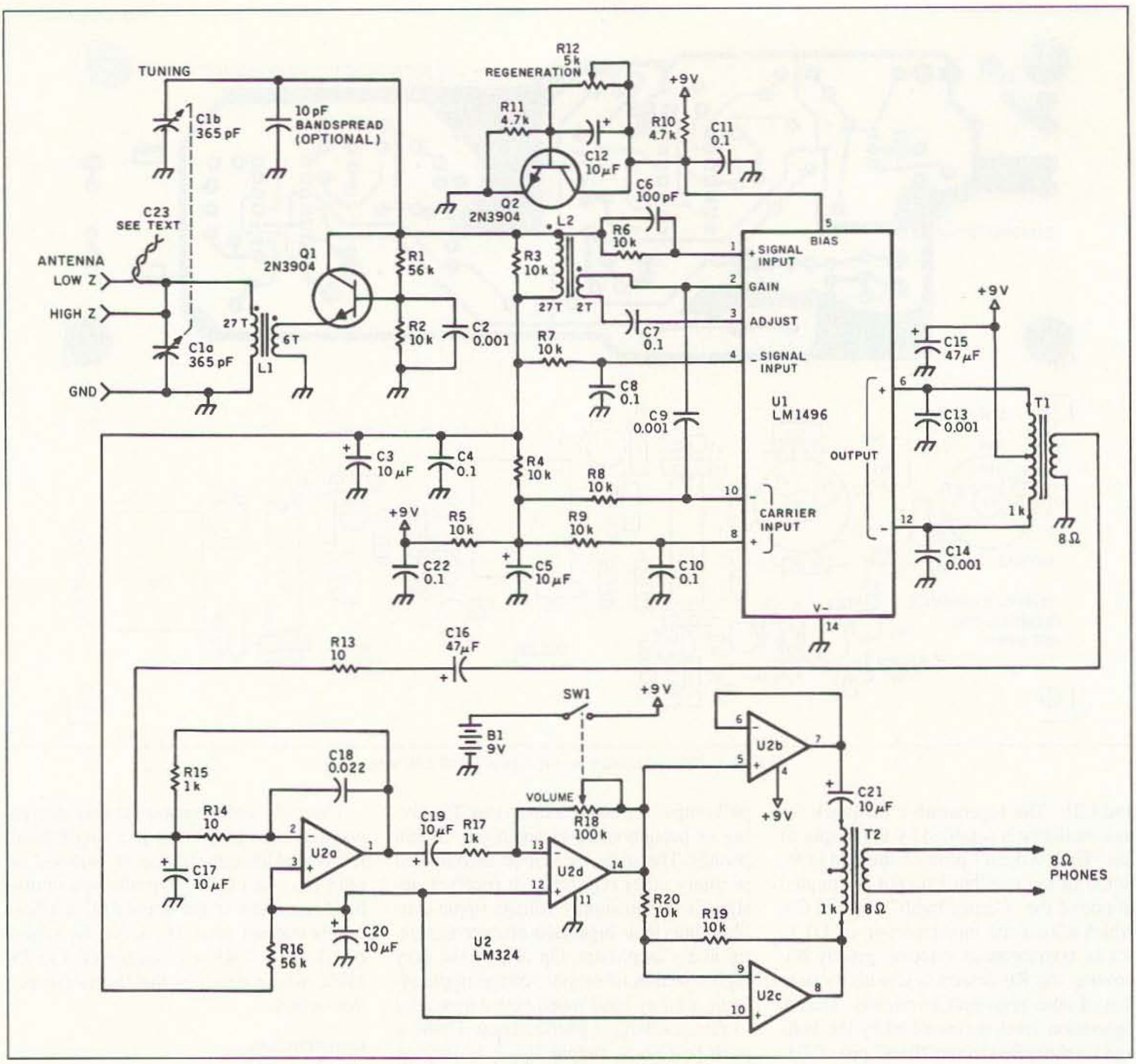

Figure 2. Schematic diagram for the Armstrong Updated regenerative receiver.

tennas, and the "Low Z" connection is for antenna wires greater than roughly 3 feet in length. The "Low Z" antenna terminal couples energy into the preselector circuit through a C23, a "gimmick" capacitor constructed out of two 1" pieces of insulated wire twisted tightly together. This helps prevent overload of the RF circuitry, which might occur from more powerful stations. Experiment for best results.

The inductors L1 and L2 are wound on Amidon T-50-2 iron-powder toroids. The primaries of each consist of 27 turns of #30 magnet wire distributed evenly around the core. The secondary of L1 consists of six turns of #22 gage stranded, insulated hook-up wire. The secondary of L2 consists of two turns of #22 hookup wire. Try to keep these windings short and direct to the circuit board.

The tuning of the receiver is done with variable capacitor C1a and C1b. Using a dual-gang capacitor makes the tuning of the antenna preselector and the regenerative oscillator track automatically. It may be difficult to obtain dual-ganged 365 pF variable capacitors, but check at your next hamfest, or with surplus dealers such as Fair Radio Sales. The value of these variables could be larger than 365 pF and still work well. Otherwise, two separate capacitors could be used. It is also very helpful to use a vernier drive on the tuning capacitor, so that closely spaced stations can be separated. Optionally, a bandspread capacitor, a 10 or 20 pF variable, can be added in parallel with C1b. Use whatever you can find.

With the relatively small quantity of components used here, I was able to construct the entire receiver on one of Radio Shack's solder-pad perf boards, #276-168. Alternately, dead-bug construction techniques could be used to construct the circuit on a piece of blank, copper-clad PC board material approximately 3" by 4". For ease of construction, a drilled and etched PC board (Figure 1) is available for $6 plus $1.50 S & H per order from FAR Circuits, 18N640 Field Court, Dundee, IL 60118.

Finally, mount the entire assembly in a metal enclosure (see Photo A). This will provide additional shielding against oscil-

HF for only $549

HOW IT ALL STARTED

We wanted to offer the most affordable HF rig in the industry and still provide real performance for even the most experienced ham. In recent years, many hams requested a "back to basics" transceiver that was simple to use. We reviewed all the latest design techniques, selected the best concepts from the 20 rigs we designed over these 25 years and asked 500 hams across the country for their ideas.

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HERE'S HOW IT'S USED

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Hams complain about today's cars having precious little space for gear. The SCOUT is the smallest HF rig in the industry (excluding QRP) measuring only 2.5" x 7.25" x 9.75" and runs directly off the 12 VDC car battery. If the SCOUT won't fit your car, nothing will. The optional noise blanker reduces ignition noise from both your car and the one that just drove by.

PORTABLE

Business travelers and vacationing hams typically set up a briefcase or small travel bag to include the 5 lb SCOUT, wire or whip antenna and lightweight power supply like our Model 938 switcher (its only 3 lbs!). It is surprising how many hikers and cyclists take along their SCOUT using some clever battery arrangement.

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The SCOUT is the most economical way to get started in ham radio. Consider the choice a new ham must make just to test his interest in HF: (1) Spend nearly $1000 or more on a new rig, (2) buy a used radio and take a chance on its condition, or (3) invest in a SCOUT at $549 with a one year factory warranty and our legendary TEN-TEC support.

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Operators with years of experience and a shack full of expensive HF gear also buy the SCOUT. It's refreshing to many who say "It takes 5 minutes to learn and without all the complicated features, there is only one thing to do with a SCOUT, work someone!" Experienced hams call us constantly to report "I can't believe this receiver, it outperforms my $1400 synthesized rig".

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The SCOUT has a little brother, the ARGO 556. It is identical to the SCOUT without the 50 watt final. adjustable 1-5 watts output. TX-2 Amps, RX-.6 Amps.
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- Runs Off 12-14 VDC, TX -10 Amps, RX -.6 Amps
- Receive Offset Tuning
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$549* Includes one band module of your choice

$29* Each additional band module

SCOUT ACCESSORIES:

MODEL		PRICE*
296	Mobile Bracket	$15.00
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lator radiation and hand-capacitance. It takes some extra work over that of a breadboard layout but is worth it. I also recommend mounting the PC board with a 1/2"-thick piece of foam rubber sandwiched between it and the chassis, using double-sided adhesive tape. This helps reduce any tendency for microphonics.

The only potentially tricky part in assembling this project lies in getting the secondary of L2 wired in the proper direction. Connect a short (one foot is fine) antenna to the "Hi Z" antenna terminal, turn on the power to the unit, then advance the volume control to its midpoint while listening to the output on your headphones. Slowly rotate the "Regeneration" control from one end of its range to another. You should notice at some point in its travel a fairly abrupt increase (or decrease) in audio noise in the phones, indicating that oscillation has begun. If the noise level in the phones remains constant while rotating the "Regeneration" control, you probably have L2's secondary wired in reverse. Swap the ends of the winding, and try again. If there is still no change, try increasing the number of turns on the L2 secondary from two to three, and repeat.

In operation, the receiver is surprisingly sensitive. With a 1-foot antenna and no ground, I was able to pick up over 2 dozen broadcasters. With the regeneration control at the threshold of oscillation, the selectivity was such that there was no adjacent channel interference, and the headphone volume was more than adequate. Pretty impressive for 80-year-old technology! I would like to think Howard Armstrong would approve. 73

Notes

Vernier drives are available through Mouser and Fair Radio.

Mouser stocks a dual-ganged 266 pF miniature variable cap,#24TR218, which may be used with the same frequency coverage if the primaries of L1 and L2 are increased to 32 turns each.

56k resistors and the LM1496 are available through Mouser, DigiKey, or on special order through Radio Shack.

Sources

Amidon
12033 Otsego St.
North Hollywood CA 91607
(310) 763-5770

Digi-Key
701 Brooks Ave. South
P.O Box 677
Thief River Falls MN 56701
(218) 681-6674

Fair Radio Sales
1016 E. Eureka
Box 1105
Lima OH 45802
(419) 227-6573

FAR Circuits
18N640 Field Court
Dundee, IL 60118

Mouser Electronics
11433 Woodside Ave.
Santee CA 92071
(817) 483-0165

Parts List

Part #	Value	RS #
All resistors 1/4 W unless noted.		
R1, 16	56k	See below
R2-9, 19, 20	10k	271-1335
R10, 11	4.7k	271-1330
R12	5k Var. Audio	271-1720
R13, 14	10 ohm	271-1301
R15, 17	1k	271-1321
R18	100k Var. Audio	271-1722
C1	365 pF, 2-gang variable	See below.
C2, 9, 13, 14	0.001 µF	272-126
C3, 5, 12, 17, 19-21	10 µF 'lytic	272-1025
C4, 7, 8, 10, 11, 22	0.1 µF mono ceram.	272-109
C6	100 pF	272-123
C15, 16	47 µF 'lytic	272-1027
C18	0.022 µF	272-1066
Q1, 2	2N3904 or equiv. NPN	2762016 or 276-1617
U1	LM1496 balanced mixer	See below
U2	LM324 Op amp	276-1711
T1, 2	1k:8-ohm audio xfmr	273-1380
L1	Amidon T-50-2 Primary: 27 turns #30 wire Secondary: 6 turns #22 wire	
L2	Amidon T-50-2 Primary: 27 turns #30 wire Secondary: 2 turns #22 wire	
S1	SPST pot switch, mounts on R18	271-1740

A Note from Wayne Green W2NSD/1

One of the first really popular ham receivers was the National SW-3, a regenerative receiver. That was state-of-the-art in the early 1930s when I first got involved with amateur radio. My first ham building project was the RSR receiver, which was regenerative on the shortwave bands and super-regen on the VHF bands. When I was assigned to the *USS Drum* (SS-228) in 1943, we still had regenerative receivers for the lower bands. Eventually I got superhets to replace them, but you'll notice when you visit the *Drum* in Mobile that the old regenerative receivers are back in place. Also check out the plaques with stories about our patrol runs. I wrote those stories, and the whole series is available from Uncle Wayne's Bookshelf for $7.50.

Have Beam, Will Travel!

Shake, twist—your walking stick becomes a beam!

How would you like a four element 2 meter yagi that travels the mountain trails as as walking stick? Pick a rest stop, remove the end cap, shake out the elements and feedline, and in two minutes your HT is full quieting wherever you point it.

Finished resting? Unscrew the elements and drop them into the boom; you're ready for travel. But whenever you get the urge, it's there, ready to zero in on a jammer, chase a radio fox, or shoot your signal out of a hole in time of difficulty.

What is it? ArrowBeam. It shoots straight and true, and its strong flexible elements are stored in the boom like arrows in a quiver. It weights only a pound and a half and is balanced in the hand, but it can take abuse.

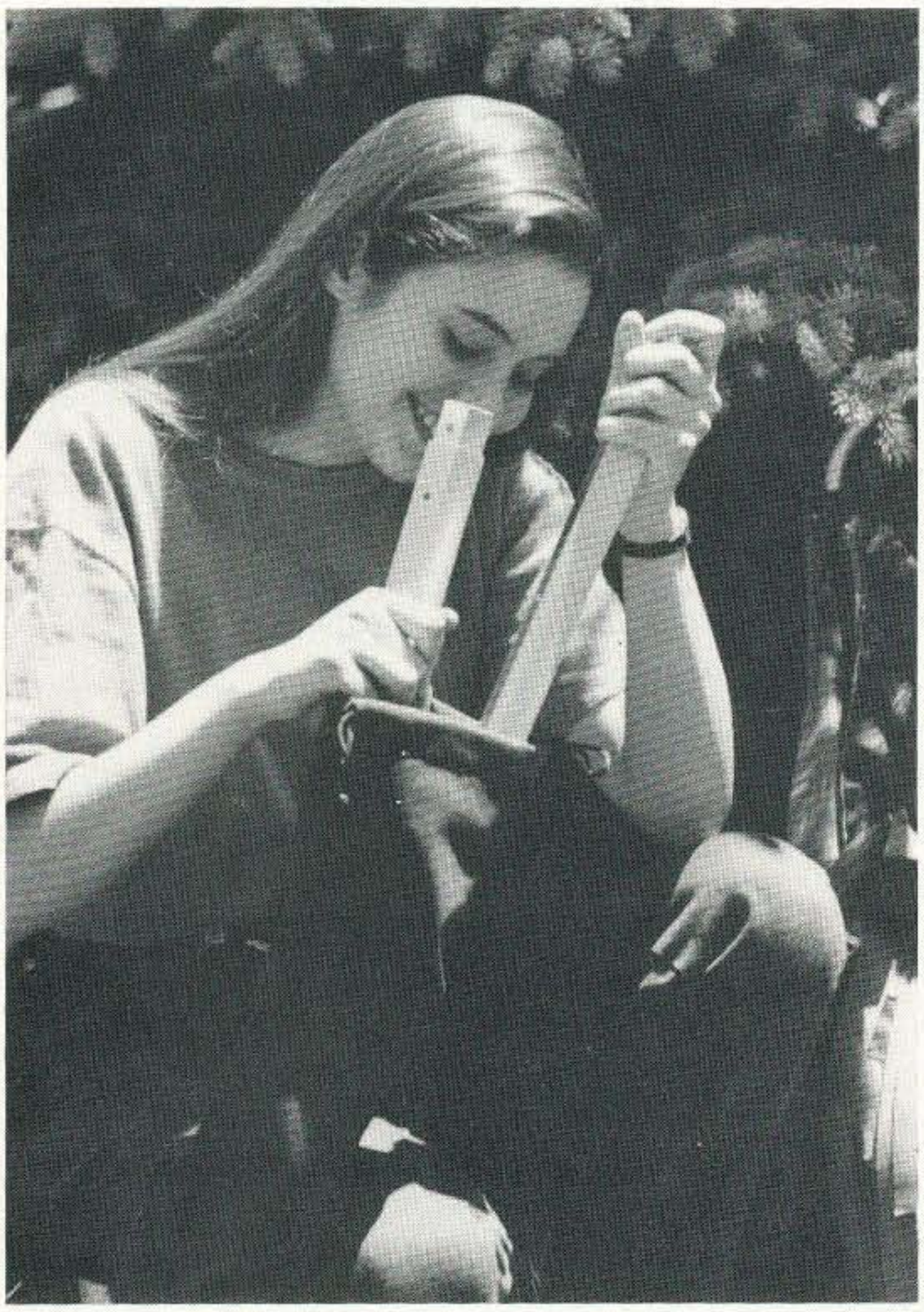
Keep it in the trunk of the car. It's tough exterior protects everything against damage as it gets tossed and knocked about. But when it's time for action—shake, twist, and ArrowBeam is ready to shoot your RF right where you want it.

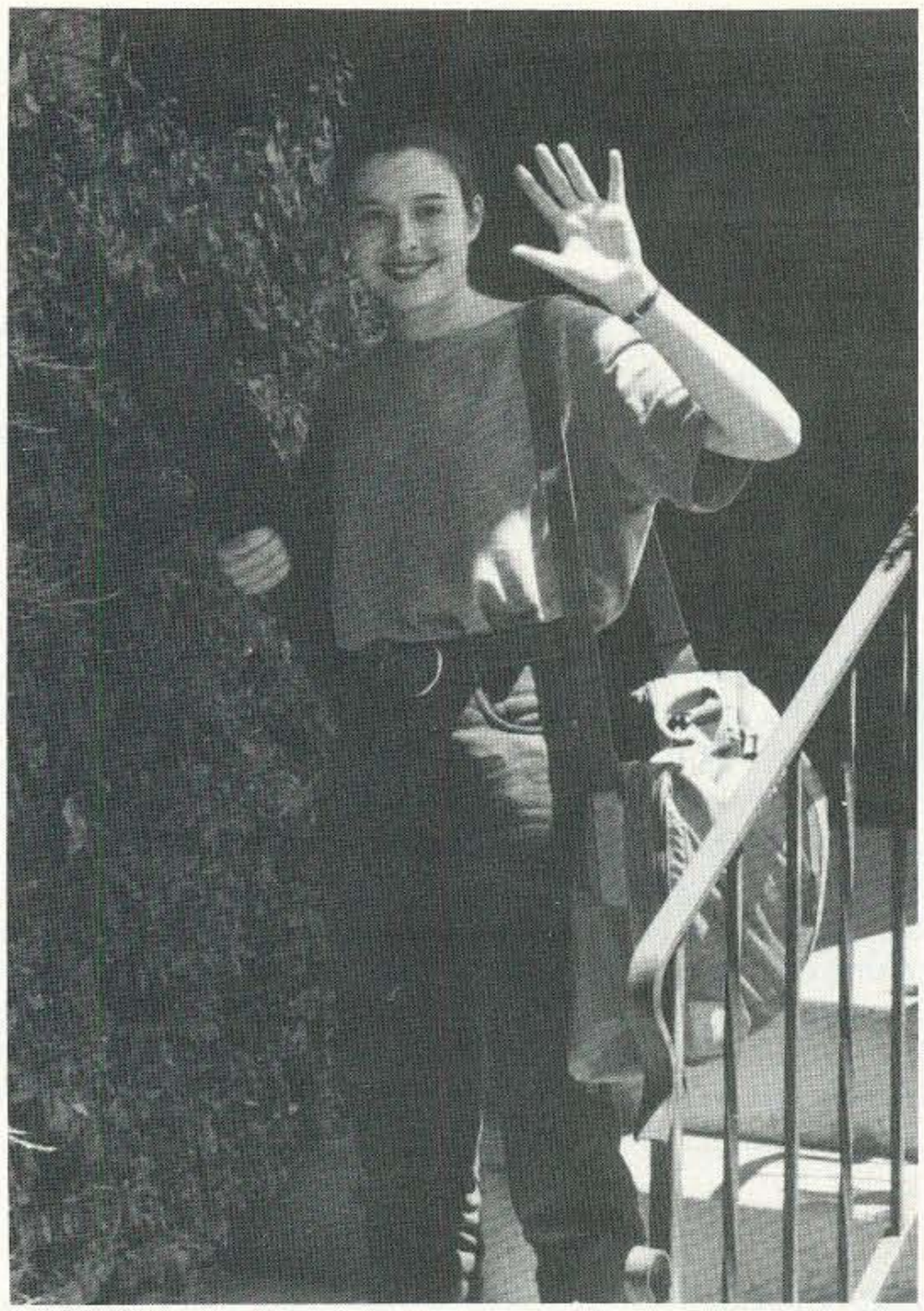
This handy versatile antenna is made to be dropped, bumped, and stepped on while you are racing through brush and branches in pursuit of the elusive radio fox. Drop it? It bounces. Snag a low limb as you drive by? Twang! the tempered elements just spring back into position. Sit on it? You'll need a bandaid for your fanny, but ArrowBeam will be ready for more.

Of course ArrowBeam will do just fine in an attic or on a mast even though it's made for the torture of the T-hunt.

Performance? ArrowBeam scored best for its boom length at the Dayton VHF competition. It's the antenna chosed by the FAA for its spook beacon and rogue ELT search teams.

Now you can have ArrowBeam's performance and toughness for your radio adventures.





Half-Size ArrowBeam? Now there's a version of ArrowBeam that breaks down to half the Walking Stick size—the Grab-N-Go Arrow Beam. For storage the boom separates at the center, so the whole antenna stores in half the length—perfect for slipping in a backpack.

You get the same great performance, the same ease of assembly, the same robust durability, but Grab-N-Go fits in your suitcase.

The Grab-N-Go ArrowBeam comes in its own forest green stuff sack. There's extra room there for other goodies you may wish to carry with your beam—feedline, homebrew PVC mast, omnidirectional Pico-J antenna, etc. This is the version Becca is taking on her trip.

Link it All!

Why settle for operation on just two bands?

by Klaus Spies WB9YBM

The modern generation of dual-band radios has shown us the benefits and convenience of being able to operate on two VHF or UHF bands at once. But why limit yourself to just two bands? Here's a way to increase the benefits, as well as the fun, of operating multiple VHF and UHF bands all at once.

To obtain a signal from a receiver that indicates a positive voltage (logic 1) when a signal is received, you can use the receive indicator (usually an LED), or obtain a signal from a transceiver's squelch[1]. Figure 1 shows one easy approach to adding an interface to your transceiver.

Figure 1 also illustrates the basic concept of linking two transceivers; not shown (but to be added later as desired/required) are optional timers to avoid noise bursts randomly toggling on a transmitter, combined with a hang-timer[2].

Figures 2 and 3 show how you can use logic gates to add more transceivers into a link, including a way of figuring out how many gates are required for the quantity of transceivers (and options) in an entire system. Examples of options include local microphone/speaker, IDer, and autopatch. This approach is wired so that if any one input (receiver, local

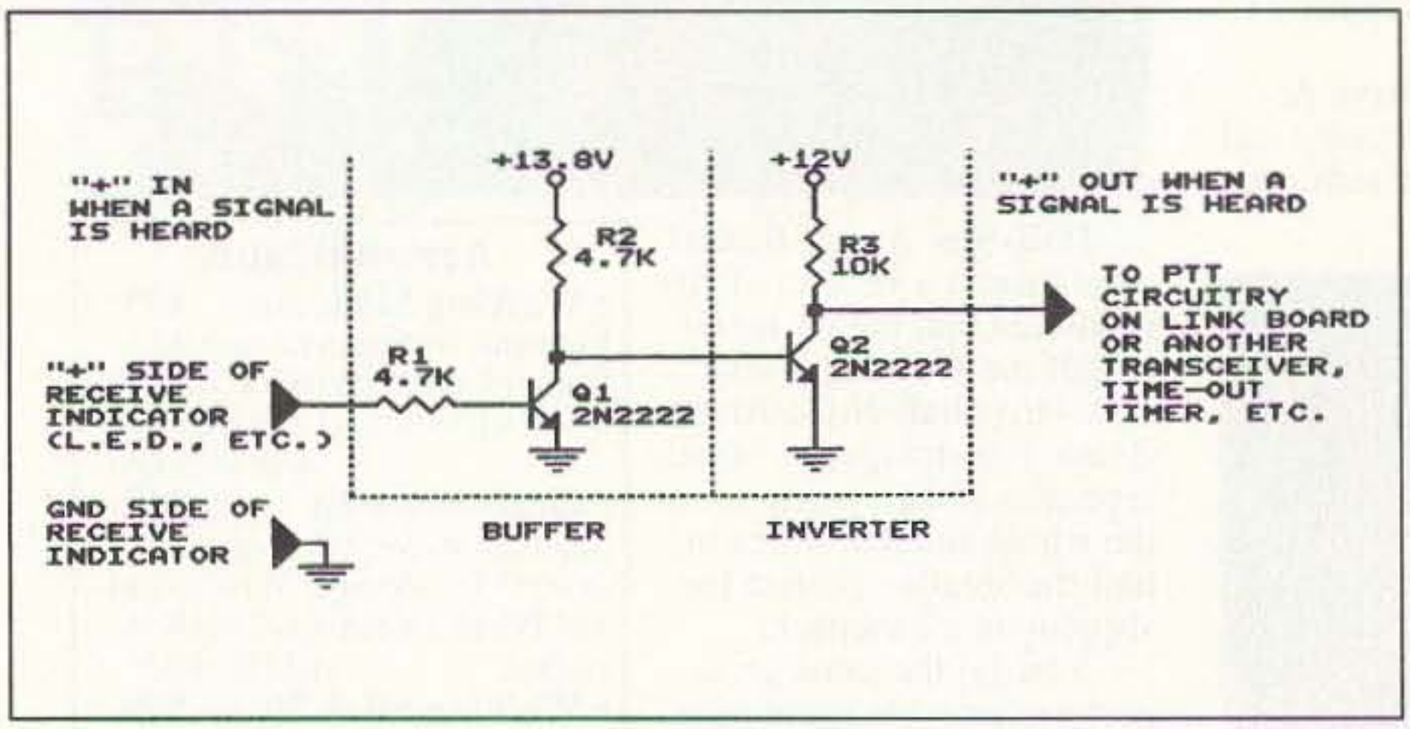


Figure 1.

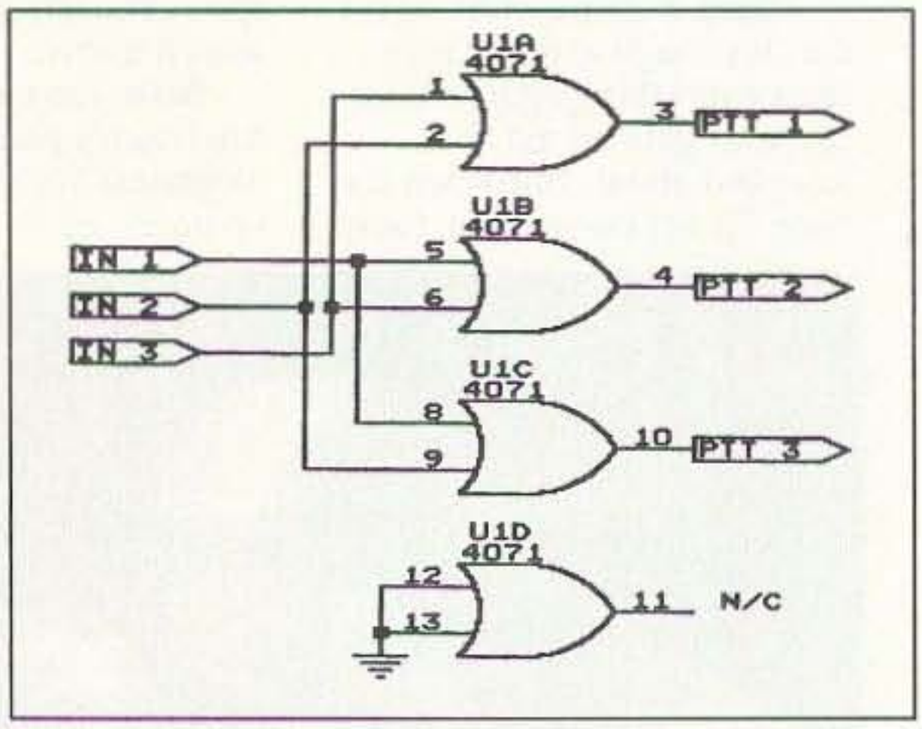
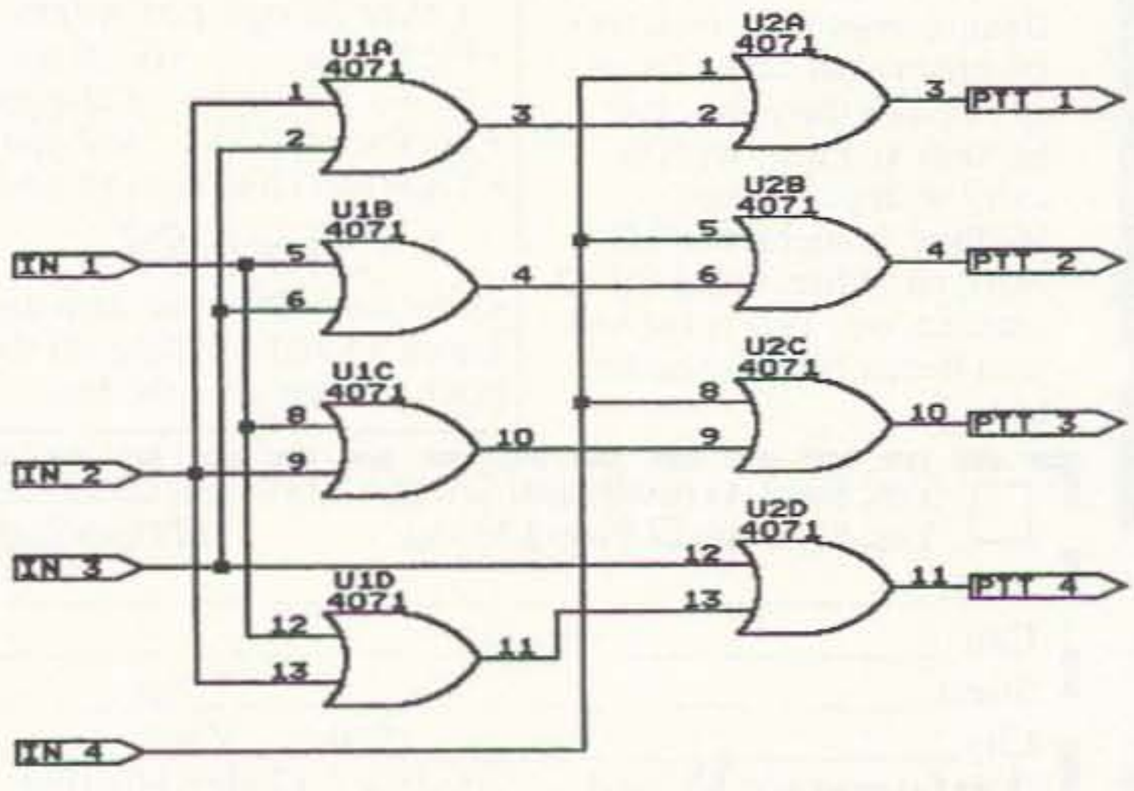


Figure 2.



I.C. SUPPLY CONNECTIONS
(NOT SHOWN ON SCHEMATICS, FOR CLARITY)

I.C.	+13.8V	GND
4069	14	7
4071	14	7
4078	14	7
4081	14	7
4538	16	1,8,15

TO CALCULATE THE NUMBER OF USE THE FORMULA:

G = N(N-2)

WHERE N = # OF PORTS DESIRED, AND;
G = # OF GATES REQUIRED
(SINCE THERE ARE 4 I.C. GATES PER I.C. PACKAGE, DIVIDE "G" BY 4 TO GIVE THE TOTAL NUMBER OF 4071 I.C.S REQUIRED —— OR SEE SCHEMATIC 4!)

Figure 3.

microphone, and so forth) becomes active, all but that one corresponding output become active.

For my prototype, I used 4078 NOR gates and inverters (since we're dealing with positive logic) to simplify the wiring and to keep the parts count low (see Figure 4).

The final requirement is an audio combiner, shown in Figure 5. I've noticed some audio distortion in certain transceivers if the audio gain (volume) is set too low; therefore, I set the volumes of my transceivers at about the half-way point, and use boost/cut control in the operational amplifiers in the combiner to set the volume controls.

If you plan to be away from your link enough to make it a concern, a simple time-out timer[3] can be added in almost any convenient spot (for each transmitter, after each receiver that eliminates only the one receiver hung up due to noise, or at other convenient spots in the circuitry). 73

1. "Midland 13-509 Modifications," *73 Amateur Radio Today,* December 1988, p. 27.
2. "Ending Transmit Chatter," *73 Amateur Radio Today,* February 1991, p. 27.
3. "PTT Time-Out," *73 Amateur Radio Today,* August 1990, p. 82.

Schematics by Klaus Spies WB9YBM

Parts Sources

1. Digi-Key Corporation, 701 Brooks Ave. S, Thief River Falls, MN, 56701; (800) 344-4539, fax: (218) 681-3380.

2. Tri-State Electronics, 200 W. Northwest Highway, Mount Prospect, IL, 60056; (708) 255-0600, fax: (800) 255-0526.

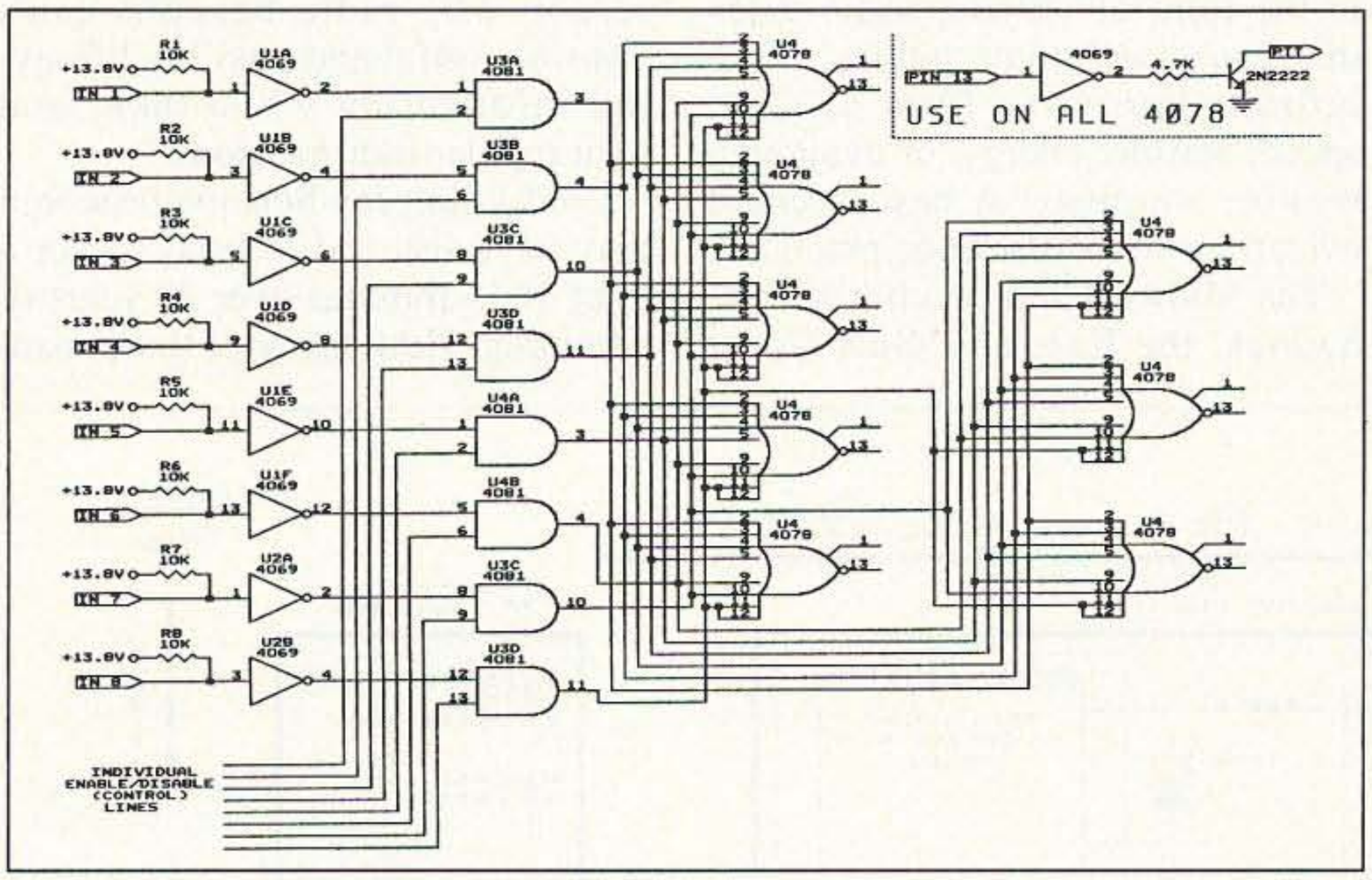


Figure 4.

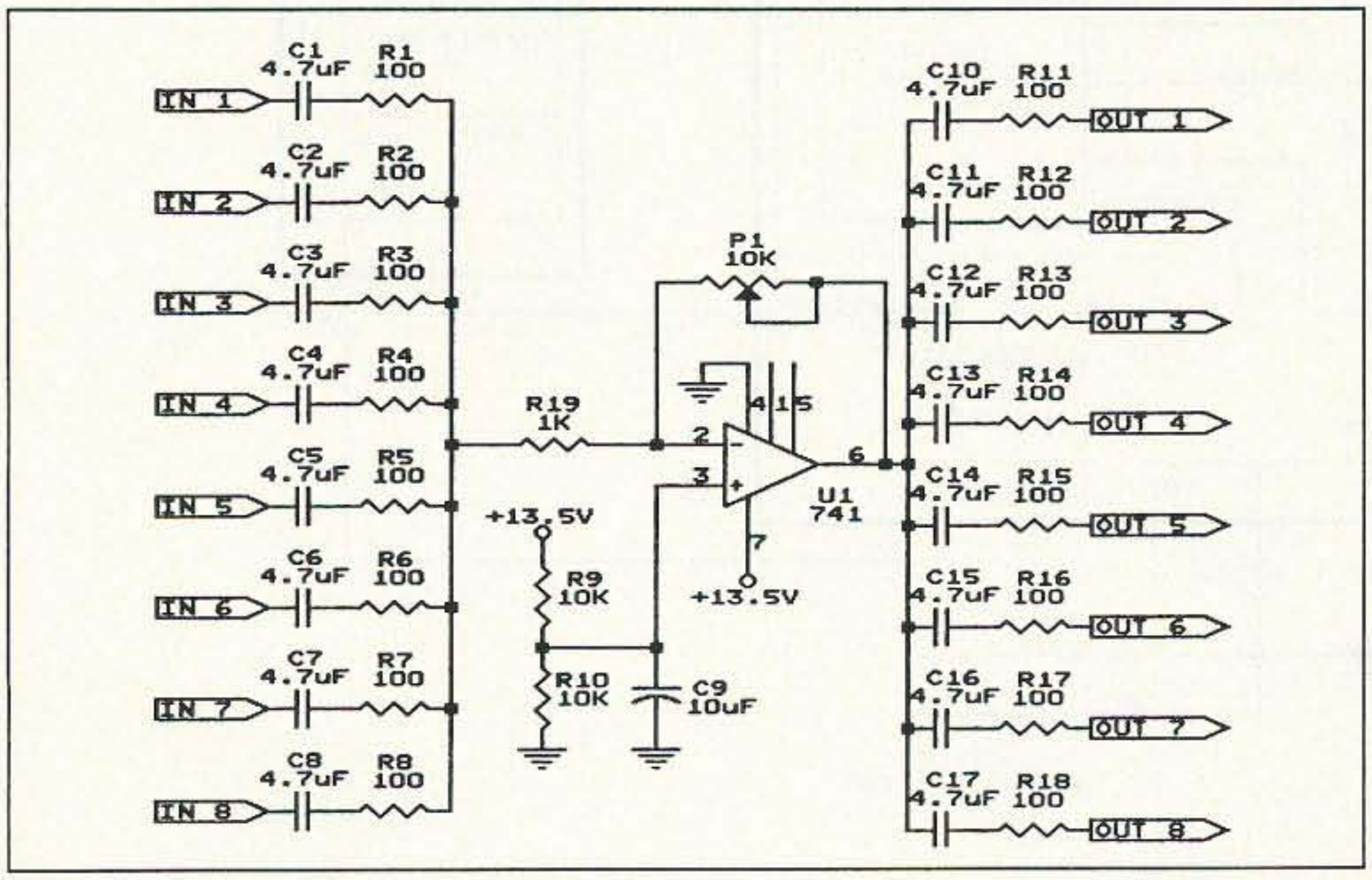


Figure 5

Boring Beacons!

Making additional use of beacon signals.

by D. R. "Kuby" Kubichek N6JSX

Amateur Radio has set aside dedicated portions of various bands for radio beacons which typically broadcast the operator's callsign in CW on a low-power omnidirectional antenna. A beacon's *only* recognized purpose is to evaluate radio wave propagation on a specific frequency from a specific location. But beacons can do double duty—being an RF source for monitoring propagation and also transmitting telemetry information. The beacon telemetry can be in the form of varying audio tones that can disseminate public safety information in the form of wind speed, seismic energy, or even area weather warnings! A beacon could even transmit Morse code practice.

The Midwest and South have tornadoes, the East and Gulf Coast have hurricanes, and the West has earthquakes and volcanic activity as major natural threats. There is no reason why radio beacons can't transmit useful and possibly lifesaving information while they send their regular transmission.

Until I built my Seismic beacon, I may have listened to beacons for a total of 15 minutes over 22 years of hamming. How many of these read-

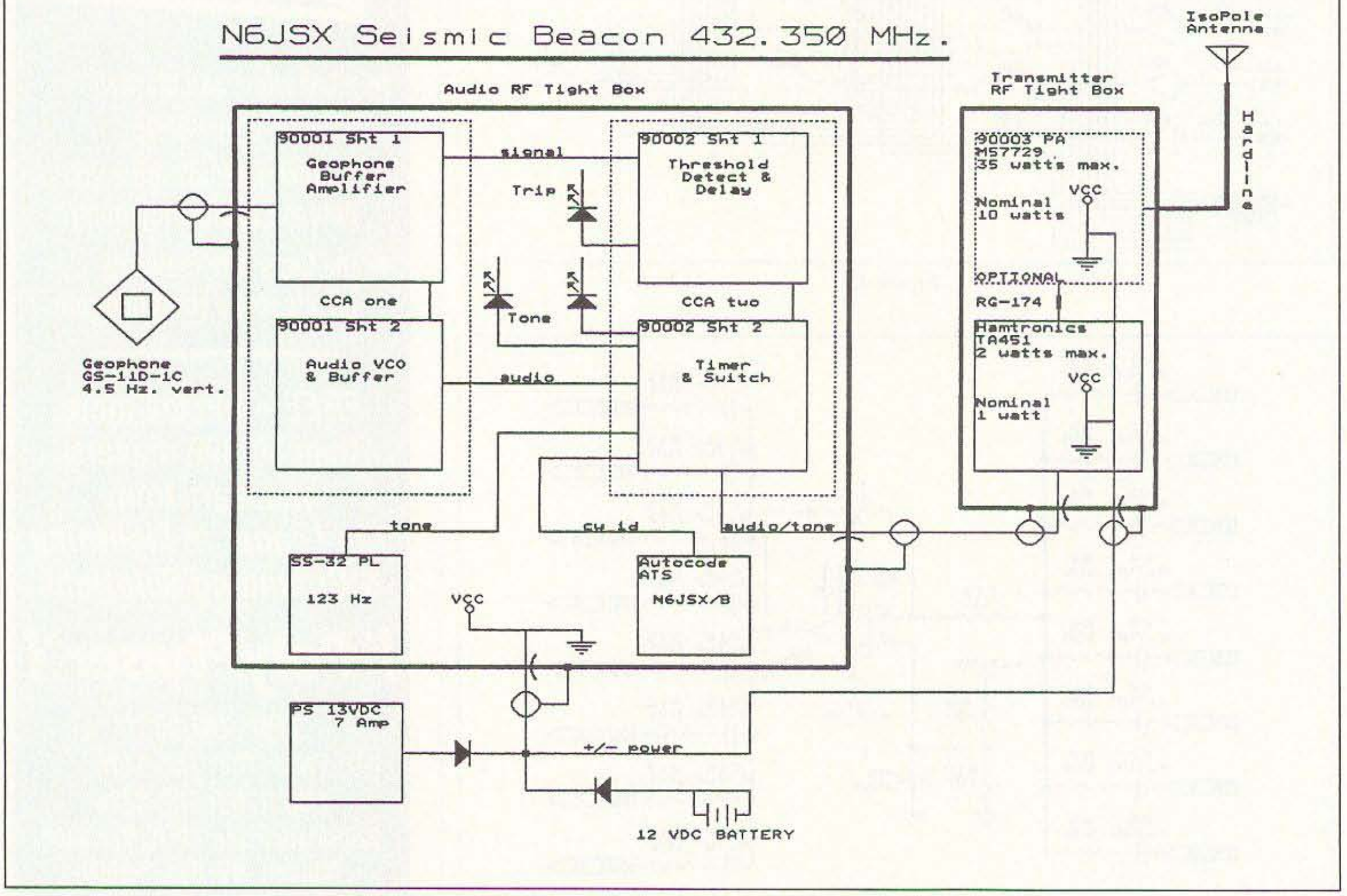


Figure 1. System Interconnect Diagram.

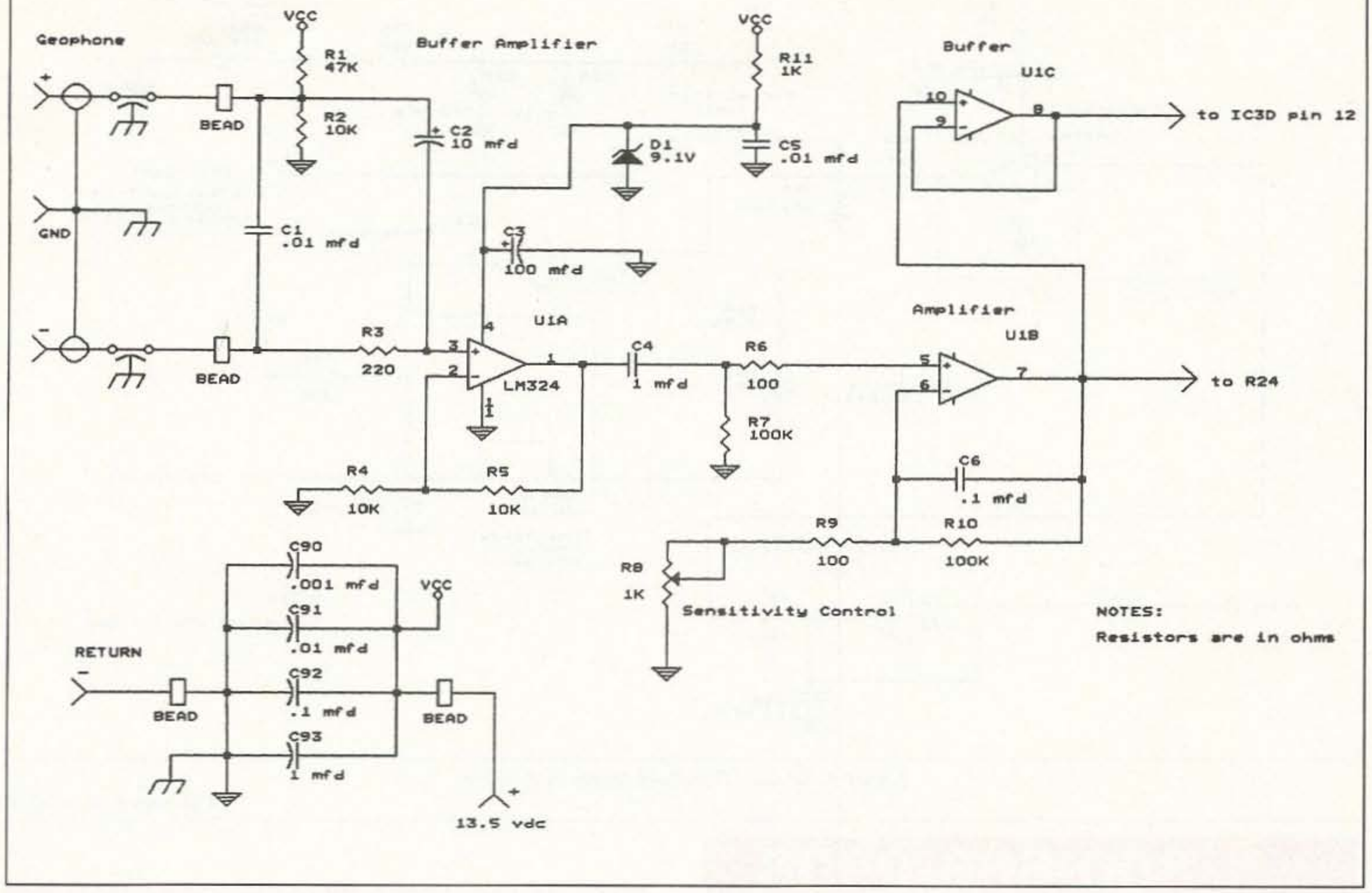


Figure 2. Geophone Buffer Amplifier.

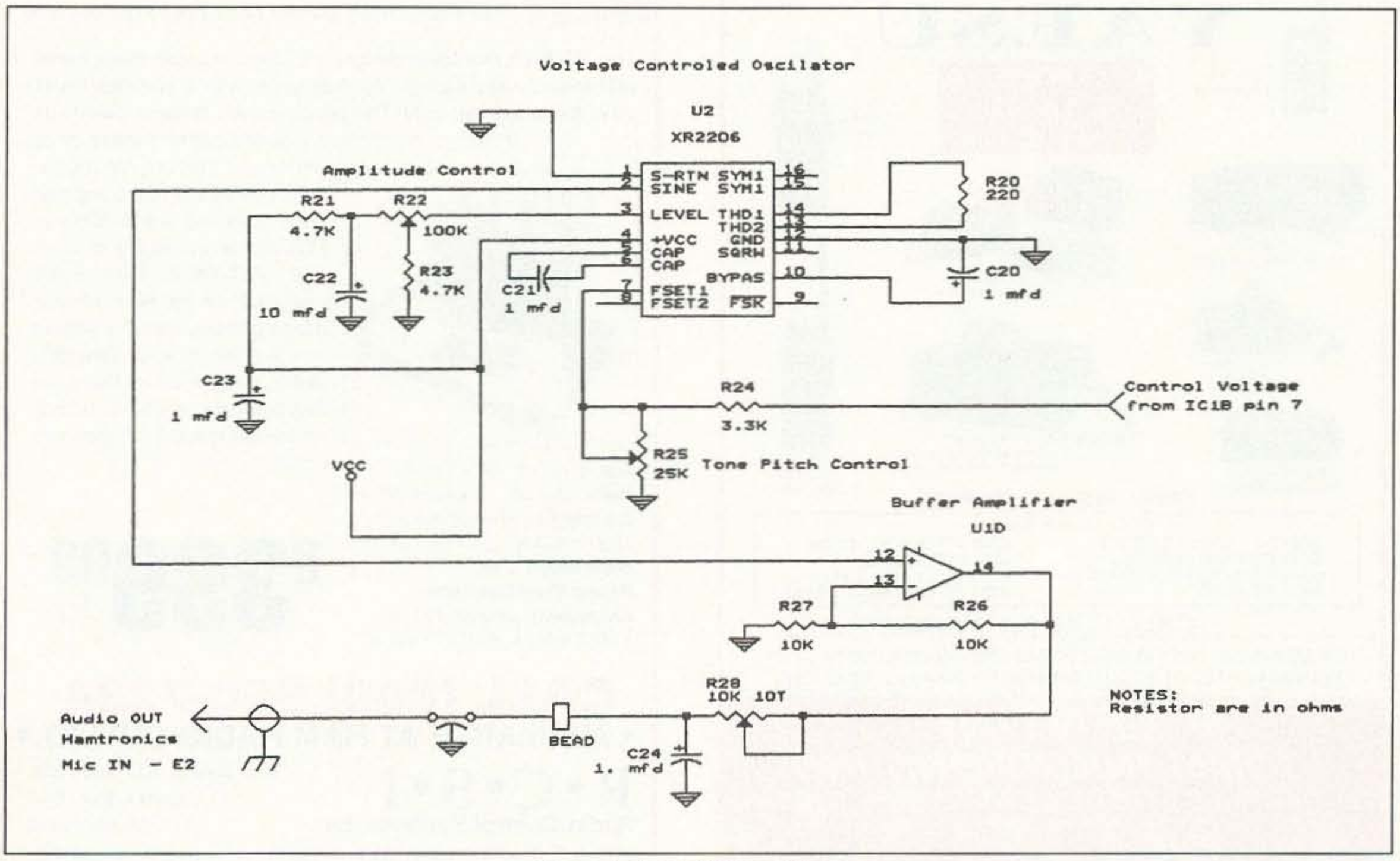


Figure 3. Audio VCO and Buffer.

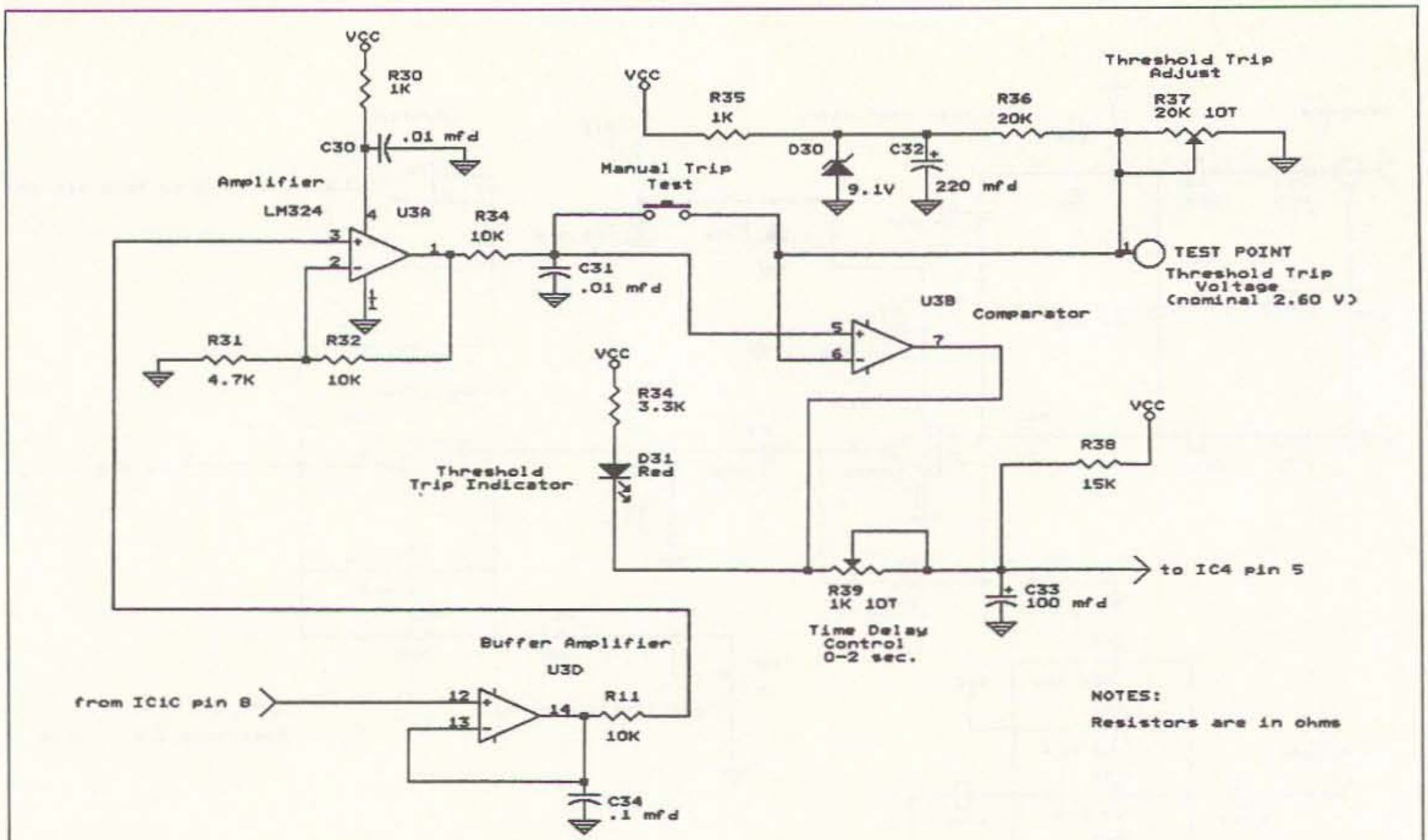


Figure 4. Seismic Threshold Detect and Delay.

Continued on page 38

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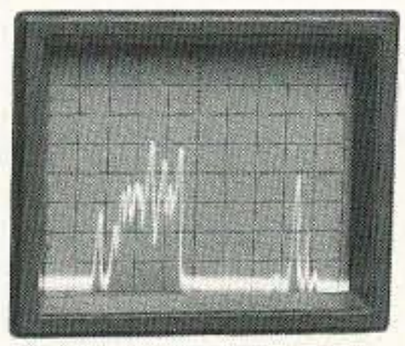

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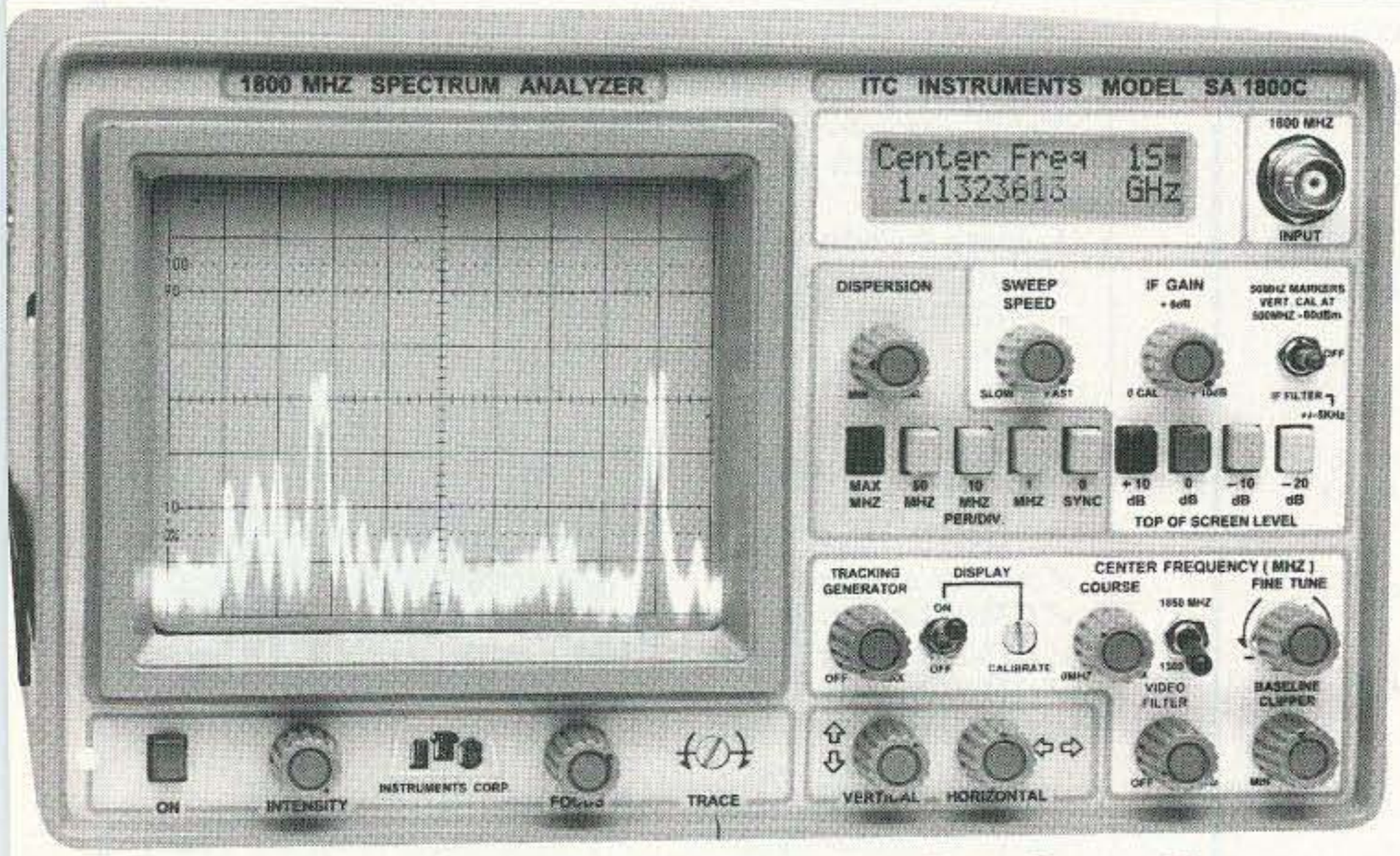

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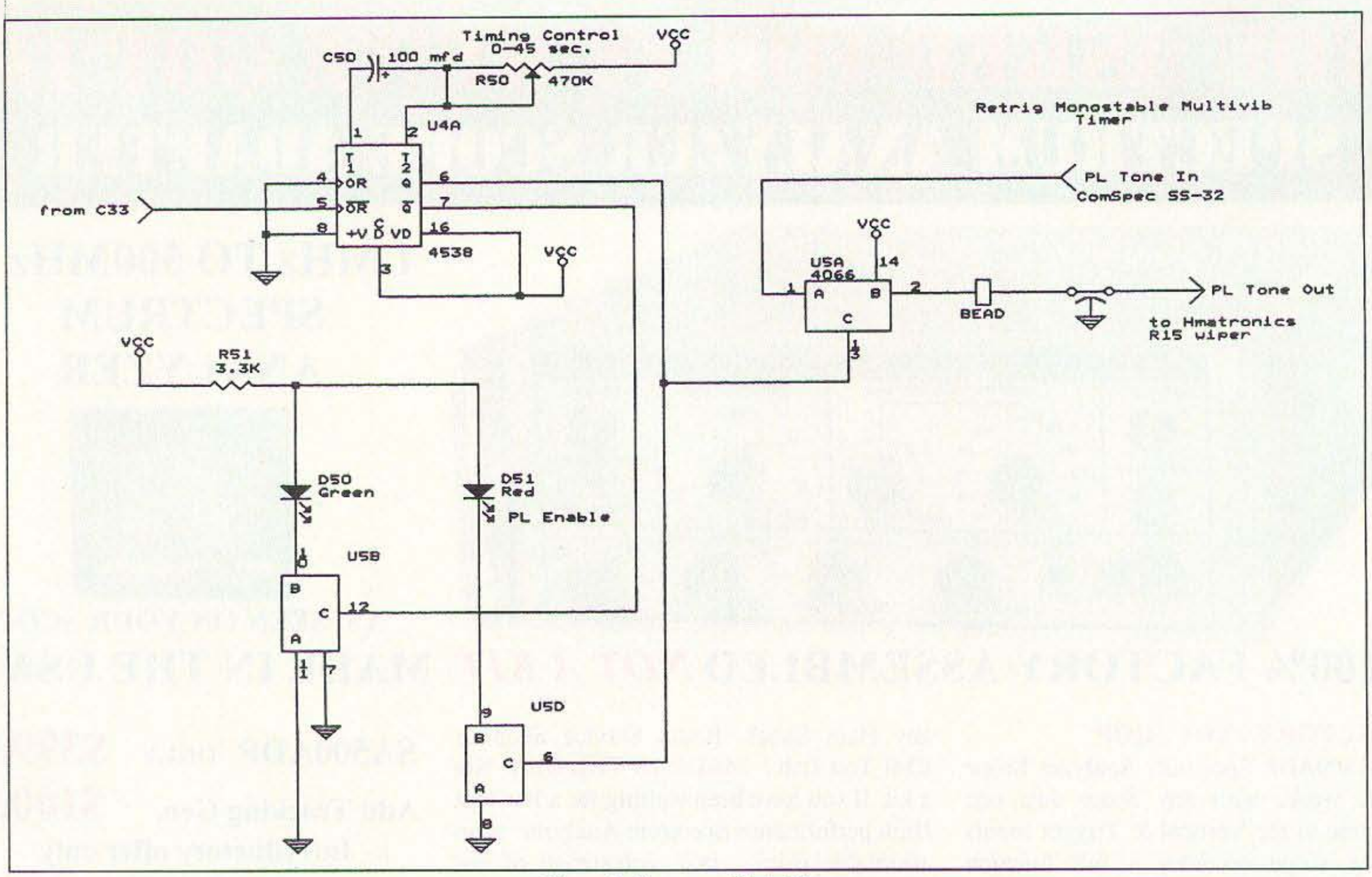

Figure 5. Timer and Switching.

Continued on page 40

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MC-1, Micro size sensitive mike cartridge for FM-1,2,4.....**$2.95**

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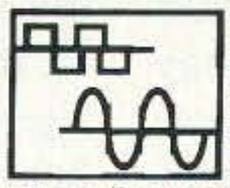

DDS (Direct Digital Synthesis) technology brings you a terrific audio generator at a fantastic price! Generates from 0. 01 Hz to 50 KHz with five digit LED display of frequency. Sine and square wave output adjustable 0-5 volt p-p. Frequency selected by direct keyboard entry and with handy continuous tune tuning knob. Crystal controlled accuracy of 10 ppm and two memories for rapid frequency changes. Retire that jury-rigged old generator and treat yourself to the pleasure of using a new state-of-the-art SG-550!

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Shortwave receiver kit, SR1.....**$29.95**
Shortwave converter kit, SC1.....**$27.95**
Matching case set for SR1, CSR.....**$14.95**
Matching case set for SCI, CSC.....**$14.95**

AM TRANSMITTER

High quality, true AM broadcast band transmitter is designed exactly like the big commercial rigs. Power of 100 mW, legal range of up to 1/4 mile. Accepts line level inputs from tape and CD players and mike mixers, tunable 550-1750 KHz. Complete manual explains circuitry, help with FCC regs and even antenna ideas. Be your own Rush Limbaugh or Rick Dees with the AM-1! Add our case set for a true station look.

AM-1 Transmitter kit.....**$29.95**
CAM Matching case set.....**$14.95**

SCANNER CONVERTER

Tune in on the 800-950 MHz action using your existing scanner. Frequencies are converted with crystal referenced stabilty to the 400-550 MHz range. Instructions are even included on building high performance 900 MHz antennas. Well designed circuit features extensive filtering and convenient on-off/bypass switch. Easy one hour assembly or available fully assembled. Add our matching case set for a professional look.

SCN-1 Scanner converter kit.....**$49.95**
SCN Matching case set.....**$14.95**
SCN-1WT Assembled SCN-1 and case.....**$89.95**

SURROUND-SOUND/REVERB

Add concert hall realism to your stereo, TV or even 2-way radio! Easily sythesize a stereo effect from mono sources or richly enliven regular music. Add a big-voice reverb to your radio voice that others will envy! Our reverb/surround sound kit uses a Bucket Brigade IC Device for reliable solid-state performance. Adjustable reverb, delay and mix controls to customize your sound. Easily connected to radios, stereos, CB's and TV's. Plently of audio to drive a small speaker for stand-alone operation too. Experierence the fun and realism that surround sound provides - without spending hundreds! Add our case set for a neat, pro look.

RV-1 Surround Sound/Reverb kit.....**$59.95** CRV Matching case set.....**$14.95**
RV-1WT Assembled RV- 1 and case.....**$89.95**

TOUCH-TONE REMOTE CONTROL

Control virtually anything by Touch-Tone remote control. The URC-1 has 16 switched outputs, 4 adjustable voltage outputs (20 mV steps 0 to 5 VDC), two 10K digital pots (for volume, squelch, etc.) and 3 timers adjustable from 10 mS to 40 hours! Two level password control allows secure control and multi-level access. Six digit LED display shows currently entered codes and a crystal controlled touch-tone decoder provides reliable operation. There's nothing else like this unit, be in complete control of remote radios, thermostats, hi-fi's, homes or even factories with the URC-1. Add our matching case set for a handsome finish.

URC-1 Remote control kit.....**$129.95** CURC Matching case set.....**$14.95**
URC-1WT Fully assembled URC-1 and case.....**$189.95**

FM SUBCARRIER DECODER

Tap into the world of commercial-free music and data that is carried over many standard FM broadcast radio stations. Decoder hooks to the demodulator of FM radio and tunes the 50-100 KHz SCA subcarrier band. Many radios have a demod output, but if your radio doesn't, it's easy to locate, or use our FR-1 FM receiver kit which is a complete FM radio with a demod jack built-in. These "hidden" subcarriers carry lots of neat programming - from stock quotes to news to music, from rock to easy listening - all commercial free. Hear what you've been missing with the SCA-1.

SCA-1 Decoder kit.....**$27.95** CSCA Matching case set.....**$14.95**
FR-1 FM receiver kit.....**$24.95** CFR Matching case for FR-1.....**$14.95**

L-C METER

Measure inductors from 10 uH-10mH and capacitors from 2 pF-2uF with high accuracy by connecting the LC-1 to any digital multimeter. Two pushbutton ranges for high resolution readings and we even give you calibration components to assure proper accuracy of your kit! Active filters and switching supplies require critical values, no one should be without an accurate LC meter. For a pro look, add our matching case set.

LC-1 LC meter kit.....**$34.95** CLC case set.....**$14.95**

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Control the speed and direction of any motor. Use our SMD-1 for those nice steppers you see surplus, and our MSC-1 for DC motors. The stepper driver features variable speed, half step rotation, direction and power down mode, can drive most any stepper motor. Our DC driver features pulse width modulation control allowing full motor torque even at low speeds and can drive motors up to 50 VDC @ 10 Amps! Add our case set for a professional assembly.

SMD-1 Stepper kit.....**$24.95** MSC-1 DC motor kit.....**$24.95**
CSMD SMD-1 case.....**$14.95** CMSC MSC-1 case.....**$14.95**

STEREO FM TRANSMITTER

Run your own Stereo FM radio station! Transmits a stable signal in the 88-108 MHz FM broadcast band up to 1 mile. Detailed manual provides helpful info on FCC regs, antenna ideas and range to expect. Latest design features adjustable line level inputs, pre-emphasis and crystal controlled subcarrier. Connects to any CD or tape player, mike mixer or radio. Includes free tuning tool too! For a pro look add our matching case set with on-board whip antenna

FM-10A Stereo transmitter kit.....**$34.95**
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Quit spending big bucks for replacement battery packs, rejuvenate and condition your batteries for peak capacity. Advanced circuitry has optimized discharge before charge to eliminate memory effect and to condition batteries that have been poorly cared for in the past. Quick charge rapidly brings battery to full charge in less than an hour-just 15 minutes for some types! And "top-off" charge mode squeezes every last bit of energy into each cell for the absolute most capacity. Switch-mode regulator controls constant current charge while being monitored by a negative delta-V system that cuts off the fast charge at the exact point of full charge-batteries are charged, not cooked! Charges NiCads or NiMH packs from 2 to 10 cells (easily expanded) and current capacities up to 10 Amp-hours. Runs on 12 to 15 VDC. Quit cooking your batteries, buying new packs, waiting hours for recharge, get a Dr. Ni-Cad today! Available in money saving kit form or wired and tested with case at a special price. Kit builders: add our matching case set for a snazzy finish.

DN-1 Dr. Ni-Cad conditioner/fast charger kit.....**$49.95**
CDN Matching case set.....**$14.95**
DN-1WT Fully assembled Dr. Ni-Cad with case.....**$89.95**

SPEED RADAR

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual Doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

SG-7 Complete kit.....**$99.95**

STEREO PEAK HOLD BARGRAPH

Finally a dual LED bar graph with a peak hold display! Bar graph displays are neat and eye catching but their speed is their downfall - they just can't capture the peaks. Our kit is like two units in one, a fast display to show the signal and a long persistance display to capture peaks, similar units go for hundreds of bucks! We offer 3 models: Linear for general use, Semi-Log for audio VU meters, and Log for power displays. Dual - for stereo! - 10 segment multi-colored LED display for snazzy, eye grabbing display and easily set ranges for virtually any signals, from voltmeters to audio VU meters to audio power amps to SWR meters. Complete intructions for easy hook-up to most any device. Add our matching case set for a sharp looking unit.

PH-14 Dual Linear bargraph kit.....**$39.95** PH-15 Dual Log bargraph kit..**$39.95**
PH-16 Dual Semi-Log bargraph kit.....**$39.95** CPH Matching case set.....**$14.95**

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Descramble most scramble systems heard on your scanner radio or set up your own scambled communication system over the phone or radio. Latest 3rd generation IC is used for fantastic audio quality - equivalent to over 30 op-amps and mixers! Crystal controlled for crystal clear sound with a built-in 2 watt audio amp for direct radio hook-up. For scramble systems, each user has a unit for full duplex operation. Communicate in privacy with the SS-70. Add our case set for a fine professional finish.

SS-70 Scrambler /descramblerkit....**$39.95**
CSSD matching case set.....**$14.95**
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CRYSTAL RADIO

Relive the radio past with a crystal set like your grandfather built. Uses genuine Galena crystal and catwhisker. Several different types of radios are built, including standard AM broadcast, shortwave and even WW II foxhole style. To compare modern semiconductor detectors, we include a diode for comparison. No soldering required and we even give antenna ideas. Radio for free, get it now before Clinton taxes it!

CS-1 Crystal set kit.....**$19.95**

TOUCH-TONE DECODER

Grab Touch-Tone numbers right off the air, phone or tape. A simple hook-up to any radio speaker or phone line is all that is required to instantly decipher touch-tone phone numbers or codes. A 256 digit memory stores decoded numbers and keeps its memory even in the event of power loss. An 8 digit LED display allows you to scroll through the memory bank to examine numbers. To make it easy to pick out number groups or codes, a "dash" is inserted between sets of digits that were decoded more than 2 seconds apart. A "central-office" quality crystal controlled decoder is used allowing rapid and reliable detection of numbers at up to 20 digits per second! For a professionally finished look, add our matching case set. Start cracking those secret codes tomorrow with the Tone Grabber!

TG-1 Tone Grabber kit.....**$99.95** CTG Matching case set.....**$14.95**
TG-1WT Fully assembled TG-1 and case.....**$149.95**

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CB-1 Voice recorder kit.....**$59.95** CCB Matching case set.....**$14.95**

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CIRCLE 34 ON READER SEVICE CARD

ers have ever listened to a beacon? How many of you can even copy the CW ID? Do you know where beacons are located and their operating parameters?

I built my Amateur Radio Beacon primarily as a radio seismometer that runs at 2 to 10 watts covering the Los Angeles area on 432.350 megahertz, and this beacon could be used for propagation evaluation. My ID cycle is set for a 9.5-minute intervals, but the beacon transmits a constant tone near 680 hertz that varies proportionally to any amount of seismic energy sensed by a geophone sensor. The sensor is so sensitive I could distinguish between a loaded or an unloaded train moving three-fourths of a mile north of my home.

When seismic energy is detected that exceeds a preset threshold, a subaudible tone is injected onto the beacon's signal. (This optional subaudible tone was added to reduce the detection in the listener's circuitry.) Threshold level appears to indicate events equal to or greater than 3.0 on the Richter scale in my local area. Event threshold detection is typically T + 0 to 2 seconds of delay.

Some Los Angeles VHF and UHF repeaters have expressed an interest in monitoring this type of beacon. With an auxiliary receiver at the repeater site that could detect the subaudible tone, the repeater could either sound a warning tone or retransmit the beacon's audio. The repeater users would get some amount of seismic warning.

"Many small earthquakes over a short period of time (called seismic swarms) can indicate an increased probability of a large, pending earthquake."

This beacon only reacts to actual released seismic energy and is not per se a prediction device. However, if a quake slowly starts releasing energy before the major shock, the beacon could give listeners some forewarning. Many small earthquakes over a short period of time (called seismic swarms) can indicate an increased probability of a large, pending earthquake. Listeners can monitor and judge for themselves how they want to react to the seismic activity. Mobile users could make a quick decision whether to travel under the next freeway overpass or pull to the shoulder. I personally consider any amount of earthquake forewarning better than no warning!

Amateurs who live in earthquake-prone areas could create an overlapping network of seismic beacons. I hope that sharing my beacon

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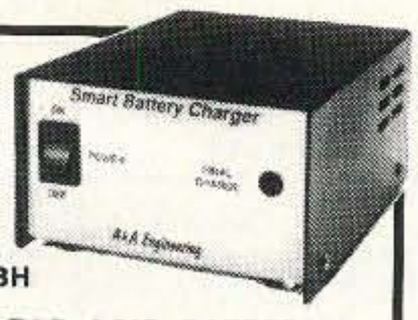
CIRCLE 11 ON READER SERVICE CARD

Smart Battery Charger



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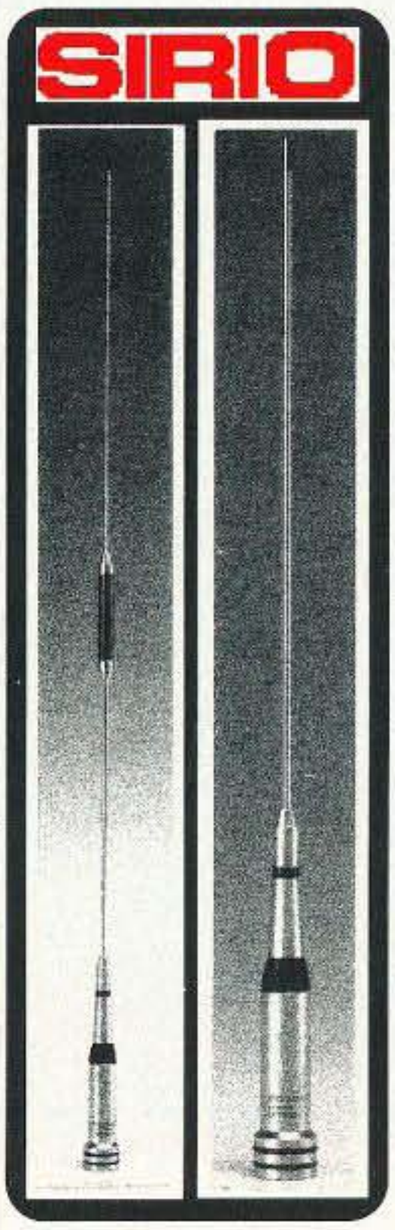
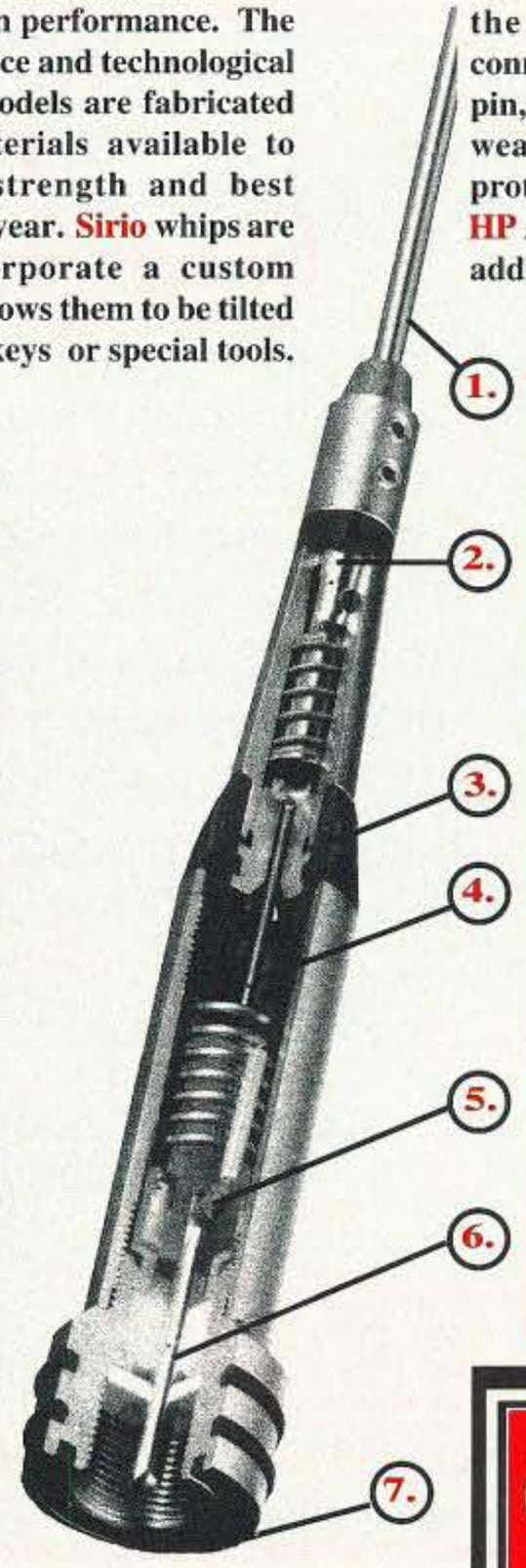
An innovative approach has been taken in the construction of the base impedance matching transformers. This new process results in very high and previously unattainable unit to unit precision. Particular attention has also been paid to the UHF male antenna mounting connector which uses a gold-plated center pin, "TEFLON®" insulation and a rubber weather seal for hi-performance and protection from the elements. All Sirio HP Antennas are factory adjusted and no additional tuning is normally required.





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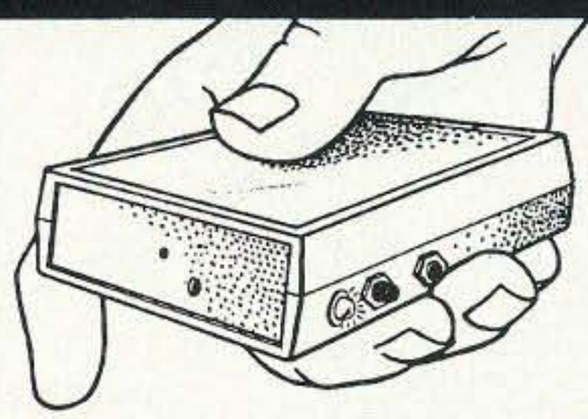
The "ZAPPER II"



With it's new and improved design it will not only test your radar detector... BUT it's tuned to the amateur radio band.

- While out on Americas highways personally test yours and your fellow travelers radar detectors.

The "ZAPPER II" is a 10.450 GHz to 10.550 CW oscillator. It has a code key jack installed for those who want to send Morse code.

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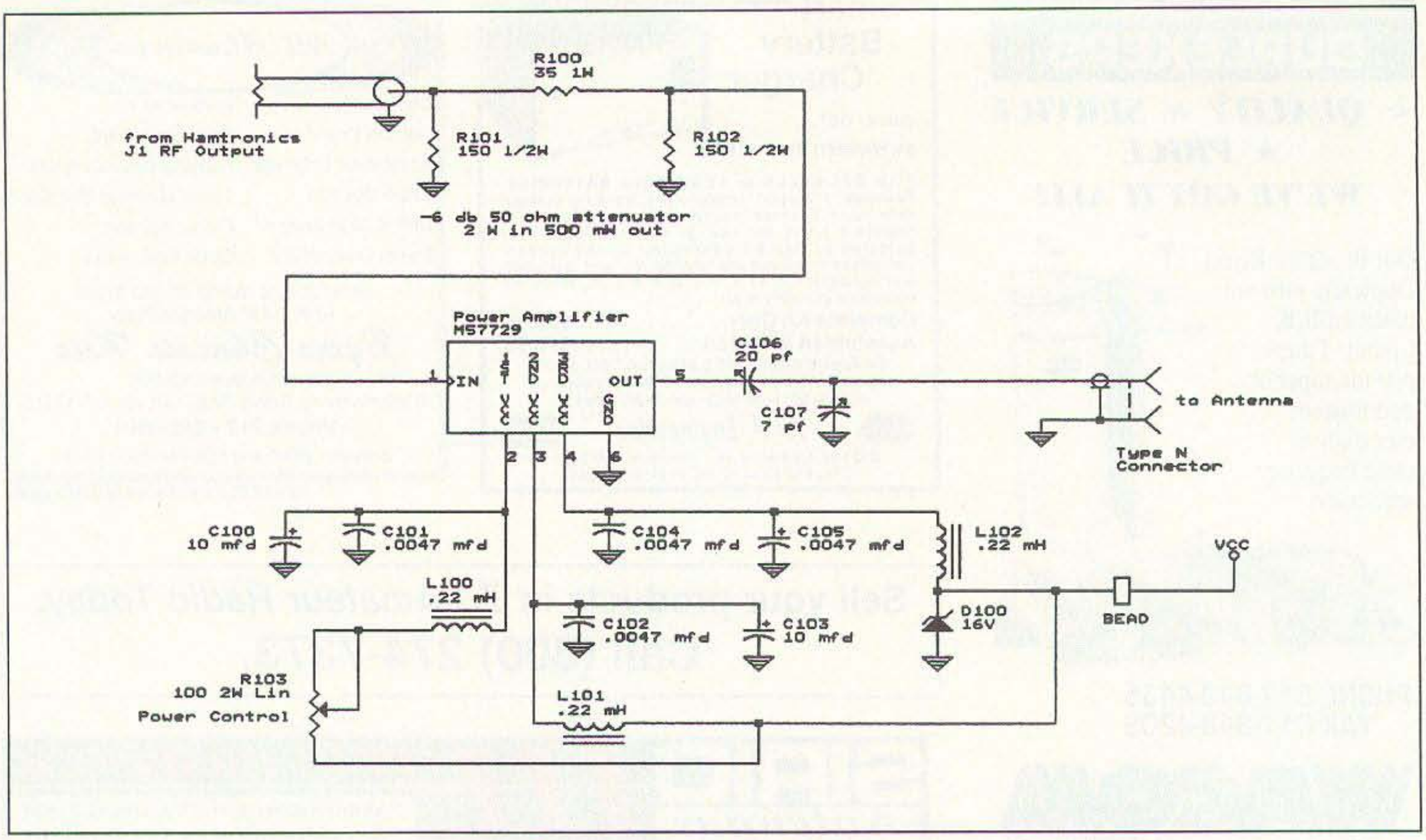


Figure 6. 430 MHz Power Amplifier.

design will initiate an interest in other beacon operators to modify existing beacons or install their own beacon for public safety. One result would be that in the near future an amateur could go anywhere on the West Coast and monitor seismic activity.

Construction

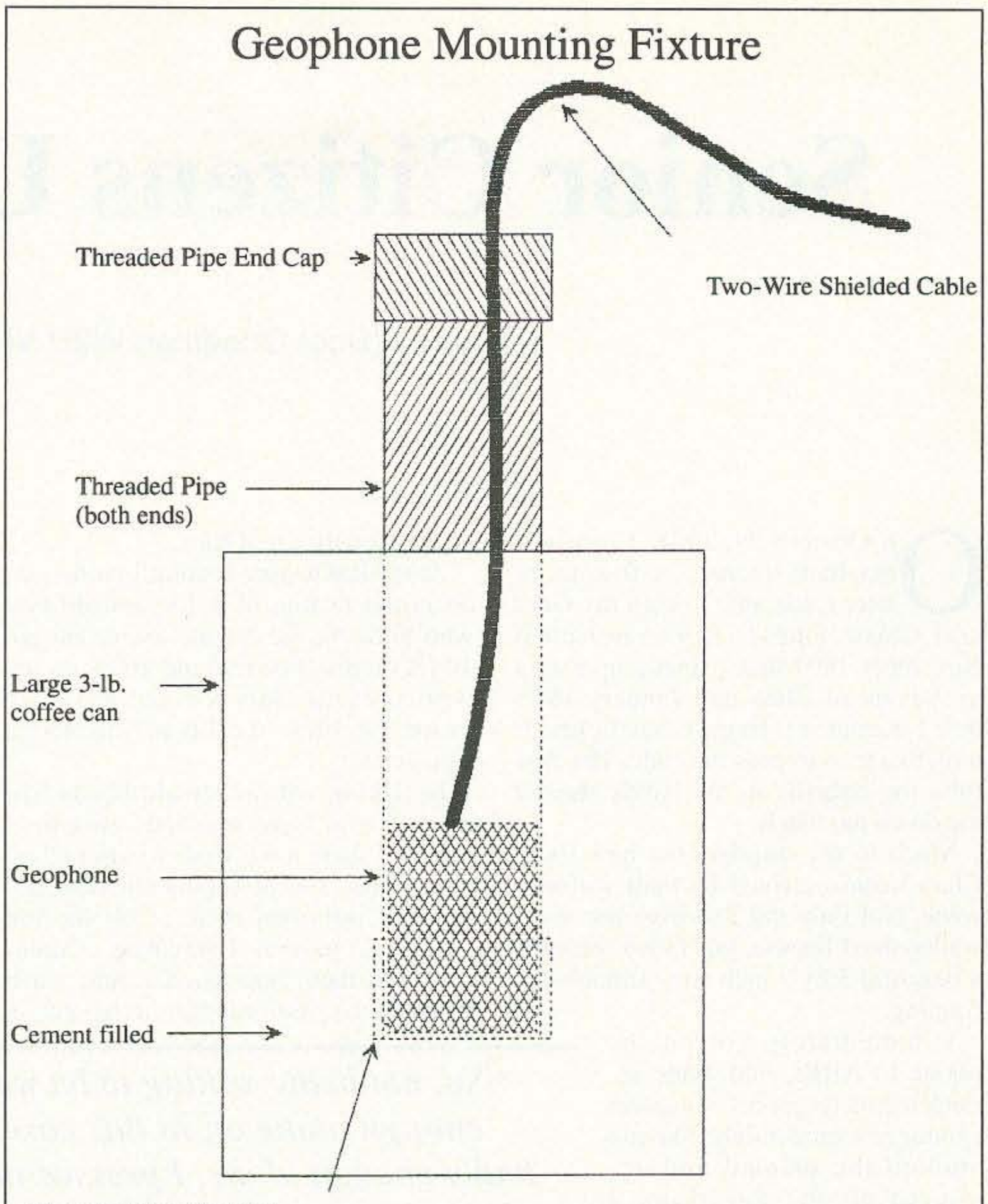
When possible, I used established kits and circuits for this beacon. Figure 1 shows the design of the system. The actual control interface has been omitted from this article as the beacon control operator could control the beacon in many different ways.

Removing the 432-MHz signal from the various power supply and signal lines can be quite a headache. Using ferrite beads, feed-through capacitors, shielded cables, and grounding methods, and experimenting with by-pass capacitors can minimize the RFI problem. There is no sure and fast method. However, the geophone amplifier, audio, ID, PL, and timing circuits (Figures 2–7) cannot be in the same RF-tight box as the transmitter or power amplifier module!

Adjustments

The various circuit adjustments are rather straightforward. Adjustments are set for the best audio quality and your seismic energy sensitivity preference. The threshold trip point is set for the PL tone activation. The time delay adjust is to help eliminate false tripping of the PL tone activation.

Hamtronics transmitters can run continuously at 2 watts of power but still get quite warm, so I recommend a small cooling fan. To eliminate this fan requirement, I run the Hamtronics transmitter at about 1 watt. The nearly 1-watt signal is further attenuated and used as an exciter into a S-AU4 PA brick. The power on the PA board is capable of 15 watts, but is set to run at a cool 10 watts. The power amplifier is an optional item, which is a matter of personal preference. 73



The total weight of the fixture is about 16 lbs. A small piece of foam rubber is placed in the bottom of the pipe. A wooden dowel is carefully measured and placed on top of the geophone to the top of the pipe end. The geophone is now firmly held in place. Silicon caulking is placed at the wire exit to make a moisture-tight fixture.

Figure 7. Geophone Mounting Fixture.

N6JSX Seismic Beacon—Purchased Equipment List

Hamtronics TA451 UHF Transmitter 12-VDC Kit	$99.00	(716) 392-9430
Crystal 432.350 MHz	$12.00	
Crystal Oven	$30.00	
A16 RF Tight Box	$30.00	
Autocode ATS IDer 12-VDC Programmed N6JSX/B	$79.50	(805) 497-4620
Communications Specialists SS-32 12VDC	$29.95	(714) 998-3021
Oyo Geospace GS-11D-1C 4.5-Hz vert. geophone	$56.00	(713) 939-9700
RF Parts Co. S-AU4 Power Amp 12VDC	$75.00	(619) 744-0728
Unicorn Electronics—various ICs & diodes		(818) 341-8833
XR-2206 Mono Function Gen	$3.79	
4538 Prec Mono Multivib	$0.69	
LM-324 Quad Op-Amp	$0.33	
Norcon Engineering TD16 Controller 12-VDC Kit	$44.95	(706) 664-7817

Senior Citizens Upgrade

by Hal (Doc) Goodman W3UWH

On October 29, 1948, I received my ham license. A few years later I was able to earn my General Class license. It was not until November 1994 that I finally upgraded to Advanced Class and January 1995 that I earned my Extra Class ticket. It took two tries to pass the code. The first time the arthritis in my hands slowed me down too much.

Much to my surprise, my new Extra Class license arrived by mail within a week. Not only did I receive the usual wallet-sized license, but I also received a beautiful 5 by 7 inch copy suitable for framing.

I immediately got on the phone to ARRL and made arrangements to get my volunteer examiner's credentials. Having studied the manual and answered all the questions, I mailed the packet back to the ARRL. They never told me, but I think I got all the questions right. Several weeks later, I received by mail my shiny new badge with its impressive red lettering identifying me as an Extra Class volunteer examiner.

Since that time I have had the privilege of taking part, with a large group of volunteer examiners, in several testing sessions. And it is a privilege to be able to share in the joy when someone gets his or her first license or, after much effort, is finally able to upgrade. At one session, while waiting for the testing to begin, I was able to help a newly minted Tech-plus make his first CW contact using the club station. I sat next to him and copied the incoming code with him so he could relax and not worry about missing anything. I helped him figure out what to reply with and when he should repeat things, such as RST and name. When it was all over, I felt like an old pro and he felt like he was finally a real ham.

At the last testing session I participated in the testing of a 13-year-old boy who blew the lid off the exam. He got 100% on his code test and 100% on his written exam. This was not a Novice exam. He blew the lid off the Extra Class exam!

In talking with other old hands like myself who have reached retirement age and now have time to appreciate ham radio, I kept urging them to upgrade. I informed them of all the fun they could have as a volunteer examiner. I told them how good it felt, when working the Maritime Net, to be able to go down to 150 and find an open spot to run a phone patch without all the usual interference. The more I talked, the more they all seemed just to get quiet and lose interest in the conversation. When I questioned them about why they weren't interested, their answers surprised me.

"So, not being willing to let well enough alone or, in this case, badly enough alone, I pressed them about this 'crazy' idea of getting an automatic upgrade."

They believe that after thirty, forty, fifty, or more years as hams who have done things right and have no violations, they ought automatically to be given an upgrade. Now you should understand that these are hams who got Class "B" licenses or, in a few cases, General Class licenses before half the current hams were born. They, for the most part, have lived very successful lives both personally and professionally. They were not the type of people who had lost interest in life or their hobby.

So, not being willing to let well enough alone or, in this case, badly enough alone, I pressed them about this "crazy" idea of getting an automatic upgrade. What they finally admitted was that they could not do the high-level math and did not feel they were still able to memorize well enough to pass either the Advanced or Extra exam. They felt they could handle a 20-wpm code test, but almost nothing could convince them that it was even worth trying the written. They were absolutely convinced that at their age they had no chance of passing. What is even more ironic is that most of these guys had forgotten more radio and electronic theory than I will ever know.

I explained to a couple of my close friends that I could show them how they could pass without having to learn the "new math." I told them that if they agreed, I would spend only 10 minutes a day with them for a few weeks and guarantee that they would get all the math questions right without having to do any math. One friend finally said okay, and I gave him my copy of the Advanced Class license preparation manual. However, every time I stopped by to visit him there was always something that needed doing—anything but work on the test.

This is a shame. Here they were, the very people who built ham radio, at a time in their lives when ham radio was their main method for socializing and keeping active, and they did not have all the privileges and opportunities that an upgrade could give them.

Simply to give an automatic upgrade is unfair. So what I would like to propose is a senior citizens upgrade exam. To qualify, a ham would have to be at least 60 years old and have been licensed (General Class) for at least 25 years. The exam would consist of ques-

tions on radio etiquette, rules and regulations, basic radio theory (not nands and nors and polar coordinates), contributions of ham radio to public safety and well being, the history of ham radio, and so forth.

I am not suggesting that the test be so superficial and easy that it doesn't require any study. It should be reasonably difficult enough that it allows the seniors to feel as if they really earned the upgrade, such as through drawing schematics and designing circuits. The exam could be challenging without asking them to do high-level math.

I was talking to a Norwegian station a little while ago. He told me that in order for him to get his Extra Class license, which incidentally has more privileges than an American Extra Class, he had to pass a 12-wpm code test and a written exam that is the equivalent of our General Class exam.

This may sound like sour grapes; however, if the rest of the world is willing to give their hams a break, we could at least be more understanding of our own old-timers. Experience, etiquette, patience, understanding, and wisdom generally come with age. New math, however, is for youngsters. You will never be able to convince these "old dogs" that they can learn new math.

What is needed is for us to start a campaign to benefit our senior hams. We should be exploring ways to cooperate with the FCC in designing a Senior Citizens Advanced Grade test. And if that works out, even an Extra Class exam that still requires 20-wpm code but does not require learning new math.

As a VE, I am involved in administering and scoring all levels of written tests as well as all levels of code proficiency. It would not be any burden to add one or two additional written tests. I am sure that my fellow VEs share my feeling. The sheer pleasure of seeing some old-timer upgrade is no less than watching a youngster getting his first license.

The purpose of our hobby is not just enjoyment. We are here to perform public service in times of need. Who better to reward than those who have for years faithfully performed public services and helped ham radio gain its good reputation?

I would like my fellow hams to start a dialogue. Write in, fax, get on the air, and discuss the idea of a senior citizen upgrade. If I am wrong and most hams don't favor the idea, so be it. If I am right, then let's get the ball rolling while many of our senior hams are still around to take advantage of the upgrade. 73

QRP Mini-Tuner

A neat little addition to your rig.

by Mark L. Meyer

Have you ever wished for a physically small antenna tuner for your portable operations or maybe to build into your next rig? Here is one that will fit the bill.

There is nothing new about the circuit. This is the old familiar "T" match circuit that has been around for years. The feature that will catch your attention is that this design uses toroids for the inductors. Inductors wound on toroidal cores concentrate the field within the core. They also pack plenty of inductance into a small package. This allows you to compact the design without loss of performance.

All the parts are easily obtained. The toroid cores are the garden variety available from Palomar, Amidon, Dan's Small Parts, Ocean State, and many others. The switches specified are light-duty Radio Shack units.

The variable capacitors are the APC type that can be panel mounted with the rotor and stator both insulated above ground. Almost any variable will work as long as you remember that however you construct your unit, neither rotor nor stator can be grounded. You don't have to worry about the plate spacing if you operate at QRP levels. Many of these can be found in the junk box and hamfests, or you can order them from Dan's Small Parts. APC types do require an insulated knob to protect you from getting "bit" by RF.

In Figure 1, the diagram specifies 150 pF for the variable capacitors C1 and C2, but any value from 150 to 250 pF is suitable. I had the 150 pF units, so I used them. On the output side, I paralleled a variable C2 with a 36 pF capacitor to increase the loading slightly. This will not be necessary if you use a 200–250 pF unit.

When winding the toroids, space the winding out over about 3/4 of the core. When you come to a tap turn, twist a small loop in the wire and then keep on winding. When you have the entire winding on, you can use some Duco cement, Q-dope, or epoxy to help keep the winding in place. Scrape the insulation off the end wires and off the loops you place for taps and you're ready to hook things up.

If you use fairly stiff wires to connect to the taps, and if you allow room, you can mount the toroids hanging in air off the switch taps. Thin strips of copper or solder-saturated solder wick can be used as wide, flat conductors to connect to the capacitors and connectors to keep stray inductance down for better high-frequency performance.

With a "T" match, more than one setting of the controls can be found that will minimize the SWR. The correct setting to use is the one that maximizes the C2's capacitance. This will insure the most efficient operation. To tune up, select a tap setting, set C1 and C2 to mid-range, and then peak a received signal. Then apply low power, and tune C1 and C2 for minimum SWR indication. Try to find a tap number that will result in the maximum C2 capacitance. Experiment.

I have my unit built into a home-brew 20-40-80 meter transceiver. With most antennas I find that I generally have the inductor tap set at 3 for 20 meter operation, 6 for 40 meters, and 8 for 80 meters.

With this antenna tuner you can use any of the SWR-indicating meters designed for low power. I find the one designed by G4ZNQ to be about the best. This bridge circuit can be found in Doug DeMaw's *W1FB's Design Notebook.*

This little tuner will be a great addition to your QRP arsenal. 73

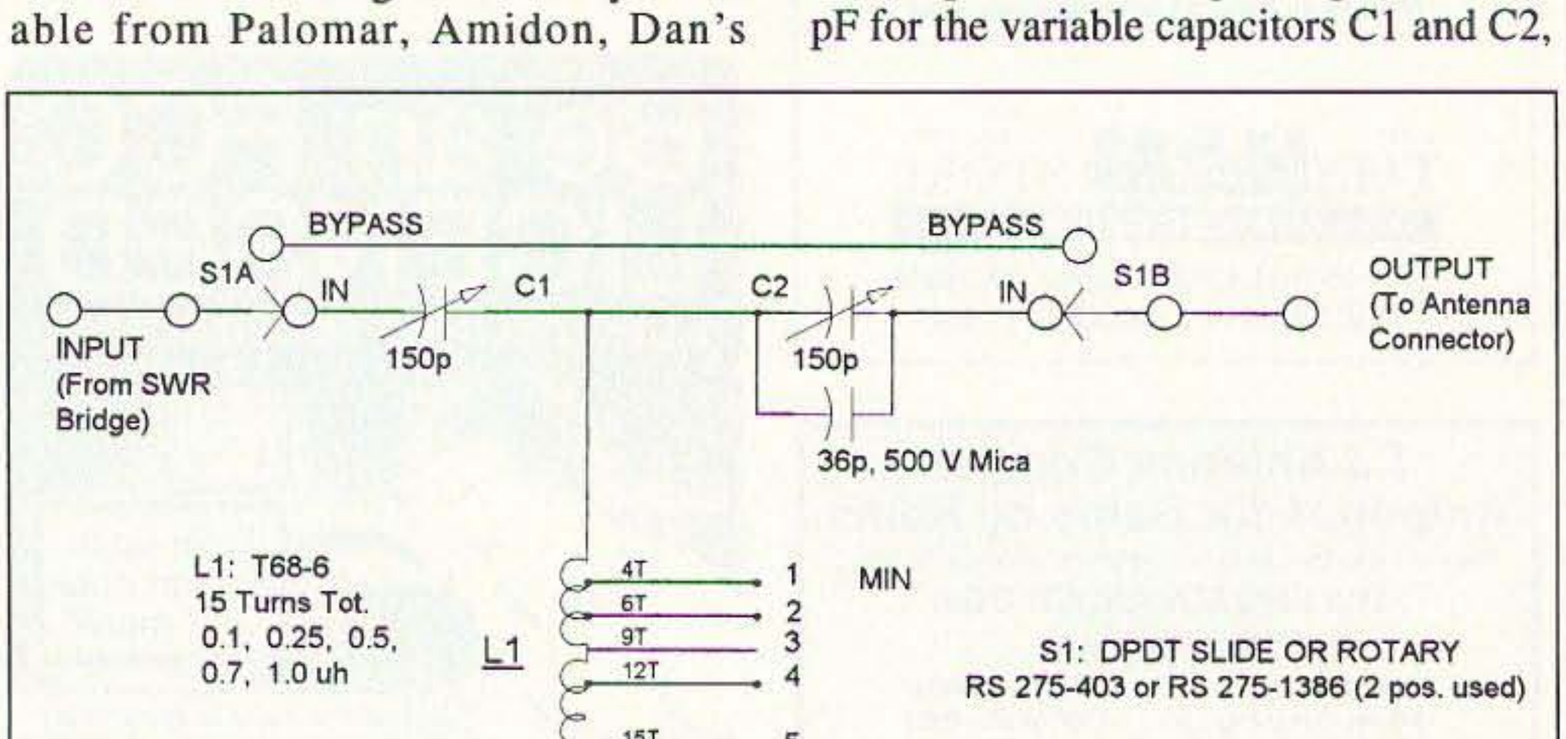


Figure 1. QRP Antenna Tuner.

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CIRCLE 41 ON READER SERVICE CARD

73 Review

Number 12 on your Feedback card

by Peter H. Putman KT2B

The Ramsey Electronics SX-20 QRP SSB/CW 20m Transceiver

Ramsey Electronics
793 Canning Parkway
Victor, NY 14564-8924
Price class: $349.95 (kit)
$429.95 (wired and tested)

A QRP powerhouse.

Yes, that's right . . . *another* QRP rig for 20 meters. Boy, it's getting harder to flip through *73* these days without coming across an advertisement or review for transceivers like these. Build-it-yourself QRP rigs for 20 m, 40 m, and other bands are about as hot as pogs, O. J. Simpson, and sport utility vehicles! But the SX-20 isn't really "just another QRP rig," what with features like direct digital synthesis (DDS), dual VFOs, RIT, built-in iambic keyer, three different tuning speeds, WWV coverage, and a pretty versatile CW filter. And it's all yours for about $350 and a couple of weekends of your time.

When I first saw the SX-20 at Dayton '94, I was impressed with its compact size, one-piece board construction, and range of features. It was only a matter of time before I persuaded John Ramsey to send one down for a build-up and evaluation. And my timing was perfect: While SX-20s had previously been shipped, wired, and tested, the kit versions were just being released, meaning I'd have a chance to debug the manual during construction.

Specifications

The design behind the SX-20 is pretty clever, packing a lot of features into a 9.5"W x 3.7"H x 9"D case weighing all of 5 pounds (see Figure 1). It makes extensive use of LSI chips for all active signal processing, and tuning adjustments are kept to a minimum. Frequency coverage is from 14.0 to 14.5 MHz on receive and 14.0 to 14.35 MHz on transmit, using either 10-Hz, 100-Hz, or 1-kHz steps.

The output stage uses a pair of P3055E power MOSFETs, and maximum power output is spec'ed at 10 watts, though you can adjust this down to under 1 watt using the ALC control for true-blue QRP operation. Receiver sensitivity is claimed to be less than .25 µV for 10 dB S/N, and selectivity in standard SSB mode is -6 dB > 2.3 kHz and -60 dB < 4.0 kHz. But enough numbers! Let's take a look inside the SX-20 and see what makes it tick.

How It Works

The heart of the SX-20 is a Harris HSP45102 chip, working as a direct digital synthesizer. DDS circuits have become quite popular in contemporary transceiver designs, owing to a combination of reasonable cost, compact size, and accuracy. It outputs LO frequencies between 7.5 and 8.5 MHz, which are mixed with the incoming 20 meter signals in an NE602A mixer chip to the first IF of 6.143 MHz. Additional filtering is provided by a six-pole, 2.5-kHz crystal filter before the signal is sent to a CA1350P IF amplifier. Another NE602A mixer works with the second LO at 6.1415 MHz and a CW/SSB frequency offset circuit to provide signals for the LM324 audio amplifier.

In transmit mode, incoming audio signals are amplified a couple of times and fed to a MC1496 balanced modulator/mixer circuit. The suppressed carrier 6.1415 MHz signal from this chip is then sent through the same six-pole crystal filter from before and into an NE602 mixer, which combines this signal with the same 7.5- to 8.5-MHz DDS frequencies to produce the final 20 meter signal. Additional bandpass filtering cleans up the RF before it gets to the 2N3866 pre-driver, P3055E driver, and the final output stage.

The "brains" of the circuit (as Ramsey likes to call it) is a member of the popular Motorola 68HC05-series microcontroller family. Working with a handful of other components, including an inverter and shift register, this processor controls front panel displays, interprets switch closures from the front panel membrane keyboard, and selects the various TX/RX, filter, and mode states.

While there are quite a few bipolar transistors scattered throughout the circuit, they're all either 228256 PNP or 2N3904 NPN devices that perform very simple functions—in fact, most of the time they're just working as switches or low-level amplifiers. This is one of the reasons there are so few circuits to tune in the SX-20, and why the kit is so reasonably priced—none of the components used is that exotic and costly. Even the 68HC05 micro is available in abundant quantities and iterations.

Human interfaces to the SX-20 (let's not forget those!) include a main tuning control, microphone gain control, volume control, a standard eight-pin microphone connector that works with Ramsey's mikes or any ICOM mi-

crophone, and membrane-button controls for TUNING SPEED, DIAL LOCK, RIT, MODE, KEYER, ATTENUATOR, AGC FAST/SLOW, VFO A/B, and WWV. The display is made up of eight-segment, red, alphanumeric LEDs (you were expecting LCDs?) that read to 10-Hz resolution; an eight-step LED S-meter and headphone jack round out the front panel.

Rear-panel connections are kept to a minimum: a standard SO-239 UHF jack for the antenna, stereo phone jack for your CW key, and a 2.5 mm power jack for connection to 12–14 volts. I should add that I'm not thrilled with the use of that particular power plug, as they slide out of the jacks quite easily. My suggestion would be to go to a Molex or other locking connector.

Other controls are provided for calibrating the S-meter, setting the sidetone level when transmitting CW, setting the CW TX/RX cycle delay, and controlling power output. But you'll need to remove the cover to adjust them. Considering that CW delay and sidetone levels are often adjusted to suit the operating circumstances, I think it would be smart of Ramsey to relocate these controls and provide access to them either through the side or top of the transceiver.

Putting It Together

Ramsey has always done a first-rate job of packaging up their kits, and the SX-20 is no exception. There are eight different subassemblies to put together, and individual bags with all the parts for each are clearly identified. Good thing, too, as there are nearly 600 individual components in the kit (not including the optional CW filter)! But mistakes can happen; my particular kit was missing the microcontroller and DDS chips, which were promptly shipped via express mail after a call to Rochester.

If you read the manual carefully, you should have little difficulty in getting each stage of the SX-20 up and running. Each section opens with a discussion of the theory and operation of that circuit, followed by a detailed parts list and parts overlay. Three schematics and two large overlays are also provided with views of the main board and front panel, so locating parts is a quick job.

In addition, both the front panel and main PC boards have part numbers and locations screened right on them; thus, if you install something backwards, blame that guy in the mirror! (**Hint:** When first setting up my work area, I usually spread out sheets of white paper to sort the various parts on. It is considerably easier to spot small capacitors, diodes, and resistors this way.)

The SX-20 instruction manual contains the usual detailed instructions, check-your-work boxes, and off-the-wall Ramsey wit. (The jokes and puns are especially effective during a 3 am building session.) At the end of each chapter, you solder up a few wires, apply power, and check to see if that particular circuit is functional. If not, some troubleshooting hints are provided so you can back up and recheck your work.

Fun and Games

Probably the trickiest part of the project is the front panel assembly, which uses 21 different LEDs for indicators. Because the front panel itself is a membrane keyboard, you must take care must when soldering in the LEDs to avoid pressing too hard against the panel and damaging it. What you actually do is insert all the LEDs in their holes, attach the panel, and tilt everything upside down. The LEDs will just touch the membrane and you can finish soldering and trimming leads. (Of course, I managed to put one LED in backwards!)

Another tricky job involves winding the various transformers between the predriver and driver stages, driver and finals, and final output. These are turns of #24 enamel on large ferrite cores which have been pre-drilled. While winding the turns isn't hard in itself, there have been problems with sharp edges on the core holes that have actually nicked the wire. Since the cores are made of a conductive material, it's possible that the 13.8 volt supply could be shorted, or that turns could be shorted to themselves. (This happened to me.) Tom Hodge of Ramsey advised me that they are now checking these cores under magnifying glasses to make sure they're deburred.

More fun stuff: While testing the front panel, I inadvertently installed one of the Relliflex cables into the wrong side of the connector. After talking to the folks at Ramsey and realizing my error, I inserted it the correct way—and nothing happened! When I first installed the cable incorrectly, it "dimpled" the silver fingers enough so they wouldn't make contact. Rubbing them gently with a pencil eraser cured the problem.

Here's another change for the better: During testing of each stage of the SX-20, the manual requires you to solder up volume control, power, and speaker wires, then desolder them so you can proceed with the next assembly and be able to flip the board over and back. Current kit versions now use molex connectors to eliminate these steps and relieve wire stress.

While these may sound like an annoying series of minor problems, I can assure you they are quite common when debugging a kit and in every case were easily fixed (especially problems caused by my careless assembly!); nor did they slow me down much, as I was still able to test all of the stages of the rig to make sure things were working. When I hit a real stumper, Tom Hodge was able to come up with a good answer in short order.

By now, you may be wondering how long it will take to assemble an SX-20. I like to build at odd hours and work pretty quickly, but my conservative guess is probably four or five nights, with plenty of breaks to check your work and stretch. And you don't need much in the way of tools, either; a 25W to 40W soldering iron, diagonal cutters, small pliers, and wire strippers will suffice for board assembly. A magnifying worklamp is a real help.

Alignment

Tuning up the SX-20 is a fairly quick procedure, and using some rudimentary test equipment makes it go a lot faster. The receiver can be aligned with a strong on-air signal, but I used my time-tested HP608F signal generator, since it isn't affected by sunspots! Ramsey provides their universal "diddle stick" plastic alignment tool, which is used to peak up about nine different transformers for maximum signal. The calibrated generator also makes it easier to set the S-meter correctly, but you could also do this by comparing signals to a calibrated reading on another rig.

On transmit, a frequency counter is a must to set the local oscillators to 6.143 and 6.1415 MHz. I suggest letting the radio warm up and sit for about 15 minutes before making this adjustment. You'll need a VOM or FETVOM to set the idling current for the driver and finals, and this setting will change slightly as the FETs warm up. Make sure you hook up a good 50-ohm dummy load (or antenna, if you haven't anything else to use) during this step. If you have access to an accurate wattmeter, you can set the power output down as low as 1 watt and as high as 12 watts by adjusting the ALC control.

When you first turn on the SX-20, it signals "7" in CW and the numbers "7" and "3" march

Specifications

RAMSEY ELECTRONICS SX-20 20 METER TRANSCEIVER:

Price:	$349.95 in kit form $429.95 wired and tested
Frequency Coverage:	Receive 14.0—14.5 MHz in 10-Hz steps WWV @ 15.000 MHz Transmit 14.0—14.35 MHz in 10-Hz steps
Power Requirements:	13.8 VDC (11.8 to 15.8 VDC) Transmit: 5.0 A Receive: 500 mA
Output Power:	10 Watts PEP
Spurious Emissions:	> 50 dB below peak power
Sensitivity:	< 0.25 µV for 10 dB S/N
Selectivity:	-6 dB > 2.3 kHz -60 dB < 4.0 kHz
Spurious Rejection:	> 70 dB
Audio Output Power:	>2.6 W @ 10% distortion across 8 ohms
Dimensions:	9.5" (W) x 3.7" (H) x 9.0" (D)
Weight:	5 lbs.

along the screen; this is part of the boot-up test on the microcontroller. The display will then turn to 14.225.00 MHz (14.125.00 MHz on VFO B) and you'll be in business. Ramsey sent along the optional CW switched-capacitor filter kit, which comes from the factory set at 700 Hz bandwidth. I switched it to 500 Hz by resoldering a few jumpers, plugged it in, and got on the air in short order.

On the Air

The SX-20 compared favorably to my IC-751A in just about every instance, except when signals stronger than about S7 were received. In this case, the audio quality seemed a bit harsh, as if the waveform was flat-topping a bit, and this applied regardless of whether the AGC was set to fast or slow. Sensitivity measurements for 10 dB S/N are pretty much as claimed, and I measured S1 with 4 μV of signal applied at 14.225 MHz. The 500-Hz CW filter works as well as my IC-751A, with very little ringing.

In transmit mode, I had some trouble getting much output with my standard ICOM mobile microphone. Switching to an SM-8 mike and cranking the gain up almost all the way produced better results, but it took some reworking of the preamplifier stages, as mentioned earlier. I also substituted the stock Ramsey hand-held mike and got the same results, so you'll probably want to run the MIC GAIN control about 75% open.

The CW keyer speed is set by plugging in an iambic paddle, pushing the KEYER SPEED button, and sending dashes or dots while rotating the main tuning knob. Keyer speed can be set from 0 wpm (basically carrier on) to 30 wpm, but I should point out the key is also active in SSB mode. Tapping it won't send CW but will switch the rig into transmit mode; so watch those elbows!

Received signal reports were good in SSB mode, comparable to my ICOM setup with a hand-held microphone. On CW, the keying is very smooth, although it sounded not entirely free of clicks. I'd like to see the folks at Ramsey get rid of the T/R relay and use PIN diodes for switching, thereby allowing full break-in operation. You'll also want to tweak the CW sidetone a few times, since I found that a good setting for the internal speaker was too loud with headphones. Ramsey is now shipping a slightly larger tuning knob with a finger recess, which makes rapid frequency excursions easier.

Conclusions

The SX-20 is definitely not for the first-time kit builder, but if you've logged a few hours on your soldering iron and are used to "stuffing boards," it's a fun kit to put together and you'll be very pleased with the performance of the radio for the price. Its size lends itself well to suitcase or backpack operation, and there's any number of small antenna designs that work nicely with it. By the way, for you 40 meter enthusiasts, Ramsey is now considering brewing up an SX-40. Perhaps we'll get lucky and also see versions for 15 and 10 meters! 73

73 Review

Number 13 on your Feedback card

by Peter J. Bertini K1ZJH

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Price classes $589.00 to $1305.00

The Maggiore Hi Pro R1 Repeater

A full-featured repeater at an affordable price.

In celebration of their 25th Anniversary, Maggiore Electronics unveiled the new R1 repeater at the 1995 Dayton HamVention. This review is based on the unit I received for evaluation, a R1 2 meter VHF repeater outfitted with the optional Computer Automation Technologies 300DX controller, and 35-watt transmitter.

This particular configuration is Maggiore's model R1VHF35DX and lists for $1,245.00 for either the 35-watt 144-MHz or 25-watt 222-MHz repeater. The 20-watt UHF repeater with the CAT300DX is $1,305.00. If you already own a controller, the R1 pricing starts as low as $589.00 for a 2 meter 5-watt package. Maggiore also offers R1 repeaters with a basic COR, ID, and timer board starting at $650.00. Repeater rack cabinets, duplexers, premade cables, power supplies, and high-power repeater amplifiers are also offered at discounted amateur net pricing. I suggest you write or call Maggiore Electronics for a catalog or to discuss finding the R1 repeater system that meets your exact needs. The R1 is FCC type-accepted for commercial service.

The R1 repeater is enclosed in a sturdy 3.5" high by 9" deep steel custom cabinet intended for mounting in a standard 19" rack cabinet (see Photo A). The cabinet has a rugged black epoxy finish with contrasting white lettering. The R1 repeater weighs only 9 pounds. Imagine your club's three 144-, 222-, and 440-MHz repeaters stacked together in less than 12 inches of vertical rack space! (Some space should be left between R1 repeaters for air circulation if they are stacked.) All controls are internal and, once set, need no further adjustment.

Peeking Inside

The steel enclosure is divided into three RF-tight compartments (see Photo B) with the top cover being an integral part of the shielding. Fifteen screws secure the top cover to the R1 repeater enclosure. The liberal use of RF feedthrough capacitors help to maintain the isolation between the computer controller, receiver, and transmitter compartments.

"Despite its small size you can see from the photos that the inside of the R1 is still 'roomy,' with ample space for CTCSS boards, audio delay boards, or other accessories."

Despite its small size you can see from the photos that the inside of the R1 is still "roomy," with ample space for CTCSS boards, audio delay boards, or other accessories. The R1 requires 13.8 VDC at 5 amps to produce 35 watts, making it an attractive candidate for use with alternative power sources.

Maggiore EV1 transmitter

The EV1 exciter is a real workhorse. The power output is 5 watts on 2 meters, but this can be reduced by a driver stage trimpot setting. Maggiore has been using the EV1 exciter for the past several years, and this current version reflects all of the improvements made to the design. Substantial changes have been done to the audio and phase modulator stages, making it so the R1 has excellent audio. The modulator has an input for CTCSS tone encoding.

The oscillator is temperature compensated and holds its frequency to within a few hundred cycles. The 35-watt PA (model PAV-1) mounts on the rear chassis apron and uses a Motorola MRF 240 transistor. The repeater is rated for operation over a range of -20 to 60 degrees C. For hotter climates a R1F fan kit is available. This fan is PTT keyed and uses an additional 150 mA in the transmit mode. The repeater is rated for continuous commercial service. Also, the black finish on the steel case is a good heat emitter, which helps to dissipate the excess heat.

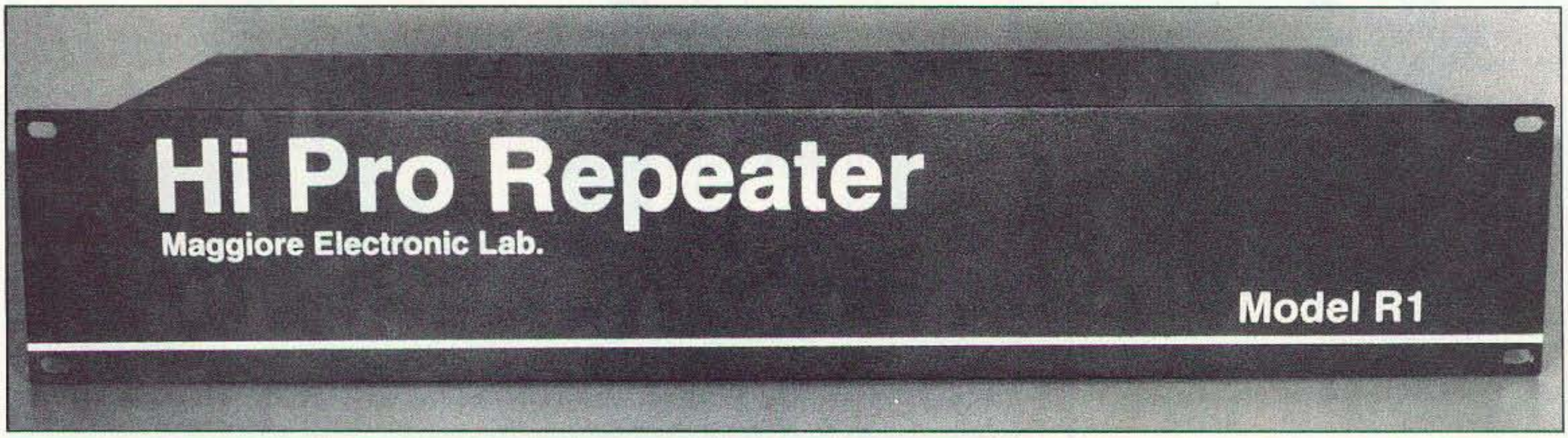

Photo A. The Maggiore Hi Pro Repeater.

The Maggiore R4V receiver

Like the transmitter, the R4V VHF receiver is a proven design. All coils are shielded (unlike some competitive offerings), resulting in minimal unwanted interstage coupling and out-of-band responses. This receiver design is totally stable. Five lightly coupled tuned stages at the operating frequency protect the RF and mixer stages from strong adjacent commercial transmitters. The first IF is at 10.7 MHz. Eight poles of crystal filtering follow the mixer, putting the selectivity up front, where it belongs. The second IF operates at 455 kHz. The second LO may operate at either 10.245 or 11.155 MHz to resolve "birdie" problems at certain frequencies. Repeater sites bothered by strong 15-kHz adjacent channel users may benefit by using the optional Murata "E" 455-kHz, 14-pole ceramic filter for greater IF skirt selectivity. An even sharper "F" filter is offered, but DTMF decoding may be adversely affected if this narrow bandwidth filter is used.

Trimpots are mounted on the R4V board for the volume and squelch settings. The squelch threshold is a bit tricky to set; but once you find the optimum point, it is extremely stable and will require no further adjustment, even over wide variations in supply voltage or temperature—a boon when operating from gel cell batteries with varying degrees of charge.

An open collector output is available for the COR signal. This open collector may be configured for low or high activity to meet the requirements of the controller used. Repeater audio for the controller may be taken from the discriminator directly (no audio pre-emphasis) from the high side of the volume control pot (audio pre-emphasis compensated) or from the 8-ohm speaker output (audio pre-emphasis compensated and squelch muted). Since the CAT controllers employ audio switches that follow the COR/COR-CTCSS signals, raw receiver audio may be fed directly to the controller from any point after the discriminator. A CTCSS decoder can directly mute the R4V receiver squelch line, or key a controller with a CTCSS input.

Controllers

As mentioned earlier, you may order the R1 without a controller. Maggiore offers an economical Hi Pro COR1 board which will supply a CW ID and basic repeater timer functions. If your club is on a tight budget and doesn't need a patch or other frills, it is perhaps a good choice. If you want some bells and whistles, such as a full-featured autopatch, voice synthesizer for announcements and IDs, and other niceties, I recommend you consider ordering either the CAT-300 or CAT-300DX controller with your R1. For the past few years we have been using Computer Automation Technologies CAT-1000 controllers (sort of a "bigger brother" to the CAT-300) on our three 2 meter Maggiore Hi Pro repeaters. I was extremely pleased to see Maggiore Electronics integrate this product line into their repeaters! (For those who demand the ultimate in controllers, a matching enclosure will be forthcoming to house the CAT-1000 for use with the R1.)

The CAT-300DX

The CAT-300 repeater controller has a 412-word vocabulary for amateur repeater operation. This allows the construction of voice messages for repeater IDs or special club announcements that are stored in a 12-position voice message table. An optional 16-channel Digital Voice Recorder is also available. The CAT-300DX differs from the CAT-300 in that a Dallas time chip is added. The CAT-300 Dallas chip contains only 2K of memory; this is increased to 8K with the Dallas time chip in the DX controller. The additional memory allows adding many functions besides the time feature alone. Memory in both versions is nonvolatile, as the Dallas chips contain an internal lithium battery backup. I think that the CAT-300DX controller offers the best value. The CAT-300 may be easily upgraded to a CAT-300DX at a later date, but the cost will be higher than the advertised difference in price. Controller programming is done via DTMF entry, either on the phone line or over the air.

"Also, the black finish on the steel case is a good heat emitter, which helps to dissipate the excess heat."

The CAT-300DX has additional autopatch capacity and also a 40-position scheduler. The scheduler allows full automation of the repeater based on the internal clock and calendar.

With the CAT-300DX you also get the digital voice clock. A digital voice readback of the time may be supplied on demand, with IDs, patches, voice messages, with scheduled operations or through the grandfather clock feature. The day of the week, day of the month, and month are also available as a time variable. Another time variable is the "salutations" greeting, a friendly female voice that gives the appropriate "good evening," "good morning," or "good afternoon" salutation depending upon the time of day.

The full-featured CAT-300 autopatch allows both manual patches and quick access to up to 25 speed dial numbers (100 speed dial numbers in the DX.) First digit 0 or 1 long distance lockout protection is provided. Voice readback of the entered phone number occurs with manual patches. The patch can be run open or closed access. The CAT controllers meet FCC part 15 requirements and have a part 68 registration number.

You can save and recall up to four unique repeater configurations in the DX controller. This permits unique repeater characteristics (timers, IDs, patch availability, etc.) for special events, such as during nets or peak traffic hours on the repeater. These memory files can be recalled, modified, and/or saved manually by DTMF entry, or scheduled to occur at preset times.

The CAT300DX offers a powerful macro command programming structure, and up to 10 macros can be stored. Macros can be executed by DTMF entry, sensing a repeater user input condition, via the scheduler, or even by another macro. Macros can allow for extra long voice messages by stringing several voice messages together, combining voice messages with memory file recalls, and controlling the user output switches, and perform many other functions.

Up to eight custom courtesy tones can be programmed and saved for future use. Cour-

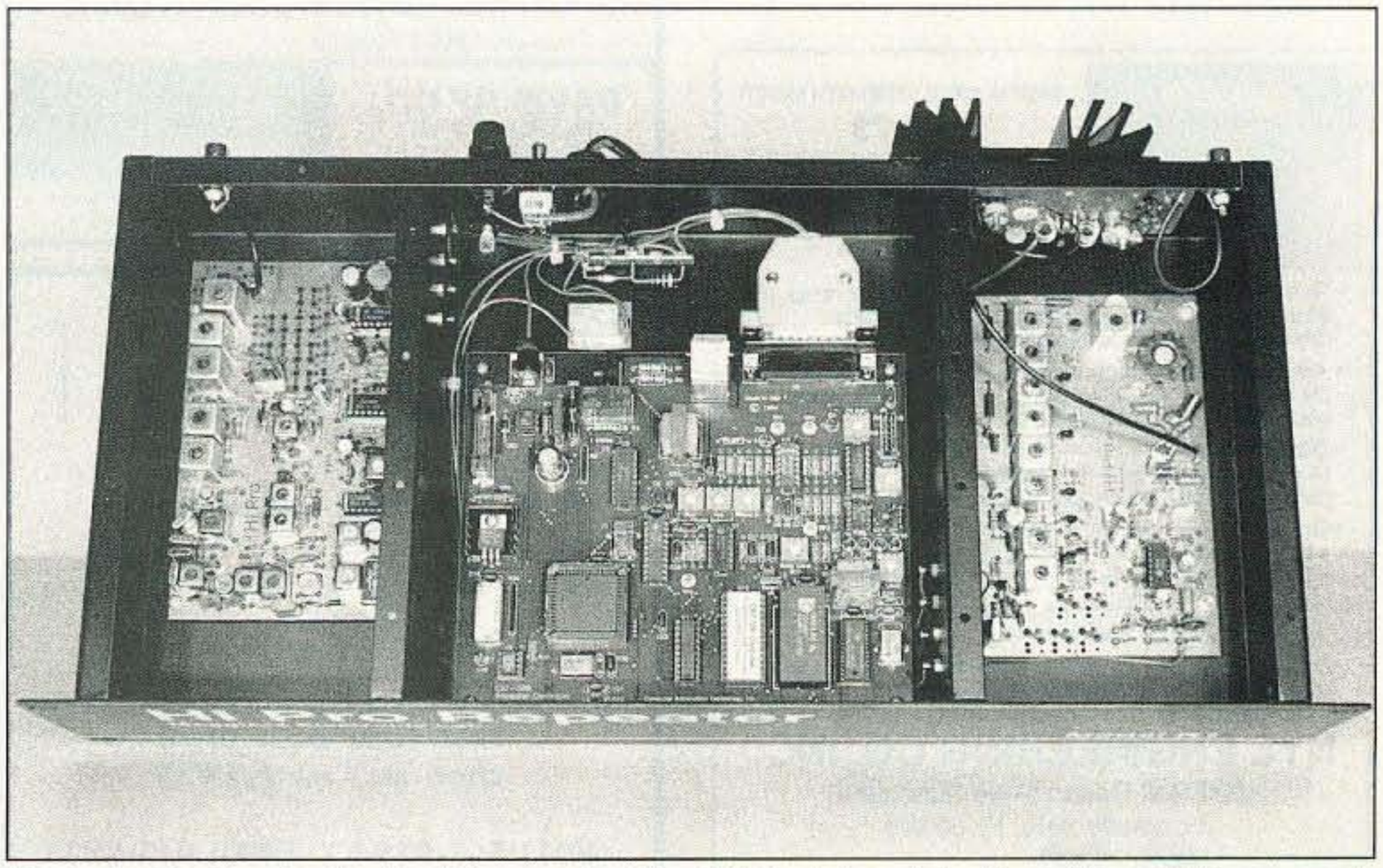

Photo B. Peeking inside the R1 repeater. The R4V receiver is in the left-hand side compartment; the EV1 exciter and 35-watt PA are mounted in the right-hand side compartment. The CAT300DX controller is in the center compartment.

tesy tones can consist of up to three different tone frequencies of various lengths and separations. IDs can be done in CW or voice.

Two hardware input and three user-function output switches are available. The outputs control external devices such as power amps, etc. The inputs can be used for temperature or burglar alarm sensing, an SWR alarm, etc. For example, you could write a macro that upon detection of a high SWR would disconnect the power amp, give a digital voice announcement warning the control operators of the failure, and have the repeater switch to a memory file that requires CTCSS access and a unique courtesy tone!

The controller can operate as an "open" repeater, or CTCSS or DTMF access can be turned on. You will need to supply a CTCSS board such as the Communication Specialists model TS-32. This can be installed by Maggiore as an option. The TS-32 also allows simultaneous transmitter CTCSS encoding and receiver CTCSS decoding. You can also have the repeater run "open access" for a predetermined time interval upon detection of the proper CTCSS or DTMF sequence to allow transients access to the repeater once it is in use. Or, control operator DTMF control functions can be protected by requiring the proper CTCSS tone for their acceptance. The key-up delay timer and the inactivity "sleep" timer (and all other timers) are remotely programmable.

"I am pleased with the Maggiore R1 repeater—in appearance, quality, and performance."

Conclusion

I am pleased with the Maggiore R1 repeater—in appearance, quality, and performance. Frank has been able to offer this repeater at this low price with no sacrifice in quality due to the time he has spent in designing the enclosure. These repeaters can be constructed in a fraction of the time it takes him to assemble some of his other models. Savings represented by the lack of unneeded frills (front panel speaker, knobs, custom die cast aluminum boxes, etc.) are all passed onto the buyer. Note that the "meat-and-potatoes" of the Maggiore R1 repeater, the R4V receiver and EV1 exciter, are the same as used in the most expensive Maggiore commercial repeater systems! The marriage of the CAT series of controllers with the Maggiore repeater is also something I have long awaited. You could easily spend twice the cost of the deluxe R1VHF35DX repeater package for a competitor's controller alone! Both Maggiore and Computer Automation are good people with whom to do business, the owners being accessible for consultation or advice and having established a proven reputation for customer support and satisfaction. 73

Number 14 on your Feedback card

CARR'S CORNER

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Experimenting with the NE-602 Converter Chip

The Signetics NE-602 integrated circuit (see Figure 1) is a nifty little device that contains an oscillator stage and a Wilson Transconductance Cell Double Balanced Modulator (DBM). These features make the NE-602 a radio frequency "front-end" in a single package. Various people have used the NE-602 as a frequency converter, superheterodyne receiver front-end, product detector, and direct conversion receiver.

It will operate normally at potentials from +4.5 VDC to +8 VDC, although you can extend the operating range by using a voltage regulator (see Figure 2). Most applications seem to call for +5 to +6.8 VDC. The V+ is applied to pin No. 8, and ground is connected to pin No. 3. Both the V+ line (pin No. 8) and the V+ source are bypassed with capacitors. You can calculate the resistor value (R1) by taking the difference between the V+ source voltage and the desired operating voltage, when the current drain is about 2.6 mA (i.e., Ohm's law).

The oscillator circuit has two terminals to the outside world: One is the base of the oscillator transistor (pin No. 6), while the other is the emitter of the oscillator transistor (pin No. 7). The oscillator operates up to 200 MHz.

The heart of the NE-602 is the DBM. There are two inputs forming a balanced pair (pins 1 and 2), although in most cases the signal is applied to pin No. 1 and pin No. 2 is bypassed to ground with a 0.04 to 0.1 µF capacitor. The output is also balanced, and appears on pins 4 and 5. You can use either pin to output a signal, or they can be used as a balanced pair.

The NE-602 will provide quite good sensitivity, although the dynamic range performance suffers a bit. The NE-612 device is an upgraded NE-602, but seems a little hard to come by in the ham and hobbyist markets.

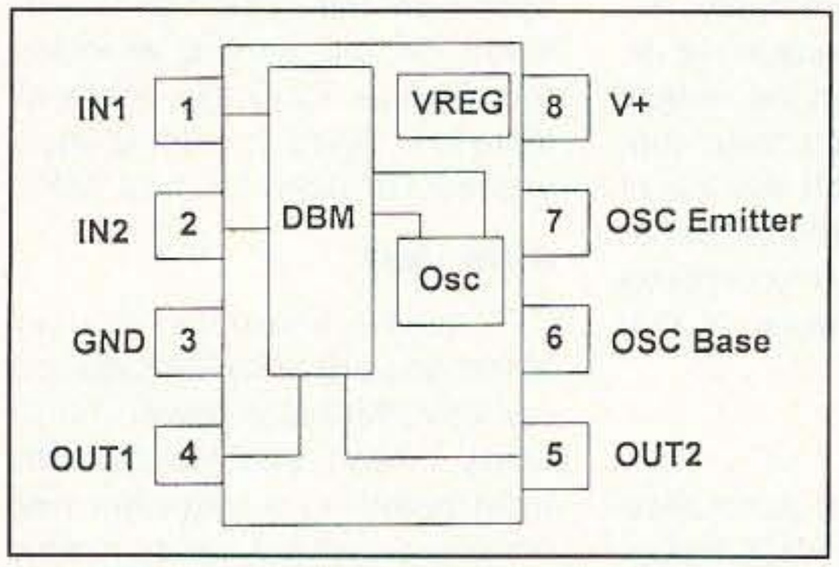

Figure1.The NE-602 internal block diagram.

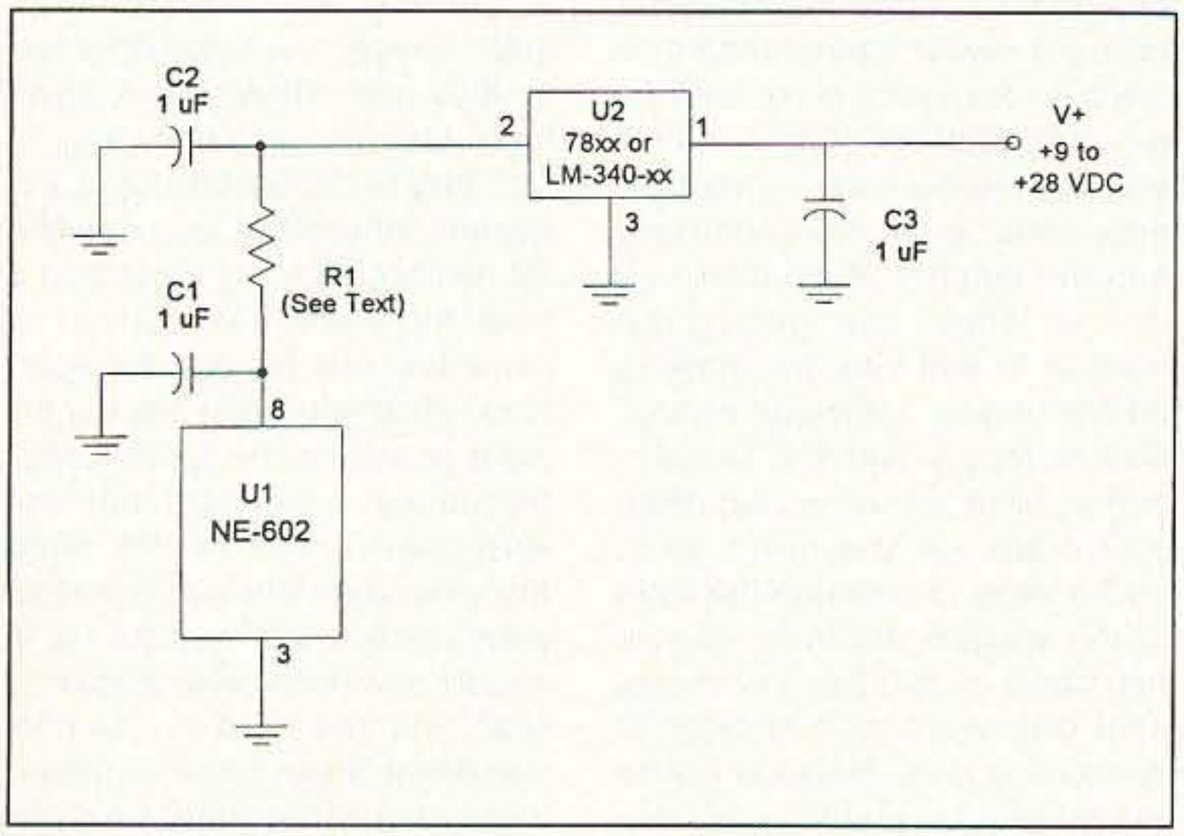

Figure 2. DC power supply for > +9 VDC applications.

NE-602 Converter Circuit

The front end of the radio receiver consists of the RF amplifier (if used) and the converter or mixer/LO stages. The basis for our designs will be the Signetics NE-602 balanced mixer integrated circuit (IC). Although this device has limited dynamic range, it is sufficient for our purposes because it compensates with a better than average noise figure and sufficient conversion gain so that an RF amplifier is not needed in most projects.

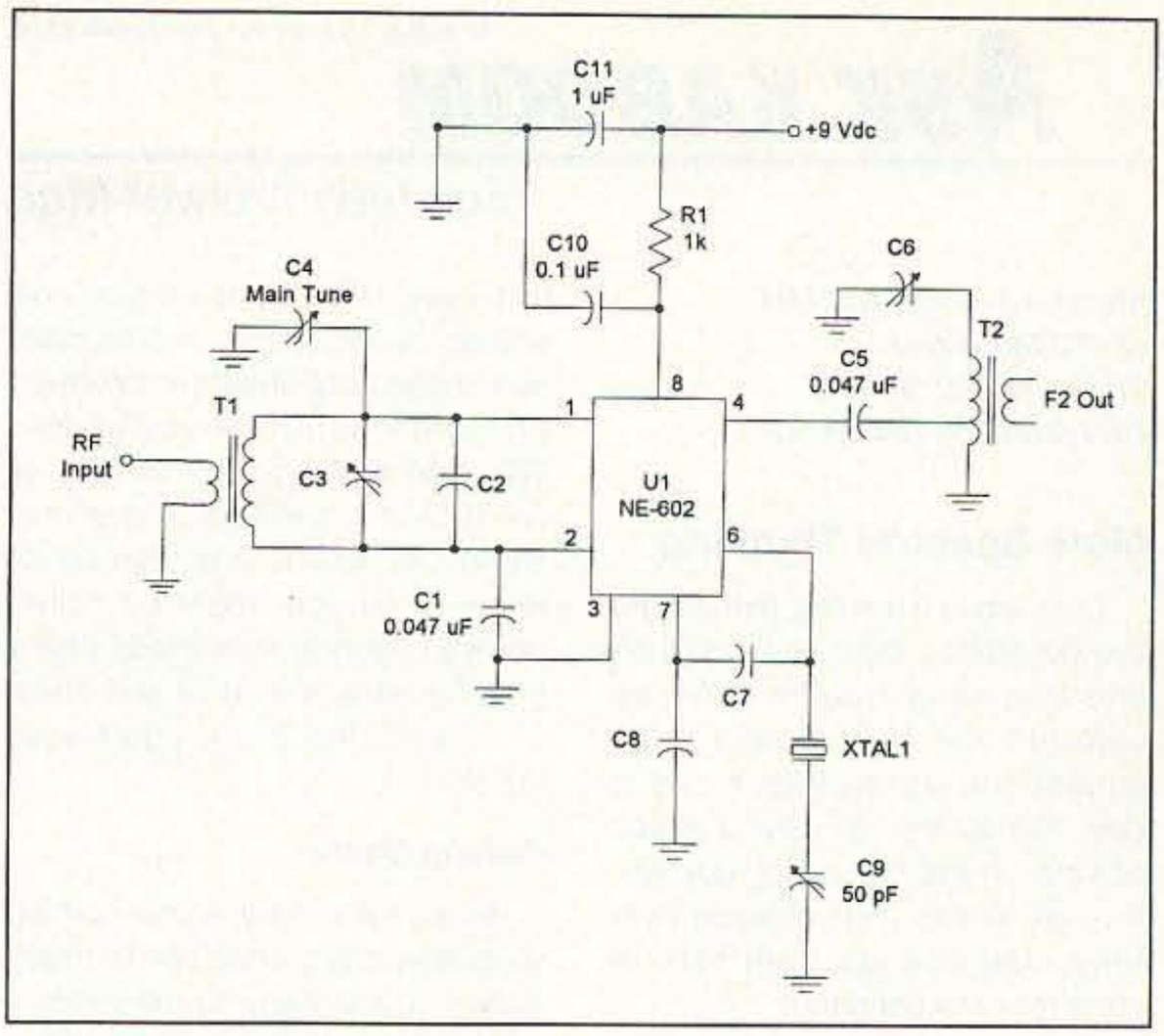

Figure 3. NE-602 frequency converter.

Figure 3 shows a simple frequency converter circuit based on the NE-602 IC. It can also be used as the front-end of a superheterodyne receiver, with the output (F2) being the desired IF frequency. The output impedances of the NE-602 are compatible with most crystal and mechanical filters used for IF selectivity.

The input side of the circuit shown in Figure 3 uses a tuned circuit consisting of the secondary winding of T1, and is resonated by the parallel combination of C2, C3, and C4. The tuned circuit must resonate at the desired RF frequency using an inductor that is not loaded too much when shunted by the 1,500 ohm input resistance of the DBM.

You can broadband the input circuit by using an RF transformer built on a toroid powdered iron form, rather than the tuned circuit. The ratio L2/L1 is typically 10:1 to 12:1; that is, there are also 10 to 12 turns on L2 for every turn on L1. Experiments and published data indicate that good starting numbers are 20 to 24 turns on L2, with 2 to 3 turns on L1 for frequencies in the upper shortwave region. As frequency is decreased, the number of turns is increased to about 34 to 40 turns on L2 at the AM broadcast band.

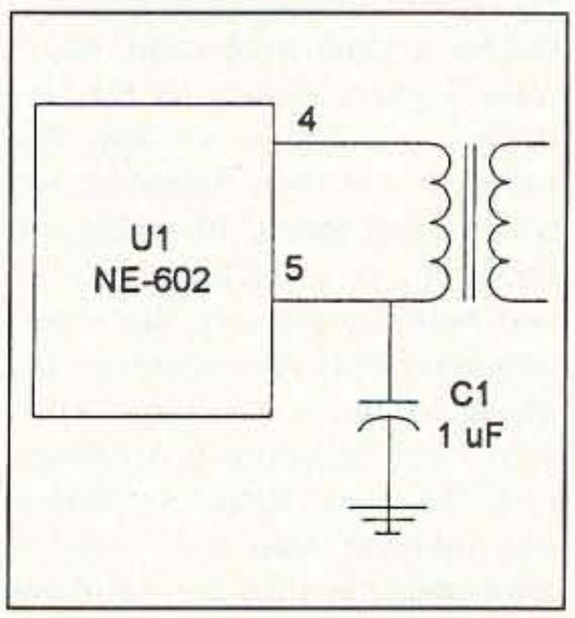

Fig. 4.Direct conversion output circuit for NE-602.

The capacitors and the 100-ohm resistor in the V+ circuit (connected to pin 8 of the NE-602) are used for isolation and decoupling. These components prevent RF in the NE-602 circuit from traveling to other stages in the radio via the DC power line or, alternatively, prevent signals from other stages from modulating the converter stage (or possibly causing oscillations).

The oscillator circuit in Figure 3 consists of the components attached to pins 6 and 7 of the NE-602 IC. In this case, a crystal oscillator is used, although a variable frequency oscillator could also be used. The operating frequency of the local oscillator section is set by the resonant frequency of crystal XTAL1. This frequency should be the RF frequency plus or minus the desired F2 output frequency, or

$$F_{XTAL} = F_{RF} \pm F2 \qquad (1)$$

The capacitor values used for the crystal oscillator are:

Continued on page 59

Number 15 on your Feedback card

ASK KABOOM

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More Spectral Thinking

Last time, we were discussing the difference between the time and frequency domains. As we explored, the time domain is the familiar one we experience day to day: Things change over a period of time. In the frequency domain, though, things that change over time also change their rate of change! Let's continue:

Seeing Is Believing

We were examining the spectrum analyzer, one of the most useful, and least available, instruments to the RF experimenter. They're not generally available because they cost too much, although that's slowly starting to change for the better. Why are the darned things so expensive? Well, a spectrum analyzer is much more complex than an oscilloscope, which is already not such a cheap beast. In fact, the analyzer is a combination of a scope, a swept filter, and the necessary controls and sweep circuits to tie them together. Also, in order to capture a signal's harmonics, the analyzer has to have at least three times the upper frequency limit of the signal you're trying to examine. So, to be usable on our 144 MHz, 2 meter band, you need at least 700 MHz of response, preferably more. That kind of stuff doesn't come cheap!

Commercial spectrum analyzers typically cost $1500 and up, often way into the thousands of dollars. If you've already got a scope, it may seem like needless duplication to buy another instrument that is also based upon a scope. Yes, you can buy an adapter for your scope, and it will cost much less, thanks to the fact that it need not include its own scope circuits and CRT. Still, a decent analyzer is not a cheap thing, even if you go that route. Should you own one? Sure, if you build transmitters and can afford the cost. Do you really need one? Usually, you can get by without it, but an analyzer can be invaluable in tuning RF output stages and setting up repeaters, not to mention sniffing out stubborn intermod and other interference cases. Whether you can afford one or not (I can't!), it still pays to understand how to use one; you never know when you might be called upon to operate somebody else's unit. Besides, the more you know . . . well, the more you know, right?

Getting Started

As with an oscilloscope, setting up a spectrum analyzer is much easier if you have some idea of what you're trying to see in the first place. I suppose that's true of any measuring instrument; even an autoranging DMM needs to be set for AC, DC, or ohms, right? With the analyzer, you need to set a frequency span that corresponds to what you're looking for. A "center frequency" control does just what it sounds like: It sets the center of the span wherever you want it. That may be the same frequency as your input signal, or it may be above it, letting the input be near the bottom of the span so that you can see harmonics farther up. But, just as a scope has a variable horizontal rate, a spectrum analyzer has a variable span width. In other words, do you want to see 100 to 120 MHz, or 50 to 250 MHz? The wider spans let you see much more, but with less resolution at any given point, just as when you set your scope for a slow horizontal scan rate. On an analyzer, the control is called "dispersion." Setting a narrower dispersion, though, lets you see much more detail, at the cost of getting only a narrower slice of spectrum on the screen.

When you begin, you'll probably want to set the dispersion control for a fairly wide span, especially if you're looking for the harmonic content of your signal. Remember, the third harmonic will be at three times the operating frequency, so you'd better look far and wide. By the way, that's also why you can't use a spectrum analyzer to much advantage when your input frequency is anywhere near the upper frequency limit of the analyzer; you can't see the harmonics because they're above the limit. Luckily, most analyzers have limits above 1 GHz, making them useful at VHF and, to some degree, at UHF.

If you're looking for spurs or other signals much nearer your operating frequency, then you can narrow the dispersion control down, limiting the width of your view of the spectrum and giving you much more detail. Now you can clearly see the modulation around your carrier frequency, along with any nearby spurs or, perhaps, signals coming from other sources that could be causing intermod problems.

Get Vertical

What about the amplitude scale on the analyzer? How the heck do you look at a signal putting perhaps a milliwatt into the analyzer, and still see the tiny, microvolt-level signals that could surround it? That would take a phenomenal dynamic range that, in this case, translates to a screen several feet high! Essentially, you're stuck with the same problem that occurs in the horizontal direction: the trade-off between size and resolution. Here, though, there's no easy way out. If you scale down the vertical response, you can see the size of your incoming signal, but you won't see the tiny signals; they'll be too small to deflect the CRT's beam in the vertical direction, and most likely will look like a flat line, indicating nothing at all. If, however, you crank the vertical up, your input signal's main indication will go way off the top of the scale. The little signals, though, will be brought up enough in amplitude to be seen. Is that bad?

Fake It

Not necessarily. It does allow you to see what you want. It also, however, has two negative side effects. First, it prevents you from taking a visual measurement to compare the strengths of the carrier and adjacent signals. Sure, you can measure the carrier first, then crank up the gain, and lastly add the number of decibels you can no longer see, getting the number to add from the marking on the vertical amplitude control. Sounds messy, and it is! The second problem is even worse: When you crank up the input gain, you're likely to overload the input of the analyzer, because your input signal is now just too strong. That can cause false readings of spurious signals, because they're really being generated in the analyzer's overloaded front end. Clipping is clipping, no matter where it happens, and it'll cause splatter and distortion products that show up on the screen just as if your transmitter had caused them; they'll be indistinguishable from the real thing, rendering the measurements useless. Is there a way out?

Natch

Sure. Most analyzers have a special control that lets you set up a notch filter on your input frequency. Why do that? Well, now you can reduce the input strength of your primary signal, by a calibrated amount, but only on its fundamental frequency. That permits the other, adjacent frequencies and more distant harmonics to be unattenuated, and you can crank up the gain much higher without causing any overload. The result is that, although the display is no longer telling you the whole truth, you can see everything you want. All you have to do is add the attenuation value in dB, read from the notch filter's knob, to the displayed amplitude of the fundamental frequency, and you've got the true value of the fundamental, which lets you easily compute things like carrier-to-noise ratio and how far down the harmonics are. That's how those specs on our radios get measured. So, the notch is an important feature. Basically, that's all there is to know in order to use a spectrum analyzer for most tasks.

Other Uses

To tune a transmitter's output stage, you adjust its trimcaps and coils for the most power, right? Oddly, though, what looks like the most power on a wattmeter may actually be spread across various frequencies, thanks to distortion in the waveform. Wattmeters aren't sharply frequency sensitive, so they don't know where, spectrally, the energy is occurring. In fact, they're designed to be as frequency insensitive as possible. Remember, anything other than a sine wave will have power in more than one place in the spectrum. What you really want is the most power on the fundamental frequency, consistent with the least power anywhere else. While that may seem obvious, it isn't always strictly true! For instance, in a radio covering a wide frequency span, you may need to tune it for equivalent output power at the extreme ends of the span; tuning for

maximum at any one point could cause the power at either end to be way too low, or even for spurious signals to appear, due to mistuning. And, in the case of a wideband transmitter, such as an ATV unit or high-speed digital link, you may need to tune for equal output power within a defined portion of the unit's coverage—as always, of course, consistent with minimum power elsewhere.

What about receivers? With the right input signal, alignment of IF stages can really be eased with a spectrum analyzer. Unlike with transmitter alignment, you don't have a handy signal emanating from the receiver. Just connecting the analyzer to the IF output won't do you much good, because the results will depend quite a bit on what's coming in at the antenna jack. But, if you feed the receiver with a wideband noise signal while you're connected to the IF output, then you can see how the IF filtering affects the shape of the passband. For aligning wideband receivers like ATV units, this technique is invaluable, and TV shops used to do something very similar with a swept signal generator and an oscilloscope synchronized to it. In effect, they had formed a crude spectrum analyzer from other equipment.

Even in regular voice radios, setting up with an analyzer can show you things you couldn't otherwise see. If you feed the receiver with a single-frequency carrier signal, you can turn up the input level until the receiver overloads and then see how that affects the IF output. Or, you can connect the spectrum analyzer to the output of the first mixer, before the first filter, and see what intermod products you get and at what input level. If you're designing receivers or troubleshooting a stubborn intermod case, knowing the overload point, and its effects on the circuit, can be crucial.

I hope you've enjoyed this peek at spectral issues and spectrum analyzers. Before we go, let's look at a letter:

Dear Kaboom,

Why does my old tube transceiver's receiver actually sound better than my newer, solid-state, synthesized, whiz-bang rig? Shouldn't the new stuff be better? Signed, Quizzical.

Ah, a question relevant to this month's topic! There are two reasons your new rig may not sound as "clean" as old faithful. First, the old rig almost certainly doesn't have the sensitivity of the newer one, so you're hearing less band noise, QRN, and weak-signal QRM. Most of today's radios are way more sensitive than they have to be, or perhaps even should be. Really, who actually works stations buried in noise below S-1? Even if you do hear them, chances are they won't hear you! Besides, stations with better paths to them will undoubtedly be occupying their time. Most rigs have an attenuator button, which can help reduce the mess by putting some of it below the receiver's noise floor, but people seem afraid to use it, lest their S-meters read lower. It's silly; if it sounds better, go with it!

The second reason is harder to fix. Nonsynthesized radios have crystal-controlled oscillators, mixed with variable analog VFOs, controlling their operating frequencies. For all its limitations of drift and lack of memory capability, that old technology had the virtue of being spectrally cleaner than many synthesizers! Phase-locked loop (PLL) synthesis involves the constant correction of an oscillator by a digital control system. It works great, and offers the long-term stability of the digital system's timing crystal, which is much, much better than can be achieved with analog oscillators. But, the short-term stability is much worse, because the oscillator must start to wander a little before the digital controller can correct it. So, it's constantly wandering around and being readjusted, ever so slightly. That creates an effect called "phase noise," which is just a fancy way of saying that the oscillator has random modulation on it. It's small, but it's there, and it leads to a slightly fuzzy quality in the receiver, as well as on your transmitted signal. Newer rigs employing direct digital synthesis, in which the local oscillator signals are directly built up from digital pulses in CD-player style, are much cleaner, letting you enjoy the best of both worlds. I mention that all this is relevant to our topic because phase noise is a frequency-domain phenomenon, and can best be seen on a spectrum analyzer!

See you all next month. 73 de KB1UM.

HAMSATS

Number 16 on your Feedback card

Amateur Radio Via Satellites

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The Shuttle and *MIR*

When the Space Shuttle *Atlantis* went to orbit this summer on mission STS-71, changes were needed for the Shuttle Amateur Radio Experiment (SAREX) program. The primary goal of STS-71 was to dock successfully with the Russian *MIR* space station. The mission was accomplished. It was a historic first for both programs as the *Atlantis* and *MIR* came together.

For SAREX planners it was also a success, but several changes in ham-radio activity planning were required. Both the Shuttle and *MIR* have shared 145.55 MHz for ham activities. The cosmonauts on *MIR* use the frequency for simplex voice and packet operations. For the astronauts on the *Atlantis* it is the primary downlink for general voice and packet activity. During STS-63 last year, the Space Shuttle *Discovery* and *MIR* performed an approach test. The two spacecraft did not dock, but were very close for maneuver trials. Everything went well for a productive mission, but some difficulties were noted with using 145.55 MHz for both *MIR* and the Shuttle. *MIR* was running packet with the onboard 2 meter rig, Terminal Node Controller (TNC), and outside antenna. On the Shuttle SAREX operations included a Motorola radio and window antenna. Signals from the Shuttle were much weaker than those from *MIR*. Whenever the packet system on *MIR* transmitted, the Shuttle voice downlink was covered up. The window antenna on the Shuttle could not compete with the signal from *MIR*. Therefore, a change was needed.

The SAREX working group and AMSAT, the Radio Amateur Satellite Corporation, selected a new set of frequencies for use during future Shuttle-*MIR* docking missions. The new downlink was to be 145.84 MHz for general ham operations from the Shuttle. Two uplinks were also chosen: 144.45 and 144.47 MHz. During STS-71 the new frequencies were in use, but due to the intense level of operations associated with the docking procedures, there were few general contacts during the mission. Also, due to the lack of packet gear in conjunction with the Motorola radio (the primary use is Shuttle-*MIR* communications in the 121 MHz area), little was heard by earthbound enthusiasts. Unfortunately, future missions involving docking activities will likely have limited general ham-contact operation. The next SAREX use of the Motorola radio will come in October with the scheduled flight of *Atlantis* and mission STS-74. With Ken Cameron KB5AWP as Commander and Mission Specialist, and SAREX enthusiast Bill McArthur KC5ACR onboard, more general QSOs are possible. Keep tuned to 145.84 MHz and don't forget to listen for Shuttle downlink signals on other frequencies during passes that may involve scheduled school contacts.

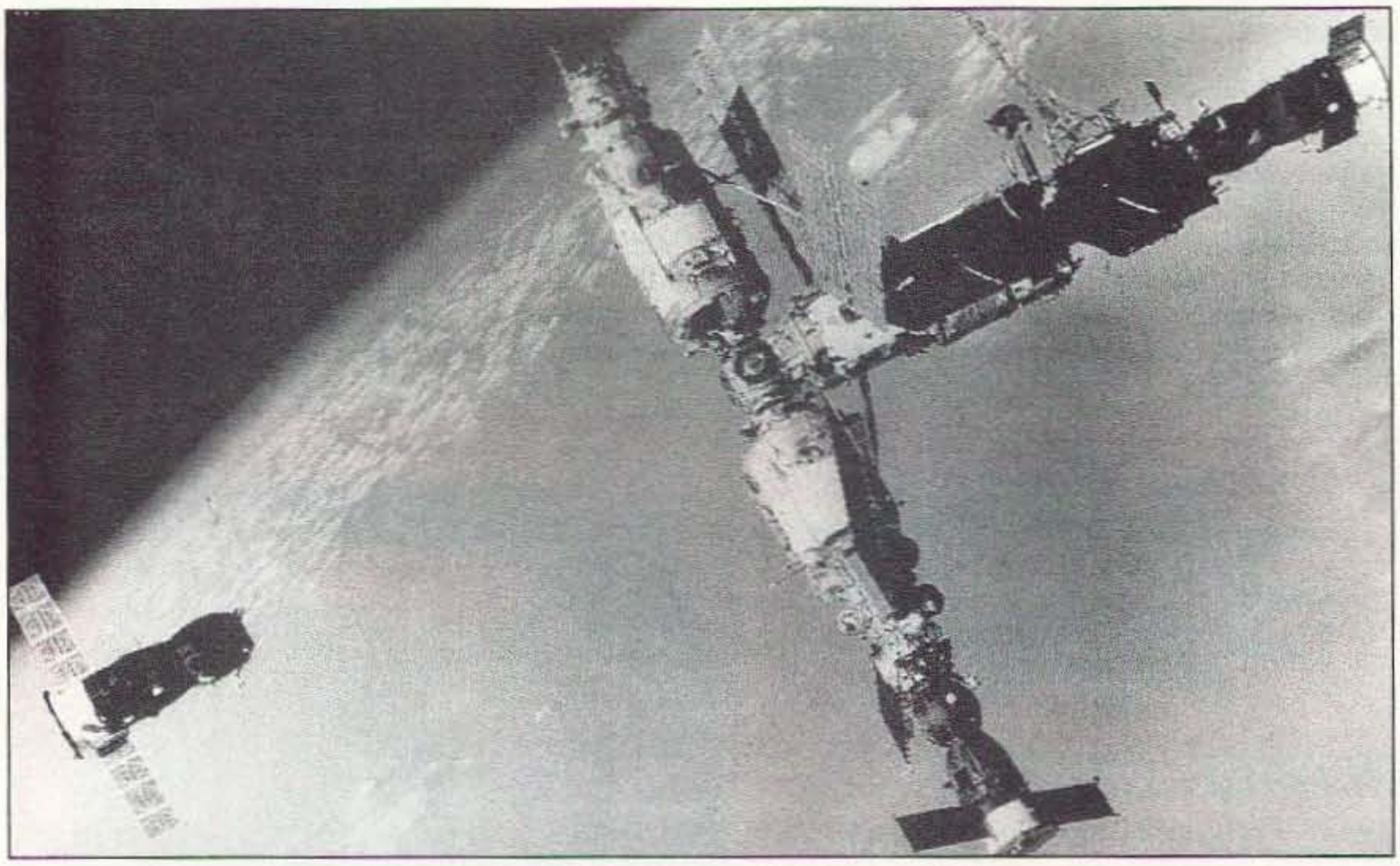

Photo A. The Russian MIR *space station with a Soyuz craft about to dock.*

MIR Activity

The core module of the *MIR* Space Station was launched in 1986. It has six docking units, which can receive up to six space vehicles the same size as

Photo B. Sergei U5MIR and Musa U2MIR (with ham-rig microphone) on MIR *(U5MIR photo).*

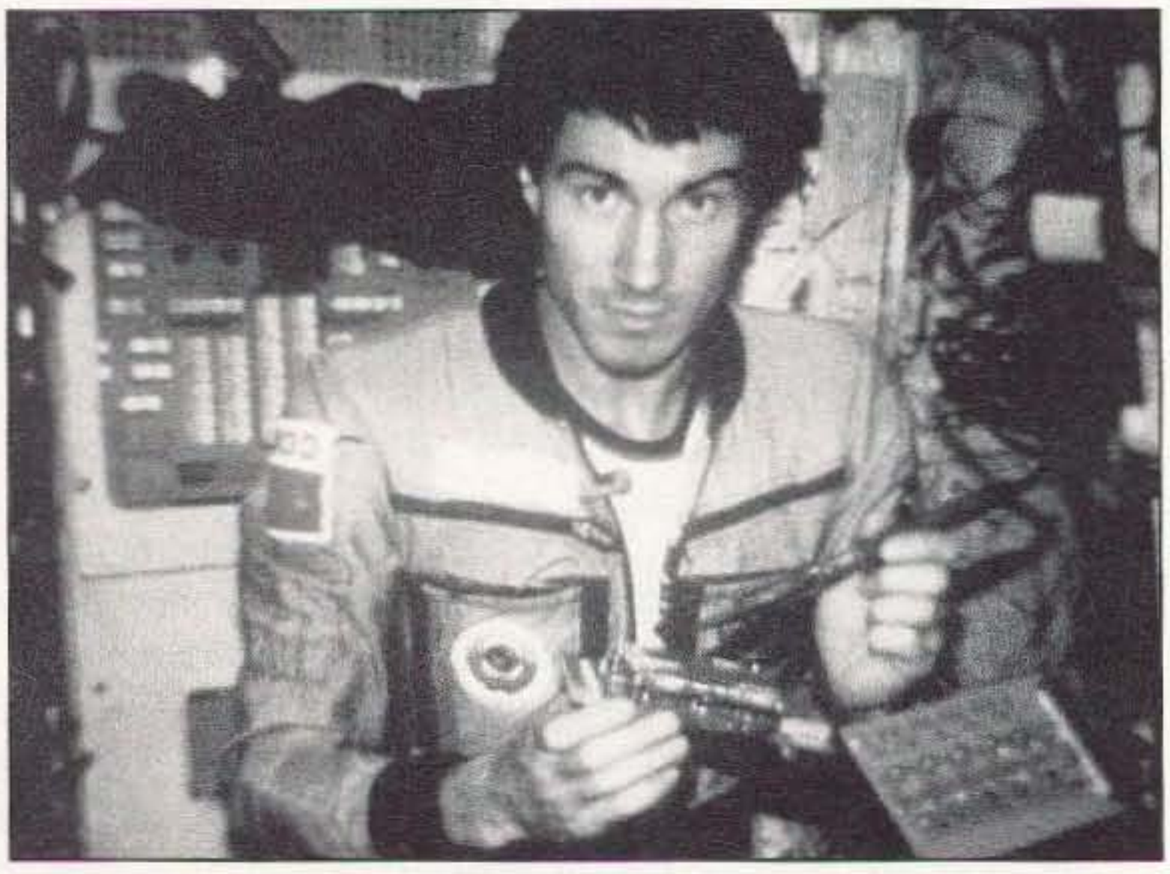

Photo C. Sergei Krikalev U5MIR does some soldering on MIR *(U5MIR photo).*

itself. In addition to manned *Soyuz* crafts, unmanned Progress cargo ships dock with *MIR* to replenish supplies. The docking units were designed specifically for the Russian space program, and differ from those used during the *Soyuz-Apollo* mission of the mid-70s. In order to dock with *MIR*, NASA needed to provide the required, compatible hardware on the Shuttle.

Interest in the *MIR* Space Station has increased since the docking activities of mission STS-71. Another positive result of the Shuttle-*MIR* docking missions is the increased interest in ham radio contacts with the cosmonauts aboard *MIR*. They have been active on 145.55 MHz FM simplex for many years. During a pass, voice, two-way packet, or packet BBS signals may be heard. Since the days of Musa U2MIR and Sergei U5MIR, many hams, including astronaut Norm Thaggard, using the call R0MIR, have been active on 2 meters from *MIR*. Sergei, on the other hand, has also flown on the Shuttle and has spent over two years in Houston for training and other activities.

During times of low activity from *MIR*, many have wondered if the crew was busy with onboard experiments, conserved power, or was just disinterested in ham activity. During most of these ham radio lapses the 2 meter ham rig has been in use for nonamateur communications outside the 2 meter band. This may soon change. A new 2 meter rig, TNC, and antenna are to be sent to *MIR*. This will allow one station to be used for the mission-specific work with Moscow, while the other can be dedicated to ham activities. This promises to be an exciting improvement for both the cosmonauts and hams on the ground. As before, the primary frequency for ham work will be 145.55 MHz. The orbiting packet bulletin-board system (PBBS) has been both interesting and useful for all involved and the occasional voice contact with *MIR* crew members is always an exceptional experience. 73

Photo D. Sergei U5MIR with wife, daughter, and Rita VK3CFI at the Johnson Space Center Amateur Radio Club Christmas dinner in Houston, Texas.

CARR'S CORNER

Continued from page 55

$C7 = 100/(F_{MHz})^{1/2}$ (2)

and

$C8 = 1000/F_{MHz}$ (3)

When making calculations for resonance or C7 and C8, allow about 10 pF for stray circuit capacitances.

The output of the NE-602 must be tuned to either the desired other frequency (F2) or the desired IF (that is, the difference between the received RF signal and the LO signal) by a tuned IF transformer (T1 in Figure 3). In most receiver projects, this difference frequency should be 455 kHz, 9 MHz, or 10.7 MHz, depending on application because of the easy availability of the coils and crystal filters.

Several sources offer coils, but perhaps the easiest to obtain are the Toko-brand coils marketed by Digi-Key (P.O. Box 677, Thief River Falls, MN 56701-0677; 1-800-344-4539).

Direct Conversion Receivers

You can use the NE-602 chip as a direct conversion receiver. In this type of circuit, the LO operates on the same frequency as the received RF signal for AM reception, and slightly offset for single-sideband—SSB (2.7 kHz)—reception. As a result, when the RF signal and LO signal are zero beat, the difference IF is the audio modulating the incoming carrier. In CW reception, the LO is tuned to a frequency a few hundred hertz from the incoming RF. In that case, the difference frequency will be a beat note that is interpreted as a CW signal.

To make a direct conversion receiver, simply replace the output network in Figure 1 with an audio transformer, and then follow it with a high-gain audio amplifier (see Figure 4).

You can use the NE-602 device for a wide variety of receiver, conversion, and other frequency translation problems. It can also be used as an oscillator or RF signal generator by connecting the oscillator circuit, as normal, and then connecting a 10k-ohm resistor from pin No. 1 to ground (and a 0.047 µF to ground from pin No. 2).

I can be reached for comments, questions, and criticisms at P.O. Box 1099, Falls Church, VA 22041.

73

Number 17 on your Feedback card

RTTY LOOP

Amateur Radio Teletype

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Last month I highlighted one of the many sites on the Internet of interest to radio amateurs, the QRZ Home Page. I have been a bit taken aback by the reaction to this information, with the number of requests for more such sites. Well, the Internet is literally crawling with ham radio sites. That should not surprise you, given the nature of the Internet, and that hams have traditionally been in the forefront of innovative communication.

Ham Radio in Cyberspace

To begin, let's take a look at one of the services that can search out sites on the Net. The Galaxy site is one such service. Amateur Radio is under their Leisure and Recreation section, and setting your web browser to:

http://galaxy.einet.net/galaxy/Leisure-and-Recreation/Amateur-Radio.html

will take you to a multiple-paged list of links. Looking at the list reveals several books, discussion groups, commercial organizations, universities, ham clubs, and individuals. There are even several nonprofit organizations and government sources included. All in all, this is a good place to get started.

Lou Williams KE4ARM manages an Amateur Radio Web Server from Raleigh, North Carolina. This is another example of a focus on the net that allows you to look at the Amateur Radio NewsLine, information on SAREX missions, callbook servers, the online repeater database project, and latest FCC rules and regs, and, of course, to download some of the latest software. You can get to this site at URL:

http://www.acs.ncsu.edu/HamRadio/

Geoff GJ4ICD maintains his Ham Radio Pages, "The World's Hotspot For Amateur Radio Information & News" from New Jersey. This is a huge listing of links for amateur radio, including just about every available facet of the hobby: the ARRL, European groups, antennas, and much, much more. As with many of these servers, it provides the "taking off point" for many other directions on the worldwide web. Take a look at Geoff's efforts at URL:

http://user.itl.net/~equinox/

As I mentioned above, there are several commercial interests addressing the needs of the radio amateur on the Internet. Our old friend Kenwood is one of them, with their Kenwood Communications Corporation Amateur Products Group North America Home Page. No, you don't have to type all that in, just the URL:

http://www.accessnv.com/kenwood/

On that server you will find the "Kenwood Report," dealer list, new stuff at Kenwood, and, of course, links to other sites. This is, after all, the web! A different kind of site may be found at URL:

http://wb5fnd.tech.uh.edu/irc/

This is the #HamRadio Home Page, home of the ham radio access to the Internet Relay Chat (IRC) network. The IRC is as close to a free-form QSO as you are likely to find in cyberspace at this time, and may be one-on-one or roundtable in form. Adequate information is provided for the novice to get started but, as with anything, the best way to learn is to jump right in.

How about practicing for the next licensure exam? The Ham-Exam site, managed by Stephen McClaran KK5QE at URL:

http://w5ac.tamu.edu/ham-exam.html

can help you by generating random questions from Novice, Technician, General, or Advanced levels. He is working on including figures for some questions, and adding the Extra level.

Not to leave out the packet crowd, how about The Packet Radio Home Page, found at URL:

http://dingus.n5lyt.datarace.com/tapr/pkthome.html

Lee Ziegenhals N5LYT hosts this page, prepared by Howard Goldstein N2WX in Sebastian, Florida. It features packet radio pages, archives (a virtual library of packet information), and a link to the TAPR Home Page, the nidus of packet, everywhere.

Not all of us have the latest callbook, but the Buckmaster World Wide HamCall™ Server can help those of us with Internet access find out who's who. By looking at:

http://www.buck.com/cgi-bin/do_hamcall

you can access a callsign search engine that can look up just about any callsign you can give it.

The last in this month's series of sites is another overseas location, the Amateur Radio WWW site of DK0TUI at Technical University of Ilmenau, Germany. There are collections of information on amateur radio in German as well as English, together with links to other servers. Take a look at URL:

http://www.systemtechnik.tu-ilmenau.de/ham.html

Do you have a favorite site you think others should know about? Send it to me here, at RTTY Loop, via any of the addresses at the end of the column. I'll try to include at least one per month in future columns. While plans are still quite sketchy, there is even the possibility of a RTTY Loop Home Page in the works. So, as they say, stay tuned!

Now, for those of you to whom much of this URL and http:// stuff is so much gibberish, a few words of advice. If you have a computer and a modem, getting onto the Internet through one of the commercial services is really very easy. Yes, you can save some money by connecting directly to the Net through a local Internet provider, but you may have to jump through a few hoops to accomplish it. On the other hand, if you can connect through CompuServe or America Online, it is about as easy as going to any other place on the service.

Not on a major service? I am sure that most of you have seen or received an offer for America Online, if not others, to try it out for a bit for free. Go ahead, give it a try. If you have absolutely no idea of how to get started, drop me a note, with a self-addressed stamped envelope if by snailmail, and I'll send you some simple things to try.

I devoted this month's column to online amateur services because the demand for software seems to be growing. At least that's how many of your letters and E-mails sound when inquiring about the RTTY Loop Software Collection. Now up to 10 disks, it is a reasonably cheap and easy way to acquire a wide variety of radioteletype, packet, SSTV, CW, and other ham utility programs. To get the latest listing, and details on how to obtain the software, drop me an E-mail message, at 75036,2501 on CompuServe, at MarcWA3AJR on Delphi or America Online, or at MarcWA3AJR@aol.com via Internet. Of course, a piece of USPS Snailmail sent to the address at the top of this column also works, if you enclose a self-addressed, stamped envelope for the reply. 73

QRP

Low Power Operation

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Receiver Incremental Tuning

As more hams take to the low bands, things can get a bit messy. I would guess that every commercial rig has a RIT, or Receiver Incremental Tuning control, built in. But most of the QRP rigs I've used in the past don't have this very useful feature. In fact, it took Heathkit three tries to finally add an RIT to the HW-9 QRP transceiver.

What is RIT?

In its simplest form, RIT is a circuit to allow the operator to vary the receive frequency up or down a few kHz. Most RIT circuits have a frequency spread of plus/minus 1.5 kHz. Now, it's very easy to move the frequency of a VFO. In fact, most of the VFO circuits I've built in the past moved all by themselves! The trick in designing a practical RIT circuit is to keep the RIT from screwing up the VFO.

Let's look at a few ways in which we can move the frequency of a VFO. A trick used way back when is to place an inductor in series with a crystal. By switching in various amounts of inductance, you can change the frequency of the rig. There are some drawbacks to this method. First, you can't lower the operating frequency by a great amount. Second, the amount of inductance is fixed by the coils selected. If you need to move your receive frequency between the selected inductors, you're out of luck. A variable inductor could be used, but then you must worry about keeping the tuning linear. Third, this method only works with crystal-controlled rigs. Also, if you add too much inductance, your crystal-controlled rig becomes an all-bander.

The very same idea can be accomplished by using several small fixed capacitors. You select the amount of offset by grounding a capacitor connected to the tuned circuit of your VFO. You end up with most of the problems you get when trying to use inductors. The old-fashioned "bandspread" control used in the older radios is a prime example of this type of circuit design.

By far the most popular method to date is to use a varactor diode across the tuned circuits of the VFO. A RIT control voltage is applied to the diode and its capacitance can then be varied. Since the control voltage is generated by a pot, there's no direct connection from the RIT control and the VFO. Also, the RIT may be turned on and off at will.

Now that you see how to vary the frequency of an VFO ever so slightly, you must also be able to return the VFO to the proper frequency during transmit. And this is the part that gets tricky!

During key-down, you must return-disengage the RIT. Return the VFO to the transmit frequency. Mute the receiver. Switch the antenna to the transmitter. Key the transmitter. All of these steps must be done in the proper order and all within a few milliseconds. The steps are done in reverse when you're through sending. Add on the complexity of full break-in keying and whoa!—things begin to get sticky. To make things even more interesting, you need some way of turning the RIT off without affecting the frequency of the VFO. Then, there's the problem of finding the center of the RIT control. Add up all of these tasks, and you'll see why adding in a RIT is not as easy as it sounds.

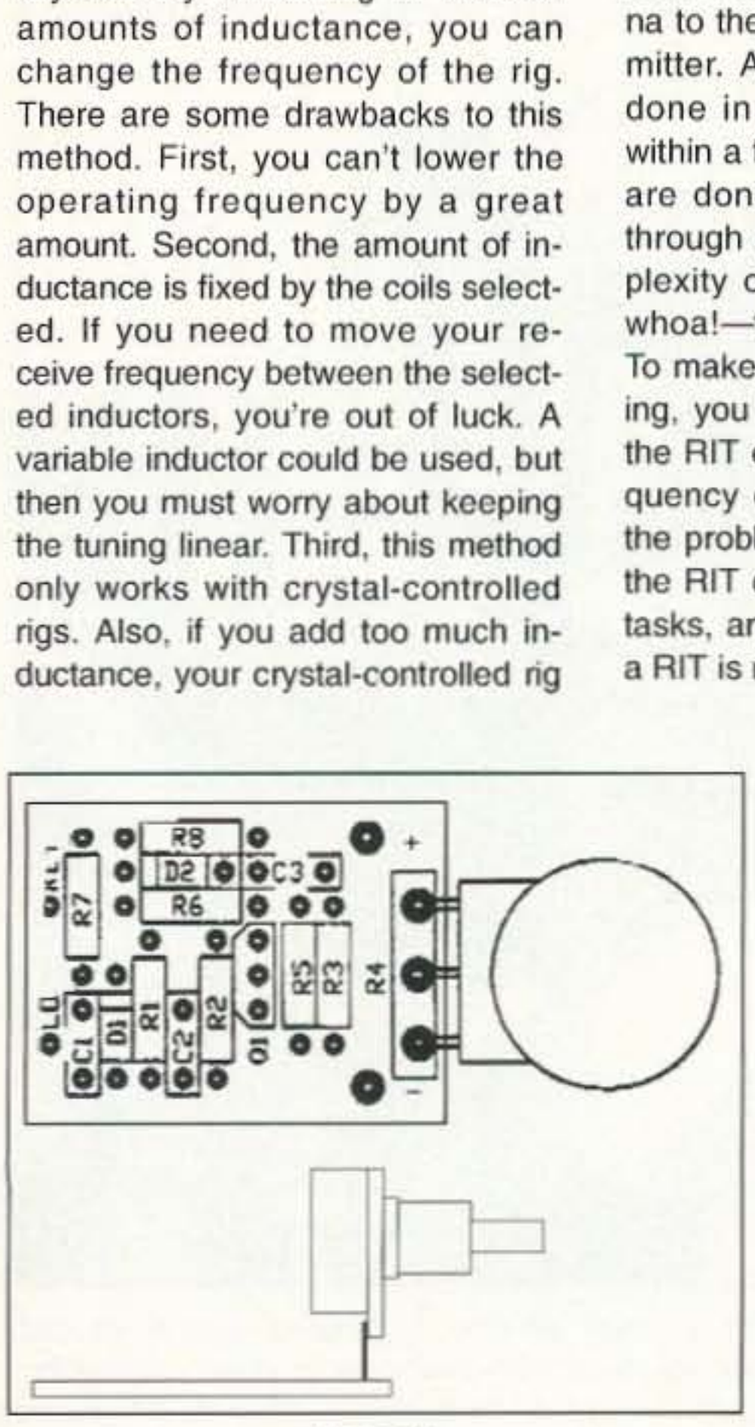

Figure 2.

No Need to Panic!

But, take heart, you can design in a RIT for most rigs. In fact, here is a RIT that you can install in the original version of Dave Benson's 20 meter transceiver.

The circuit is rather basic. A varactor diode is used to add capacitance to the VFO's tuned circuits. A panel-mounted pot is the RIT control. You can place this pot anywhere on the rig to suit your liking, without the worry of keeping leads short. For the best performance, a center detent pot would be a great idea. Check out Digi-Key and Mouser for suitable controls. Here's a thought: Ten-Tec, Kenwood, Icom, and the others all have or have had center detent controls on the equipment. You could use a replacement part in your new design. All you need is a part number, and a good place to find that part number is a service manual. As a benefit, you can also order the matching knob set while you're at it.

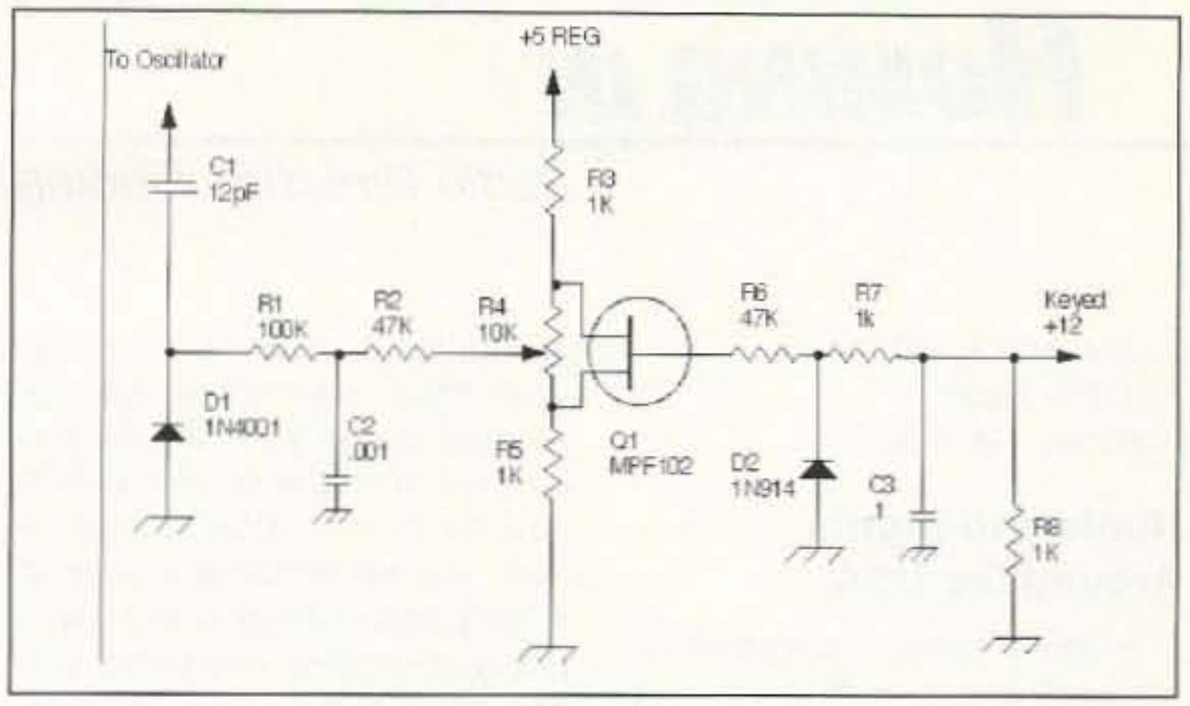

Figure 1.

A RIT Circuit

Take a closer look at the schematic of the RIT circuit. This circuit was designed by W6EMT and you should contact him if you need more information. Construction is best done with a PC board, but point-to-point wiring will work just as well. There's nothing really critical about the circuit. Just keep your leads short to the parts going to the VFO. You should use a stable supply voltage to operate the RIT circuit. If the rig you're putting this into does not have a regulated VCC line, a 78XX series regulator will work. Remember, unless you plan on using a low drop-out regulator, a 7812 will not provide a stable +12 volts from a 12-volt power source. I have used a National LM2940CT-12 (Digi-Key part number 9192B-ND) with good results down to 12.4 volts input. The LM2940CT-12 costs about $2.50 in single-lot quantity. Be sure to bypass the input and output of this low drop-out regulator the same as you would with any other 78XX series regulator.

As I mentioned, this RIT is designed to go directly into the rig designed by Dave Benson. If you plan on using this basic circuit for another rig, check to make sure the VFO is operating as it should before you add on the RIT. Some (at least the ones I built) VFOs may not like the added capacitance and stop oscillating.

Many times, adding on an extra circuit such as this will cause the keying of the rig to become all screwed up. Check for proper keying by using your 'scope or by having a close-in ham buddy listen to your signal. The keying should be clean and well shaped after you install the RIT modification.

Although you may never encounter this problem, I've read stories about light hitting the diodes and causing their capacitance to change. If you notice this, apply some black paint to the protect the diodes from the light. Or a strip or two of black plastic tape will work just as well.

Another thought when you're working with add-on circuits to your VFO: Be sure you use some means of holding the parts down on the circuit board so they won't move about. I've been using hot-melt glue and find the results to be just great. It takes a bit of a time to get the glue off the board if you need to replace defective parts, but then who ever said life was perfect? 73

RIT Assembly

( ) R1	100K resistor
( ) R2,R6	47K "
( ) R3,R5	1K "
( ) R4	10K control
( ) R7,R8	1K "
( ) C1	12 PF NPO
( ) C2	.001 ceramic
( ) C3	.1 "
( ) D1	1N4001 diode
( ) D2	1N4148 "
( ) Q1	MPF102 transistor

Check off the parts as you install on the PCB.

Check for solder bridges, shorts, opens, etc.

Mount the control/PCB assembly as required.

Connect +12V as shown.

Connect ground as indicated.

Connect the LO cap to the VFO main tune capacitor

TEST
Apply power to the receiver. To find the RIT control center. Connect a VOM to R4 pot center pin. Apply +12V to the key line at R8. Note reading on VOM. Remove the +12V from the key line, and adjust the pot R4 to the same VOM reading. This is the RIT center.

HOMING IN

Number 19 on your Feedback card

Radio Direction Finding

Joe Moell P.E. KØOV
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Hunts and Stunts Around the USA

Imagine going to a football or baseball stadium that doesn't have a scoreboard. Imagine also that final scores aren't published for weeks after the games end. It sounds absurd, but that's the way most ham radio competitions work.

When you finish competing in a QSO party, Field Day, or a DX contest, you have only a vague idea who the leading competitors were and how well you did against them. You won't find out the winners and all the details until months later, when the official results are printed in a magazine.

On the other hand, when you go hidden transmitter hunting, you'll know exactly who you are up against and you'll usually find out how well you placed before you go home. After a mobile hunt, you will probably end up at a lively post-mortem session with plenty of success and failure stories, either at the hidden transmitter location or a nearby restaurant. Later, there will be lots of chatter about past and upcoming hunts on the local repeater.

Last month, I explained the basics of this fast-growing radio sport, which most hams call "T-hunting" or "foxhunting." In a nutshell, it's ham radio's version of hide-and-seek for all ages. Participants track down the location of well-placed transmitters using easy-to-make radio direction finding (RDF) equipment. This month, I'll tell about some creative ways that hams around the country are having RDF fun.

Surprises Guaranteed

Most T-hunts in North America involve miles of driving in RDF-equipped cars, trucks, vans, and even motorcycles (see Photo A). After the mobile portion of the hunt, it's often necessary to "sniff out" one or more concealed Ts on foot (see Photo B). Besides experiencing the instant gratification of knowing how they did at the end, hunters like this challenging sport because, when they start out, they never know where they will end up and they are never sure what they will find there.

If you go foxhunting at Halloween time, maybe you'll track down a pumpkin! A couple of years ago, Randy Skirvin N6KHO and son Brandon KD6MMZ cut a small hole in the bottom of one and replaced the innards with an Alinco 580 transceiver. They placed their pumpkin-T under a pine tree in a park for the monthly T-hunt of the Amateur Radio Club of El Cajon, California. It might have been just a bit obvious there. What if they had left it in a patch with dozens of other pumpkins?

Jim Bowman W7HPK, Direction Finding Coordinator for a RACES group in the Seattle area, recently wrote about a T-hunt he and his wife Betty put on: "We spotted an old barbed wire fence around a pasture next to a church in Lynnwood. On closer examination, I discovered that it included an old, unused strand of electric fence wire. That did it! I found a spot where the fence wire came close to the ground and hid the transmitter and battery right under the fence in the bushes. I had made a temporary antenna from a 19-inch piece of insulated wire, which I wound around the electric fence wire to couple the signal to the fence. (Who worries about SWR?)

"Some carefully arranged grass and flowers picked nearby completed the camouflage of the rig. Betty and I obtained permission to conceal ourselves inside the church to watch the proceedings (a kind term for a pack of frenzied T-hunters beating the bushes). After about half an hour, we saw the first signs of them. One team pulled right into the church parking lot, drove in a circle, and came back out. Shortly thereafter, they pulled in the park-

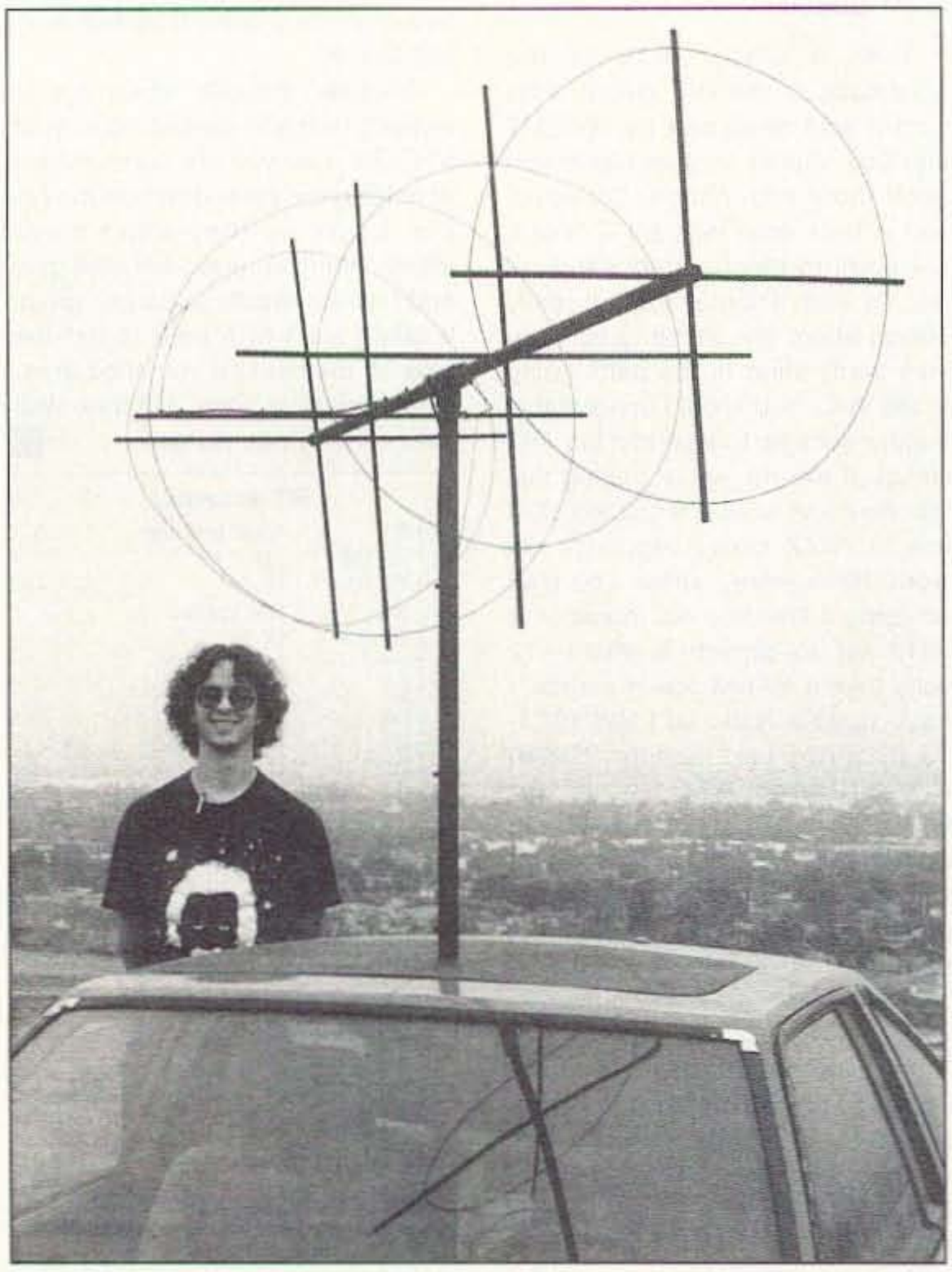

Photo A. Who says quads have to have square or diamond-shaped elements? Dave Hess KD6LZA has great results on meter T-hunts with a circular-element quad.

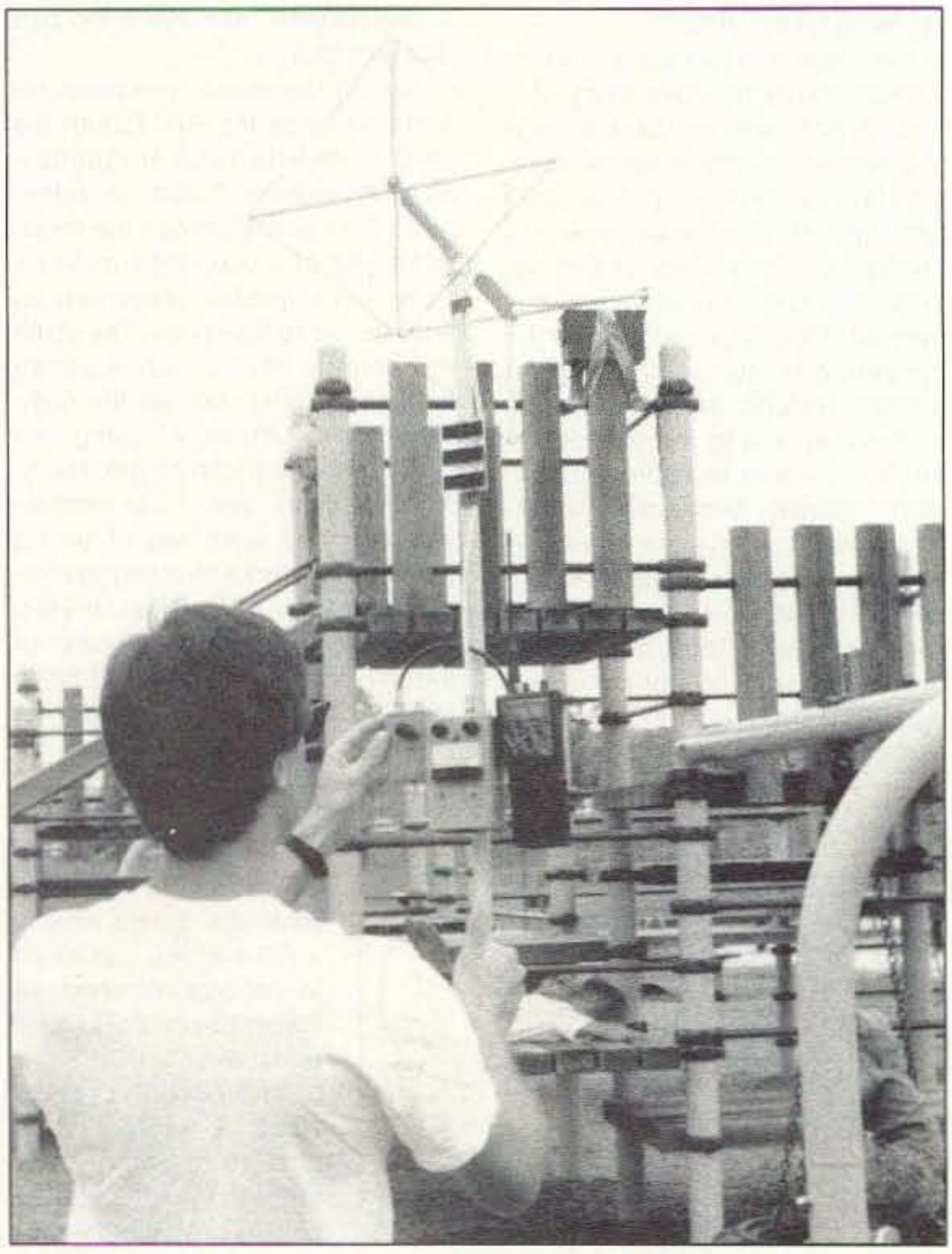

Photo B. Most hidden Ts aren't alongside the road, so "sniffing" gear is required. Marty Mitchell N6ZAV is well equipped with a Shrunken Quad, Sniff-Amp, handi-talkie and active attenuator. The object of his search is atop the playground equipment.

ing lot again and stopped about 50 feet from the hidden transmitter."

Then the fun intensified, as more teams arrived and the on-foot portion of the hunt began. "The first team went in opposite directions up and down the fence line," Jim continued. "For awhile there was a confused mob wandering along the fence. The long-wire antenna was making sniffing tough. I was really whooping it up in my hiding place, loving every minute of watching the best teams we have working so hard to find a transmitter right at their feet.

"This frenzy continued until Tom Bruhns K7ITM finally spotted the transmitter and raised his monster yagi in the universal victory sign. It was impossible to determine any other finishing positions because everyone was so close that when Tom found it, everyone knew. This was the hardest I had ever seen so many T-hunters work, for so long, and so close to a transmitter without finding it!"

Safe and Sober Hunters Only

Over the years, I have written articles about hiders who put Ts in unlikely places such as baby carriages, shopping carts, ferris wheels, and fake fire hydrants. Jami Smith KK6CU tried to outdo them all this spring on the weekly Friday night hunt in the San Gabriel Valley near Los Angeles. "This is a 'find it quick and hurry to the restaurant' type of hunt that normally lasts a half hour to an hour," he told me. "On the Monday before the day I was to hide, I went to my Temple City Ham watch meeting as a volunteer for the Los Angeles County Sheriff's Department. They needed volunteers to help out at a sobriety checkpoint, so I raised my hand and they signed me up. Then I remembered that I had to hide the T that night.

"Now during the meeting, our Ham watch leader, Lola Lowe KE6JDW, mentioned that she wanted me to plan a demonstration T-hunt for some of the deputies," Jami continued. "That started me to thinking about combining the two. I explained my idea to her and she checked with the sergeant. He is a pretty straight-laced guy, but he said that as long as my transmitter was safe and out of the way, it was okay.

"But when I arrived Friday night, the sergeant was not at the checkpoint and he had not talked to anybody who was there. I approached one of the deputies and he told me I could put the T in my parked car, right at the checkpoint. My original plan had been to put it in one of the traffic cones in the middle of the lanes, but this worked out fine. Without giving away my location, I instructed the hunters to pay particular attention to their driving and for them to approach whatever they thought was the T—only one at a time. A few people were hesitant to drive down the checkpoint street with their RDF vehicles, but we had a great time and everyone thought the idea was pretty neat."

"After the mobile portion of the hunt, it's often necessary to 'sniff out' one or more concealed Ts on foot."

In most cities and towns, rules for T-hunting are straightforward and simple. They specify the boundaries, hunt frequency, and scoring method. The winner is usually the team that finds the transmitter first or the one having shortest start-to-finish odometer mileage. In other places such as the Grand Rapids, Michigan area, foxhunt rules have interesting twists.

According to Sam Nabkey WJ8T, hunts begin at 6:30 PM Saturdays at a Red Cross Building. Boundaries include all of Kent County. The hider asks one participant to be huntmaster, assisting at the starting point. To insure that all participants drive safely, each vehicle operator gives his or her driver's license to the huntmaster, who places it into a sealed envelope and gives it back to the driver. The huntmaster writes down the starting time and mileage on this envelope, too. "By doing this, we can tell at the end if any team has been pulled over by the authorities for unsafe driving," Sam says, "because the seal on the envelope will be broken. That hasn't happened . . . yet."

Grand Rapids hunters have an unusual scoring system, too. A few hours before the hunt, the hider covertly drives the shortest route from the Red Cross Building to the hiding spot, determining the minimum possible mileage and elapsed time. When a hider finds the T, his score is calculated by computing two fractions, minimum mileage divided by actual mileage and minimum driving minutes divided by actual minutes. Each fraction will be less than 1, unless a team manages to take less time to drive the course than the hunter did, in which case that fraction is declared to be 1. Each of the two fractions (for mileage and time) is multiplied by 50 and the two products are added together to give a team's final score. The highest scoring team wins. This scoring method sounds complex, but each score takes only a few seconds with a hand calculator. For example, if a beginning team finishes with twice the minimum mileage and takes four times as long as the minimum time, its score will be 37.5 out of a possible 100.

Grand Rapids hiders like to announce scores as the hunters come in. This can be demoralizing when you're stuck without a good bearing and you hear the hider say that one of your competitors just found him and scored 85 points!

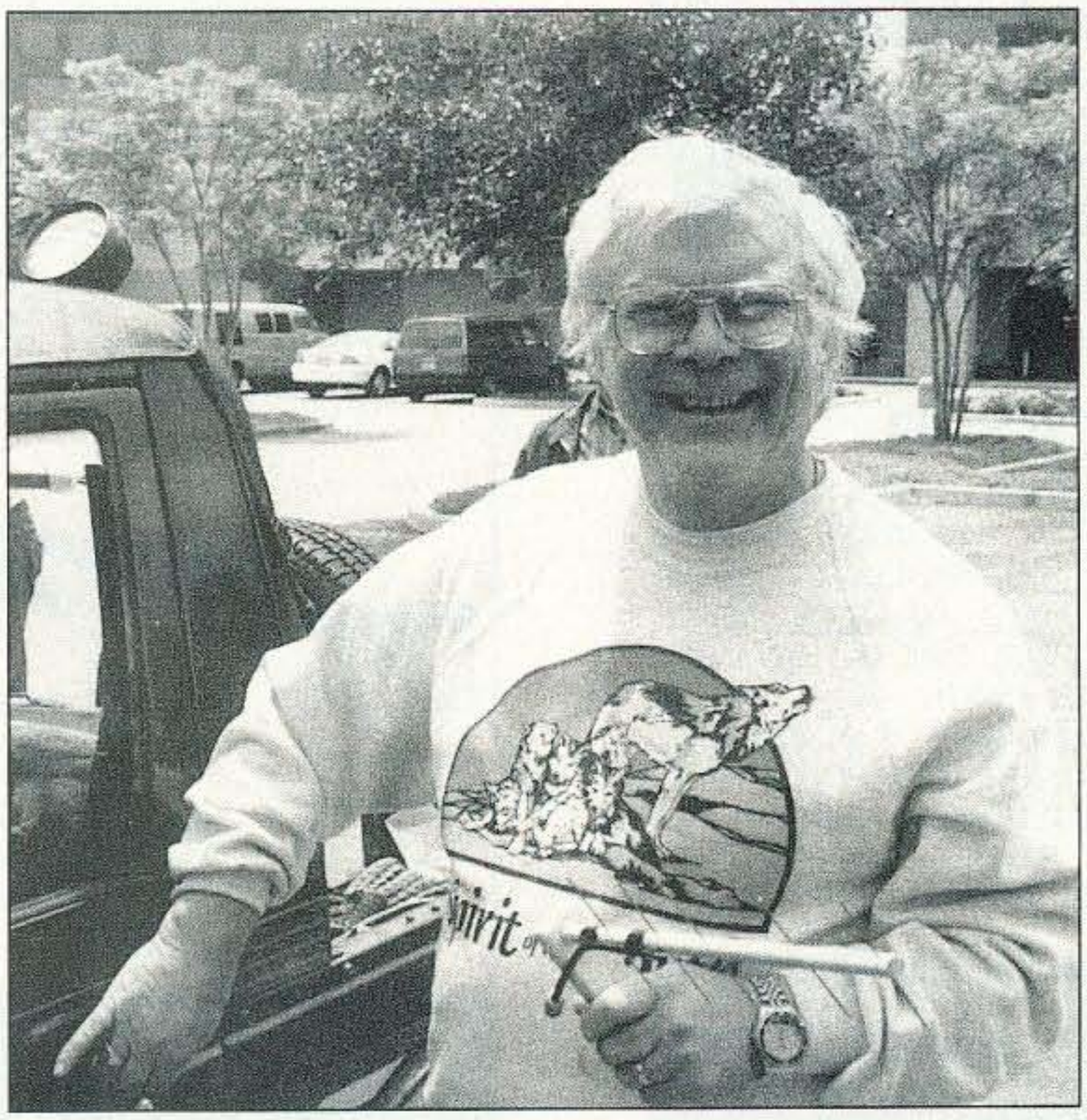

Photo C. Bob Thornburg WB6JPI shows off a home-brew 1.2 GHz yagi he built for the 1995 West Coast VHF/UHF Conference T-hunt. He made two—one for his rotating mast and the other for sniffing.

Not For Weekends Only

Is it hard to find time in your busy schedule for RDF? Want to stay fit and have fun at the same time? Dave Sims KC5JKN has the answer. "Our little radio club here in Los Alamos, New Mexico, has been doing T-hunts on our lunch hour," he says. "All of us work in the same place, we got our licenses in the last year or so, and we all like to bike ride. We work next to a residential area that's nice for riding. At the start, we give the fox about 10 minutes while we eat lunch. He rides out, usually to a cul-de-sac or dead end street, never much more than a mile from where we start. He sits down, eats lunch, and starts talking or reading a book into the mike.

"The first person to get there wins. We do it on 2 meters and the hider tries not to make it too hard," Dan continues. "We stop when we have about 15 minutes left. When the fox is ready to go back, he starts giving obvious clues."

KC5JKN is looking at ways to mount RDF equipment directly to his bike, because his present method is cumbersome. "We all use handi-talkies," he says. None of us knew how to do RDF at first. We read somewhere that you can hold the HT close to your body and turn in a circle to listen for body blockage of the signal. Unfortunately, you have to get off the bike to do that. "I use the rubber duck and when I get close, I

remove it. Sometimes I use a 2-inch piece of wire as an antenna when close. Another person keeps the rubber duck on but holds it with both hands to shield it when close. It's tricky because a lot of times the fox will be eating his lunch and not transmitting when you need a signal."

Indianapolis hams have found a way to go RDF contesting without having to ask a ham to be the hider. Cliff Vaught N9FHF wrote on CompuServe's HamNet: "We have both monthly hunts and impromptu hunts. The traditional hunts are on Sunday afternoons. The spur-of-the-moment hunts are usually at night, often during the week."

N9FHF continues, "Around 10 PM or so, after my fellow crazies have put their kids to bed and other chores are completed, we congregate on our favorite repeater frequency. Our scanners are also going, looking for a signal to hunt. It could be an errant one or just a strange-sounding one. It's usually 6 meters or higher and most often around 2 meters or 70 cm, as that is where most of have equipment ready to go. The signal could be ham, business, government, or anything else that's out there.

"When a worthy signal is found, a 'CQ Foxhunters' call goes out. After everyone has tuned it in and agrees that it is worth the chase, the hunt is on. Afterwards, we always retire to a restaurant to compare notes and discuss the evening's activities. This usually gets us home between 1 and 3 AM. Most of our wives have become so accustomed to this that they don't wait up for us any more."

First T-Hunt on 23 Centimeters

Southern California T-hunters have done their sport on every band from 28 to 450 MHz in recent years. Knowing this, the organizers of the 1995 West Coast VHF/UHF Conference in Cerritos decided that it was time for RDF on a new band. The last event of the Conference was a mobile hunt featuring several 2 meter Ts and one on 1.2 GHz FM. To win, a team had to have low mileage to the 23 cm band emitter and shortest time to all the foxes on 146.565 MHz. Some teams DFed the new band with a short or long yagi on a rotating mast (see Photo C). However, the winning team of Gary Holoubek WB6GCT, Don Frizielle W6HRC, and Jason McLaughlin KD6ICZ did it much more simply. All they used for microwave hunting was Jason's handheld with a little five-element J-beam plugged into its BNC antenna connector.

"I was sitting in the back holding the handheld out the window, not expecting to hear much," Jason says. "Our strategy was that I would listen to 1.2 all the time and the guys in the front would T-hunt 2 meters as usual. We figured that the 1.2 T would be near one of the 2 meter Ts, so we would hunt 146.565 MHz and if the 1.2 GHz signal came up, then we would go find it. "As it turned out, there was an S-3 microwave signal at the starting point and I got excellent bearings on it the whole time. We ended up turning off the 2 meter radio and hunting the 1.2 GHz signal first, because we decided that if we could get great mileage on that one, we could spend the rest of the hunt pedal-to-the-metal finding the 2 meter Ts."

I have lots more tales of unusual T-hunts from all over, but I'm out of room for this month. If you want more "battle stories" in future "Homing In" columns, let me know. While you are at it, send details and photos of the hunts in your home town. Write to the address at the beginning of this article or send e-mail to me via Internet (HominginIn@aol.com) or CompuServe (75236,2165). 73

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

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 × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

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MODEL RM-35M

- 19" RACK MOUNT POWER SUPPLIES

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

RS-A SERIES

MODEL RS-7A

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

RS-M SERIES

MODEL RS-35M

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

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

RS-S SERIES

MODEL RS-12S

- Built in speaker

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

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

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Mars Base Simulation

One of the best ways for teachers and instructors to get new ideas is to share with each other. That certainly is a primary goal of this column. One of my ham radio acquaintances who is a super creative teacher is continuously coming up with innovative teaching projects. Dave Reeves KF6PJ is a teacher at Chaminade College Preparatory School. We met several years ago at a NASA Educators' Conference at the Kennedy Space Center. Since then we've kept in touch and shared some great teaching experiences.

Mars Base Omega

On June 2 and 3, Dave and fellow teacher Margery Weitkamp KA6OCL led the honors topics class at their school in West Hills, California, in a 36-hour Mars Base simulation. Dave tells me that everyone connected with the project had a great deal of fun. I'll share what Dave wrote me about this exciting learning experience that he and Margery helped orchestrate.

The two classes moved the science experiments that they had been preparing for the entire school year from Margery's biology classroom, "Lunar Base Alpha," into newly constructed "Mars Base Omega." Heather KE6RRD and her module group designed and built the Mars base by covering a frame of 4-inch PVC pipe with sheets of translucent plastic. For 36 hours, base leaders Mike KE6QNT, Steve KE6QNU, Kristen KE6UJH, and Jon KD6FOZ guided teams of three or four classmates. The teams worked in 2-hour shifts, reporting results from Mars Base Omega to the command post in Dave's physics classroom, "Lunar Base Charlie."

Students sent reports on scientific experiments, base temperature, solar electricity battery voltages, and crew temperatures and respiration rates. They typed and sent packet radio reports every half hour on their "Data Link." They kept continuous 2 meter radio voice communications while they watched one another on closed circuit TV. For two days and a night, the 2 meter ham radio band was ablaze with the chatter of the 39 teenage amateur radio operators exchanging information such as "Phoebe (one of the base chickens) just laid her first egg."

Photo A. Mike Spasoff KE6QNM and Dan Radovich KE6SOO transmit GPS data from the Mars Rover.

Mars Rover

John KE6UJM, Jacob KE6UND, and Mike KE6UJJ completely renovated an old golf cart in the ground's maintenance shed, transforming it into the proud "Mars Rover." And rove it did! During the entire simulation, the Rover Group automatically transmitted their GPS position to the command post in Base Charlie. They maintained 2 meter voice contact. A computer in Base Charlie Used APRS software to display their changing location. Satellite ground station transmitted a picture of the Rover to Pacsat during the event.

Satellite Ground Station WA6BYE

Greg KE6PND and Rob KE6PNF ran a unique special events station by contacting the Pacsat Satellite on every pass over the 36-hour period. They enjoyed several exchanges with Jan ZS6BMN, who reviewed their Mars Rover picture in Pretoria, South Africa.

Mars Expedition

On March 27, 1995, the honors topics classes rehearsed the Base simulation by taking their Rover to the Santa Susana mountains overlooking the historic Rocketdyne Field Laboratory. Teams explored the "Mars environment," locating plant, animal and rock specimens. They reported their findings to the command post over 2 meter voice radio. The Rover transmitted its position from its GPS receiver to the command post on 2 meter packet radio using software created by their advisor, Mike Tweedy KA6SPT

Lunar Base Alpha—Margery Weitkamp KA6OCL, Teacher

The plant group, led by Luigi KE6QVU, designed a hydroponics system and grew genetically engineered "Brassica rapa" plants. They gave the plants to Eric KE6QVS, the biotechnology group leader, who extracted the genetic material and used electrophoresis to characterize the different strains of DNA. Biotech team members Caryn KE6THF, Pratima KE6QVV, and Travis measured the fertilization rates for sea urchins in different salinity, and obtained classic results.

Jennifer KE6TZD and Amanda KE6UNB used four chickens to measure the egg production, density, and shell thickness as a function of various day/night proportions. Kyle KE6TTZ, Danielle KE6QVR, and Curtis did an exhaustive study of crayfish. They took plaster casts of their boroughs in several simulated Mars soil types.

The Celestial Navigation Team used a computer program to simulate the trip from lunar orbit to Mars. Chuck KE6TGZ, and Rachel KE6UQN enacted a simulation of the trip to Mars over the 2 meter com link.

Lunar Base Charlie—Dave Reeves KF6PJ, Teacher

The GPS group, Mike KE6QNM, and James KE6QNL, mounted an Eagle GPS receiver, a Tiny-2 TNC, and an HT transceiver on the Mars Rover. They tracked the Rover's position on a computer in Lunar Base Charlie using APRS software. Richard KE6RRF, Vanessa KE6RVL, and Kevin established the "Data Link" using packet radio. They operated from a laptop computer and an HT transceiver in Base Omega.

Mike KE6QNT and Steve KE6QNU did extensive work on a fiber optics data link. It was not, however, fully operational at the time of the simulation.

The public relations group published the articles submitted by each group in a 16-page booklet called, "Mission 2 Mars."

Editors Mike, Mark, and Brian also produced a video containing Patrick KE6QNP's animation of the Rover, the Base, and the Martian terrain. They obtained most of their images from the WWW on the Internet.

During the Mars Base simulation, Nilou KE6QVT prepared an excellent weather report from one of the NOAA weather pictures that she acquired directly from the satellite. The occupants of the Mars Base were grateful for the cool and cloudy June gloom.

The Power Systems Group, Amy KE6RVN, Sean, and Fernando set up the solar power electrical system used to power radios, computers, and lights in the Mars Base during the simulation.

Jon KD6FOZ and Brian KE6QWE established the com Link between Command Base Charlie and Mars Base Omega. They used 2 meter radios for voice and closed circuit video for the television signals between the two bases.

In Summary

According to Dave, the students mastered the science and the technology skills needed to operate both Mars Base and the Rover. The students were responsible for all aspects of designing and setting up the base, and for its subsequent operation. As teachers, Dave and Margery were excited about how well the young people exercised leadership during the mission. They were also pleased with how the students were able to train one another in the operation of the experiments and the packet radio system. For their part, the students were surprised that even while they were learning, they were having a good time.

For more details about the Mars Base Simulation project, contact Dave Reeves KF6PJ at Chaminade College Preparatory School, 7500 Chaminade Avenue, West Hills, California 91304. 73

Photo B. The command post in the field on March 27.

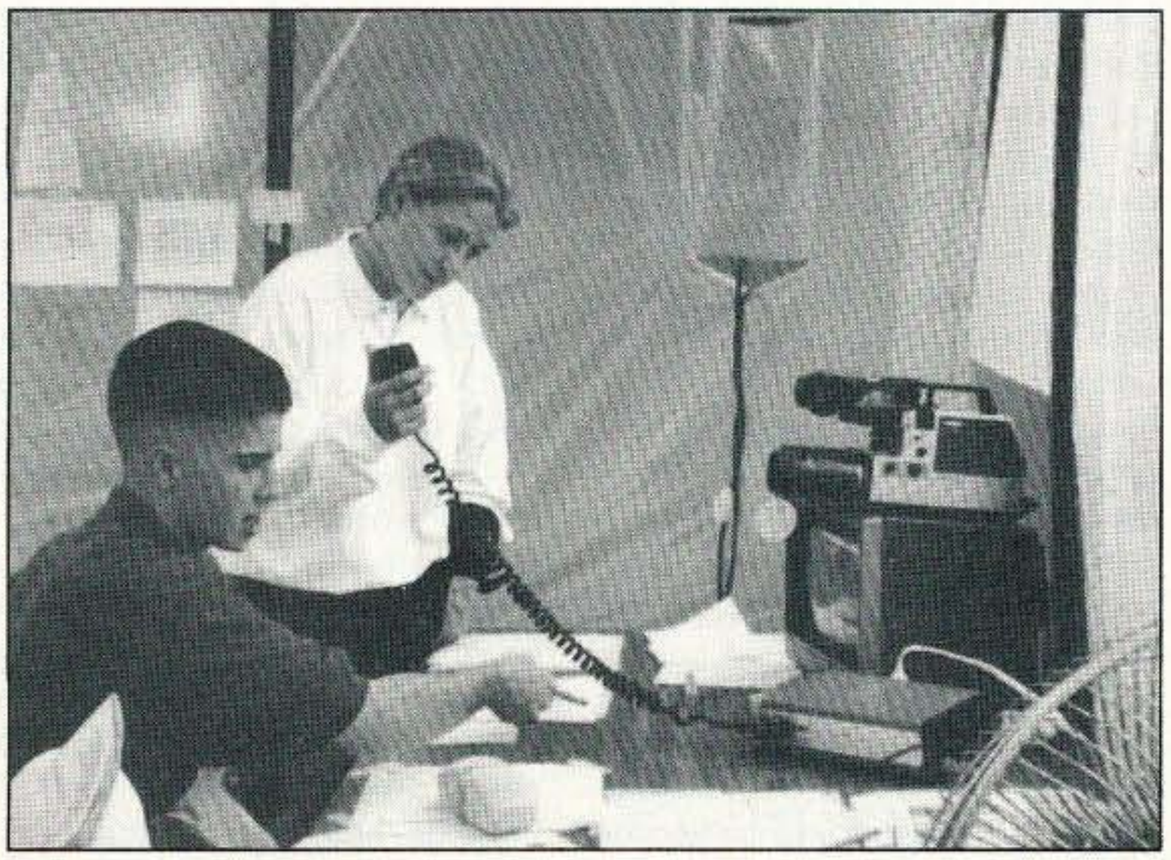

Photo C. David Reeves KF6PJ and Greg Flowers KE6PND speaking about ham radio for the bases.

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Surplus Ideas for GOES 1691 MHz Converter

Well, I had to do something on this topic sooner or later. I have had so many requests and letters all commenting how on a limited budget a GOES Weather Satellite receive converter can be constructed. Usually the converter in question takes the form of a downconverter to 137 MHz, where the VHF receiver and existing system is used for VHF WEFAX. By using existing hardware at 137 MHz for WEFAX, this project necessitates the construction only of an RF amplifier, mixer, and local oscillator. The trick is, of course, to keep the project low in terms of cost to remain within budget.

System parameters dictate that the system should have a noise figure of 2 dB or less and gain of about 15 to 20 dB minimum in the RF preamplifier. More gain and a reduced noise figure would be nice, as this would allow a margin of extra performance to allow for signal variation.

Now, the hardest part is trying to put together a system on a shoestring budget. That's always the hard request to fill, but we will give it a try and tackle that problem head-on. What I have to offer is not a complete PC board layout for construction but rather a set of conversion ideas that in part will allow you to construct a good portion of a 1691 MHz receiving downconverter from surplus material that should be available in your local area. After all, if you can't find the surplus material, you can't construct this low-cost converter. Lets take the problems of our surplus material one-by-one starting, with the RF preamplifier.

The biggest problem in any high-sensitivity downconverter is, of course, the receiving RF preamplifier that must have lots of gain and a good, or low, noise figure. Given that, other components required include a mixer and possibly an IF preamplifier in addition to the all-important local oscillator. We will handle the local oscillator problem last as this will be a problem to solve in next month's column. This month, I want to present ideas that can be put into motion so that we can take the finished form next month. I like to work with deadlines as they tend to make creative ideas sprout faster rather than waiting for something to happen. I call this sort of a creation research crash program. Now, back to surplus-material renovation.

What, then, is available in common surplus material that can deliver the basic design considerations and fill the bill? Well, what's more natural than to use the very surplus old standby TVRO 3.7 to 4.2 GHz Low Noise Amplifier (LNA). Prior use of surplus LNAs at other than TVRO frequencies have proved successful in a general-use amplifier. Putting this same LNA back to service in the 1691 MHz frequency range is not a problem. The basic converted amplifier showed good usable gain from 800 to slightly over 4 GHz when modified. Be aware that the gain is not uniform across the frequency responses when the bandwidth is opened up to cover 800 MHz to 4 GHz. Variation is great but consider that the original gain was some +40 dB in the 3.7 to 4.2 GHz range.

The conversion is quite simple, since all that is required is to remove the frequency determining stripline components between amplifier stages. By removing the frequency-determining trim stubs, the amplifier will be changed from a relatively narrow band unit to one of wide bandwidth. The finished stripline will look like the devices are all interconnected by just a 50-ohm or so stripline with no frequency-peaking stubs. If you are a real perfectionist, you could even try your hand at improving gain at the 1691 MHz frequency if of interest (snowflake tuning). I haven't tried this but suspect that you can obtain some success with this improvement.

A normal (stock LNA) amplifier provides about 40-50 dB of gain in the 3.7 to 4.2 GHz TVRO band. Now there is usually lots of excess gain to play with making broadbanding quite practical. The type of LNA you happen on to for this conversion is not important as long as the cost is low; usually surplus LNAs can be had for about $4 to $5 each. As I said before, a surplus LNA has about 40-50 dB gain and, even after conversion, these typical amplifiers still provide at least 30 dB of usable gain. Of course, there are peaks and valleys in this wide bandwidth mode but, with a little retuning effort, I am sure that you will have good results making the preamp work at 1691 MHz.

The rest of the conversion requires a mixer and for embellishments an IF preamp, if you desire. Now with this in mind you might be able to pick up a variation of the LNA—namely, the LNB. This is a unit that not only incorporates an RF preamplifier but a mixer and usually an IF preamplifier. If you can find one of these LNBs, it would save a few dollars on conversion and provide more gain as the IF amplifier can be brought into play.

The conversion scheme with an LNB is a little more complex because the unit has an internal local oscillator, usually a Dielectric Resonant Oscillator (DRO). Unfortunately this oscillator cannot be modified to work for our conversion and needs to be removed, as intact as possible, for some future project. With the DRO removed in most modules, there is space available to place a small voltage-controlled oscillator. In the unit that I converted, I just removed the entire metal wave guide flange to eliminate bulk not required in our converter. I mounted a coaxial connector to connect an external LO of choice. More on the local oscillator later.

Removing the DRO leaves the basic RF preamplifier for conver-

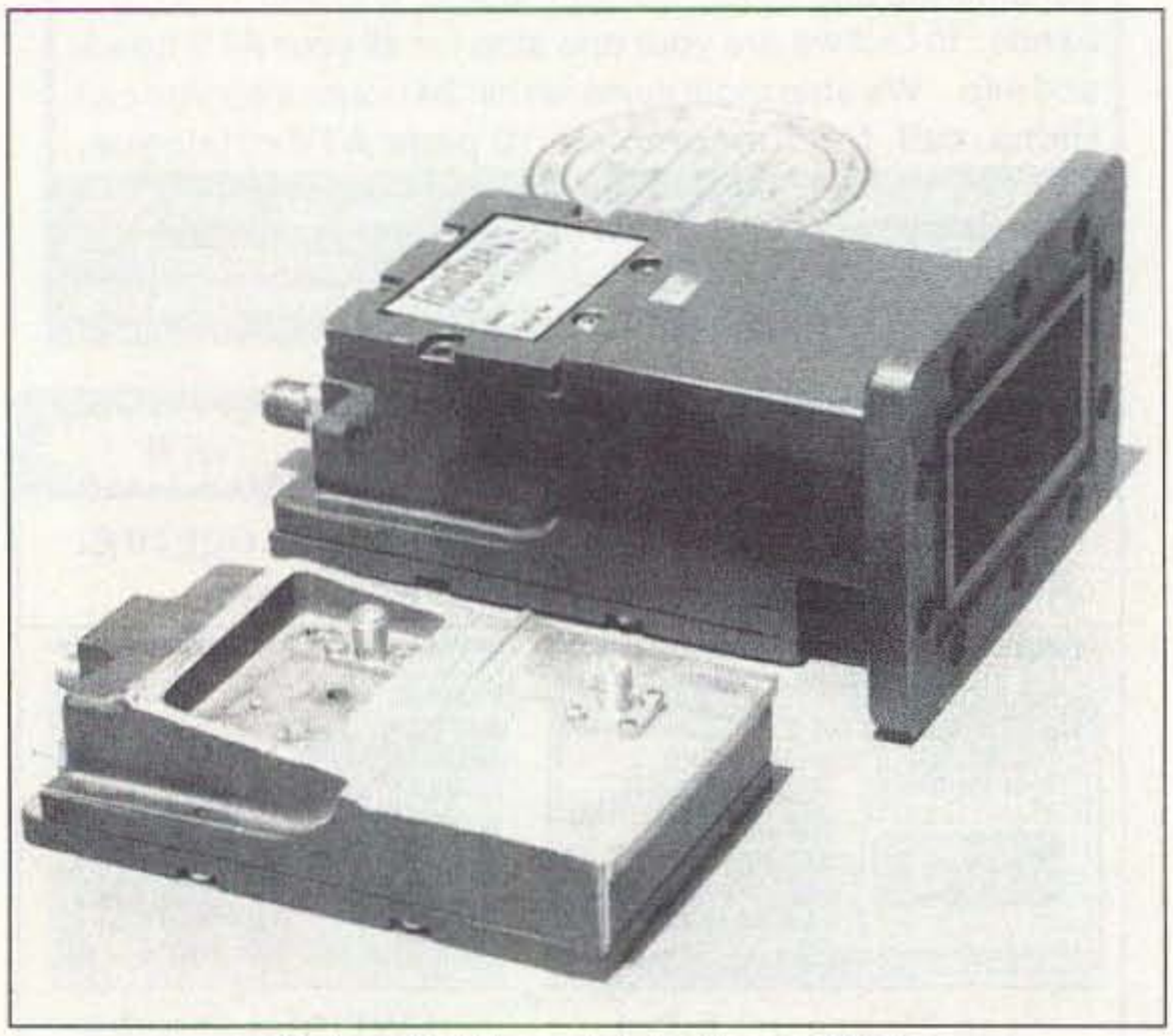

Photo A. Both the modified and original LNB.

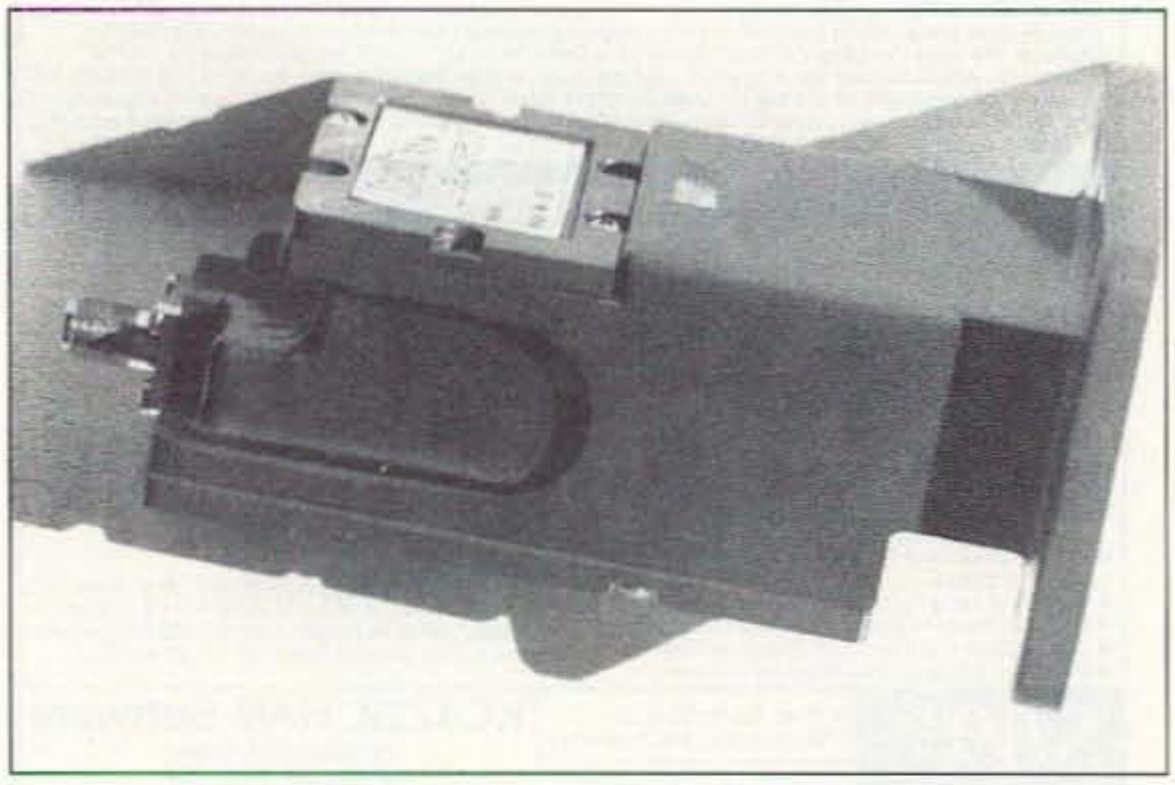

Photo B. Original LNB for 3.7 to 4.2 GHz TVRO operation.

sion using the same procedure as in a stock LNA. The IF preamp that comes with an LNB needs attention, as it operates in the 1,000-MHz range and is frequency restrictive due to its low-value frequency coupling capacitors. To lower the frequency response to the 137-MHz range, all that is required is to increase the interstage coupling capacitor's value, thereby lowering the frequency of operation. For an IF of 1,000 MHz or so, the value should be very small—say, a few pF—but with an IF in the 137-MHz range, a value near 10 times the original is normal. This one conversion will improve the low-frequency coupling and lower the operating frequency of the IF preamp.

Modifying the LNA or LNB housing to remove the waveguide flange is best done with a good bandsaw to eliminate most of the LNA's case. A hand hacksaw could be used, but the effort required is almost superhuman; I know, because I tried my hand at one on a hot California day. You can remove quite a bit of metal, as is evident in Photo A, which shows both a stock and converted LNB. As you can see, the profile of the converted unit is quite small. Before you are ready to take a whack at the metal, make sure the PC board will survive; either remove it or take a chance and leave it in place. (That's if you have several units available to check out G-force survival on your band saw "shake" table.) I removed the complete PC board assembly and left the minimum amount of material connected before sawing, using good static-free procedures to afford FET-device protection.

When you remove the PC board, make a sketch of the interconnecting leads and be sure to include details showing how the leads were attached and the wires dressed. A simple sketch will jog the memory, as most will fall into place. But do not leave it up to chance; make the drawing or sketch showing where everything attaches.

After the waveguide section is removed from the LNA housing, drill and tap holes for the coaxial connections to be used for the amplifier input. Drill a new hole in a location near the output RF connector; this is where we will install a new DC power feedthrough capacitor. After all drilling operations and cleanup are complete, remount the original PC board to the metal assemble, using grounded static-free procedures. This will insure that you will not subject the PC board and its sensitive FETs to destructive static charges.

Before attaching the input coaxial connector, cut the input trace and add a 10-pF chip capacitor between the coaxial connector and the base of the first device. Mount the capacitor nearest to the coaxial connector, leaving as much of the input stripline lead as possible going to the input FET.

Next, connect the DC power lead to the feedthrough capacitor. It should be mounted near the output coaxial connector on the amplifier, if practical. The original LNA used a power feed option that provided DC power up the coax feedline. It is better to separate this line into separate DC power and RF output. Remove the connection for the DC power to the regulator input on the PC board from the coaxial connector. It's usually a small wire-wound RFC that connects to the output connector. Remove this lead and attach to the feedthrough. This operation is the same for both the LNA and the LNB.

If you are modifying an LNA, a separate mixer will be used. There are several choices for a suitable mixer, you could build one or purchase an excellent mixer for less than $20. The most reasonably priced mixer that I have come across is the SRA-11, which is good to 2,000 MHz and works well at 1691 MHz. It's a very small mixer about the size of a 14-pin IC. This mixer is starting to show up in modest quantities from surplus and that should hold down costs even further for construction of this converter. Coupling this external mixer and a small IF amplifier—for instance, an MMIC amp—completes the basic RF to IF circuitry, with the exception of the local oscillator.

Local Oscillator Circuit Ideas

Construction of a local oscillator is a task that can take many twists. There are several different PC boards available to get crystal-controlled circuitry going in the 500 or so MHz ranges. One of these types was developed for local oscillator injection use with the no-tune type of transceivers. This design was originally published in *QST* magazine. A variation of this circuitry is from the English publication, *RSGB*. Another variation would be to construct a VCO and synthesizer using the old favorite MC-145106 Motorola synthesizer chip with an appropriate frequency divider. All circuits require a frequency multiplier either to double or to triple the frequency of operation. The VCO model could be made to operate on the frequency needed for LO injection, but requires frequency dividers to allow the low-frequency synthesizer chip to be used. Of course, there are other circuits that can be used. These are just some starting ideas.

"In trying to give this project a fair shake, I must mention a few others and let you choose what is the easiest for you to obtain or construct."

In trying to give this project a fair shake, I must mention a few others and let you choose what is the easiest for you to obtain or construct. A suitable local oscillator can be obtained from a 10-GHz "Brick"-type, phased-lock oscillator, as most of the cavity-tuned oscillators run in the 1,600 to 2,000 MHz ranges and do not require conversion. Even a "Brick" with a defective diode multiplier can be put to use. The multiplier section originally multiplied the 1,600–2,000 MHz oscillator frequency by 6 to 10 times, to the 12-GHz range. For fundamental frequency operation of a "Brick"-type oscillator is not required. In this application, the high-power LO is phase locked to a crystal that is 1/16 or 1/17 of the high-power local oscillator.

Now what can be the cheapest local oscillator for this application? Well, again, the answer can

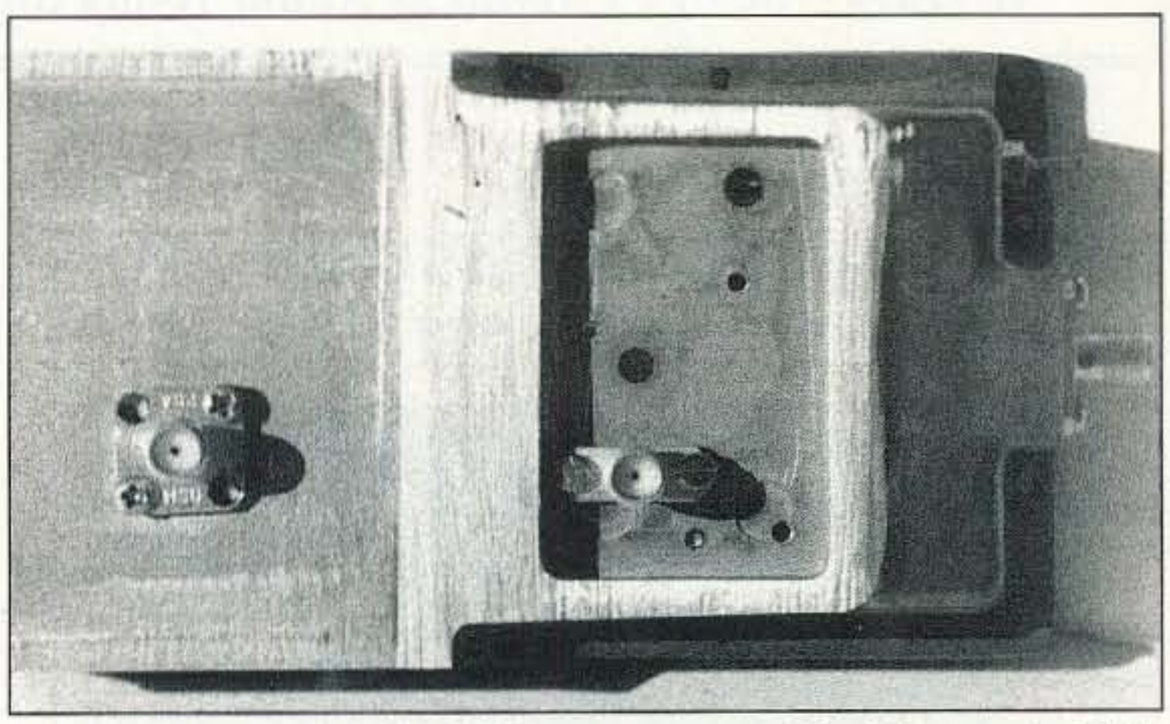

Photo C. Close-up of modified LNB, center connector LO, right connector RF input, left IF output.

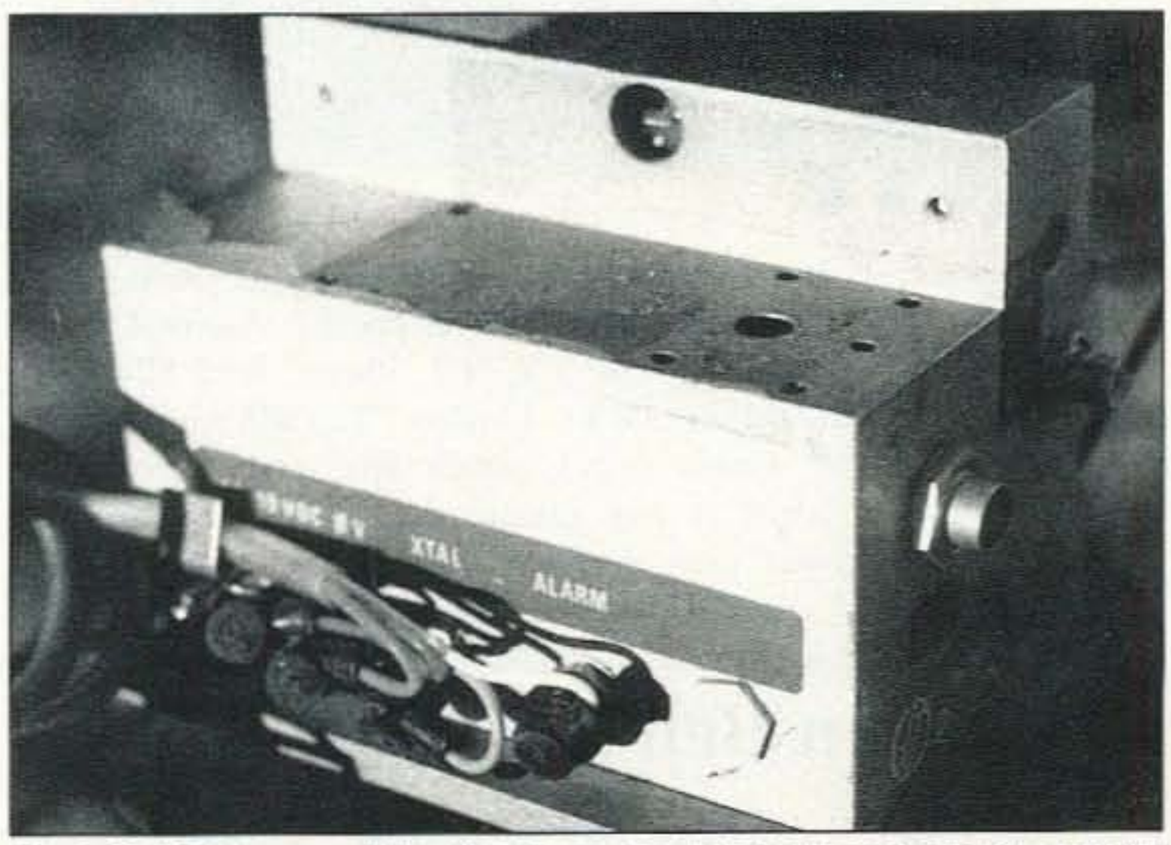

Photo D. Brick-type oscillator from Frequency West. Upper harmonic multiplier removed showing hole to which to connect probe for fundamental output. Hole is just above "M" in alarm notation on upper flat surface.

be found in the television marketplace in an unlikely component: a simple television tuner converter module. These tuners have a voltage-tuned oscillator that covers 500 MHz to over 1 GHz. They can be used with minimal circuitry to obtain the required injection frequency. Am I still on the kick of using a Motorola synthesizer chip (MC-145106)? You bet; it fills the bill well. The only problem with this circuit is that it provides 1/2 or 1/3 of the required local oscillator frequency. That necessitates the construction of a multiplier stage to double or triple the phase-locked synthesizer frequency. It should not be too tough to construct whatever type of oscillator you choose. Next month, some circuit ideas on the material we covered verbally. Be on the lookout for LNAs and LNBs for this conversion, which will continue next month.

Microwave Update 1995

The North Texas Microwave Society will hold the annual Microwave Update Convention in Arlington Texas on October 26, 27, 28, and 29, at the La Quinta Hotel. Reservations can be made by calling (800) 453-7909. The La Quinta is at 825 N. Watson Rd., Arlington, Texas 76011.

The technical program for Microwave Update 95 is nearly completed. The program consists of many well-known technical microwave enthusiasts from across the nation, and even Japan and England. There will be a wide range of topics that cover 902 MHz to 24 GHz. The customary noise-figure-measuring workshop will be held Friday evening along with the flea market. Test equipment demonstrations are planned by Hewlett Packard and Tektronix. We plan to have a network analyzer available for tuning filters, etc. Bring your LOs.

Kent WA5VJB will help out with the customary equipment auction, which is always helpful in offsetting conference expenses. Prize drawings will be held in between the technical papers, and again all donations are very much appreciated. Please contact WB5LUA if you have anything to offer.

"We are always looking for conference papers even if you do not wish to present them at a formal session."

As in past years the ARRL has again offered to publish the proceedings, and all information on the world above 902 MHz is very much appreciated. We are always looking for conference papers even if you do not wish to present them at a formal session. The articles can be any length, even one page. It is preferred that the papers be camera ready, and therefore best printed on a laser jet printer. The ARRL prefers 1-inch margins at the bottom and 3/4-inch margins on the other three sides. Photographs should be labeled but not attached to paper.

Conference pre-registration costs $40 and is due by October 2. Regular registration fee at the door and after October 2 is $45. Contact Al Ward WB5LUA, 2306 Forest Grove Estates Rd., Allen, Texas 75002, for information about this great convention, which centers on microwave activity and the dissemination of the latest information to the amateur community.

Number 22 on your Feedback card

HAM TO HAM

Your Input Welcome Here

Dave Miller NZ9E
7462 Lawler Avenue
Niles, IL 60714-3108

Beginning this month, *73 Amateur Radio Today* is inaugurating a totally new column, *Ham To Ham*, or HTH for short. We're looking for interesting ideas, tips, suggestions, simple equipment modifications, workshop techniques—whatever you think might be of interest or helpful to other hams, both those who are just starting out and we Old Timers alike.

HTH will be just that, a column of interesting ideas passed on from one ham to another. We'll need your help in designing both the actual format and the month-to-month contents of the column. I'll start if off, but whether it continues is up to you. Send in your favorite ideas, the things that perhaps you wish someone had told you before you were forced to find out the hard way, and we'll include them in this column.

To motivate and somewhat compensate you for your efforts, Uncle Wayne's unlimited budget for this effort will pay you $10 for every tip or suggestion that's published. No, you won't get rich, but it will help to defray your postage and writing costs; also, you'll have the satisfaction of knowing that you've helped a fellow ham and you'll get to see your name in print, a process perhaps making you famous, but not likely rich!

What kind of things are we looking for? You be the judge. Basically anything that seems like it might be helpful to others with the same rig or station accessory that you have. It might be an operational tip, a nifty modification (one that you know actually works well and is duplicatable), a novel way of doing something, or a circuit that you've found to be of benefit around your station. There are many new and exciting rigs and accessories out there today, and we're interested in your experiences and in the ways you found to improve some of them.

Just about any item ever designed has some bugs or inconveniences built into it. What have you discovered to make a particular piece of gear more "user friendly"? Send it to me and I'll try to include it in this column.

Anything around the ham shack is fair game here: transceivers, amplifiers, microphones, monitoring equipment, antennas, computers, computer peripherals, test equipment, clever shop tools, or new techniques on using tools—just about anything in the way of information that the rest of us will also find helpful. Try to keep it within the ham radio field, but even some ideas that may have universal appeal in our non-ham electronic lives will be considered. After all, we have to keep the XYL and harmonics happy, and they too may be potential hams in the rough.

When you send in your ideas, try to include as much detail as you possibly can. The more you can tell a person exactly how to implement your idea, the better chance of success they'll have to duplicate it. If a photo would help, include a clear, well-exposed one in color or B&W along with your idea. If a schematic or partial schematic would be invaluable, be sure to send a copy of one. If a mechanical drawing is called for, then a clearly marked, reasonably easy-to-read drawing would be very much appreciated by everyone who'll be using your idea. Even a sketch is better than nothing, if drawing isn't your strong suit.

By the way, we're definitely not looking for unsubstantiated complaints about any particular manufacturer's product. Try to be fair when writing about a particular brand of equipment. All electronic devices have faults or room for improvement. Even at that, what you may think is a problem someone else may see as a benefit. I suppose that the bottom line is: Err on the side of understanding rather than on the side of unjust criticism. We're a whole lot better off today than we were in the days when hams had to build just about everything they used around the shack.

So that's the basic game plan. Send your ideas, suggestions, tips, and techniques to me at:
Ham To Ham, c/o Dave Miller,
NZ9E, 7462 Lawler Avenue,
Niles, IL 60714-3108

Please include a self-addressed, stamped return envelope if you would like to have any of your materials returned to you. Actually, I'd prefer that you send copies that you can spare, keeping the originals for your own files in case of questions or if further information is needed. Also, send only your original, unpublished ideas. If you're sending in an idea that a friend or club group originated, make sure that they have no objection to the idea being published and then use at least part of the 10 bucks to buy them all coffee & rolls.

New 73 columnist David F. Miller NZ9E, in the ham shack.

So show us the direction that you'd like to see this column take by sending me your best brainstorms. Uncle Wayne has given the go-ahead to give this idea a try, but we all have to work at it to make it work for us. Think of this column as a kind of "clearing house" for tips that all of us can use at some point or another. Uncle Wayne is providing us with the medium of the magazine to do that effectively. Above all, think of this as your column, a place where you can see your efforts in print so they'll be available to others in the hobby.

To show that my heart is in the right place, I'll give you a couple of my own ideas to get the ball rolling. These are just a couple of samples of what we're looking for in HTH; I hope that you or someone you know might find them useful. And don't be afraid to spread the word about HTH. The more ideas we have coming in, the more we can give back to the ham community.

A Source For Small Switch or Jack Boxes

Here's a tip I've used to obtain a small plastic box for mounting a miniature toggle switch or two, or perhaps a couple of miniature or sub-miniature phone jacks, and so forth in a hurry. Best of all, it's basically free!

If you own—or know someone who owns—one of those ultra-small pocket dictation tape recorders, the kind that use the "micro" cassette tapes, don't throw away the small plastic boxes that the blank tapes come in. These boxes measure about 2-1/4" x 1-1/2" x 1/2" and can be used to house the small switches & jacks mentioned above, plus many other miniature electronic do-dads very nicely. The boxes are insulated, have a built-in hinged lid, and are *free* with the microcassette tapes.

The box can be spruced up a bit with matching color of spray paint, if desired, and the ends are easily drilled and reamed to accommodate the incoming/outgoing cables plus miniature switches and jacks—along with other small parts such as resistors and capacitors—to complete whatever circuit you might be duplicating. A strip of double-faced tape will hold the finished box wherever you wish, on the side of a piece of equipment or perhaps under the lip of a shelf. It can be tucked away in any unobtrusive corner on the operating table, while providing both protection and easy access when needed.

Perhaps you'd like to bring out a remote input or output from the back of your transceiver, or maybe mount a small switch to control remotely one thing or another at the location of your choice, to fit your operating style. One of these little boxes can easily be recycled to accommodate the idea.

And the XYL wonders why I never throw anything away!

Better Visibility Tuning Indicators

Both the AEA PK-232 and the MFJ 1278B digital multi-mode controllers use red LED bargraph tuning indicators to assist the operator with correct transceiver tuning when operating on the HF bands. These red bargraphs are fine in subdued lighting, but they tend to "wash-out" under direct or overhead lighting, making the "dancing bars" difficult to see.

Fortunately, these bargraphs are made in convenient, 20-pin, plug-in, DIP packages, with 10 pins along each long edge and 5 LED vertical bars in each package. I've found that green bargraphs are much easier for me to see under high ambient lighting conditions, and since they are plug-in, it's an easy matter to change over to them if you've had the same experience. One source of these compatible green bargraphs is Digi-Key Corp., PO Box 677, Thief River Falls, MN 56701-0677 (Tel: 1-800-344-4539). They list the green arrays as their catalog part number LT1067-ND and also offer yellow ones as part number LT1068-ND.

Keep in mind that you'll also have to change the color of the "filter" plastic covering the rectangular cut-out in the front panel to match the color of the bargraph you've chosen. The filter material can simply be a small piece of colored plastic film available in many stationery or variety stores. The filter film isn't absolutely essential, but it does significantly improve the contrast ratio between the lighted LED and the background color-tone.

By the way, if when you plug-in the new LED array, it doesn't work the first time around, simply unplug it and rotate it 180 degrees. If you install it backwards, no harm will be done.

I'll be back with more Ham To Ham tips next month, and please remember to send in your ideas to the address shown above and we'll publish the better ones in this column each month, plus send you 10 bucks for your time and trouble!

73, DE Dave, NZ9E

Note: The ideas and suggestions contributed to this column by its readers have not necessarily been tested by the column's moderator nor by the staff of *73* magazine, and thus no guarantee of operational success is implied. Always use your own best judgment before modifying any electronic item from the original equipment manufacturer's specifications. No responsibility is implied by the moderator or *73* magazine for any equipment damage or malfunction resulting from information supplied in this column. 73

Number 23 on your Feedback card

HAM HELP

We are happy to provide Ham Help listings free on a space-available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double-spaced, on a full (8 1/2" x 11") sheet of paper. Use upper- and lowercase 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. Specifically mention that your message is for the Ham Help column. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

WANTED: To borrow service manual/schematics for SINGER/GERTSCH FM10CS Station Monitor. *Marvin Moss, Box 28601, Atlanta GA 30358.*

WANTED: Manual for UNIDEN Bearcat Scanner BC 140 and information for modifications on this scanner. I will gladly pay for photocopies and postage. *Tom Waller, 311 Hillside Dr., Greenville AL 36037.*

I need an operating and/or technical manual for the REALISTIC PRO-2001 receiver. Anyone who can help please respond to *Daniel Anderson KB7PLO, P.O. Box 5306, Apache Jct. AZ 85278.* Or call *(602) 484-1037.*

NEEDED: Any information or schematics, etc., for an ATRONICS Code Reader (mfd. in Escondido CA). I will gladly pay for any costs incurred. *Len VE3INK, Toronto Ontario, Canada M9B 3W7. Tel. (416) 233-4998.*

I need a copy of a manual and/or schematic for a DENTRON MLA 2500 Linear Amplifier. I am willing to pay xerox and postage costs. Call collect first. *Edwin Barr K2HD, 3275 Lighthouse Way, Spring Hill FL 34607. Tel. (904) 686-7684.* Thanks for any help.

Regarding "FM Your IC-730," an article which appeared in the December 1985 issue of *73:* I need the parts placement corrections for the FM2 board. Can anyone help me? *Eugene Fischer W7IOR, (360) 293-6212.*

ADVERTISERS

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NEVER SAY DIE

Continued from page 4

chap from Illinois who was able to turn water into gasoline with a green powder. He demonstrated it for the skeptical reporter, who then proceded to run his car on it. Of course, that was 22 years ago and Harley is kicking himself for not following up on the idea.

The chap with the secret powder was cautious, and asking billions for the invention. He claimed that a Mr. Kraft had shown him the formula when he was 15. It was also shown to a friend of his, Anderson, who then went to the government and demonstrated it at the Brooklyn Navy Yard. Anderson disappeared the next day and has never been seen again.

Scientific Evidence

Do you personally have to see something to believe it? Supposing the same event is reported by several people around the world who have had no way to get together to concoct the story? Scientists have a problem believing in anything they can't reproduce on demand with 100% reliability, yet there are a wide variety of things going on that don't fit in with those restrictions.

While I've always had an interest in the occult, UFOs, and other anomalies, I've been put off by the close-mindedness of many people who reject the experiences of others. When something unusual happens, my instinct is to investigate it and try to understand what's going on, not to make every effort to reject or ignore it.

Scientists tend to sweep the unexplainable under the rug as "anomalies." For them that's enough of an explanation, and never mind trying to understand the anomaly or reproduce it. Doctors have the same mind-set, sweeping aside sudden cures for fatal illnesses as "spontaneous" cures. Thus, instead of trying to find out what brought about the "spontaneous" cure so it could be used to help others, they close their mental doors.

For centuries people have been having near death experiences (NDEs). There's a magnificent book by Dr. Crookall, *The Supreme Adventure,* published in 1961, which examines hundreds of NDE reports and shows how remarkably consistent they are. He then takes the next step and examines hundreds of reports of the "next world" as received through mediums. These, too, are quite consistent with the NDE reports. It's almost enough to make a person think.

I've read three recent books you might want to look for. There's Dannion Brinkley's *Saved By The Light* (1995; 204p), where he's struck by lightning and has quite an NDE. It's worth the $6. Unlike most other visitors to "heaven," this chap was given some glimpses into the future. If you've been keeping up with the latest in technology, you'll find his piece on the coming development of DNA-type computer systems most prescient for a 1975 NDE experience.

Then there's Mally Cox-Chapman's *The Case For Heaven* (Putnam 1995; 203p; $30). She tells in detail about her own experience, and then the stories of dozens of more people she's interviewed who've had similar experiences. Having gradually become an old man, and thus perhaps a little more concerned with death, these "light" books are of increasing interest to me.

There's also Betty Eadie's *Embraced By The Light* (1994; 145p; $6), You should be able to whip through it in less than an hour. She puts more of a religious interpretation on heaven than most others who've been through the experience, but her story is quite similar to all the others in most respects.

Another NDE resource is Cherie Sutherland's *Reborn In The Light* (1995; 303p; $6). Like the others, she reports on a number of people she's interviewed. Their stories are similar. There is the pattern after the NDE of no longer fearing death, but looking forward to it. Most come into contact with a Supreme Being who radiates love. Most are told they have tasks to do on earth before going to heaven and so must return until it is their time. While most of them become more religious, few continue going to organized churches. They come back with the message that God isn't interested in theology. Most of them, while dead, undergo a life review where they experience what they felt and what the other people around them felt as a result of their actions. I have an ex-wife who's going to have a major problem with that, and not a few ex-employees.

Of course I can't help, while reading about these NDEs, looking back at my life to see how I might have done better. My total lack of interest in money has been a hardship for my wife, who is much more money oriented. It's also been a magnet for those who would take

advantage of my lack of interest and who have robbed me of millions. But, having (at least in my eyes) helped the world along with the development of cellular telephones, microcomputers, compact discs (better music), my record companies, and now (hopefully) cold fusion, I feel my visit to earth has been worthwhile.

My love of amateur radio has been guiding me for most of my life. Sure, I get frustrated when I hear hams using bad language and being inconsiderate on the air. I almost got angry when the ARRL virtually destroyed the hobby 30 years ago in their move to generate greater visibility for the League with their so-called "incentive licensing." And my ability to forgive, forget, and love my enemies is sorely strained when people print lies and distortions about me.

Another, slightly older book on NDEs is Dr. Moody's *The Light Beyond,* (1988; 205p; $4.50). He even interviewed a number of children who'd had NDEs, with their stories all being quite consistent.

The reports are that a whole realm of the afterlife is set aside for the pursuit of knowledge. Well, I've got a good start in that direction. When I die, it's going to take a trailer truck to bring my library, and I'm not going anywhere permanent without it. If I can't take my books and music, I'm not going.

Closer To The Light by Dr. Morse (1990; 237p; $6) deals with children's NDEs. What does it feel like for them when they die? What do they learn? We're going to have to understand more about how time works because many NDE reports have to do with future events. You'll also enjoy Brad Steiger's *One with the Light* (1994; 300p; $5), which not only covers a wide variety of NDE reports, but shows how in every case the experience has substantially changed the people's lives.

If you've read very many biographies, you know that many (most?) of our creative artists attribute much of their inspiration to the ineffable. Sousa said that all of his marches came to him when he was in a half-sleep state. They came full blown, so all he had to do was get up and write them down. Many composers and writers tell similar stories. In *Neither Dead Nor Sleeping,* May Sewall (Bobbs-Merrill, 1920; 320p; $2.50 in an old book store) wrote that her deceased husband explained to her that spirits on "the other side" are responsible for these subconscious creative events.

There's a current spate of books about guardian angels. The recent TV programs on angels probably triggered this interest. In between reading Peter Graneau's *Ampere-Neumann Electrodynamics of Metals,* I'll whip through Hope Price's *Angels,* a $5 Avon inspirational pocket book that reports on hundreds of angel interventions. There are a bunch more angel books, all packed with stories of people who've been touched by them. Now, are you going to try to tell me that every single one of these people are totally mistaken? Give me a break!

No, I can't see auras or bend spoons, but I have no good reason to disbelieve the many people I know who claim to have done these things. There are a great many things going on for which we have no good scientific explanation. Can you assure me that not one person in history has ever been able to dowse? My grandfather, who was an inventor, taught me how to dowse (to use a divining rode to find underground water or minerals). "Pop" was good at it. He also was a good inventor. You wouldn't see Citgo or Continental Can Company around today except for him. He knew a lot about everything, so I accepted dowsing and had no trouble learning how to do it when I was about seven. Alas, he was a heavy smoker, so he died when I was only 12. My grandmother, who didn't smoke, lived on almost 30 years longer. I'll have to tell you more about her some time. She put me onto the Sewall book 3 years after she died.

Though I haven't had a near-death experience, I still have a pretty good idea of what my mission in this life is. It's what I've been doing for the last 44 years as a publisher: sharing the things I've found fun and exciting with you, and urging you to share with me. So I'm on your case, urging you to do better. To lose weight and thus live a longer and happier life. To not smoke. And to be adventurous. To try new things. To go new places. To try packet. To try satellite communications. To try going on a DX-pedition somewhere. To learn more. To read.

If your reaction is negative, remember that this could be an approach to life that you carry around with you. Life is more what you make it than it is a box of chocolates. If you're nasty, so will be the

people around you. If you get on the air to have fun and meet new people, that's what you'll find, for the most part. When you run into an ill-mannered op, try another frequency instead of getting mad or getting even.

One thing both the angel and the NDE reports all agree on is that prayer can be surprisingly powerful. It doesn't seem to matter what deities you believe in; just the act of praying has power to heal and change things. No, this is not a new concept and it doesn't mean that poor, old, aging Wayne is newly converted to any particular savior. I'm just telling you what thousands of people I've read about have reported.

As I'm writing this, I'm thoroughly enjoying a CD of Louis Moreau Gottschalk's (1829-1869) music. His music was sort of a precursor of ragtime, and he was the first internationally famous American composer. Though it's difficult for me to imagine, I suppose there are some people who might not find his music irresistible. His *Tarantella, Résponds Moi, Ojos Criollos, Orfa, La Gallina, Bamboula, Grand Fantasia,* and *Pasquinade* are incredible. If I can't get you to enjoy reading books and learning, maybe I can turn you on to some wonderful music? No, all you want me to write about is ham radio, right?

So what do you find the most exciting about amateur radio? What adventures have you had? If you've made even a tenth the number of friends via the hobby that I have, it's paid off for you handsomely. That's probably what brings me back to Dayton every year most of all. When's the last time you had a contact where you talked with someone for over an hour and you both hated to end it? I used to offer a certificate for long-winded contacts: the Real Rag Chewer's Club certificate (RRCC) for contacts over an hour. Let me know if I should offer that again.

Of course,I used to offer a WAAS (Worked Almost All States) certificate for hams who'd worked 49 states. Then there was my CHC (Certificate Hater's Club) for hams who hate certificates and promise not to go after them; and if they do by chance get one, they promise to hate it.

Maybe it's best I don't write about amateur radio and just stick to my secret goals of trying to get you to have more fun, to learn, and to shape up.

Leasing The Spectrum

The FCC's recent spectrum fire sale brought in $10 billion . . . just for a few more cellular phone channels. Not bad, considering the FCC's annual $200 million budget. I know you aren't going to believe this, but Congress has noticed this new revenue source.

The estimated value of the commercially used spectrum, according to Peter Huber in Forbes, is at least $200 billion. And that doesn't count the frequencies some projected new services are going to need. Leasing the currently used spectrum could therefore be expected to provide at least an extra $20 billion a year for Congress either to reduce the national debt or to invest in bigger and better pork. Guess which way I think they'll elect to go?

So what is going to happen now that Congress has found that there is a megadollar value to those microwave megahertz we haven't been bothering to use? Yes, I know—who cares as long as they leave 20m and 75m alone, right? It wasn't very long ago that *CQ* Magazine proposed that the 146–148 MHz band be taken away from us and turned into a new CB band. Have you thanked them for that yet? That was just before repeaters got popular. Up until then the top two megahertz of 2m was almost unused. If we lose two or three microwave (satellite) bands, that could end our potential for developing a worldwide ham net similar to the Internet.

Hmm, seems to me I've written most of this before. Often. Anyone awake out there?

A Great Role Model

John Abbott K6YB has been getting some superb publicity for amateur radio in the L.A. Times. Bravo. That's what we need. John has been teaching youngsters about radio as a volunteer for 5 years. Carole Perry had a nice piece about his work in her December 1993 "Hams with Class" column. And Gordon West reviewed John's *Riding's The Airwaves with Alpha and Zulu* in *Radio Fun.*

How about you? Could you spare some time once or twice a week to visit a local school to teach some 9–11 year olds about amateur radio?

Auto-Ident?

A letter from Ernest N7ULU of Phoenix suggests that our rigs might have a built-in chip that would automatically identify our station in code when the mike button is pushed. It's been some time since I've written about that, but for some reason no one seems to have picked up the ball.

If the call is sent at around 20 wpm, it would only require a 3-second wait before talking. This might present a problem for over-excited talkers, but most of us would soon learn to adapt to it. I'd also suggest a timer be built in which would prevent the identification from being sent more than once every 5 minutes. It could also be programmed to butt in and identify every 10 minutes if the transmitting operator happens to be as long winded as I.

Instead of keying the transmitter on and off, it could send the call with a tone (MCW). This would make it so you could talk over it if you just couldn't wait 3 seconds.

This would make it possible to save a good deal of time spent in oral identification. The fact is that I'm quite familiar with my own call, so it gets a bit tedious to hear the chap I'm in contact with repeating it at the beginning and end of every transmission. Yes, I know we've been doing this ritual ever since hamming started. But that doesn't make it any more sensible.

"Could you spare some time once or twice a week to visit a local school to teach some 9–11 year olds about amateur radio?"

Of course, what I would much prefer is some work done on achieving what we should have done 50 years ago: duplex contacts. This one-way simplex business is right out of the smoke-signal age. When will I start hearing the ARRL petitioning the FCC for a return of spark? Maybe narrowband spark, for better spectrum efficiency.

The War On Poverty

The recent PBS series on President Johnson's futile war on poverty made it pretty clear that throwing money at the problem hasn't worked. Most of the thrown money ends up in the hands of the goverment bureaucrats. That reminds me of the quote about the missionaries going to Hawaii to do good, and doing very well indeed. America's "war on poverty" has cost taxpayers trillions of dollars, and helped build an even larger federal bureaucracy which has made the poverty situation worse.

Maybe there *is* no solution to the poverty problem. Maybe there will always be poor people. Yes, there probably always will, but there don't have to be as many of them. Not nearly as many. So what's happening that's generating generation after generation of poor people, and what can be done to break the insidious pattern?

You may at first think I'm really stretching to claim that amateur radio can be a big part of the solution. So how can I make the claim that amateur radio can be instrumental in helping eliminate much of the poverty in America (or anywhere else in the world, for that matter)?

Let's start with fundamentals. If you've given any thought to the poverty problem, you've certainly noticed that there are very few really poor people with good educations. Oh, I know a couple, but they are certified nut cases and are thus unable to work despite their education. As a good general rule let's agree that education and poverty don't go together. You may also have noticed that very few rich people are uneducated. This is not a coincidence.

Okay, if we want to get rid of poverty we're going to have to somehow see that poor kids get educated. And this isn't going to be easy. I won't go into the gory details, but we're saddled with one of the worst government-run school systems in the world, plus parents who are busy teaching their children how to stay poor, and peer pressure (gangs) pushing them to drop out of school.

Immigrant Asian parents, who emphasize the importance of education to their children, prove that the parents can have a powerful impact on their kids. Though often poor, they see to it that their children get a good education and move out of poverty, despite our terrible school system.

There are some practical solutions to improving our schools and to generating an interest in poor parents to encourage their children to be educated. I've covered this territory in some depth in my *Declare War* book and its updates, so I won't repeat all that.

Where Does Amateur Radio Fit In?

It's a high-tech world. Our kids have to cope with the information superhighway, and that means computer literacy, a need to understand electronics, television, and so on. A generation ago we used typewriters, today it's word processors. It wasn't very long ago that we used pens, blotters and pen wipers. There aren't very many blotter manufacturers any more. If any.

Just as there is a strong parallel between education and success in life, in today's world there is also a parallel between high-tech and success. Scientists, engineers, and technicians are being more and more needed to fuel the changes in our society. Communications and transportation are speeding up and

getting cheaper. This is putting every worker in America on a more level playing field with workers around the world. If your job can be done as well or better by a foreign worker at a lower cost, you're going to lose out. Job protection can't be legislated. One's job protection is one's accumulation of skills and knowledge.

Here comes amateur radio.

As a scientific hobby, amateur radio has the potential for interesting youngsters in learning about electronics and communications. Even computers are an integral part of hamming these days. One of the big keys to making our American school system more effective is to make it more fun to learn. Hamming, where we have a group of around 73 hobbies, has almost unlimited fun for youngsters. It is a key to getting them to learn because they want to, not because the government will punish them if they don't go to school.

Back in the 1950s, before our only national amateur radio organization, the ARRL and their so-called "Incentive Licensing" proposal to the FCC, destroyed both the ham industry and the infrastructure which was feeding youngsters into the hobby, studies showed that 80% of all new licensees were youngsters and that 80% of those went on to high-tech careers as a result. That's what happened to me.

Indeed, amateur radio was the major supplier of scientists, engineers and technicians for our country. When World War II came along 80% of our hams enlisted. As did I. When I went to the Navy electronics school I found hams everywhere. Virtually all the instructors were hams. Later, when I went into ham publishing, I found that a high percentage of the top people in the electronics and communications industries were hams who had, like me, started in their teens. In the 1950s 50% of all new hams were 14 or 15 years old!

In those days virtually every high school had a ham radio club. That's what got me going. I went to Erasmus Hall High School in Brooklyn (NY). My interest in building radios and listening to the short waves got me to join the club. From there on the club members got me to practice the code and get my ham license. These clubs were almost all wiped out by ARRL's Incentive Licensing mess 30 years ago. That's when the hobby stopped growing, going from 11% growth per year (for 18 years) to less than 1% most years since then. That's when every major ham equipment manufacturer and 85% of the ham dealers went out of business.

Packet radio is an exciting aspect of the hobby. It gets kids to learn about computers and digital communications because they want to. Slow- and fast-scan television teaches them about video and digital data compression. Ham satellite communications helps them learn to deal with microwaves. And all of this is real fun!

I've been urging every ham radio club in America to get busy and get radio clubs restarted in our schools so we can regain our lost amateur radio infrastructure. Today we need to get kids interested in high-tech when they are 8-10 years old. This is why I've proposed that we start teaching the fundamentals of electronics in every school in grades 5-12. There is less and less need in business for people who are ignorant of technology. Almost everyone has to deal with computers and communications in their work, so the more they understand what they are doing, the more valuable they are going to be. The man or woman who looks up helplessly when his or her computer stops working will be replaced by a more self-sufficient worker.

We're heading into a world of video conferencing, telemarketing, and information handling. Good jobs await those with the skills and knowledge to deal with this world. Poverty awaits those who don't keep up.

Amateur radio is by far the best hobby there is for getting youngsters interested in learning the things which will be more help to them later on. There are a bunch of other scientific hobbies, but none of them have such a wide variety of interests and excitement to offer.

We have DXers, who are mainly interested in contacting foreign countries. We have specialists who love contests, who want to see how many countries they can contact on some particular ham band, such as 160 or 80 meters. We have awards for contacting all states, and so on, which can be very difficult on some ham bands. We have weirdoes (like me) who love to visit countries which haven't many active hams and get on the air for a few days, making thousands of short contacts and providing DXers with a confirmation of a new country contacted.

Most hams get interested in building their own equipment. Some buy kits and assemble them. Others buy the basic parts and build. At the Dayton hamfest every year there are acres of hams selling equipment and parts at the flea market.

There are over 500 such exhibits. And parts are being sold at every hamfest and convention around the country. It's fun to build and get something new to work.

Unless we in America use every stratagem to get our kids to build their skills and high-tech knowledge, youngsters in other countries are going to take away their jobs. Just look at the way Asian countries such as Japan, Taiwan, Hong Kong, Singapore, Thailand, Malaysia, and India have been pulling themselves from incredible poverty to wealth. I've been visiting these countries for over 35 years now and I have seen the unbelievable changes first hand. In Japan, there are more than twice as many ham radio operators per capita as we have. Every school in Japan has a radio club. Is it any wonder they've been able to take away every consumer electronics industry of ours?

We invented the transistor, they developed and marketed it. We invented video tape, they developed and marketed it. And so on. We don't make TV sets any more. We don't make cassette recorders or VCRs. Japan makes about 90% of our audio equipment. When I visit their factories in Japan I am met by Japanese hams at every turn.

What can you do about all this? That's easy, start helping your local schools to form radio clubs and get kids interested in amateur radio. It'll be the best thing you can do for the kids, for America, and for yourself. Yes, the school administrators will probably fight you at every turn. Try my motto: Never Say Die! Get on your local school board and keep the pressure on. We need tens of thousands of school radio clubs and millions of new hams. Maybe tens of millions. We have more than enough frequencies available. Heck, we're using less than 3% of our ham bands today.

What are you doing just sitting there? Why aren't you on the phone calling your local schools to arrange to talk with the 8–10 year old kids about hamming?

Amateur radio, properly applied, has the potential to do more for anti-poverty than all of the enormously wasteful government programs. In the long run we'll have a far more stable society when we have as few people in poverty as possible. The extremes of wealth and the lack of it feed discontent, as we see our politicians using to their advantage at every turn. The more we can build up our middle class and eliminate our poor and rich, the less jealousy and envy we'll have dividing us. But it's up to us to do something, not our politicians or bureaucrats, who are in bed together.

The millions of bureaucrats kept in business by anti-poverty programs and welfare have a powerful vested interest in maintaining poverty and welfare. Why on earth should a welfare worker do anything which is going to get people off of welfare? That's shooting themselves in the foot. In the long run your choice is to let things go along as they have, sending a large part of your earnings to the government to distribute, or to start your own private war against the status quo by striking sparks to enlighten the minds of our kids.

I can do no more than give you the tools and point out a worthy goal. I can't come to your home and yank you off your sofa, away from that ball game, or from your ham rig where you are probably adding to a pileup trying to get a 15-second contact with some guy in a rare country. Or checking into a net for the benefit of no one whatever. Our kids need your help. And so does our country. And so does amateur radio.

Yes, I mentioned my book, *We The People Declare War On Our Lousy Government*. Do you read books? I review interesting books I've read in my *73* editorials. In my book I provide proposals for simple, inexpensive ways to help solve our more serious social problems. Like our terrible school system. Our unhealthy so-called health care system. Crime, drugs, foreign aid, and stuff like that.

At Dayton this year there was a parade of hundreds of *73* readers coming by my booth to say how much they enjoy my editorials. Many claimed that I've changed their lives. So I'll keep writing . . . about amateur radio and the fun it can provide . . . about how we can use this to help the whole world. And about anything else I find fun and thus want to share with you.

Next Month?

After several pages of small type I'll bet you think I've run out of things to write about. No way. Next month I'll get into some books I've read recently on how to stay totally healthy and live to be a hundred or more. Will I be able to change your whole life around, making it so you'll never have to worry about cancer, heart by-pass operations, Alzheimer's, and so on? Only if you pay attention to Uncle Wayne. 73

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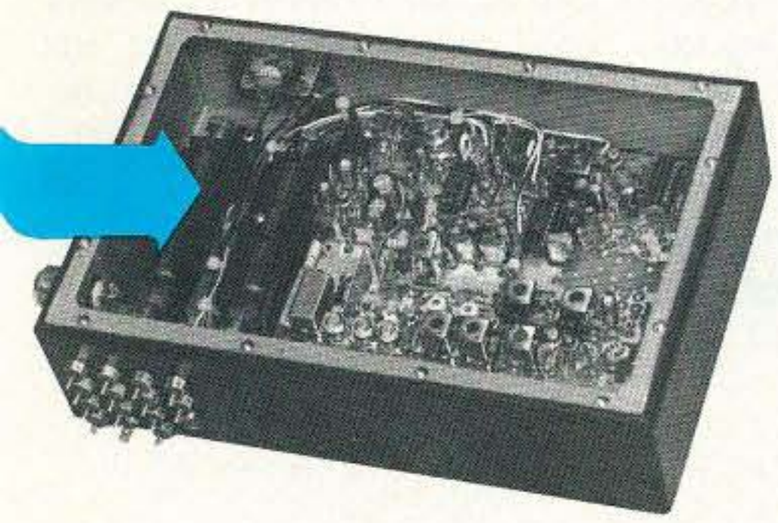

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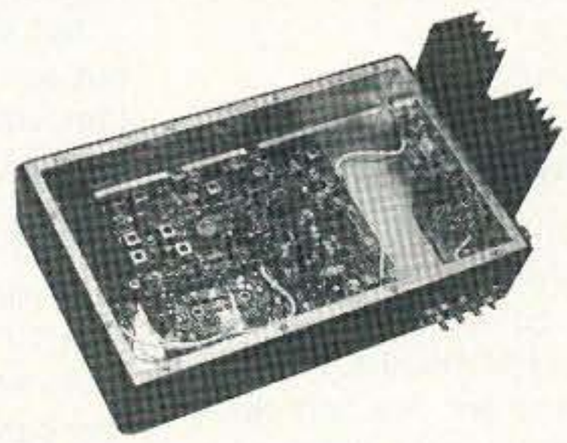

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- Rcvr. Board mounted in shielded housing.
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- As used in the SCR 1400
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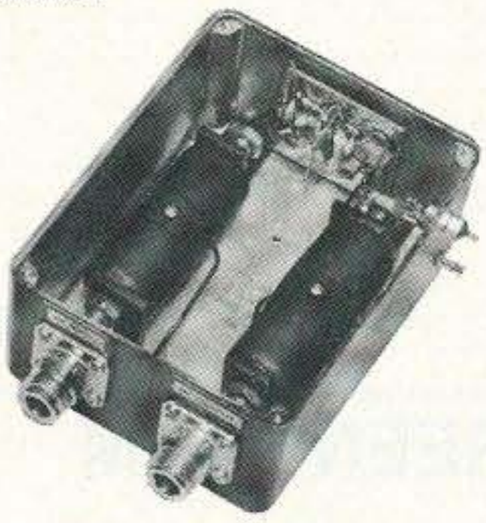

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- **FL-4H: 4Hi Q Helical Resonators & Lo-Noise Tr. Amp. in shielded housing. (420-470 MHz)**
- **Provides tremendous rejection of "out-of-band" signals w/out the usual loss!** Can often be used instead of large expensive cavity filters.
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Call or Write for Data Sheets

CTC100 Rptr. COR Timer/Control Bd.

- Complete solid state control for rptr. COR, "Hang" Timer, "Time-Out" Timer, TX local & remote Shut-down/Reset, etc.
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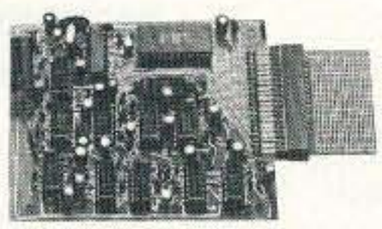

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TTC300 TOUCH TONE CONTROLLER

- High performance, versatile design. To control any ON/OFF Function at a remote site via DTMF Radio Link.
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  3 ON/OFF Functions per Main Card. Easily expand-able to any no. of functions w/Expansion Cards.
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  Latched or pulsed outputs.
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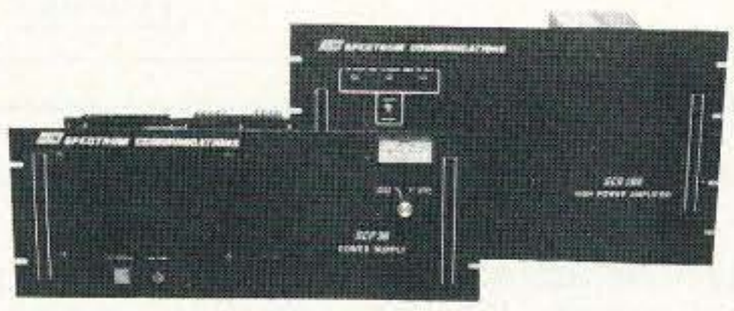

SCP30 HEAVY DUTY 30 AMP RACK MT. POWER SUPPLY

- 13.8 VDC out. 115/230 Iin 50/60 Hz.
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Number 24 on your Feedback card

PROPAGATION

Dennis Kopecky WJ2R

Dennis Kopecky WJ2R
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Conditions This Month

This month has the appearance of being one of the best months for HF communication in the past several months. Fall conditions prevail and the only really POOR days forecast are expected to be the 12th, 13th, 30th, and 31st. The calendar shows that very GOOD days are extended from the 15th through the 29th, with only a few of those days (15, 21-23, 28-29 trending to Fair). Remember, though, that Cycle 22 is drawing to a close and that most HF bands will soon be at their lowest ebb. Make the most of this month with your finest operating skills!

Weather-wise, the 12th and 13th and the 30th and 31st may produce storms and/or other geophysical upsets. Be prepared a day or two either way.

10 and 12 Meters

Not expected to be very good, but still should be monitored for transequatorial/tropical paths during the daylight hours.

15 and 17 Meters

Similar in overall outlook as 10 and 12 Meters, but with better chances to work DX because of the outright popularity of these bands throughout our worldwide community.

20 Meters

This is your workhorse band for worldwide DX during the daylight hours this month, with occasional openings beyond local time sunset, moving from east to west, and long skip north and south.

40 Meters

DX on this band should be available from just before sunset until just after sunrise, which also means broadcast station interference in the phone portion of the band. Concentrate on the days marked fair or even poor, as conditions on the higher bands (which should still be checked) may make them unusable.

80 and 160 Meters

Expect some fairly good DX and short-skip openings during the hours of darkness, which will be lengthening the time we will be able to pursue our pastime!

VLF (160–190 kcs.)

Anyone with interesting happenings in this portion of the spectrum is invited to contact me. I'd like to receive data regarding conditions over a period of time—that is, fair, improving to very good over a period of days, and vice versa, with signal levels, distances worked, time of day, etc. (the usual stuff! TNX). 73

OCTOBER 1995

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

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA								15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40	40		20	15	15	15	15	
SOUTH AFRICA									15	15	15	
U.S.S.R.							20	20				
WEST COAST			80	80	40	40	40	20	20	20		

CENTRAL UNITED STATES TO:

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

WESTERN UNITED STATES TO:

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

Number 25 on your Feedback card

BARTER 'N' BUY

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

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

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

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, *73 Magazine*, 70 Rte. 202N, Peterborough NH 03458, and get set for the phone calls.

The deadline for the December 1995 classified ad section is October 12, 1995.

ALL ABOUT CRYSTAL SETS. Theory and construction of crystal set radios. $9.95 each, ppd USA. Send to: **ALLABOUT BOOKS**, Dept. S, P.O. Box 22366, San Diego CA 92192. BNB200

WANTEDWestern electric amplifiers, tubes, speakers & parts. **Free Quote!** 1-800-251-5454. BNB268

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KENWOOD AUTHORIZED REPAIR. Also ICOM, Yaesu. **GROTON ELECTRONICS,** Box 379, Groton MA 01450. (508)448-3322. BNB310

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RCI-2950/2970: New modification manual including Power increase. Clarifier modification. Modulation increase. Operating hints, and more. Parts included. Only $20.00 ppd in U.S. (Missouri residents add $1.15 tax). **SCOTT**, P.O. Box 510408, St., Louis MO 63151-0408. (314)846-0252. Money Orders or C.O.D. BNB340

HR2510, RCI2950, CONNEX 3300, COBRA 148, GALAXY SATURN, plus many more kits to increase your modulation, $19.95. **(800)536-0109.** BNB350

WANTED: Squires-Sanders SS1BS, SS1RS, SS1R, SS1V **WEBER**, 4845 West 107 Street, OAK Lawn Illinois,60453-5252. BNB381

NI-CD BATTERY analyzer cycler. PC controlled. DOS software. $289 PO Box 672, London, Ontario Canada N6A 4Y4 **Lamantia Products** 519-472-5566 Fax 519-472-1702. BNB385

SOLAR PANELS 17volts at 4.45amps. Best one made. 10-year warantee. $450 plus $15 S&H plus 7.5% tax CA. residents. Free shipping >3. Check or money order to **Pacific Coast Prototype** 215 Lake Blvd. Unit 251, Redding CA. 96003-2506. Phone 1(916)472-3091. BNB395

IT'S BACK! The return of the HW-8 Handbook! Second printing. Modifications for the Heath QRP rigs. First class mail $11. DX add $4 for air mail shipping. **Mike Bryce, WB8VGE,** 2225 Mayflower NW, Massillon OH 44647. BNB404

Continued on page 82

WANTED: HAM EQUIPMENT AND RELATED ITEMS. Donate your excess gear, new-old-in-any-condition to the Radio Club of Junior High School 22, the nation's only full-time, nonprofit organization working to get ham radio into schools around the country as a teaching tool using our EDUCOM--Education Thru Communication--program. Send your radio to school. Your donated material will be picked up ANYWHERE or shipping arranged, and this means a tax deduction to the full extent of the law for you as we are an IRS 501(c)(3) charity in our 15th year of service. It is always easier to donate and usually more financially rewarding, BUT MOST IMPORTANT your gift will mean a whole new world of educational opportunity for children nationwide. Radios you can write off, kids you can't. Make 1995 the year to help a child and yourself. Write, phone or FAX the WB2JKJ "22 Crew" today: The RC of JHS 22, P.O. Box 1052, New York NY 10002. 24 hours call (516)674-4072 or FAX (516)674-9600. Join us on the **WB2JKJ CLASSROOM NET,** 7.238 MHz 1200-1330 UTC daily and 21.395 MHz from 1400 to 2000 UTC. Meet us at Beachfest 95 on November 11 in Myrtle Beach SC sponsored by the Grand Strand ARC. BNB762

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R-390 Power Input Cables $25 Shipped. (419)255-6220. BNB813b

Morse Code Computer Interfaces $49.95, CW Filters $39.95. Free IBM Shareware and Ham Catolog.**Dynamic Eletronics,** Box 896, Hartselle, AL 35640, (205)773-2758 Fax 773-7295. BNB815

FCC COMMERCIAL LICENSE PREPARATION RADIOTELEPHONE-RADIOTELEGRAPH GMDSS. Latest home study fast easy audio video. Q & A pool disks. FREE details **WPT PUBLICATIONS** (800)800-7588. BNB840

ELECTRONICS GRAB BAG! 500 pieces of new components: inductors, capacitors, diodes, resistors. $5.00 postpaid. **ALLTRONICS,** 2300 Zanker Rd., San Jose CA 95131. BNB855

BEST OFFER FOR; KRONE-HITE WIDE BAND AMP MODEL DCA-50(R), DENTRON AMP GLA 1000 1200 WATT, TEN-TEE TRANSCIEVER MODEL 540, DAIWA SWR & POWER METER MODEL CN-620. PHONE/FAX 914-234-7763. BNB900

HANDSOME AWARD CERTIFICATES FOR DX ACCOMPLISHMENTS. FOR INFO SEND S.A.S.E TO **NOPZA** 1801 CIMARRON TRL CHOCTAW, OK 73020. BNB905

HEATHKIT WANTED! S.B. Series **'Green Front'** for parts. **Robert Schlegel** 2302 286th St. East, Roy WA 98580. BNB910

WANTED: BUY AND SELL All types of Electron Tubes. Call (612)429-9397, Fax (612)429-0292. **C & N ELECTRONICS,** Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. BNB915

Capacitor Close-out Retiring HamFest Scene. Must Sell thousands of brand new capacitors. Electrolytic, Disc, Tantalum. All must go! Free Listing. **Send SASE to:** James Grogan, Box 20809, Raleigh NC 27619. BNB945

RF TRANSISTORS, Japanese transistors and tubes need dealers, repair shops, kit makers, etc. for 2SC1969, 2SC2312, MB8719, MRF455, MRF454, 2SC2879 and more. **WESTGATE** (800)213-4563. BNB950

FREE HAM GOSPEL TRACTS. SASE. **N3FTT**, 5133 Gramercy, Clifton Heights PA 19018. BNB960

HEATH COMPANY is selling photocopies of most Heathkit manuals. Only authorized source for copyright manuals. **Phone** (616) 925-5899, 8-4 ET. BNB964

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

AZDEN SERVICE by former factory technician. **SOUTHERN TECHNOLOGIES AMATEUR RADIO INC.,** 10715 SW 190 St. #9, Miami FL 33157. (305) 238-3327. BNB979

ROTOR PARTS ROTOR SERVICE, ROTOR accessories: Brak-D-Lays, Quik-Connects, Pre-Set mods. NEW models for sale. Free catalog. **C.A.T.S.,** 7368 State Road 105, Pemberville OH 43450. BNB996

SECRET CB BOOKS 1-29 $10 ea., SAMS books $15 ea. Tune up masters books 1-6 $20 ea., Uniden export service manual $10, RCI 2950/2970 service manual $10. Call for free catalog of other goodies. **1-800-536-0109.** BNB999

Wanted for Museum: Apple-1 and other pre-1980 microcomputers. Also early microcomputer journals, newsletters and advertising literature. **KK4WW,** 703-231-6478/763-2321. BNB1001

CODE 5 News and Petition information. SASE to **KB7PNQ**, 503 Dubois Atreet, Cheney, WA 99004. BNB1012

AMATEUR RADIO REPAIR, most makes and models, discount labor rates until June 1995. **WESTERN AMATEUR RADIO REPAIR CO.**, John Rupe, Box 697, North Cove, WA 98547; (360) 267-4011. Thanks, AB7DR. BNB1015

Number 26 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 April issue, we should receive it by January 31. Provide a clear, concise summary of the essential details about your Special Event.

OCT 21

GRANDVIEW, MO The Southside ARC will hold their "Octoberfest" at Grandview East Jr. H.S., 12650 Manchester. VE Exams. Talk-in on 147.120. Contact *KG0UP, P.O. Box 1142, Grandview MO 64030.*

GRAY, TN The 15th annual Tri-Cities Hamfest will be held at the Appalachian Fair Grounds, located off I-181 in Gray TN. Drive-in Indoor/Outdoor Flea Market. Mail inquiries to *Tri-Cities Hamfest, P.O. Box 3682 CRS, Johnson City TN 37602.* Sponsored by the Kingsport, Bristol, and Johnson City Radio Clubs.

HOLLAND, MI The Holland ARC will host a Hamfest at Holland Christian H.S., 950 Ottawa Ave., 8 AM-1 PM. VE Exams. Talk-in on 147.060(+) pl 94.8. Contact *Barbara Siebelink N8NXA, 6418 Otis Rd., Saugatuck MI 49453. Tel. (616) 857-1343,* or Fax *(616) 857-1463.*

MEDFORD, OR The Rogue Valley ARC will hold a Swapmeet at the Medford Armory, 1701 South Pacific Hwy., 9 AM-4 PM. Setup at 7 AM. Computers. Radio Gear. VE Exams, pre-reg. and walk-in; contact *Paul Miller KE7VO, Box 555, Shady Cove OR 97539. Tel. (503) 878-3433.* Make check payable to *RVARC, 1707 East Main St., Medford OR 97504.* Your name tag and entry tickets will be at the entrance door. South of Medford, talk-in on 147.160 Rptr. North of Medford, talk-in on 146.940 Rptr.

SALEM, OR The Mid-Valley ARES will present the 1995 "Swap-toberfest" and ARES/RACES Convention at the Polk County Fairgrounds in Rickreal OR. Time: 9 AM-4 PM. Swap table setup 6 PM-9 PM Fri., Oct. 20th, and 7 AM Sat. Talk-in on the 146.86 Rptr. Flea Market. Dealers. VE Exams, pre-reg. required; contact *Sandy Berry N7TQQ, (503) 588-7685.* To reserve swap tables, contact *Evan Burroughs N7IFJ, (503) 585-5924.* Commercial and Specialty Dealers, call *Garry Zinn KC7BSX, (503) 378-3702.*

SENECA, PA The Ft. Venango Mike & Key Club Ham Radio Auction and Flea Market will be held at the Christian Life Building, Rte. 257 between Rte. 322 and Rte. 62. All activities will be held in the gymnasium and cafeteria. Auction items are cash only! Doors open at 8 AM; the auction begins at 10 AM. Talk-in on 147.12(+), 145.23(-), 145.19(-) and 444.125(+). To reserve Flea Market space, call *Mary Housholder N3QCR, (814) 437-2036; e-mail address: MAHOUSHOLD@AOL.COM;* or write to *Fort Venango Mike & Key Club, R.D. #1, P.O. Box 591, Cranberry PA 16319.*

SUMTER, SC The Sumter ARA Hamfest/Computer Fair will be held 8 AM-4 PM at the Sumter County Exhibition Center, 700 W. Liberty St. Dealer and Flea Market setup Fri., 4 PM-9 PM; Sat., 6 AM. VE Exams will begin at approx. 10 AM, walk-ins only. Call for more info. Talk-in on 147.015(+). Dealers call *Tommy Dubose KB4CIH, (803) 469-5093.* For Flea Market tables, camping/tailgating and general info., call *Mike Dunlap KC4HUT, (803) 481-4611.*

OCT 21-22

WEST PALM BEACH, FL The Palm Beach Rptr. Assn, Inc. will host the Palm Beach County Hamfest Amateur Radio/Computer Show at the South Florida Fairgrounds, Southern Blvd., in West Palm Beach. Gates open Sat., 9 AM-5 PM; Sun., 9 AM-3 PM. VE Exams both days, on site, at 9 AM. Vendors, call *Hal Gainen, (407) 439-0805.* To reserve Flea Market tables, call *Vi Kiekenapp, (407) 585-9074.* Full RV hookup - *1-800-527-3247.* Talk-in on 147.165/.765.

OCT 22

SELLERSVILLE, PA The RH Hill ARC will hold a Hamfest at Sellersville Fire House, Rte. 152, 5 miles South of Quakertown and 8 mi. North of Montgomeryville. Talk-in on 145.31. VE Exams start at 9 AM, all classes. Bring documents. Contact *Linda Erdman KA3TJZ, P.O. Box 29, Colmar PA 18915. Tel. (215) 679-5764.*

WARREN, MI The Utica Shelby Emergency Comm. Assn., Inc. will hold their "USECA Swap" at Our Lady of Redemption Conference Center, 425 Cole, in Warren. Ham gear, electronics, computers, software. VE Exams, pre-reg. required; call *Bill N8CVC, (810) 468-8345.* Non-ham gift items will also be featured. Contact *Chairman Kevin Everett N8QVX, 21947 Birchwood, Eastpoint MI 48021; Tel. (810) 772-8082;* or call *Jim N8OKW or Marianne N8TMJ, (810) 739-6565;* or *Biff N8NQQ, (810) 566-7743.* Talk-in on 147.18(+) (100 Hz tone), and 147.42 simplex.

OCT 28

CONNECTICUT The annual Ham Radio Auction sponsored by Tri City ARC will be held at the Senior Citizens Center, Waterford Municipal Complex, from 10 AM until sold out. Bring your equipment to be auctioned. Talk-in on 146.37/.97 Rptr. For info call *KA1BB at (203) 739-8016.*

PORT ST. LUCIE, FL Port St. Lucie ARA will present "Hamfest-95" 0800-1500 hours at the Port St. Lucie Yacht Club, 500 Prima Vista Blvd. Talk-in on 146.955/R; alternate 146.520 simplex. For details, call *Bill Perciasepe, (407) 879-4020;* or *Roy Cox, (407) 340-4319.*

ST. LOUIS, MO The 4th annual Halloween Hamfest, sponsored by the Gateway to Ham Radio Club and the St. Louis ARC, will be held from 8:30 AM-2 PM at West County Technical H.S., Hwy. 40/I-64 and Maryville Centre Dr., 8 mi. W of St. Louis. Talk-in on 147.34/.94. Commercial vendors, forums, VE Exams. For info on tables, tickets, call or write *Keith Ray N0KFE, 4642 Ray Ave., St. Louis MO 63116; Tel. (314) 832-8895.*

ST PAUL, MN The 11th Hamfest Minnesota and Computer Expo, sponsored by the Twin Cities FM Club, will be held 8 AM-4 PM in the main arena at the St. Paul Civic Center, Kellogg and West 7th St. Flea Market, educational and fun seminars, and more. VE Exams administered Fri. at 6 PM by St. Paul Radio Club VE Team. Flea Market setup Fri. night. For info and advance reg. call *(612) 535-0637;* or write *P.O. Box 5598, Hopkins MN 55343.* Talk-in on 146.16/.76 Rptr.

OCT 29

DES MOINES, IA "Hamfest Iowa '95" will be sponsored by the Tikva Tracers ARC in the 4H Building at Iowa State Fairgrounds. Setup Sat., 6 PM-9 PM; Sun., 6 AM. VE Exams at 9:30 AM. Talk-in on 146.22/.82. Contact *Randal Lees N0LMS, 1575 Northwest 78th St., Clive IA 50325-1255. Tel. (515) 279-4241.*

LINDENHURST, NY The Suffolk County RC and The Great South Bay RC will hold their AARL approved Long Island Hamfest/Computer Show 9 AM-4 PM at the Knights of Columbus Hall, 400 South Broadway. Talk-in on WB2FKZ Rptr., 146.685 (pl 4Z - 136.5 Hz) and 223.86 (Open Carrier). Call for info 7 PM-10 PM, *Andy Feldman WB2FXN, (516) 928-3868;* or *Walt Wenzel KA2RGI, (516) 957-0218.*

NEWTOWN, PA The Penn Wireless Assn. Ham/Computer Tradefest will be held 8 AM-4 PM at Bucks County Comm. College, next to Tyler State Park, on Swamp Rd. VE Exams 10 AM; call *(215) 943-4886.* Talk-in on 145.250 pl 131.8, or 146.520 simplex. For details, call *Steve, (215) 752-1202.*

SOUTHWICK, MA The Hampden County Radio Assn. will present its annual Hamfest/Electronics Show at the Soutwick Rec. Center, Powder Mill Rd., just off Rte. 57. Setup at 6 AM. Open to the public at 9 AM. VE Exams, pre-reg. required; contact *Yorke Phillips K1BXE, (413) 566-3010.* For reservations and info, contact *Barry Mason N1IJK, (413) 747-7010 before 10 PM;* or *John Walker N1QXV, (413) 572-4592 before 9 PM.* Or write to *Hamfest Committee, 36 Kenwood Terrace, Springfield MA 01108-1716.*

WESTMINSTER, MD The 6th annual Mason-Dixon Computer/Hamfest will be co-sponsored by the Carroll County and Penn-Mar ARCs., at the Carroll County Ag Center. Seminars will be presented. 6 AM Vendor and Tailgating; 8 AM General Admission. VE Exam reg. begins at 8 AM; pre-reg. requested. Call *Bill Wolfgang NZ3J, (717) 359-7095.* Talk-in on 145.41 MHz. For general info, contact *Larry Martin N3DGK, (410) 374-4544.*

SPECIAL EVENT STATIONS

OCT 7-8

LAKE STEVENS, WA and WICHITA FALLS, TX The 5th annual Missionfest will be on the air, seeking to talk with and encourage Christian missionaries throughout the world. Co-sponsored by Christ Lutheran of Wichita Falls TX, and Elim Lutheran of Lake Stevens WA, HF operations will be from 1500 UTC-0600 UTC Sat., and again from 1900 UTC-0100 UTC on Sun. Freq.: 28.420, 21.420, 14.278 and 7.278 MHz. Join in with prayer requests, and visit with foreign missionaries worldwide! Callsigns N5JRF (Wichita Falls), and N5UJA (Lake Stevens). Call *(206) 334-2540* for more info.

PITTSBURG, PA The Breezeshooters ARC will operate W3XX from the submarine USS Requin, 1400Z-2100Z Oct. 7-8, to celebrate the Centennial of the Carnegie Science Center. The Requin is docked at the Carnegie Science Center. Operation will be on vintage CW equip., in the lower half of the Novice subbands. Phone operation will be in the General class segment of 20m and 40m. For a certificate and QSL card, send QSL and an 8 1/2" x 11" SASE to *Ron Berry WB3LHD, 326 Sunset Dr., Bethel Park PA 15102.*

OCT 11-15

CINCINNATI, OH Radio amateurs in the tri-state area around Cincinnati will operate SE Stations using /TS suffix, as part of the 1995 Tall Stacks celebration. Sponsoring club calls will be K8SCH/TS (OH-KY-IN ARS), W8DZ/TS (Greater Cincinnati ARA), and W8VND/TS (Queen City Emergency Net). They will operate all bands and modes thru 70 cm. Special QSLs will be available to the callbook addresses; or N8FU SASE, or via bureau for any or all of the special calls. Tall Stacks recalls the historic and continuing importance of river commerce, and will include 19 steam boats. Sponsored by the Greater Cincinnati Convention and Visitors Bureau.

OCT 13-15

WISCONSIN To commemorate its 4th annual disaster-services seminar, SATERN (Salvation Army Team Emergency Radio Network) will sponsor Station WW9E. CW and SSB activities are planned for the lower portions of the General and Novice subbands. Digital activities are also planned. For QSL, please send your card, SASE, and the name of the operator worked to *NH2Z, Apt. #608, 84-265 Farrington Hwy., Waianae HI 96792;* or directly to the operator contacted.

OCT 14

PENSACOLA, FL KF4BHC, The Serious Hams ARC, will put IOTA NA-142 from Fort Pickens in Santa Rosa Island, on the air 1230Z-1800Z. For QSL, send SASE to *Mike Brown N4MAD, 519 S. Edgewood Cir., Pensacola FL 32506.*

OCT 14-15

RICHMOND, CA The East Bay ARC will observe the 90th Birthday of the City of Richmond by operating W6CUS from club headquarters at the Richmond Red Cross building. Times: Oct. 14th, 0100-0500 and 1700-2400 UTC; Oct. 15th, 0000-0400 and 1700-2400 UTC. General subbands on 80, 40, 20, and 15m; Novice subbands on 10m and 2m. For a certificate, send QSL and a 9" x 12" SASE to *EBARC, P.O. Box 1393, El Cerrito CA 94530.*

OCT 21

CONCORDIA, KS The Kansas-Nebraska ARC will operate Station W0IND to commemorate the 50th Anniversary of the closing of the German Prisoner of War camp near Concordia. The station will operate 1400 UTC-2000 UTC from the Airport Park during the POW Camp celebration. W0IND will operate in the lower 25 kHz of the General phone portions of 80, 75, 40, 20, and 15m, along with packet on 145.01 MHz. For a QSL certificate, send QSL and large SASE to *Kansas-Nebraska ARC, c/o Arlan R. Campbell W0NBT, Rt. 3 Box 20-A, Concordia KS 66901.*

OCT 21-22

BOLIVAR, VENEZUELA Station YW6AF will operate during a DXpedition to the top of Angel Falls, the world's highest water fall; Sat., 0000 UTC-2400 UTC Sun. 10, 20, 40, and 80m bands will be used with SSB, CW, RTTY and packet. The QSL card will be via YV6AG. Sponsored by the Radio Club Venezolano, Chapter Ciudad Guayana (YV6AG). 73

Uncle Wayne's Bookshelf

REFERENCE

RS-1 **The Amateur Radio Mail Order Catalog and Resource Directory, 4th Edition** is the most comprehensive source book for electronic parts, software, and equipment targeted at the radio amateur or serious electronic hobbyist anywhere! Plus a wealth of "value-added" reference material all in 262 pages. 4th Edition clearance at only **$8.95**. (was $16.00)

TAB2701 **Transmitter Hunting** *by Joseph Moell and Thomas Curlee* Radio direction finding simplified. **$19.95**

UE202 **RTTY Today** *by Dave Ingram* Modern guide to amateur radioteletype. **$8.95**

TP002 **The World Ham Net Directory** *by Mike Witkowski* New—2nd edition. Introduces the special interest ham radio networks and shows you when and where you can tune them in. **$9.50**

WGP87158 **1995 North American Callbook** The 1995 North American Callbook lists the calls, names, and address information for 500,000+ licensed radio amateurs in all countries of North America. **$35.00**

MMH24 **Radio Handbook, 23rd Ed.** *by William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. **$39.95**

WGP1234 **1995 International Callbook** The new 1995 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). **$35.00**

AR4092 **Your RTTY/AMTOR Companion** invites you to explore the world of HF digital communications. If you've never operated RTTY or AMTOR before, this book is written expecially for you! You won't find complicated technical jargon here. Just information you can use right away. You'll discover how to . . . Assemble your own RTTY/AMTOR station . . . Use RTTY and AMTOR to talk to amateurs throughout the world . . . Compete in RTTY/AMTOR contests . . . Hunt for digital DX. **$8.00**

AR3754 **Radio Frequency Interference—How to find it and fix it.** Interference problems are challenging, but curable. With the techniques in this book, you can help restore electronic peace in your neighborhood. **$15.00**

DOV41 **Basic Electronics** *Prepared by the Bureau of Naval Personnel* Covers the important aspects of applied electronics and electronics communications. **$12.95**

DOV76 **Second Level Basic Electronics** *Prepared by the Bureau of Naval Personnel* Sequel to Basic Electronics, thorough treatment of the more advanced levels of applied electronics. **$9.95**

20N096 **How To Read Schematics (4th Ed.)** *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. **$19.95**

WLSWOCP **Radio Operator's World Atlas** *by Walt Stinson, W0CP* This is a compact (5x7), detailed, and comprehensive world atlas designed to be a constant desk top companion for radio operators. **$17.95**

TAB37109 **Secrets of RF Circuit Design** *by Joseph J. Carr* Written in clear non-technical language, covers everything from antennas to transistors. **$21.95**

TAB11065-1 **Mastering Radio Frequency Circuits** by Joe Carr, 411 p. If you're interested in learning about radio components and circuits, this book is great! Plus there are a ton of simple circuits you can build. It explains how circuits work, about test equipment, receivers, the works. This will take a lot of the mystery out of how radios work . . . the easy way. This will be one of your better $20 ham investments. **$20.00**

DP919 **73 Magazine Index 1960-1990** A complete index to every article published in *73 Magazine* through 1990. IBM software **$20.00**

NEW BOOKS

AR4920 **Introduction to Radio Frequency Design** In this practical book, the author emphasizes use of models and their application to both linear and nonlinear circuits, reviews traditional material stressing the viewpoints taken by the RF designer and illustrates subject material by numerical examples. Includes 3 1/2 inch disk for IBM PC or compatibles. **$30.00**

R&D57450 **Raptures of the Deep** *by Fred Jueneman* What we understand in science today, and the challenges facing scientists in just about every field. An incredible job of research on how and why scientists believe what they do about our world and how it works. **$29.95**

GEI3579 **Final Quantum Revelations** Dr. Kiril Chukanov uses not only science but revelation to answer difficult and profound questions about physical reality and cosmic destiny. **$34.95**

TEC7787 **Exploring the Physics of the Unknown Universe** *by Milo Wolff* Packed with intriguing discussions like, What is the origin of the laws of physics? and What is the nature of space? A simple and readable book on how mathematics describes the physical universe and what paradoxes and enigmas remain for an enterprising mind to solve, with speculations on the nature of subatomic particles as standing interference patterns of spherical waves. **$39.00**

SHORTWAVE

NBPAW94P **1995 Passport to World Band Radio** *by International Broadcasting Services, Ltd* You'll get the latest station and time grids. **$19.95**

07R25 **The RTTY Listener** *by Fred Osterman* New and expanded. This specialized book compiles issues 1 through 25 of the *RTTY Listener Newsletter*. Contains up-to-date, hard-to-find information on advanced RTTY and FAX monitoring techniques and frequencies. **$19.95**

09S42 **The Scanner Listener's Handbook** *by Edward Soomre N2BFF* Get the most out of your scanner radio. **$14.95**

CRBSM1 **Scanner Modification Handbook, Vol. 1** *by Bill Creek* provides straightforward step-by-step instructions for expanding the operating capabilities of VHF scanners. **$17.95**

CRBSM2 **Scanner Modification Handbook Vol. 2** *by Bill Creek* Here it is—a companion to Vol. I. In fact, Vol. 2 has a section that provides improved approaches and updated techniques for the mods in Vol. 1. There's 18 new exciting modifications for popular scanners. **$17.95**

TAB 339643 **Tuning In To RF Scanning** From Police to Satellite Bands. Bob Kay. 150p 1994, Tab Books. This is a wonderful book for the VHF-UHF scanner listener. It explains about the various radio bands, antennas, the laws, and lists frequencies for every imaginable service . . . including the Secret Service, FBI, military, IRS, prisons, Fish & Wildlife, McDonald's order windows, nuclear search teams, railroads, Russian satellites, Treasury Dept., wireless microphones for concerts, and so on. **$14.95.**

07A66 **Aeronautical Communications Handbook** *by Robert E. Evans* Exhaustive, scholarly treatment of shortwave aeronautical listening. **$19.95**

AR4025 Beyond Line of Sight. Shows how hams pushed forward the discovery of the propagation modes that make VHF DX possible: tropo, sporadic-E, aurora and auroral-E, meteor scatter, F-Layer propagation, transequatorial propagation and earth-moon-earth. **$12.00**

TAB 447748 **The Shortwave Listener's Q&A Book**—Everything you need to know to enjoy Shortwave Listening. Choosing receivers, accessories, antennas, frequencies, and getting QSLs. SWL is an exciting hobby . . . that's what got me interested in hamming . . . Wayne. **$12.95**

WAYNE'S PICKS

WG2 **The Million Dollar Video** Explains how just about any company can increase sales by over a million dollars through the sneaky (aka intelligent) use of promotion. Explains in detail how you can get tons of free advertising. Uncle Wayne shows you how to beat the system. **$39.95**

"SEEK YOU" by The Ham Band—The titles include "Always on the air", "On the Monday Evening Grayline", "Radio Widow", "The Trip to Dayton", "The Contest" and seven more. Ham radio CD includes experiences that radio hams go through. This is an extremely entertaining CD and will strike a chord with any radio ham, SWL or XYL—an ideal present! **SYCD $15 SYTAPE $10.**

IB8657 **Dumbing Us Down: The Hidden Curriculum Of Compulsory Schooling.** *by John Gatto* If you enjoyed "Declare War", you'll enjoy this also. A Wayne Green recommended reading. **$9.95.**

WG1H **LEARN THE CODE** There are two ways to learn the code, (1) the easy way, (2) everyone else's way. Your choice. There are two speeds of code you need to know — one (5 wpm) you can learn in less than an hour, the other (20 wpm) takes longer, but nowhere near as long as you probably think. Sure, you can also learn it at 13 wpm, if you want, but that just wastes your time.

Learning to copy code is just like learning to type or play the piano, if you have to stop and think, you can't do it. It has to be made automatic, so if you go the usual code training route of starting slow and speeding up you are screwing up. That brings you to that dreaded plateau at about 10 wpm, where you've reached the brain's clock speed. Then you have to start all over from scratch and do it the way you should have in the first place. With Uncle Wayne's tape you start right out at 20 wpm and train your hand to write what your ears hear.

Uncle Wayne gives you a choice on the 5 wpm code test. You can either buy the El Zippo one hour method of passing the test, which is enormously over-priced at $5 (order 73-EZ), or you can buy two tapes . . . one, The Genesis, takes about an hour to teach you the code characters ($5.95 — 73T05) and the other, The Stickler ($5.95 — 73T06) gives you an hour of fiendishly difficult practice at 6 wpm. Then there's the 13 wpm Back Breaker ($5.95 — 73T13), in case you for some masochistic reason want to bother learning the code at 13 per. And the ever popular Courageous 20 wpm tape ($5.95 — 73T20). If you find you've become a code fanatic, there's the 25 wpm Mind Boggler ($5.95 — 73T25) which will serve you right.

Until wiser herds . . . er, heads . . . are able to dump the code requirement from the ham exams, the El Zippo and Courageous are the least frustrating route to ham nirvana. And by the way, anyone can learn the code if they go about it Uncle Wayne's way.

SOFTWARE

GGTE Morse Tutor From beginner to Extra Class. Code from 1 to over 100 words per minute. Standard or Farnsworth mode. Create your own drills. Exams conform to FCC requirements. 5 1/4" floppy for IBM PC, XT, AT, PS/2 or compatibles.

GG52/5 Morse Tutor 5.25" Disk	**$19.50**
GG31/2 Morse Tutor 3.5" Disk	**$19.50**
GGADV5 Gold Edition 5.25" Disk	**$29.95**
GGADV3 Gold Edition 3.5" Disk	**$29.95**

W5GWHO **Ham Operator Education Package Software**, Novice—Extra for PC's, contains both 3 1/2" and 5 1/4" disks. **$39.95**

W5GWNSW **No-Code Ham Radio Software Package for PC's,** contains both 3 1/2" and 5 1/4" disks. **$29.95**

Lanze Code Programs—(Available on 5 1/4" * disk.) Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

	IBM Part#	Commodore Part#	Price
Novice	LZIBM01	LZCOM01	**$14.95**
Tech	LZIBM02	N/A	**$14.95**
General	LZIBM03		**$14.95**
Advance	LZIBM04	N/A	**$19.95**
Extra	LZIBM05	LZCOM05	**$19.95**

* Add $2.00 for 3 1/2" Disk

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	**14.45**

LAST CHANCE ITEMS

ONLY A FEW LEFT

SAM22488 **IC User's Casebook** A 'must' for any hobbist's workshop, covers ideal operation amplifiers, inverting and noninverting followers, linear amplifiers, active filters, digital circuts and waveform generators and timers. **$12.95**

SAM48441 **178 IC Designs & Applications** A comprehensive collection of linear developments for electronic design and basic applications. **$12.95**

ARRL BOOKS

AR1995 **ARRL 1995 Handbook (71st Ed.)** Features: added DSP, improved treatment of Pi and Pi-L, all new all-digital-logic, plus lots more. **$30.00**

AR1086-4 **ARRL Operating Manual (4th Ed.)** Information on how to make the best use of your station, including: interfacing home computers, OSCAR, VHF-UHF. **$18.00**

AR3657 **QRP Notebook** *by Dave DeMaw W1FB* Presents construction projects for the QRP operator. **$10.00**

AR3207 **W1FB's Design Notebook** *by Dave DeMaw W1FB* Filled with simple practical projects that can be built using readily available components and common hand tools. **$10.00**

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ANTENNAS

AR4114 **Low Profile Amateur Radio** For the Ham who lives where antennas are frowned upon. From hiding your antenna to operating with low power. This books tells you how to get on the air using these tehniques, and others,without calling attention to yourself. **$8.00**

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WGP87034 **All About Cubical Quad Antennas** *by William Orr and Stuart Cowan* "The Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **$11.95**

TAB 3270P **Practical Antenna Handbook**—Second Edition, 1994, Joseph Carr; Tab Books. This 560-page book is a real treasure. Sarts with the fundamentals of antenna and feedline theory, explains about propagation of all kinds, and then provides a ton of easy antenna construction projects. Covers antennas and feeders for all bands. The explanations are simple and well illustrated, with some math, where it's unavoidable, but it won't bog you down. It even has the ZL-Special antenna, which I've used on 20m with some spectacular DX-ing success. A low angle of radiation and made it so I could always work the rare stuff first . . . Wayne. **$26.95.**

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TAB4354 **The Beginner's Handbook of Amateur Radio, Third Edition** *by Clay Laster W5ZPV,* 395 pages. Wonderful book for newcomers. It is basic and well illustrated. Even if you have all the other ham handbooks, you'll still find this one useful. **$22.00**

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XTAL-1 The Crystal Set Handbook by Phil Anderson WØXI. Want to give a kid an exciting present? Or maybe yourself? Crystal sets are alive and fun. Here's a whole book packed with crystal set circuits that anyone can build. Now start saving those oatmeal boxes, okay? 133 pages **$10.95**

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WG1 **We The People *Declare War* On Our Lousy Government**—360p soft cover. This is Wayne's report explaining what the major problems are facing both New Hampshire and the country, and proposing simple, inexpensive solutions: a simple way to have government departments happily cut their expenses by 50% within three years; how to cut the cost of incarcerating prisoners by over 90%; how to end welfare; how to reduce the deficit; how to cut medical costs and improve health care; how to cut school costs and improve schools. An absolute steal at **$13**.

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NEW PRODUCTS

Compiled by Victor Lapuszynski

KAWIN SOFTWARE

KaWin, the only Windows program to support Kantronics TNCs in Host mode, is now available for download from the Internet's World Wide Web. KaWin provides concurrent access to four TNCs, to both ports of multiport TNCs, to simultaneous VHF packet and HF non-packet modes, for up to eight attached transceivers and as many as 26 concurrently connected stations on each radio! Each connect, as well as the background activity on each TNC port, is displayed in its own window using color-coded index tabs to select the active window.

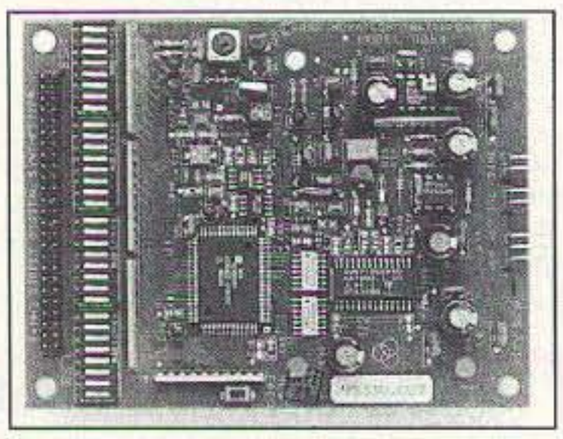
KaWin is a fully featured communications program offering binary file transfers with concurrent chat, send and display of international character sets, extended ASCII graphics, and ANSI color graphics. Brag files and Quick Key sets are enhanced by intelligent macros that expand into everything from the current WX report or time of day, to commands that key and unkey your transmitter.

Users of Kantronics Kam All Mode TNCs will find nonpacket modes have become as easy to manage as packet operations. KaWin fully exploits the enhanced Host Mode features of late-model Kam TNCs to provide faster keying and unkeying response in CW and RTTY operation. Critical operating parameters such as AFSK shift are instantly reset with each HF mode change. KaWin's unique AFSK Tone Calculator solves one of the oldest problems of amateur HF digital operating: "What frequency am I really transmitting on?"

KaWin may be downloaded from the KaWin WWW Home Page, http://www.mutadv.com/kawin/. Others may choose to download from the /kawin directory at the FTP site, ftp.csn.net. This provides a fully working copy of KaWin, limited only by an insistent "nag meter" that limits each evaluation session to about 15 minutes. Registration of KaWin turns off the nag meter and is available for US $79.00. For more information, contact: *Stan Huntting KFØIA, 4655 Pleasant Ridge Rd., Boulder, CO 80301; (303) 444 2311(voice), (303) 444 2314 (fax); E-mail: stan@mutadv.com. Or circle Reader Service No. 201.*

NOVATECH

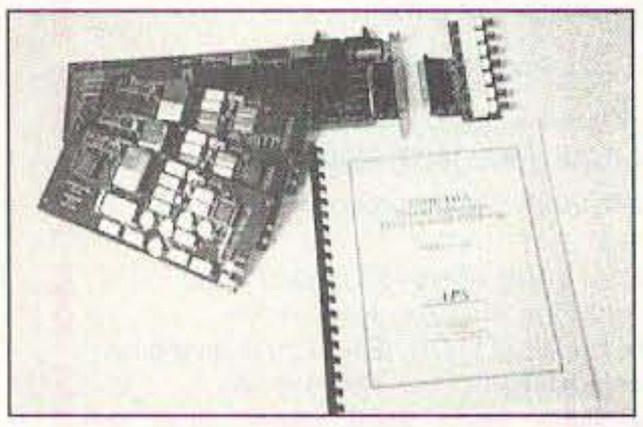
Novatech Instruments, Inc., introduces the Model DDS4m Direct Digital Synthesizer (DDS) Module. The DDS4m is a low-cost, 34-MHz signal source that combines small size, excellent stability, fast switching, and low noise for only $395 in single-unit quantities. On a 3.5" x 4.5" board, the DDS4m simultaneously outputs a precise sine wave and an accurate TTL clock signal. The output frequency is programmable from 1 kHz up to a maximum of 34 MHz in steps as small as 0.02 Hz. Typical phase noise is -90 dBc at 1 kHz offset from carrier. The desired frequency is selected by setting a 31-bit binary number either manually using DIP switches or remotely by HC-MOS-compatible parallel input lines. The DDS4m contains a quartz crystal oscillator that provides excellent stability of 10 ppm per year. Fast switching is enabled since the parallel input can be driven up to about 25 MHz by external customer-supplied control hardware.



For more information, contact: *Bob O'Brien, Novatech Instruments, Inc., 1530 Eastlake Ave. E., #303, Seattle, WA 98102; (206) 322-1562, (206) 328-6904 (fax). Or circle Reader Service No. 202.*

APS

Associated Professional Systems announces the release of its Spread Spectrum Development Program (SSDP). The SSDP is an IBM PC ISA format board which can produce three independent Linear Recursive Sequence streams with lengths up to 4,394,967,295 bits long, passing through a programmable logic matrix which allows various data modulation and switching scenarios. The SSDP contains an onboard Direct Digital Synthesizer and allows external chipping rates up to 30 MHz. Several RF daughter boards are available to interface with the SSDP. It comes with a Windows control program and C drivers and is ideal for testing and development of Wireless and Spread Spectrum systems.



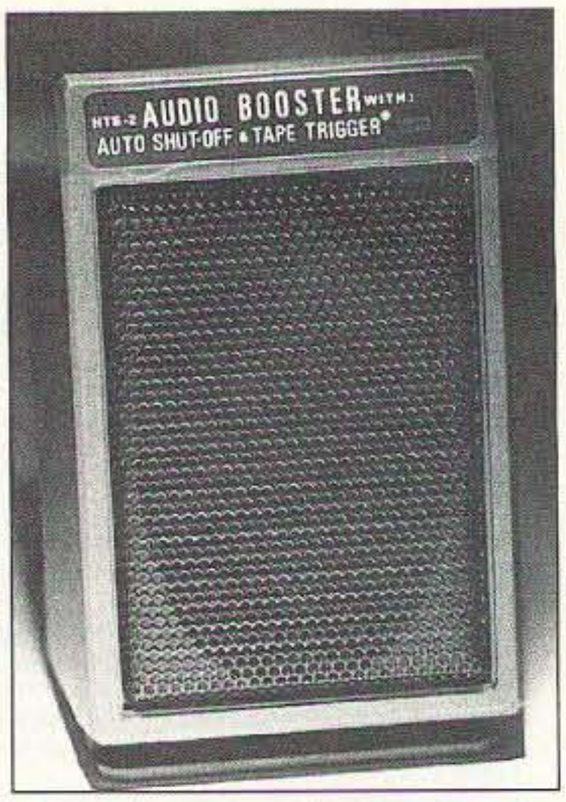
For more information, contact: *Richard Schwarz, Associated Professional Systems, 3003 Latrobe Court, Abingdon, MD 21009; (410) 515-3883, (410) 661-2760 (fax). Or circle Reader Service No. 203.*

NAVAL ELECTRONICS INC.

Naval Electronics Inc. introduces the HTS-3 miniature speaker-amplifier. It's smaller than a bread box—one for those loaves you get with your soup. I'm talking 4-1/2" high by 2-3/4" wide by 2-1/2" deep. Boy, is it handy! My first application was to use it to amplify my HT receiver output and give it some beef. Then I needed some more pep from a tape recorder for transcribing notes. And then I grabbed it to help track down a problem with my hi-fi system. We all need a small speaker-amplifier around the shack and test bench.

Naval did a nice design job on this one. It's powered by four AA batteries. You can use Ni-Cd rechargeables and it'll keep 'em charged if you plug in an 8-14 volt source—with either polarity! It senses a lack of activity and shuts off until there's action. Great for using your HT to monitor a repeater. There's also a recorder jack which will turn on a tape recorder and record whatever is coming through the repeater. And turn it off after. Heaven forbid you should miss something.

The HTS-3 sells for $34.95 (plus $4 UPS and $3 for packing, plus tax for Florida shipments) and will make a valuable addition to your shack. It's small enough to throw into a corner of a suitcase and take on trips, thus improving the sound of miniature radios and tape recorders, as well as HTs.

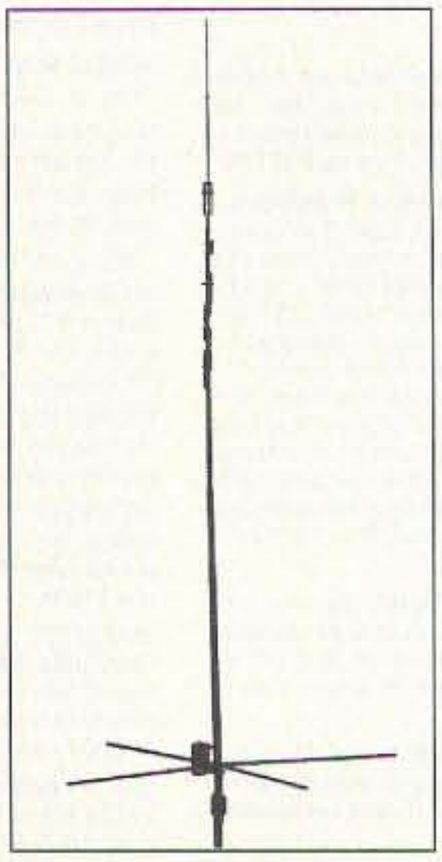


For more info, contact Naval Electronics, 5417 Jetview Circle, Tampa FL 33634; (813) 885-6091. Tell 'em Wayne sent you, or else. Or circle Reader Service No. 204.

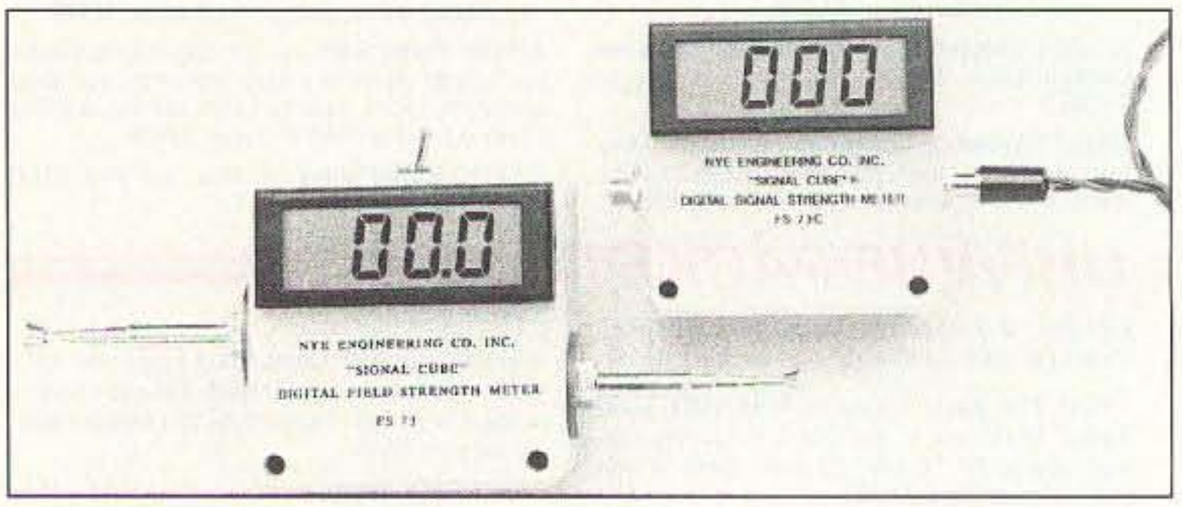
TELEX

Telex introduces its new Hy-Gain DX77 Advanced Vertical Windom with features surpassing any verticals on the market. It puts the ham world of 10 through 40 meters at your fingertips without the need for ground radial wires, and up to 1,000 watts of RF output. Automatic band switching and low angle of radiation allow for enhanced DX capabilities.

The Hy-Gain DX77 features superior quality and reliable mechanical design, with double-wall tubing, steel mast clamps, and all stainless steel hardware. The 29' vertical also features an easy tilt mount that makes lowering it for tuning a one-person job. It comes with Telex's 2-year limited antenna warranty.



For more information, contact: *Telex Communications, Inc., 8601 E. Cornhusker Highway, P.O. Box 5579, Lincoln, NE 68505; (402) 467-5321, (402) 467-3279 (fax). Or circle Reader Service No. 205.*



NYE ENGINEERING

NYE Engineering can now supply the FS73 "Signal Cube"® RF field strength meter in the form of a digital "S" meter connected directly into the RF/IF section of a radio receiver. In this form, model FS73C will provide a much higher resolution of signal strength than a conventional communications receiver type "S" meter.

The original product, the FS73 with telescoping dipole antenna, is a calibrated RF field strength meter. The new FS73C connects directly to a receiver to be a digital signal strength ("S") meter. The selectivity and sensitivity of the receiver is utilized. The price of either is $169.00 plus $5.00 shipping.

For more information, contact: *NYE Engineering Co. Inc., 4020 Galt Ocean Drive, Suite #606, Ft. Lauderdale, FL 33308; (305) 566-3997, (305) 537-3534.* Or circle Reader Service No. 206.

ADMS-1 COMPUTER PROGRAMMABLE

Ultra Compact Handhelds FT-10/40R

ARTS
Tracks range of 2 identically programmed HTs.

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Ergonomically designed, conveniently located, insures maximum comfort.

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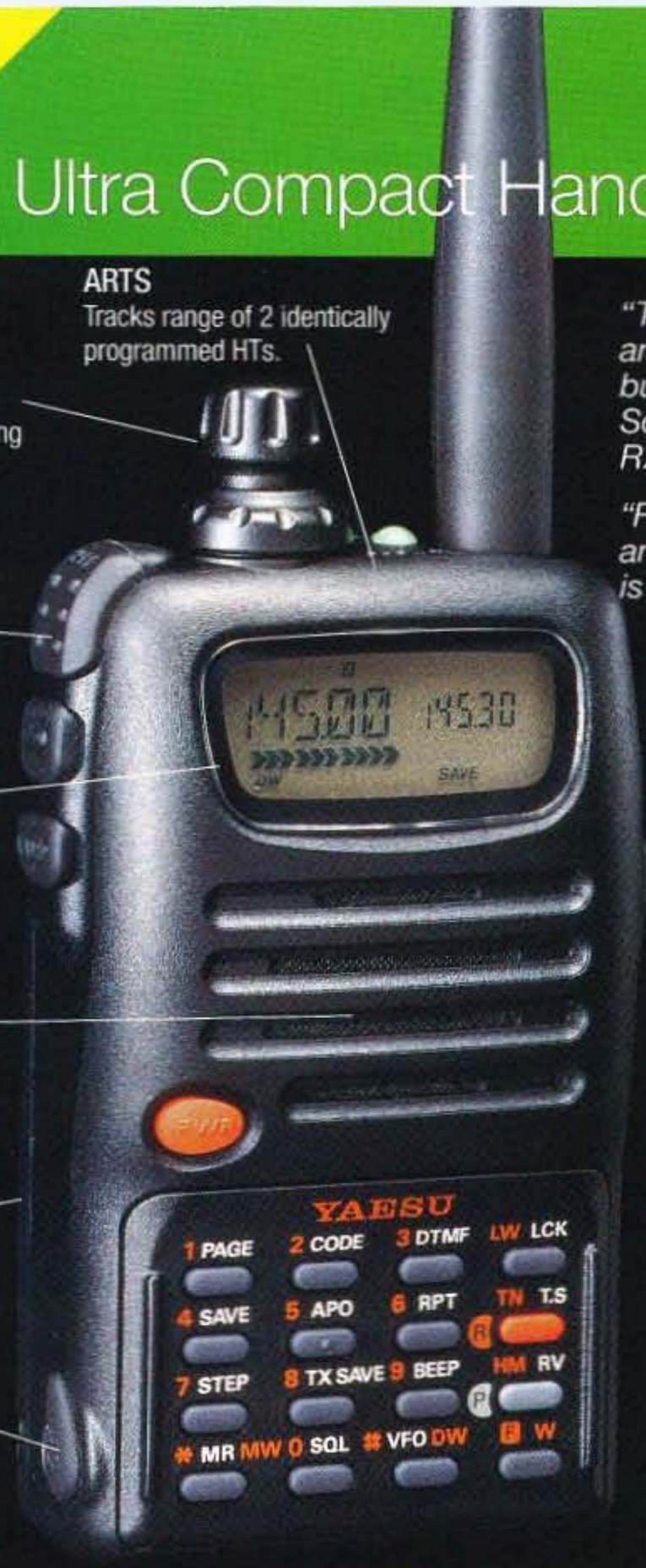
Use optional E-DC-5B power adapter in your car for 5 W PWR O/P.



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6-Key, CTCSS Enc, DCS Enc/Dec, 30 Channels

FTT-10/A16D
16-Key, CTCSS Enc/Dec, DCS Enc/Dec, 99 Channels

Specifications

- Frequency Coverage
  FT-10R
  2m: RX: 140-174 MHz
  TX: 144-148 MHz
  FT-40R
  70cm: RX: 420-470 MHz
  TX: 430-450 MHz
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- MIL-STD 810
- High Audio Output
- 12 V DC Direct Input
- Alphanumeric Display
- RX/TX Battery Savers
- Digital Coded Squelch (DCS)
- Digital Voice Recording System (DVRS) w/FTT-10/A16S
- True FM for better voice clarity
- High Speed Scanning System
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- Full line of accessories

The FT-10/40R is a totally new HT concept! Built to rugged, tough military spec, commercial radio standards inside and out, it's small, powerful, feature-packed and ready to roll out in four versions!!

Four different keypads – count 'em, FOUR! First true user-choice customized HT on the market, offers a 6, and three 16 keypad selections plus 2.5 and 5 W battery choices, too! Easy for Yaesu, the electronics are in the keypad. Easy for you, they're already installed. Just pick the one that suits your HT "style"!

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First ever, amateur HT rated MIL.-STD 810! What else could you hope for? This, maybe. Dual Watch – see two frequencies displayed simultaneously in the display. No other single band HT has this feature. Another Yaesu exclusive, the Auto Range Transpond System™ (ARTS™) alerts you visually and audibly when a companion HT is out of simplex range. Most radio functions, are controlled of the Top Notch™, the neatly placed knob on the HT. This minimizes complex key sequences. Only Yaesu has this. Digital Coded Squelch (DCS) – for convenient semi-private operation. Digital Voice Recording System (DVRS) – records voice messages for playback, and received messages. And, of course Omni-Glow™ display, because you won't be able to put this one down!

The FT-10/40R is a military-tough, commercial-quality force in a small package. Exactly what you've come to expect from Yaesu! Better get one now, before the dealer sells out!

FT-51R
Dual Band with Windows Spectrum Scope™, Alphanumeric, Scrolling Menu, Battery Voltage Display. 2 or 5 W. World's smallest dual band HT!

FT-11/41R
Slim, trim and powerful! Alphanumeric, Compact Battery Design, Up/Down Thumb Control, RX/TX Battery Savers. 2 or 5 W Available.

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TS-50S
HF TRANSCEIVER

Features

- 500kHz-30MHz general coverage receiver
- DDS(Direct Digital Synthesizer) with fuzzy logic control
- Large LCD panel with digital bar meter
- Auto-mode capability
- Menu system
- AIP (Advanced Intercept Point)
- Switchable AGC Circuit (SLOW/FAST)
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- CW reverse mode
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- Optional 500Hz CW filter (YK-107C)
- Optional external antenna tuner(AT-50)
- Optional computer interface (IF-10D)

For the Amateur Radio enthusiast, going "beyond bounds" is what it's all about. That's why Kenwood created the TS-50S, the world's smallest and smartest HF transceiver. The choice is yours: you can mount it in a vehicle, take it on a DX-pedition, or even install it permanently as a base station transceiver. Yet despite its size, the TS-50S provides a maximum output of 100W and the sort of sophisticated features normally found only inside a shack. Take for example the 100 memory channels for independent storage of transmit/receive parameters, the microprocessor-controlled DDS with innovative "fuzzy" control, and Kenwood's own AIP for superior dynamic range. There's also a powerful menu system, IF shift and CW reverse mode for interference reduction, TF-SET, and a noise blanker--plus everything you need for split-frequency operations. So, if you want HF operation beyond bounds, check out the TS-50S at your favorite authorized Kenwood Amateur Radio Dealer today!

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