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October 1993
Issue #397

73 Amateur Radio Today

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Contract: Congratulations! You have just been drafted by Uncle Wayne and the Team. Your first assignment is to contribute a clear, concise, and complete manuscript for publication. Drop us a line and we'll gladly send you a "How to Write for 73" package. Now get out there and enjoy your hobby. Dismissed.

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Have You Seen Radio Fun Yet?

Well, I know the answer. No, you haven't. Because if you had you'd be a subscriber.

I started Radio Fun as a way to help the new no-coders get more fun out of amateur radio, and to encourage them to go for their General and to subscribe and a 2% response. It seems the best way to find out how much fun we're having with packet, slow-scan, fast-scan, our ham satellites, radio clubs, DXing, certificates hunting, building kits, foxhunting do it, the emergency relays, and so on. I wanted them to know that amateur radio has a lot more to it than listening to old retired men talk about their illnesses over the local repeaters. Or, as in this case, the Year award winner at Dayton this year, driving everyone within repeater range nuts extolling my virtues and my Horatio Alger success story.

So, how's Fun doing? Pretty well.

We've been sending it to every new licensee for about five or six months for free. Why for free? Well, I noticed that QST was having surprisingly little luck in getting new hams to subscribe. My idea was to get them really involved in their new hobby while it was new and they were still excited about it. But how many readers could we convert to paying subscribers? That was the key question. You can't give things away forever.

Thirty years ago, before our mail boxes were as stuffed with junk mail, it was possible to send out a subscription for a magazine and get 10-12% of the people to subscribe. These days a 2% response is considered outstanding, with 1% being in the "good" range in the business. Today's postage rates have to figure at least 60¢ per letter sent. That's $600 per thousand. At $13 for a year's subscription and 50¢ to get 20 subscribers and $260 back for every $600 we spent. We didn't go that route.

Instead, I decided to let the publication sell the subscriptions instead of selling. It costs around $5 to send five issues, so the question was, what percentage of the readers would pay to subscribe after getting the five issues? That's about the break even cost of a letter. And eight letters might be, at best, bring in a 16% response. So, have we been doing better than a 16% sale with the free sample route? You bet.

By the way, while it's a no-no for me to go on the air and solicit QST subscriptions, there's nothing to prevent you from bringing up the subject when you run out of more important things to talk about. . . if there are any. It sure beats those old tired weather reports and cliché recitals of your equipment and antenna model numbers. If enough readers keep mentioning the magazine, I'll gradually begin to seep into even a few of the denser connoisseurs.

Your reward for all this? Firstly, I can assure you that you will be richly rewarded in heaven. I have connections. Secondly, you'll start having more magazine to read. A lot more. And the more stuff we have, the more fun you'll have reading it. We might even get your juices going and get you off dead center and into satellite communications or something.

That Lap of Luxury Deal

There's this myth about Wayne living in luxury on the enormous profits from QST. Har-de-har. Oh, I can't complain but that's because other ventures have done well. Ask anyone who knows me and you'll find that NSD stands for never spend a dollar. I'm cheap. And whenever I do manage to send out a quickie investment in a new venture, thus getting rid of it.

I think I mentioned that Sherry and I spent a week in Rome in April this year. I'm not sure whether they've had a big enough organization to be able to take back 72. By that time the computer publisher had come close to killing it. The circulation of Fun was doing well. There were an awful lot of discontented readers and angry ex-advertisers. And once you make customers mad they are incredibly difficult to ever get back, so we've been kind of limping along at half strength ever since.

I made a deal to publish 73 on contract, as a way to save it. I put my editors back in and increased the construction projects and equipment reviews. Then, last year, I swapped CD Review for 73 and finally got back the ownership. Now I'd like to get it growing again and make it the biggest magazine in the ham field. . . the way it used to be.

If every subscriber would get just one other ham to subscribe, we'd really have a deal with about a dollar for each subscriber. If we ever get close to their readership we'd get plenty of advertising and be fatter than they are. However, circulation is still stuck in QST, so the competition for this bonanza has been low. $12.97 may not buy much these days, but I'll get you 12 months of Fun.

A Bigger, Fatter 73?

If you'd like to see more pages of construction articles and equipment reviews in 73, that's easy. No, my editors won't get bigger; the additional pages will be used for more articles. Like back in the late 1970s and early 1980s.

How can we do that? The formula is simple: For every extra page of advertising we're able to sell you'd get an additional page of articles. So how can we attract more advertising? Your complaining to the advertisers might help a little, but probably not much. They advertise in the magazines claiming the highest circulation. So, if we have 65,000 paid readers and QST has 130,000, that's where most of the ads are going to.

How come QST has double our circulation? And what, if anything, can be done about it? Well, 73 was doing fine until I had to sell it 10 years ago.

I started a bunch of computer magazines back when the microcomputer industry was just getting started. Eventually the megapublishers with deep pockets came along and offered me a choice of selling my magazines to them or going out of business. Eventually the megapublishers with deep pockets came along and offered me a choice of selling my magazines to them or going out of business. Eventually the megapublishers with deep pockets came along and offered me a choice of selling my magazines to them or going out of business. Eventually the megapublishers with deep pockets came along and offered me a choice of selling my magazines to them or going out of business.

One time or another we offered to sell our entire publishing company. That left me with no way to publish 73, so that went along with the computer magazines and I had to start all over again to build a new publishing business. It took a while before I had a big enough organization to be able to take back 72. By that time the computer publisher had come close to killing it. The circulation of Fun was doing well. There were an awful lot of discontented readers and angry ex-advertisers. And once you make customers mad they are incredibly difficult to ever get back, so we've been kind of limping along at half strength ever since.

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From the Hamshack

Number 2 on your Feedback card

Keith Bruno KCAVZ, Orlando FL

Wrote a letter just inspired me to finally take some time out of my schedule and write. Let me first state that you have a fine magazine and it is the only one that supports multiformation in existence, hands down. I have read them all, but have only kept up my subscription to yours.

I agree almost all of your opinions, especially those relating to the face called government. Most of your ideas for change are very logical. Unfortunately, that is precisely why the government will probably never listen to them.

You are always bashing the educational system of our "fine" country and I would like to further reinforce that opinion. I am a product of our poor educational system. I graduated from high school in 1963, nowhere near prepared for the real world. I can honestly state that I was bored with most of the subjects in high school, except for computer science. Luckily, I got a good job right after high school working for the world's largest defense contractor and had many great opportunities to pursue my first love: computers (my second being amateur radio).

I have to say, though, that if one wants an education, it is out there. Ninety-five percent of everything I have learned about computers, and ninety-nine percent of what I have learned about amateur radio I have learned on my own. Right now I am enrolled in the NFL course for Radio Electronics and hope to get my General Radio Telephone Operator's License. There is no one who is responsible for my education and my well-being except me. I hate it when people grumble about how the government "fails." I am aware that the world owes them a living. Baloney! Get out there and get yourself an education. Stop complaining about your life and do something about it.

My wife is always making fun of me. I am 27 years old and now always seem to get involved in what she calls "old men's hobbies." It is a shame, but at the club meetings I go to almost everyone is over 40, with most of the guys in their 50s. I may see one or two, but that's it.

And as for offering any help, forget it! No one, not even the local amateur radio shop, is even helpful. As a matter of fact, they all seem to have this attitude that if you don't already know, then they are not going to take the time to explain it. Pity.

I have taken your advice to try something new and have gotten into packet. Again, I had to dig through the manuals and call the manufacturer to figure out how to connect it to my computer and radio. I want to figure out how to link my two computers together with some kind of protocol. When I figure it out, I plan to try it on the packet radio.

Have a no-code Technician license.

I got it before they even had a formal no-code test, about two months after they came out with it. I do not plan to upgrade until the code requirement is dropped. I really have no desire to exchange call signs, QTH, and a signal report with some guy who has never done anything but pound on those brass keys. Heck, if I need CW to "punch through" in bad conditions, I'll hook up a tape recorder and punch through any QSO type on the keyboard and let it send CW.

Adam Hale NOYCL/UE, Sterling OH

Wayne—I am writing in response to your editorial in the May 1993 issue of 73. You were right about schools. I am 14 years old and I am homeschooled. We are wrapping up our second year, I have enjoyed homeschool very much. These two years have gone by faster than any two years in public school.

For science (up until April of this year), I studied radio and electronics theory. I am studying for my Technician Class license in October 1992. On April 6, 1993, I upgraded to Extra Class. While getting school credit, I did something I enjoyed doing. I could not have done this in public school. Now I have gotten my dad interested in ham radio and he is studying for his Technician license.

Also, I agree with your editorials on EMR. Keep up the good work. Your ideas are very good, and they get better as more research is done on this subject.

Bruce Williams N6JCV, Lake Villa IL

Six months ago I purchased an ICOM 728. I love it. I had a problem with it (the preamp went out). I sent it back to ICOM for warranty repair and it was back in my shack two weeks after I sent it away.

Yes, I bought a kilo also. I purchased a Ramsey 32M transceiver, spent three hours putting it together, and it works like a charm.

I used to work all SSB, 100 watts. I got tired of it and I bought a W4PY (20 meters) and now I am very interested in QRP operation and building. By the way, 73 does a great job supporting QRP enthusiasts. I think everyone should cut their power by 50%. What nicer bands we would have.

Wayne, I don't agree with everything you write, but I always read your column from front to back as soon as I get 73.

Oh? What in hell don't you agree with? . . . Wayne

Bill Eaton N9OTZ, Eligin IL

Wayne, along with so many other hams, I enjoy 73. The deciding vote for 72 vs. QO or any other publication is your editorials. It's so refreshing to hear intelligent, well-thought-out ideas and viewpoints. Of yet I've found no point of contention, although I suspect we may differ on religious ideas.

In May 1992, my partner (I'm a paramedic) was browsing through a handle-talkie sale pamphlet. "Neat looking scanner," I said. From that point on my interest in the "other" side of the radio started. In November, I went home of yesteryear, consisting of an oversized, tube-operated transciever, a Morse code key and an antenna that made neighbors nervous, has changed. I was licensed in March and have loved the hobby. I've met many hams, all of whom have confirmed my father's comment of ham radio as "a generator's hobby." From this I've seen my recent QSOs with DX to ATV balloons and ATV with the shuttle spacecraft. Needless to say, this kept me occupied and entertained.

One thing that holds me back is time and money (not necessarily in that order).

Frustrations? Yes. The pathetic lack of any substantial, in-depth conversation. On my attempts to initiate such, the normal response is, "Oh, that's interesting . . . Well, what local FCCs are you using?" or "How's the weather?" On this I have to work, then work. A new is on the service issue: Any educational method now requires initiative and learning, that may lead one to higher education, etc.—keeps kids off the street—a service. It may lead someone to your editorials and get them thinking. Now, that's service!

How for my pocket review: The Yaesu FT-415 2 meter handle-talkie. After a year and a half of almost daily operation, the only problem I've encountered so far is that the back of the keyer dial is slipping and clicking. I dial began to turn freely, scooping up and down frequencies with annoying ease. I switched back to the tournament and the battery passport on the battery operated bike, bypassed factory service and fixed it by sliding a small plastic tube over the dial post and replacing the knob. This makes for a nice snug fit, which still works. I've always received good reports on audio quality. A fine feature of most handle-talkies is that your ham radio 'bomped' you talk too long, keeping a check on the motor-mouth syndrome.

Fixing things yourself? What are you, some kind of troublemaker? . . . Wayne

Richard Monjure, Covington LA

Wayne, I see comments about other hams in your column. There are all kinds of different malefactors in radio. I've heard a lot of people talk about varied topics. Such as racial separation, homosexuality, politics, etc., are offensive to some, but I've never been allowed to expand upon this, in a non-offensive manner. This has been the problem for me. I don't mean I haven't been able to express my opinions, but I have to do so with my back against the wall. I do not want to upset them, but they do upset me. I am a member of a group of like-minded hams who live in the same area. They are all very intelligent and seem to be interested in the same things.

I believe I have been an active ham since 1983, now I see that these frequencies should cover all bands? I have been an active ham since 1983, now I see that these frequencies should cover all bands?

The world's radio operators are becoming more and more interested in the radio spectrum, and I think it is important for hams to be involved. I think it is important for hams to be involved.

If you cannot copy 20 WPM you cannot expect to handle traffic efficiently on manual Morse circuits. The ability to receive code using a typewriter is also a requirement. You hear hams say that they copy "words, not letters." Come on! They cannot copy that way and expect to deliver the service expected by the amateur community.

The professional CW operator must have a typing speed of at least 20 WPM. Automated keying allows anyone to make a good speed. Automated keying allows anyone to make a good speed.

The International Telecommunication Union now acknowledges the need for emergency services.

The microwave hams probably won't be a problem for long. Satellite bands will probably be the next. But there is an enormous demand that we lose 'em all fairly soon. Too bad. It would be fun to have a ham satellite system which would allow all hams to communicate anywhere in the world 24 hours a day. With spread spectrum, this is possible. There's an outlet here for the amateur radio community. It may lead somewhere.

Fick on CW. But why bother testing the code when someone using it has to be able to copy it to do that? Self-testing.

The microwave hams probably won't be a problem for long. Satellite bands will probably be the next. But there is an enormous demand that we lose 'em all fairly soon. Too bad. It would be fun to have a ham satellite system which would allow all hams to communicate anywhere in the world 24/7. With spread spectrum, this is possible. There's an outlet here for the amateur radio community. It may lead somewhere.

I doubt there'll be much more of a need for ham emergency services once this gets going. It's a kind of super cellular telephone. Cheers . . . Wayne
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FCC Relaxes Business Restrictions

The Federal Communications Commission has enacted a major change in the law restricting amateur radio use for personal business and public service. Under the new rules, it will no longer be a violation to order a pizza or make an appointment via amateur radio. The Commission has acted to amend the Part 97 Amateur Service rules allowing for more flexibility in personal business and public service communications.

The amendment permits licensees to use the amateur service frequencies to assist with public service communications at races, parades, and educational activities. Personal communications which will no longer be prohibited include making appointments, ordering food, and collecting data for the National Weather Service.

Effective 30 days after publishing in the Federal Register (approximately September 15th), here is what you can do (with some exceptions) on the ham bands:

Any amateur-to-amateur communications are now permitted unless:

a. Specifically prohibited. These include:

1. Music (except for incidental space shuttle music);
2. Communications facilitating a criminal act;
3. Messages obscured by codes or ciphers;
4. Obscene or indecent words or language; and
5. False or deceptive messages, signals, or identification.

b. Transmissions for compensation. The following exceptions apply:

1. Morse code practice and information bulletins (special criteria);
2. Classroom teachers using ham radio in the classroom.

The following communications are permitted, but not on a "...regular basis" (not defined by the FCC):

1. Communications which could be reasonably furnished through other radio services;
2. Notices concerning sale or trade of amateur station apparatus; and
3. Retransmissions of government provided space shuttle, propagation, and weather forecast broadcasts.

Here are some examples of the old and new part 97.113 which covers prohibited communications:

OLD RULE: No amateur station shall transmit any communications which promotes the business or commercial affairs of any party. If anyone profits financially, it is an illegal transmission.

NEW RULE: An amateur may not be paid directly or indirectly, at his voluntarily provided communications.

OLD RULE: Except for emergency communications, the ham bands may not be used as an alternative to other authorized radio services.

NEW RULE: Amateur-to-amateur communications which could reasonably be furnished alternatively through other radio services will now be permitted on the ham bands—although not on a regular basis. This will allow amateurs to legally participate with the Weather Service, police and fire departments, parks and forestry service, and many other local, state, and federal agencies. TNX Westlink Report, No. 654, July 29, 1993, and W5YI Report, Issue 16, August 15, 1993.

Technician is Hot Ticket

The Technician Class amateur radio license is maintaining its accelerated growth rate of 20%—by far the fastest growing ham class. Before 1991, amateur radio overall grew at only a sluggish 3% rate. Today, that figure is a healthy 10%. If the rate of growth of amateur radio continues on the track it's on now, we will surpass one million licensed ham operators by 1998.

In 1985, only one amateur in five was a Technician. But since the arrival of the Codeless Technician Class in 1991, the demographics have shifted significantly. Today, one third of all hams are Techs. TNX W5YI Report, Issue 13, July 1, 1993.

2 Meter Transmitter for AMSAT Phase 3D

The AMSAT Phase 3D Satellite will don a snappy new 2 meter transmitter, designed and built by Mike Dosek GO6GEJ. This task will be undertaken as part of AMSAT-UK's participation on the international project team. Mike described his proposed design at the recent AMSAT-UK Colloquium held at the University of Surrey in England.

Together with the 70cm uplink receiver being constructed in Germany, the AMSAT-UK-supplied 2 meter transmitter forms a mode U/V station, (also known as Mode B on OSCAR). Current users of Mode B on OSCARS 10 and 13 can look forward to better performance with the launch of the new bird, slated for April 1996.

Calling All Home-Brewers

The Radio Amateurs of/du Canada are making a call for papers for the Technical Symposium of their First National Convention. Papers concerning both the technical and practical aspects of ham radio are welcome. Subject areas include: HF, VHF, and UHF communication methods and techniques, packet, AMTOR, RTTY, AMSAT, and EME.

The papers will be featured in a 30-45 minute presentation and a 15-minute Q & A session with the audience. They will also be printed in the Technical Proceedings of the First National Convention of RAC.


Clinton is High on Hams in Space

The president of the United States, no less, took time out of his busy schedule recently to extoll the virtues of the Shuttle Amateur Radio Experiment (SAREX) program. While talking to the STS-57 mission astronauts on a special hookup, President Bill Clinton said: "I understand that later in the mission Janice (Voss) and Brian (Duffy N5WQW) are going to be talking with schoolchildren around the world. I just want to tell you how much I appreciate the fact that you're making an international education project out of this mission. That's very important to me."

Astronaut Brian Duffy responded: "Mr. President, we find that using amateur radio is an excellent way of communicating with children all around the world, and we're also able to excite them by using space and science."

President Clinton concluded: "You may be on this mission, creating thousands of scientists for the future just by the power of your example and by this direct communication. I think sometimes we underestimate the impact that human contact in an enormously impressive setting like this can have on children across the world—not only those with whom you talk, but millions of others who will just see it and know that it happened." TNX Westlink Report No. 693, July 15, 1993 and W5YI Report, Issue 13, July 1, 1993.

Alkaline Batteries Rise From the Dead

Look out NiCds (nicads)—technology has given new life to spent alkaline batteries. Until recently, alkalines were considered throw-away types. Now Rayovac Corporation has unveiled an improved alkaline cell and recharge combo that blends the advantages of alkalines with those of NiCds.

The low cost Renewal battery comes fully powered and ready to go. Rayovac says it lasts up to three times longer than a NiCd when new—however, the cycle-hours decrease to about the same as a NiCd after about 25 charges. The new battery also can hold a charge for five years (compared to three months with a NiCd) and shows no susceptibility to the dreaded memory effect of NiCds. TNX Electronic Products, No. 3, August, 1993.
INTRODUCING THE PK-900...
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IN MULTI-MODE CONTROLLERS.

Now, there's a new standard of excellence in multi-mode digital controllers...the new PK-900 from AEA. It incorporates all of the features which made the PK-232 the most popular multi-mode controller in the industry. But that's just the start. AEA's new PK-900 also features dual port HF or VHF on either port; low cost 9600 baud plug-in option; memory ARQ and VHF DCD state machine circuit; powerful triple processor system; zero crossing detector for the sharpest Gray Scale FAX you've ever seen; and many other new software selectable features.

Inside and out, the new PK-900 from AEA is what other multi-mode controllers will now be measured against.

- Processors used: Zilog 64180, Motorola 68HC05C4, Motorola 68HC05B4
- Data rates: 45 to 1200 baud standard, up to 19.2K baud with external modems
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Connect with us
More Gadgets for Your MFJ-9020
Add features to this great QRP rig.

Robert W. Vreeland W6YBT

Like many hams, I just can't leave ham radio at home. The ideal traveling station should be lightweight and compact and should also have sufficient power for use with indoor antennas. The MFJ-9020 is the ideal basic building block for such a station. I have added an extra audio amplifier, some keying modifications and a lightweight power supply. For hotel room use, I built a short inductively-loaded dipole and a 20 watt amplifier to drive it.

Although the MFJ-9020 audio is quite adequate under normal conditions, some hams may want a little more volume. Therefore, I've added an LM380N amplifier using the circuit provided by the manufacturer (Figure 1). The LM380N has a gain of 50 but I wanted a gain of 10 so I added a five-to-one input divider consisting of a 22k resistor and a 4.7k resistor. The 0.02 \( \mu \)F capacitor rolls off the high frequencies to reduce noise.

Photo A shows the method of mounting the amplifier using the MFJ speaker mounting screws. The original mounting nuts were left in place to serve as spacers, providing adequate clearance between the circuit board and the cabinet. Note that the circuit board has been cut to fit the contour of the speaker. The strange tunnel on top of the LM380N is a sheet-copper heat radiator, grounded and soldered to pins 3, 4, 5, 10, 11 and 12. The white wire was disconnected from the speaker and reconnected to the amplifier input. The amplifier ground was connected to the speaker and to the original brown ground wire. Of course, I connected the amplifier output to the free speaker terminal. Power for the amplifier was taken from the two rear terminals on the MFJ power switch. The amplifier is used only with the loudspeaker. I have found that my old 2000 ohm Telex earpiece works much better than the earpieces designed for 8 ohm outputs.

The MFJ keying, although crisp and clean, was a little bit too solid for my taste so I decided to soften it, as shown in Photo B. This was done by bypassing to ground the output of the 78L05 regulator (U8), using a 47 \( \mu \)F capacitor in parallel with a 220 ohm resistor. A 1N4005 protective diode was connected across the 78L05 as shown in Figure 2. This modification was done without drilling any holes and without removing the MFJ circuit board. The regulator (U8) is located at the left near the front of the circuit board. I very carefully soldered a piece of #26 hookup wire to the regulator output lead on the top side of the circuit board. (A voltmeter was used to locate the 5 volt output lead.) The other end of this wire was connected to a terminal strip which I mounted on the MFJ antenna connector using one of the existing mounting screws. The 47 \( \mu \)F capacitor and the 220 ohm resistor were then mounted on this terminal strip.

The manufacturer has thoughtfully provided a circuit board trace bringing the keyed 12 volt supply out just in front of the relay. The 1N4005 was connected between this point and the terminal strip. The keyed 12 volt bus was also brought out through a 100 ohm 1 watt resistor. This was connected to a red pin jack mounted in one of the unused holes on the rear panel. The jack is used to control my 20 watt amplifier for semi-break-in.

The RF amplifier uses a pair of 600 volt Supertex VN0660N5s (Supertex Inc. 1225 Bordeaux Dr., Sunnyvale CA 94088-3607). High-voltage MOSFETS are nice because they can be powered directly from the recti-

Photo A. The audio power amplifier was attached using two of the original loudspeaker mounting screws. Note the tunnel-shaped sheet-copper heat radiator at the lower right. It is soldered to the LM380N.

Photo B. A double exposure showing the keyed RF envelope before modification (above) and after (below). The horizontal time base is 5 milliseconds per division.
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MFJ-8100W, $79.95, assembled.
fied and filtered 120 volt line without the need for a step-down transformer. The amplifier was built into a 4" x 6" plastic cardfile box. Radio frequency transformers are used for the input and output to keep the high voltage inside where it belongs. High-voltage MOSFETS have been improved considerably in the last few years. Our amplifier runs at 50% efficiency and will withstand moderate antenna mismatches, but that is a subject for another article. A general discussion of high-voltage MOSFET amplifiers was published in RF Design (Vreeland, R.W.; “An Ultra Light-Weight Transmitter Using High-Voltage MosFets,” August 1985, pp. 46-50) and in QEX (Vreeland, R.W.: “Notes On a Light-Weight Portable CW Transmitter With a Transformerless Power Supply,” June 1988, pp. 11-13).

Add a Dipole

The station (Photo C) was completed by the addition of a 12 volt regulated supply (Edlic TE626-24: Edlic Electronics, 2700 Hempstead Turnpike, Levittown NY 11756-1443). Did I say completed? Well, not quite. What good is a station without an antenna? And how do you fit a half-wave dipole into a hotel room? The obvious answer is the inductively loaded dipole shown in Figure 3. The coils are wound on sections of 1-1/16" outside diameter PVC water pipe using Archer 278-1218 #22 gauge hookup wire. The method of anchoring the wire is shown in Figure 3. The wire was threaded down through one hole and up through the adjacent one. I fed the dipole through a 22-foot length of RG-58/U (Archer 278-971).

Tuning was done by adjusting the lengths of the end sections. A bowline was tied in each end to form a loop for supporting the antenna. The end sections for my antenna are 38 inches long as measured to the outer end of the loop. It is best to start with at least 42 inches of wire to allow for pruning. I have found the MFJ-207 SWR Analyzer to be indispensable for this purpose. When properly tuned the antenna will cover the entire tuning range of the MFJ-9020. The antenna should be mounted in the clear. Metal lath walls will cause detuning, as will aluminum-backed insulating material.

The question of the possible existence of non-thermal RF health hazards has not yet been answered. Until it has, it would be best to hang the antenna a reasonable distance from the operator and to refrain from running high-power. As a former 75 meter AM mobile operator, I have been exposed to moderate RF fields without noticeable ill effects. For this reason I take a fairly casual attitude toward moderate RF exposures. However, you should make your own decision. In these days when intelligent people worry about exposure to 60 Hz magnetic fields that are only one one-hundredth as strong as the magnetic field of the earth, how careful can you get?

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Universal Automatic Minimum Power Control for AMTOR

Use just enough punch to get the job done.

by Ed C. Miller N7APE

Most of the digital communications in the ham bands is done at whatever power setting the operator chooses. I am sure most hams would prefer to operate at the minimum power needed, but with AMTOR it would require virtually constant adjustment.

The circuit described here was inspired by the automatic power control (for AMTOR) unit developed by Carl D. Gregory K8CG. It was designed for use with transceivers using external voltage control power adjust. The circuit presented here is for use with any SSB transceiver being used on AMTOR. It senses the same TNC signals as Carl’s circuit, but uses that information to adjust the TNC audio level to the transmitter—and thus the power output. If no error signals are detected by the TNC, the transmitter power will be gradually reduced until an error is detected. It will then increase the output power level until no errors are detected. Thus, the transmitter power output will generally be at the minimum level necessary for reliable communication, meeting the FCC’s requirement.

Although this circuit was designed for use with an AEA PK-232 TNC, it should be adaptable to other units with only minor modification. And, because it controls the transmitter audio level, it should work with any SSB rig.

The main unit is on a small circuit board mounted inside the TNC. It interprets the error signals from the TNC. Its input includes ground, +5 volts, and the outputs of four of the TNC LED drivers, one of which enables the power control feature in the ARQ mode. All of the digital activity is conducted on this board. Its output consists of one shielded two-wire cable that plugs into the power control section, which is an L-pad with an FET for the output leg. This pad is connected between the TNC transmit audio and the transmitter audio input. One wire provides initial bias to the FET, and the other the control voltage to the gate of the FET. With this installation, no traces are cut, so the TNC can easily be returned to its original condition.

Control for this circuit is provided by the indicator driver ICs. If the TNC is in AMTOR mode, whenever an error is detected the RQ, PHASE, or OVER indicator driver is enabled. The voltage at pins 12 and 13 of the 4093B goes negative, which in turn causes pin 3 to also go negative. C5 is gradually discharged, increasing the negative bias on the gate of the FET, reducing the loss in the T-pad consisting of Ra and the FET impedance. This increases the audio level to the transmitter, increasing its power output. When the power is raised to the point where no errors are detected, NAND Gate 2 will go positive, and the transmitted power will begin to gradually reduce. This constant automatic control of the RF output allows AMTOR usage at the minimum level necessary for reliable communication.

In any mode except AMTOR, the ARQ LED will not be lit, thus pins 5 and 6 of the 4093 will rise to +5 volts. Pin 4 will go negative, quickly discharging C4 and increasing the drain to source impedance of the FET to a very high value, causing minimum loss in the T-pad. This sets the transmitter output power to maximum in all modes except AMTOR.

Construction

The layout and construction of the main board is not critical. It can be mounted with metal brackets, using the two main board mounting screws. Care in mounting is important to prevent damaging the TNC board. Remove the bolts, then insert them in the

Photo A. Audio control unit (with cover removed).

Figure 1. Schematic diagram.
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HIGH STABILITY Only ITC Analyzers provide high stability and low drift at any span. (I< then 1kHz per Hr. after warm-up)
mounting brackets. Place a mica (or other insulated) washer over the front bolt, and a small metal lock washer over the rear bolt, before re-inserting the bolts. These washers are important in preventing damage or the introduction of a short in the TNC board, and to provide its case ground connection.

The four status sensor wires are most easily connected to the appropriate LED negative connections on the indicator board. Extreme care should be used in making these connections as some of the LEDs have PC board traces very close to them.

The T-Pad unit was made of one-sided PC board, with a metal cover. It plugs into the RADIO 2 connector on the rear of the TNC, and the RADIO 2 cable plugs into it. This compact design and layout minimizes RF interference; however, it does require a steady hand and small tools for its construction. Of course, it is not necessary to have the cable-connector assembly made in a cable-end configuration. It would work equally well in a small metal cabinet, with the male connector on it and a suitable cable to the TNC terminated in a five-pin female header.

Only one adjustment is required for setup:
With the TNC operating in any mode other than AMTOR, adjust the trimmer resistor for maximum audio output to the transceiver. It should be set just to the point where maximum audio output is reached.

In AMTOR mode, this unit will provide an output power-control range exceeding 20 to 1.

**PARTS LIST**

**Main Board**

- D1,D2,D3,D4, D5,D6
- C1,C-2 180 pF poly capacitors
- C-3 10 µF 25 volt electrolytic capacitor
- C-4 0.1 µF 15 volt ceramic capacitor
- C-5,C-6 47 µF 25 volt electrolytic capacitor
- R-1,R-2 15,000 ohms carbon 1/4 watt
- R-3,R-5,R-8 470 ohms carbon 1/4 watt
- R-4,R-6,R-7 4,700 ohms carbon 1/4 watt
- R-9 2,200 ohms carbon 1/4 watt
- R-10 22,000 ohms carbon 1/4 watt
- R-11 1,000 ohm trimmer potentiometer
- R-12 1 megohm carbon 1/4 watt
- IC 4093B Quad dual NAND gate

**Cable Connector Board**

- Ca 100 µF 10 volt electrolytic capacitor
- Cb,Cc 0.1 µF 15 volt ceramic capacitor
- Qa 2N5457 N-Channel FET
- Pa 5-pin male header
- Ra 1,500 ohm carbon 1/4 watt
- Sa 5-pin female header

A set of both drilled and etched PC boards is available for $5.25 plus $1.50 S&H from FAR Circuits, 18N84D Field Ct., Dundee IL 60118.

**Figure 2.** a) Main unit PC board pattern; b) Audio unit PC board pattern.

**Figure 3.** a) Main unit PC board parts placement diagram; b) Audio unit PC board parts placement diagram.
**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 side of this page and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

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The Challenge of QRP
An introduction to low power operation.

by Michael Bryce WB8VGE

Ham radio has become pretty comfortable for most of us. Just about anyone can chase DX with a modern 100 watt microprocessor-controlled transceiver. But just try that using minimum power! That's the challenge of QRP. There's nothing like working a rare DX station with only 1 watt to sharpen your operating skills. But, of course, there's much more to QRP than DXing with low power.

What is QRP?

Well, it depends on what side of the fence you happen to be on. To me, QRP is RF output from a transmitter that is 5 watts or less, regardless of the input power to the transmitter. If you have 50 watts input and only 3 watts output, you're QRP to me. Your transmitter efficiency is really bad, but you're still QRP.

On the other hand, if you're working the CQ World Wide DX contest, and you're running a kW, by turning the amplifier off—thus dropping your power down to 100 watts—you're now QRP! In fact, let's take this one step further. Suppose the DX station you're listening to says, "QRP only please." Snap! Off goes the amplifier. You're now QRP and you make your contact with 100 watts. That's far from operating with low power.

QRP is one of the internationally recognized Q-signals meaning: "Shall I reduce power?" Or: "Reduce power to _______ watts." Most hams have adopted it to identify low power equipment or operation. The QRP ARCI has formally adopted the power level of 5 watts as QRP. This is measured as output power from the transmitter. For really low, low power work, the term "milliwatt" has replaced the aged term "QRPp." The popular fire ball transmitter on 28 MHz proved it is possible to transmit coast-to-coast with 25 milliwatts! That's less power than the dial lights consume in most transceivers.

QRP is a great place to make new friends. QRP is a subculture within ham radio. Usually, when I tell someone I'm running QRP, the QSO changes from the usual, "Rig here is Kenwood and the weather here is warm" to a real chat with an interested human operator on the other end.

Building Your Own

Nothing in the world can beat the feeling of working a station using home-brewed equipment—a QSO with gear you constructed with your own hands. The warm fuzzy feeling will last for days after the QSO is over. That's a feeling you don't get when operating the newest microprocessor-controlled SSB transceiver.

One of the most challenging and satisfying things a QRP operator can do is build his or her own gear. Best of all, you don't need to be a rocket scientist or an electronics engineer to build your own rig. In fact, QRP projects are especially suited for the neophyte in home-brew construction. Building a transmitter is relatively easy. Usually there's a wide tolerance range for parts, and most transmitters are built around straightforward circuits. Sometimes the transmitter is nothing more than a one-transistor oscillator coupled to an antenna. Only a handful of parts are required to produce 2 watts on most frequencies. You'll be astonished by the amount of DX you can work with just a spoonful of parts.

Because most QRP projects are simple, you usually won't have trouble finding parts for the rig. A well-stocked Radio Shack can supply you with all the parts required for a 75 meter CW transceiver. Companies like Mouser Electronics and...
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CIRCLE 41 ON READER SERVICE CARD
Digi-Key will take small orders for one-sees and twosees. Several hams have started their own companies supplying small parts just to the home-builder and the QRPper.

If you have a hard time getting the parts all lined up, several different companies furnish ready-to-go kits, too. Kits range from the very simple Roner by the G-QRP club, to the fully synthesized ARK-40 from S & S Engineering.

Sometimes the challenge of QRP comes from assembling a transmitter in the smallest possible chassis. I’ve seen rigs built in pill bottles, band-aid boxes, a match box, and even a Sucrets box.

Most QRP construction projects center around building QRP transmitters. There’s nothing stopping you from rolling your own receiver either. The popular direct conversion receiver makes a perfect marriage for the QRP transmitter. A direct conversion receiver is sensitive, and easy to build. Or you can go with several of the simpler superhet designs offered in 73. Many of these simpler designs rival the performance of much more complex receivers.

There’s one more advantage to low power operation—TVI is almost unheard of with QRP.

**Equipment for QRP Use**

If you are a licensed ham, then you can operate QRP without spending one cent! All you have to do is reduce your output power and, snap! You’re QRP. It really is as simple as that. You don’t need to heat up the soldering iron if you choose not to, although you will be losing a gratifying part of the QRP environment.

All you need is already on your operating table—your HF transceiver. You don’t need a special QRP rig to enjoy low power operation, although there are commercial transceivers made especially for the low power enthusiasts. The popular Ten-Tec Argonaut II is a modern microprocessor-controlled QRP transceiver sporting all kinds of bells and whistles. The monobanders so popular today normally run QRP at 5 watts or so. Many commercial rigs, such as the ICOM IC-735, are easy to adapt to low power operation.

There’s lots of used gear on the market, too. The popular Heathkit HW series of CW transceivers will still provide a lot of fun for very little cash layout. Used Ten-Tec Argonauts 505, 509 and the 515 provide 80-10 meter coverage plus SSB.

**QRP and Other Frequencies**

Alas, QRP is not only for HF use. Special QRP days have been set aside for the OSCAR satellites. Running too much RF on the uplink may damage...
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Lower Your Electric Bill, Too

Do you own an HT? Then you’ve more than likely gone QRP at one time or another.

How many times have you said, “I’ve switched to low power. How is my signal into the repeater now?” Perhaps it was just unknown to you at the time, but you had just discovered two important facts about QRP. First, you don’t need full power all the time to have dependable communications. Second, running QRP will stretch your battery’s life, greatly expanding your ability to communicate longer without plugging in.

Because QRP equipment is normally

QRP Q&A

Ever since my Novice days, I’ve been running QRP. I’ve collected files full of letters from hams all over the world asking about low power communications.

There seemed to be a pattern developing in the questions, so I picked out some of the more common ones. Here they are, in no particular order. Enjoy!

What is QRP?

QRP is a term adopted from the international QSO signals meaning to reduce power. Hams have taken this term and its meaning to be low power. Generally, QRP is 5 watts or less from the transmitter, regardless of the input power to the transmitter. If you hear someone on 40 meters calling CQ QRP, he (or she) is calling for a low power station. More than likely, they will be using low power, too.

What is QRPp?

QRPp is the older term for RF power of 1 watt or less. That extra small "p" meant really low, low power, generally under 1 watt. That term has been replaced by the term "milliwattting." While it may be hard to believe, you can really work around the world with an output power of 50 milliwatts! There have been many hams working DXCC with only 100 milliwatts to the antenna. It is hard to do, but not impossible.

What are the most popular QRP bands?

There really is no band more popular than the others. You’ll find QRP operation everywhere from DC to light. But, some consider the 40 meter band around 7.040 MHz to be QRP Central. You can also find some action on 7.035 MHz and 7.060 MHz. In the winter time, when summer QRN is down, 80 meters is very popular during long cold nights. There is QRP activity on 160 meters, too.

The 30 meter band is a QRPer’s delight! Try 10.106 and up for low power signals. Then, let’s not forget about the 40 meter band either. This is by far the most popular ham band when it comes to working DX. Low power operation used to be located around 14.060 MHz, but alas, other forms of digital signals have been moving down, overtaking the QRP-calling frequency. Check the entire band for QRP operators—they’re everywhere on 20. You can find QRP signals on 17, 15, and 10 meters, too.

I’m not into CW. Can I still operate QRP?

CW is by far the most popular mode of QRP operation. It’s partly because CW transmitters are easier to build than SSB rigs. With CW, you get more bang for the watt, too. But, QRP is not only CW; it’s any mode you want to use, including FM or SSTV. Remember: QRP means low power—not CW only.

Do I need to change rigs or equipment to operate QRP?

Of course not! Most of today’s rigs can be easily turned down from a front panel control. You’ll end up with low transmitter efficiency, but you won’t have to spend a dime.

How about antennas? All I have is a simple dipole.

No matter what power level you use in amateur radio, the better the antenna, the better your signal will be. Use a good grade of feedline and get the antenna as high as possible.

I enjoy a good contest now and then. How can I compete with other stations if I run only 2 watts?

Most of the major contests, such as the CQ World Wide DX contest, Sweepstakes, and even Field Day, have special low power sections. You only compete against others within the same power class. You don’t have to worry about the guy running a kW because you are not in the same class.

I know many QRPers like to build their own gear. I’m not much of a builder. Can I purchase a commercial QRP transceiver?

It’s too bad you don’t like to build your own gear. You’re missing out on a lot of fun. But, yes, you can purchase a commercial QRP transceiver. Ten-Tec markets their Argonaut II QRP transceiver with all the good stuff we’re used to seeing in today’s gear. There are many other monoband rigs, such as the MFJ units, available. Tejas RF sells their popular Backpacker II fully assembled and tested.

Almost all of the circuits I’ve seen in the last few issues have been solid-state transmitters. How about us guys with boxes full of tubes?

It is the 1990s and today’s technology is solid-state and microprocessors. But, if you want, you can still use a vacuum tube in a QRP transmitter. The best place to look for a circuit is in an old copy of the ARRL Handbook. Begin looking with the early ‘70s and work your way back to the ‘50s. Parts for those circuits may be next to impossible to locate, unless you have a really big junk box.

Can I operate packet or AMTOR?

Yup! Sure can. Again, QRP simply means low power. Any mode of communications is suitable for QRP, with the exception of moonbounce! I’ve had some great QSOs using AMTOR with less than 4 watts PEP.

Are there any QRP clubs to join?

Yes! As a matter of fact, I’m the publicity manager for the QRP ARCI, the largest QRP club in the world. If you would like to have one of the info kits, all you need to do is send $2 to me (2225 Mayflower NW, Massillon OH 44648) and I’ll have one in the mail to you the next day.

The Michigan QRP Club also serves low power enthusiasts with the 5-Watter. Published four times a year, 5-Watter makes for great reading. There is also the G-QRP club. Based in England, they publish SPRAT, which is full of construction projects.

I like to collect awards. Can I still do so with QRP?

Yes! There are many, many awards issued just for QRP operation. These range from a WAS with QRP endorsement to the Miles Per Watt Award. Many other contests also provide a special QRP award such as the ARRL’s Sweepstakes or the CQ World Wide DX contest.

What are some of the limits of QRP?

QRP is not push-button communications! There will be times when your 2 watts just won’t cut it. But conditions, QRM, sunspots, and QRP all take their toll on a 2 watt signal. There will be times when your 2 watts or RF won’t be enough to make a contact.

Some modes don’t seem to work as well as others, SSB, for example, is much harder to do with QRP power levels because everyone likes that armchair copy. You won’t be armchair copy most of the time on SSB.

AM phone is really tough on QRP! It’s possible to work coast-to-coast with AM phone on the 10 meter band using QRP, but on 75 meters and 40 meters it’s not going to fly.

I’m on a limited budget. Would QRP be the best way to go to enter ham radio?

QRP means low power, not inferior equipment! Don’t get the two mixed together. You could pick up an HW-7 at a hamfest for under $50 and have a ball, or you could drop five grand for an IC-785, turn the drive down, and run QRP, too. While it is true you can pick up a brand-new rig such as the MFJ QRP monoband rig for about $150, compared to about $1,000 for an entry-level 100 watt rig, going QRP would save you money, but at a cost of only one band and being stuck with CW only.

If I start to operate QRP, what’s in it for me?

No matter what you do in life, you get out what you put in. QRP really boosts your ego. Breaking a DX pile-up with 2 watts will keep a smile on your face for weeks. Working the West Coast with 1 watt from a transmitter you put together with your own hands is the best way to generate those warm fuzzy feelings.

If you’re tired of the quick, “Hi. Rig here is blank. Weather here is blank” type of QSO, give QRP operation a try. And if it’s nothing else—it’s FUN!
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### POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

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### 19" RACK MOUNT POWER SUPPLIES

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### VS-M AND VRM-M SERIES

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### RS SERIES

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</tbody>
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much smaller, power requirements are easily met with small batteries. A QRP transceiver is ideal for taking ham radio with you. You can easily carry a complete HF rig, including batteries, in a backpack. Hiking, camping or even white water rafting takes on a whole new meaning now that ham radio is aboard. There’s also the possibility ham radio could save a life or two while you’re out camping.

Battery power is all you need for worldwide communications from your home, too. In fact, most QRPpers enjoy operating their gear from batteries. Solar power and QRP operation go hand-in-hand to supply all the energy requirements of even the busiest ham.

During a natural disaster, your QRP transceiver may be the only source of communications from the disaster area. During electrical outages, running your ham gear QRP style takes on a whole new meaning.

**Getting Started**

The best way to start in the fascinating world of QRP is to simply reduce your transmitter power a little bit at a time. This gets your feet wet without too much pain. You can make a contact at, say, 100 watts and then slowly reduce your drive until you’re at only 50 watts. Drop the power down again, and then again. You’ll really be surprised as to how low you can get before the signal becomes unreadable.

QRP is not push-button operating! If you’re used to making a contact on one call, then an adjustment in thinking is in order. Anyone can work station after station, many times over, using less than perfect antenna systems with 100 watts. That’s not so with QRP operating.

If you’re used to getting 599 reports, you’d better be ready for lots of 349 and 239 reports. With 100 watts, you’re always 59 on phone; with QRP, you’ll be QRZ? QRZ? the station calling. Working WAS with QRP SSB, is a real challenge! But, then again, many, many times, I’ve been 599 with 1 watt to the antenna. That’s part of the thrill of QRP, you never know what will happen.

**Efficiency is the Key to QRP**

I know you’ve heard it before, about the guy who works DX with a set of old bed springs. Well, that’s not going to cut it with QRP operation. You need the best antenna system you can muster up. Don’t get me wrong, you don’t need an antenna farm containing enough aluminum to build a B-52 to operate QRP successfully—but it wouldn’t hurt, either!

**“During a natural disaster, your QRP transceiver may be the only source of communications from the disaster area. During electrical outages, running your ham gear QRP style takes on a whole new meaning.”**

Antennas are placed as high in the air as possible. Only the best quality feedline is used between rig and antenna. Resonant antennas instead of trapped multiband antennas provide the QRPper with improved efficiency. Anything you can do to increase efficiency will improve your chances of making a solid QSO.

**Operating Hints**

There are many techniques for successful low power operation. Sometimes one particular technique will work this time, and then fail the very next day. Here are some of the many techniques I’ve found to be helpful in keeping the logbook filled with QSOs.

Get to know the bands and how they operate. The use of propagation aids to find out what band will be open and for how long. Why, you might even want to find out how to figure out the propagation charts in the back of 73. There are disks full of computer programs to help you determine the MUF, or Maximum Usable Frequency. Using these programs will improve your QRP score. If the bands are dead, you might as well heat up the soldering iron and work on a project; QRP and cruddy bands don’t mix together well.

Tune the band looking for stations calling CQ. Answering the loudest station sending CQ helps, too. Another method is tail-ending a QSO. You tune around until you find a QSO in progress. After the two stations have signed, you call the loudest one. Most of the time you’ll hear your call coming back. This is far the most popular method of QRP operation.

If you only want to fill up your logbook, then work the side-state contests. The West Virginia QSO party will provide you with lots of quick QSOs. Why? Because you’re an extra two points to the other station. You don’t have to be in the contest to work contest stations.

Here’s a strange one. Check out dead bands for activity. You never know: I’ve heard DX stations calling CQ on supposedly dead bands. It only takes a few minutes to tune around the high end of 10 meters for a quick check, even if the computer says the band is dead.

**Anyone Can Operate QRP**

A different frame of mind is all that is needed. It’s the idea of doing more with less. QRP operation is surprisingly easy, fun, and a whale of a good time. It may be exactly what you need to put some snap back into ham radio.
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**MODEL BANDS**

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- GD-5 40-30-20-15-10 67' 137'
- GD-6 80-40-20-17-12-10 137'
- GD-8 80-40-30-20-17-15-12-10 137'
- GD-9 160-80-40-30-20-17-15-12-10 255'

Choose between 500W PEAK or 2KW versions. Install as a horizontal dipole or an inverted-V. SWR usually better than 1.5:1. No tuner needed if properly installed. See letters from our home customers in our data report. Our special GD-balun (500W or 2KW) matches the low impedance (50 ohm) coax feedline to the high impedance windom-size antenna. All GARANZ ENDA GD-dipole antennas come with a 3 year limited warranty and a 10 day money back guarantee. Write or phone for our free data report on our all GARANZ ENDA GD dipole antennas with technical data, actual SWR curves, customer comments and our low factory direct prices.

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**73 Review**

*by Michael Bryce WB8VGE*

**The Backpacker II**

40 meter transceiver.

Operating QRP has always been a lot of fun for me. Operating QRP in the woods all by yourself, with a rig you built with your own hands, is a delight beyond words! You can join in the fun for yourself with the Backpacker II 40 meter transceiver from Tejas RF Technology.

**The Backpacker II**

The Backpacker II is based on the popular W7EL direct conversion receiver. The Backpacker II is an 1992 updated version using a doubly-balanced diode ring mixer. The Backpacker II has replaced the transistors used in the original version with low noise op amps. The results are outstanding! An improved method of frequency control is the heterodyne oscillator and mixer. In the Backpacker II, the VFO does not run at the same frequency as the transmitter. The VFO instead operates between 6.0 and 6.2 MHz in a Hartley oscillator configuration. This prevents RF from getting into the VFO and causing frequency shift or drift during key down. You get a 200 kHz segment of the 40 meter band with the VFO.

This method also allows the Backpacker II to operate on any single band (including 20, 17 and 15 meters) without losing stability due to VFO drift at the higher operating frequencies normally used in a direct conversion receiver. You could put the Backpacker II on any frequency by changing the output filters and tuned circuits. To make a band change, you'll need to change the crystal in the heterodyne oscillator and change the tuned circuit following the mixer. The tuned circuits in the amplifier stage will also need to be changed and the Backpacker II retuned. A band change kit is $10 and includes the 11 parts required for a band change. In a way, the Backpacker II is really a monoband CW transceiver for 40, 30, 20, 17 and 15 meters. Of course, you can have only one band at a time.

A RIT circuit rounds out the VFO control scheme. The RIT control features a center-detent position allowing easy zeroing of the RIT. You cannot turn the RIT function off. The range of the RIT is +/-1.5 kHz. There is a spot control to find your signal in the receiver's passband.

**The Receiver**

The Backpacker II uses the Mini-Circuits Labs TUF-1 doubly-balanced diode ring mixer. Along with this mixer, additional filters reduce interference from the 40 meter broadcast stations. If you've ever operated a direct conversion receiver on 40 meters at night, you'll really relish the front end in the Backpacker II.

A low noise amp is used as an AF preamplifier. The other half of the op amp acts as an active low-pass filter designed to allow fatigue-free CW listening.

**SSB Sounds Good, Too!**

An LM380 audio amplifier gives the Backpacker II plenty of audio to drive a small speaker. If you're used to a direct conversion receiver with a wimpy LM386, you'll be in for a nice surprise at the amount of audio coming from this little rig. You can get a maximum of 2 watts of audio into an 8 ohm load with the LM380. A speaker is not included in the kit, but there is room-a-plenty to add one to the case if you wish. A front-mounted 1/8-inch jack for a headphone is included. In fact, all the controls for the Backpacker II are mounted on the front panel.

A second op amp provides an active CW bandpass filter. The two-position CW filter provides a 180-cycle bandwidth on CW-1 and a 110-cycle bandwidth on CW-2. Both filters are peaked at 750 cycles. You can set the bandwidth to the wide position, effectively removing the filter from the audio line. With the filters out, the bandwidth is approximately 2.2 kHz wide. A sidetone is injected to the audio channel and its injection level may be set to your own liking. The sidetone volume tracks along with the audio control.

The Backpacker II uses differential keying. This is a fancy way of saying the rig shapes the CW signal and switches over to transmit before the RF reaches the antenna. The time sequence differential, keying properly and timely, performs several TR functions. The Backpacker II keys very nicely. It has electronic QSK keying, making for silent QSK keying with no relay chatter breaking the quiet of the woods. The receiver draws 25 mA with no signal to about 100 mA with reasonable volume. The entire Backpacker II weighs in at a mere 23 ounces.

**The Transmitter**

The transmitter is made up of one driver stage and the PA. The VFO signal is applied directly to the driver via a trimmer. This pot can be used to set the output power of the

---

*Photo A. The Backpacker II is at home in the woods. The 40 meter version is pictured here with a 10 watt solar panel and a 6.5 amp/hour gel battery providing the juice.*
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Model HF9V-X (shown to the left) for 80/75, 40, 30, 20, 17, 15, 12, 10 and 6 meters.

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TX Today-October, CAR D protected against $50 per service. A CRS the for the the TX is going to make you feel right at home with and knowing what is a must. All coils come fully wound and ready to be installed.
The case needs mentioning, too. It's solid 5052 aluminum with epoxy silk-screened letters. They're tough enough to be washed with Formula 409 and still remain on the aluminum. Thankfully, there are no holes in the cabinet for dirt, twigs or critters to move in.
There are many wires connecting the three PC boards together. It would be very easy to get messed up and put the wrong wire in the wrong hole. A highlighter pen would be very useful in keeping track of what wire goes where.
The manual contains all you could ask for in getting your Backpacker II on the air. There's even a section on antennas. There is a complete parts list and a set of oversized PC parts placement diagrams. Full adjustment and set-up procedures are included. If you can't get it to work, there is also a troubleshooting guide to help you track down the trouble. The Backpacker II comes with a 90-day parts warranty.

Out in the Woods
Running the Backpacker II in the woods proved to be a lot of fun! I used a random wire for an antenna and a small Ten-Tec antenna matcher. A small 10 watt solar panel and a 6.5 ampour gel battery provided the power.
Using a high performance direct conversion receiver is hard to describe. Signals seem to POP out of a noiseless background. There are no birds to contend with and no phase noise from a PLL to get in the way.

The time sequence differential keying proved very nice and the QSK worked quite well. With a nominal .5 watts output, there is enough bang to make things interesting without fretting about the batteries going flat.

I made contacts all up and down the East Coast using the Backpacker II. It's a solid 40 meter transceiver that I know you'll have a good time with. It's even more of a delight when you're working the world from your own stump in the woods.

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The RASER Revisited

How this superior HF dipole antenna can be improved.

by James E. Taylor W2OZH

The original article on the RASER ("RASER: A Novel Wire Antenna System," by James E. Taylor W2OZH, 73 Amateur Radio Today, September 1992) showed how a dipole can be extended to provide enhanced feed with a length much less than the normal two half waves in phase. This was accomplished without the need for either a high-impedance feedline or an external antenna tuner. Both end-fed and center-fed options were described. This article will show how I increased the gain of the RASER appreciably while using an improved coupler circuit, which also provides decreased feedline radiation.

The RASER Concept

The center-fed RASER for 75 meters is comprised of a dipole lengthened by self-resonant Divided Coherent Radiator (DCR) sections on either side of the center feed point. Since the RF currents in the adjacent DCR sections are essentially equal and in-phase, the antenna shown gives a power gain of roughly a factor of two over the normal figure-eight pattern of a classical dipole. Such a 20-section RASER is shown in Figure 1. Each DCR section is comprised of a chosen length of wire, which acts as an inductor, and a capacitor which, together with the inductor, forms a series resonant circuit. The wire length was chosen to be 57 inches and the corresponding capacitance was 750 picofarads. Figure 2 shows the scheme for mounting the capacitors, which were potted in insulating foam. I adjusted the antenna to resonance by changing the lengths of the two terminator wires and by selecting the capacitance in the coupler unit, shown schematically in Figure 3. The coupler unit used a bifilar-wound powdered-iron toroidal transformer for impedance matching. This 20-section RASER was used at W2OZH for over a year with outstanding results.

How Can the RASER be Improved?

Critical review of the above design gives rise to three constructive questions:

1. Could the common-mode shield radiation be decreased by placing the shield connection at the tap on the transformer, to bring it closer to the electrical center of the balanced radiator?
2. Could the capacitor in the coupler unit be eliminated by direct connection to the feedline?
3. Could the inductive component then remaining at the feed point be counteracted by increasing the capacitive reactance of the terminators, i.e. by shortening them? If so, can the number of DCR sections then be increased to improve the gain, without a net increase in the overall length of the antenna?

I investigated each of these possibilities, and made the following improvements in the design.

The Balanced Coupler Circuit

The previous coupler circuit, shown in Figure 3, which involves a simple autotransformer connection, can be redrawn as in Figure 4 to clarify ground relationships. Referring to Figure 4, the two halves of the RASER radiator naturally comprise a balanced symmetrical circuit with a virtual ground at the center. It is apparent that the shield connection is not isolated from RF ground and should ideally be placed at this center rather than at the right-hand side as shown. The unbalanced feed system shown does not discriminate against common mode coupling with its attendant feedline radiation. The circuit arrangement shown in Figure 5 would improve this situation by placing the shield connection electrically much closer to the natural virtual ground of the radiator.

I experimented with this change (Figure 5) and found that the RF current on the

Figure 1. 20-section RASER antenna (center-fed).

Figure 2. Capacitor assemblies in the DCR.

Figure 3. Coupler unit schematic (center-fed).

Figure 4. Original coupler unit (redrawn).
shield of the coax, as measured by an MFJ H-field Antenna Probe, was decreased substantially. Resonance measurements using a noise bridge led to changes in the value of capacitance required for resonance. This is consistent with the measured reduction of common mode coupling, further confirming that the answer to question 1 above is "yes." During these experiments I noticed a prominent resonance point some 100 kHz below the desired frequency of 3.953 kHz. This led to experiments answering questions 2 and 3 above.

Elimination of the Coupling Capacitor

As an experiment, I replaced the coupling capacitor by a direct connection, as shown in Figure 6. This leaves a substantial uncompensated inductive reactance at the feed point, which lowers the resonant frequency of the system. The measured resonant frequency of the 20-section RASER with the terminator lengths of 51' 4" was lowered to below 3.7 MHz. Thus, the answer is "yes"—the capacitor can be eliminated.

Re-Resonating the Radiator

I then made the terminators incrementally shorter, which raised the measured resonant frequency of the radiator. Since the terminators had been made shorter I was able to add more DCR sections for greater gain without any increase of the overall space required. These experiments showed the desired deep resonance nulls on the noise bridge with very satisfactory bandwidth. Thus, the answer to question 3 above is also "yes"—the capacitor can be eliminated and the number of DCR sections can be increased.

Thus, the procedure which I followed was first to add DCR sections and then to adjust resonant frequency by changing the length of the terminators. I found that increasing the number of DCR sections to 12 on either side of center and changing the terminator length to 29 feet gave a deep resonance null (signifying a pure resistance) on the noise bridge at a frequency slightly above 4.0 MHz. This indicated that, for my available space of some 200', I could increase the number to 30 DCR sections (15' either side of center). The final RASER design is shown in Figure 7.

The Final Design Values for Two RASER Radiators

At W2OZH, a two-element phased array is used so it was necessary to optimize the

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lengths of two parallel RASERS. This simply involves adjusting the lengths of the two identical terminator wires until the desired frequency, in my case 3.9535 MHz, is approached. The final design values are shown in Table 1.

The differences between the two RASERS are probably due to the proximity of nearby buildings, trees, etc. However, these measurements indicate a level of variation to be expected in other installations of this outstandingly effective antenna.

**Results**

The experiments described produced the serendipitous results of a simplified design which yields improved performance. The use of a coupler connection which is balanced to ground measurably decreases the feedline radiation due to common mode coupling. The elimination of the coupling capacitor simplifies resonance adjustment and the attendant shortening of the terminator wires permits the insertion of 50 percent more DCR units to further increase the gain of the radiator.

The modifications of the RASER described above were confined to the center-fed version because this configuration is suitable for my site. However, similar changes can be made in the end-fed arrangement. The procedure would only involve reversal of the input connections to the transformer in the coupler, elimination of the capacitor by direct connection, and experimental adjustment of the single terminator wire. All other adjustments should remain as described in the original article. Although the parameters indicated above are for the 75 meter band, the design can be modified for any other band. This would involve using the steps of design described in the original RASER article, but scaled for the chosen frequency of operation. It would be interesting to see the performance of a RASER designed for, say, 20 meters, where a high gain, linear beam antenna could be realized for point-to-point DX communication.

I have now used the 30-section RASER design in a two-element phased array for several months with even better results than for the previous 20-section version. It is my perception that the directivity has been improved and the large capture area of the system for reception brings about a dramatic decrease in fading of the signals. Results experienced when I have occasionally worked QRP stations lead me to believe that this would be an outstanding antenna for that application.

I wish to acknowledge the patience of many hams who have given signal strength comparisons as I switched several available combinations of RASER elements.

**Table 1.**

<table>
<thead>
<tr>
<th>Terminator Lengths</th>
<th>Tap Position</th>
<th>Resonant Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.5&quot; (east radiator)</td>
<td>25 lums</td>
<td>3.954 MHz</td>
</tr>
<tr>
<td>26.2&quot; (west radiator)</td>
<td>20 lums</td>
<td>3.948 MHz</td>
</tr>
</tbody>
</table>

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**Updates**

Nine to 10

Refer to the above article on page 56 in the July 1993 issue. KD4GRZ has pointed out a typo in the Parts List for the converter. The correct values are as follows: C4 - 0.01 μF, C7 - 0.01 μF, C8 - 100 μF, C9 - 0.01 μF, C10 - 10 μF electrolytic.

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73 Amateur Radio Today • October, 1993
As an avid CW operator who uses this albeit archaic mode more than any other, I was overjoyed to see MFJ introduce their new MFJ-451 Morse Keyboard; finally, an affordable, state-of-the-art product that will fit into nearly anyone’s station and budget! Even better, this item is almost totally self-contained and requires no connection to a computer to make it work, allowing die-hard CW ops like me to take it portable. (I say “almost” self-contained because it does require a source of 12 VDC power and cannot be operated from an enclosed battery—too bad. Its current consumption of about 250 mA DC—3 watts!—would not allow a little 9 volt Duracell or Energizer to last very long, anyway.)

I don’t know about you, but I’m really turned off by new products that take hours of set-up time and pouring through instructions to operate. This is probably why I only use computer software that is so intuitive it requires no more than loading in a disk to get going. The MFJ-451 is perfect for those of us who like to just “plug and play.” Although it is supplied with a well-written, nine-page instruction manual, reading the instructions is not prerequisite to using the keyboard as soon as you take it out of the box. I had mine on the air within about two minutes after the UPS shipment arrived!

The MFJ Morse Keyboard is actually two items: The keyer, which is enclosed in a tiny 1-1/4” x 3-1/4” x 4-1/4” (HWD) black metal case that also contains the power ON-OFF switch, sidetone monitor volume adjust control and monitor speaker; and the keyboard, which is a standard PC-AT keyboard with a normal five-pin DIN connector (just like any PC keyboard). The keyboard supplied by MFJ is made by Mitsumi Electric Co. in Malaysia and is of very high quality with an excellent “feel,” but any AT keyboard will work as well. The manufacturer warns that use of an XT keyboard, or using an AT keyboard switched to the “X” mode, will not work and may even damage the keyer, so if you don’t already have an AT-type keyboard, I’d surely recommend using theirs. Although there are other differences, an AT keyboard is most easily recognized by its row of 12 function keys (F1-F12) across the top, above the standard typewriter keys. (XT keyboards ordinarily have just 10 function keys F1-F10, located on the left-hand side of the keyboard.

Photo A. The MFJ-451 Morse Keyboard Keyer is primarily a keyboard, as you can see. The keyer electronics is all inside the tiny black box. The front panel contains only a volume control, status indicator LED, and sidetone volume control.
The keyboard supplied by MFJ with the Model 451 keyer has abbreviated operating instructions describing the 12 function key operations printed on a label placed in the upper-right corner of the keyboard. A key overlay or a long label placed above the 12 function keys might be nicer, but this thing is easy to get used to, and once you've used it for an hour or so, there's no longer any need to refer to the label, anyway.

The keyer unit itself is so small and lightweight that it could probably be "velcro" attached to most rigs in an out-of-the-way location. You really don't need to access its two controls (ON-OFF and sidetone monitor volume level) at all if your transmitter or transceiver has its own sidetone and you switch power to the keyer along with your radio. Although MFJ doesn't mention this in their instructions, you could also run the keyer off a regulated source of 5 volts DC with a minor rewiring job internally: Just rewire the "output" terminal of the 7805 regulator chip U5 to the "DC input" jack on the rear panel of the keyer, and it will run on 5V; however, if you do this, be sure to never disconnect that jack to a higher-voltage source, or you'll risk destroying the 80C32 keyer chip U1!

The keyer has just five rear-panel connections: Keyboard In (five-pin DIN), Power In (12 VDC, using a standard 2.1 mm coaxial plug with center positive); Paddle In, which allows use of a conventional three-terminal electronic keyer paddle, should you decide at some times to not use the keyboard (3.5 mm stereo "mini" phone plug); External Speaker Out, to override the internal monitor speaker (standard 3.5 mm monaural "mini" phone plug); and Keyer Out, which is the keyed line to your transmitter (RCA phono plug). The keyer output can be arranged to key both positive and negative-polarity transmitters and comes factory-wired to support positive-keyed solid-state transmitters. MFJ calls this "direct" keying (as opposed to "grid-block" negative keying, used in many older, tube-type rigs) and uses a VN10K power FET as the internal keying switch—a good choice of device for the application.

Like all keyboard keyers I've seen, the keyer uses a buffer between the keyboard and the keyed output line, so you can "type ahead" of your actual sending speed, up to a maximum of 200 characters. Adjusting the keyer sending speed to be precisely the same as your typing speed will result in "real time" sending, which is very tricky at best and leads to jerky-sounding sending. It is much better to set the sending speed to be somewhat slower than your actual typing speed, and use the "type ahead" buffer to take up the slack. Since I type at 75-80 wpm (375-400 characters/minute), and nobody can really copy code that fast, I found it convenient to set the sending speed (accomplished by depressing F3 and then typing a two-digit speed from "05" to "99" wpm) at a normal conversational rate of maybe 20-30 wpm. Then I happily type away at my more comfortable, faster speed. For a real typist, this takes no getting used to at all, but for a "hunt and peck" typist, this might take a bit of self-training.

To let you know that you're running out of buffer memory, the keyer sidetone frequency lowers in pitch when the buffer is filled to 180 characters. When the 200-character buffer is completely filled, the sidetone will sound an error message with all additional keystrokes. Pressing the "escape" key (ESC) on the keyboard while it is sending your type-ahead message will immediately stop the keying and clear the buffer. Pressing the "pause" key (upper-right-hand corner of the AT keyboard, next to "scroll lock") will stop the message, allow you to insert additional text using a paddle key, and not clear the remaining buffer memory; then, pressing the "escape" (ESC) key will continue playing the buffer memory where it left off before pressing "pause."

In addition to the sending speed being adjustable by keyboard command as described earlier, additional adjustments may be made for sidetone frequency (F2); keyer weighting (F4); two 100-character messages which may be preprogrammed (F5 and F7); playing the contents of those two memories (F6 and F8); putting your transmitter into the "tune" mode by sending continuously (similar to closing a hand key) by using another function key (F1); and even converting the keyboard space bar to a hand key (F12). When you're entering text into one of the memories, your keying sounds on the local sidetone monitor but the keyer does not key your transmitter. Another way to practice using the keyboard while it is connected to your transmitter, when you want to hear what you're keying in on the sidetone speaker but don't want the keyer to actually send a signal over the air, is accomplished by using the Key Output Disable function (F9). Two other function keys, F10 and F11, are used for serializing messages, such as would be required in the ARRL Sweepstakes and some other contests.

The MFJ Morse Keyboard is set up to send not only regular alphanumeric characters (A-Z and 0-9), but many amateur radio prosigns as well. These include popular prosigns like BT (double dash, used between thoughts instead of a period); HH (eight dots, used to indicate "error"); AS (standby); AR (end of transmission); SK (end of contact); as well as many not-so-popular ones like AL (new paragraph); SX (dollar sign, $); KN (response expected from one station only, directed) and so forth. To use the prosigns effectively, one must pretty much memorize which single key sends them. For example, BT is sent by using the = (equals sign) key; the error message (eight dots) is sent by using the @ key; AS is sent by using the & (ampersand) key, etc. Some of these prosign assignments aren't particularly logical and it takes some getting used to, but the limitation is the AT keyboard, of course. Again, a keyboard overlay provided by MFJ might help users remember these key assignments. Regular punctuation signs like , (period), , (comma), / (slash bar, used to indicate portable operation) and ? (question mark) use the regular keys that are so labeled.

The MFJ-451 also includes three "embedded command" functions which are addressed with two keystrokes rather than a single one. For the embedded commands, CTRL (the Control key, located on the lower left and right of the AT keyboard, below the SHIFT keys) is used along with the keys for L, P or S, depending on which embedded command feature you are using. CTRL-L creates a repeated message, like a beacon identification or a CQ, which, after addressed, will play repeatedly until stopped by pressing ESC (escape). CTRL-P allows the insertion of a timed pause within a message. CTRL-S allows the insertion of a sequential serial number within a message, and, to avoid wasting time, sends the letter "N" for nine and a "T" for zero, just like experienced CW operators do. These functions are all quite handy.

The message memories addressed by F5 and F7 (and played back by F6 and F8) are limited to 100 characters each, which is more than sufficient for anything I could think of. So that you needn't count characters when programming these memories, the sidetone pitch lowers in frequency when you type past 90 characters, letting you know you only have 10 characters left in memory.

The Morse Keyboard operates as naturally as a typewriter and does not require a lot of thinking during operation. If you make a typing mistake, simply press the BACKSPACE key and the keyer will erase the last character typed and allow you to make a correction.

The space bar inserts a word break space in the text, just like you are used to doing with a typewriter or word processor. The SHIFT key enables upper case characters if applicable. (In alpha text, the SHIFT key does nothing; but punctuations and prosigns can be addressed and changed with the SHIFT key.)

How does it work on the air? Like a dream. As I said, this product takes literally zero familiarization period for an experienced typist, and operates intuitively enough for immediate use right out of the box. I didn't get around to reading the instruction manual—which is printed with the bold warning "Always Read All Instructions Before Operating New Equipment" on its cover—until after my first couple of dozen QSOs. This is the perfect device for those who, like me, enjoy instant gratification
with a new "toy." Because I hadn't used any kind of keyboard keyer in years, I was just a bit shaky during my first few contacts and sent apologies in advance for any mistakes I might make: "Bear with me, OM, I'm using a brand-new keyboard keyer, so pardon my sending." No excuses were necessary, though, as I had it all under control right from the start. Everyone complimented my wonderful "list," although I wasn't doing anything, just happily typing my thoughts on a keyboard as I've done since I was a kid in grade school.

Dream On Department

When a product is this easy to use and so reasonably priced, I feel badly about asking for anything more. But nothing is perfect, and we hams are impossible to please, so here goes. The MFJ-451 does not make use of the numeric keypad on the right-hand side of the AT keyboard, so numbers must be sent using the numeral keys on the main QWERTY keyboard (top row). For those of us who are really used to using calculators, this is a tiny handicap: I'd rather use the numeric keypad and wish it were enabled by the MFJ firmware. Next, rather than two 100-character memories, I'd rather see four or five smaller memories. I never have anything so brilliant to send that it would require 100 characters, but I might want to use a bunch of smaller memories in a contest. Example: For contesting with a normal memory keyer (and paddle), I often load one memory with "WB2WIK;" another one with "ORZ? DE WB2WIK;" another with a full-length (3 x 3) "CO;" another with a short (1 x 1 or 2 x 2) "CO;" another with a brief contest exchange like "TU 599 03 DE WB32WIK BK;" another with a slightly different contest exchange like "TU 599 03 DE WB32WIK BK;" another with a full-length exchange like "TU 599 03 DE WB32WIK BK;" another with a slightly different contest exchange like "CU 599 03 DE WB32WIK BK;" another with a full-length exchange like "TU 599 03 DE WB32WIK BK;" another with a slightly different contest exchange like "TU 599 03 DE WB32WIK BK;"

"The MFJ-451 is the cat's meow (am I aging myself?) and definitely the thing for avid CW ops, or even casual operators who enjoy CW but are tired of banging away on a key.

"CFM TU UR 599 03 DE WB2WIK BK;" another with "CFM (or QSL) TU 73 DE WB2WIK ORZ?" and so forth. I'm used to this format, as most CW contesters are. Lastly, I wish the MFJ-451 didn't consume so much DC current and could be operated from a 9V battery so it would be a true stand-alone unit for portable work. (It does work on 12V, so most portable operations can support it, but this means another DC power cable, another set of connectors, etc.) Note: For home station operation, MFJ does sell a "cube" type power supply, the MFJ-1312B Power Adapter. Many hams will already own such an accessory.

Wrapping Up

The MFJ-451 is the cat's meow (am I aging myself?) and definitely the thing for avid CW ops, or even casual operators who enjoy CW but are tired of banging away on a key. If you're a reasonably good typist, it will give you a perfect "fist" which can be tailored to suit your liking. For the price, I can't believe every ham who ever operated CW won't want one. The MFJ-451 is available from authorized MFJ dealers (which are everywhere) and its suggested retail price is only $89.95. MFJ's address is P.O. Box 494, Mississippi State, MS 39762. They have two unique customer service programs: (1) If you are interested in any MFJ product, they will send you the owner's manual on request, free of charge; (2) If you buy a product and need technical assistance with it, they have a toll-free help line, which is (800) 647-8324. MFJ has come a long, long way from their start as a little company producing inexpensive ham accessories and I must commend them for growing rapidly and greatly expanding their product line, manufacturing all products in the U.S., and still remaining competitive in this very aggressive marketplace.
A New Look at a Simple VFO/Exciter

Stable tuning with minimal parts.

by Ken Cornell W2IMB

Some 20 years ago many experimenters became interested in the low frequency experimenter's band. To work this band, which ranges from 160 to 190 kHz, many so-called "LOWFERS" used self-excited oscillators to avoid the high cost of low frequency crystals.

As receiving techniques improved, including the use of extremely sharp filters, a stable transmitting frequency became necessary for serious communications.

When the CMOS 4000 series of Binary Ripple Counters (frequency dividers) became available, they permitted us to use high frequency crystals for control and provided divider outputs into the 160 to 190 kHz band. The 4024 and the 4040 were popular ICs using crystals in the 5120 to 6080 kHz range; using the "divide by 32" output would put you into the band. The frequency limitations on these CMOS 4000 series was 6 to 7 MHz.

Some years ago, the high speed 74HC series and 74HCT4000 series became available and these had an operational range up to 50 MHz. The pinout of the 74HC4024 and the 74HC or 74HCT4040 are identical to their CMOS 4020 and 4040 counterparts, with the exception that their operational voltage is 6 volts maximum, making them ideal for operating with a 5 volt regulator such as the 7805.

I got the idea of using a 74HCT4040 with a VFO operating in the 20.48 to 24.32 MHz range and using the "divide by 128" output for 160 to 190 kHz. In this case, any drift in the oscillator would be lessened by 128 times. The end result was an extremely stable signal.

Next came the thought: Why not use this same principle to build a 160, 80 and 40 meter VFO/Exciter? By using VFO tuning from 27.2 to 32 MHz, and by using "divide by 16" for 160, divide by 8 for 80 and divide by 4 for 40 meters, a stable VFO emerged.

Construction

I breadboarded several circuits and ended up with the version shown in Figure 1.

I intentionally used easily available disc ceramic capacitors to see how stable the VFO would be. Normally, silver micas and NPOs would be called for in a VFO. However, I was quite pleased with the stability after a short warm-up.

Since the oscillator is operating at a higher

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"Due to the light coupling and apparent stable load on the oscillator with the key in either the up or down position, keying is very clean."
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**Figure 1.** The simple VFO/Exciter and voltage regulator circuits.
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**Parts Description**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacitors</td>
<td>All High-Q disk types with values as shown.</td>
</tr>
<tr>
<td>Resistors</td>
<td>All 1/4 watt.</td>
</tr>
<tr>
<td>SW-1</td>
<td>Rotary switch, three positions used.</td>
</tr>
</tbody>
</table>

**Figure 2. Pinout for substituting with the 74HCT4024.** Note: When the key is used and up, plus bias is applied to Pin 2 which disables the device. When the key is down, Pin 2 is grounded and the chip becomes active. This also applies to the 74HCT4040 at Pin 11.

frequency than the used frequency, it can be left running and that helps the stability.

Due to the light coupling and apparent stable load on the oscillator with the key in either the up or down position, keying is very clean.

The only difficult part is getting the proper tuning range using the slug and tuning capacitor C1. If you don’t have access to a frequency counter, I suggest that you take the “divide by 16” output from pin 7 and tune your receiver to the 1500 to 2000 kHz range. Use a good variable capacitor of 50 to 75 pF for C1. Tune the receiver to 1850 kHz and with the tuning capacitor at mid-range, and adjust the slug in L1 to zero beat. The tuning capacitor should now be able to tune 1700 to 2000 kHz. If the capacitor is too large, you can add a trimmer capacitor in series with same and adjust the tuning to suit.

I suggest that, when you’re satisfied with the tuning range, a vernier drive be used for C1. Actually, a fixed capacitor for C1 could be used and the tuning accomplished by using the slug adjustment.

For those who wish to substitute a 74HCT4024, the pinout is shown in Figure 2.

As with any VFO, sound construction should be used and the circuit should be enclosed in a shielded cabinet.
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The ARK 40 QRP Transceiver

Enjoy synthesized tuning in a low-cost monoband rig.

I've said it before many times: "What the world needs is a low-cost synthesized QRP transceiver." Of course, all my friends tell me that's a pipe dream and I'll never see it. Well, it's the '90s—and the folks at S & S Engineering have made my dream come true.

The ARK 40

The ARK 40 is a fully synthesized QRP transceiver running 5 watts on the 40 meter band, a favorite QRP band. Band coverage is 7.000 to 7.1999 MHz. Several other bands are also in the works, including 20 and 30 meters. The ARK 40 is a CW only transceiver. Full break-in (QSK) keying is used in the ARK 40.

The ARK 40 utilizes a superhet receiver with a bandpass of 600 Hz. The receiver tunes in 100 Hz steps via a push-button thumbwheel. The four digits of the push-button tuning switch represent 100 kHz, 10 kHz, 1 kHz, and 100 Hz respectively.

Sensitivity is rated at 0.3 µV (10 dB (S + N)/N) with a blocking dynamic range greater than 75 dB. The third order intercept point is a rather impressive +40 dB. The ARK 40 comes to you as a kit, for under $270. An optional keyer is $40 and fits inside the ARK 40. The keyer is based on the Curtis 8044 chip. There is enough room inside to install your own keyer board, too.

The ARK 40 comes with a guarantee to work as specified or the manufacturer will fix it for you. If there is a problem caused by a fault of their own, it will cost you only one-way postage to the factory. If it's your fault, they'll fix it for under $25. The manual gives all the details of the guarantee.

A Look Inside

What makes the ARK 40 stand out among the rest of the QRP monobanders is the synthesized frequency control for both the receiver and the transmitter. By using two phase-locked loops, the expense and complexity of a microprocessor or Direct Digital Synthesizer is avoided.

Signals from the antenna must pass through a low-pass filter and a bandpass filter before reaching the diode mixer. The bandpass filter is approximately 300 kHz wide. The ARK 40 really holds its own during the nighttime SW broadcast station QRM, thanks to the excellent front-end filters. There is no RF gain control.

By generating a 19.0000 to 19.1500 MHz signal on the synthesizer board, and then injecting it to the mixer on the transceiver board, the result is a 12 MHz IF frequency. The IF filter consists of four matched crystal filters. The output of the crystal filter goes to a variable gain amplifier controlled by the AGC amplifier. The AGC provides good control of the audio, without a lot of pop and click. There are no clicks or thumps during keying. The AGC action is one of the nicest I've used in a QRP rig in some time. A MC3361 IC is used as a product detector and BFO.

By flipping the audio filter on, you insert a 200 Hz filter into the audio chain. Audio is provided by an LM386 audio amplifier. A sine-wave sidetone generator is injected into the audio line during transmit. The sidetone tracks with the front-panel audio volume control. You cannot change the tone of the sidetone.

On the transmitter side, again the synthesizer provides the necessary signals required by the transmitter preamplifier and the MRF-476 final. The final is biased as a Class-C amplifier. To steal a bit of thunder from my computer hacker friends, the transmitter is "what you see is what you get." The transmitter does not "shift" down in frequency when transmitting. If you have dialed up 7.040, you transmit on 7.040.

A relay controls the T/R functions of the ARK 40. This relay supplies the required transmit key voltages and toggles the antenna between receive and transmit.

First Impressions

It's true what they say about first impressions. Opening the box of the ARK 40 proved that old saying once again. I'm impressed! The kit contains all the parts you need to fully
putting together the ARK 40. The only thing you have to add is your time and some solder.

There are two main PC boards in the ARK 40, plus one smaller PC board for the thumbwheel buttons. The synthesizer board and the transceiver board are both the same size. Each PC board comes sealed in its own package with all of its parts. This way, you won’t get the parts from the transceiver board mixed up with the parts for the synthesizer board. Both boards are double-sided with plated-through holes. The parts placement guide is also silk-screened on the boards. The boards also have been solder-reflowed, which makes soldering the parts much easier.

Putting It Together

There are a lot of parts to the ARK 40. If you’ve never assembled a kit before, you’d better pass on this one. It’s not a kit for first-time builders. If you don’t know which end of a diode is which, don’t try the ARK 40. You should be comfortable working with double-sided PC boards and ICs. You should also be able to remove a part properly should the need arise. Removing parts from a double-sided PC board can be a real pooper!

Time is the one element on your side. If you take your sweet time this can be an enjoyable project. Kits should be fun! I had a good time with the ARK 40 on my workbench. In fact, I find it very relaxing to assemble electronic kits. My wife calls it “solder-fume therapy.” I assembled my unit during my Memorial Day vacation. The manual states it takes about 16 hours to complete, and I think that’s about right. Take your time and you’ll enjoy yourself.

Construction begins with the synthesizer board. One of the first things that really caught my eye was the quality of the parts used in the kit. There are ICs supplied by Harris, National, and Motorola. The same goes for the transistors—they really are marked 2N3904 instead of some off-the-wall surplus part number. All the parts are first-rate and there are no surplus parts used anywhere in the kit. In fact, as I found out later, even the SO-239 antenna connector is supplied by Amphenol; this is no humbug special.

Because there are so many resistors in the kit, that’s where you start construction. Now, either my eyes are getting bad or I’m getting old, but I had one hell of a time telling the value of some resistors from the rest. The violet and the brown on the resistors looked so much alike I ended up getting several in the wrong location. The violet paint must have been rather watery, and it sure looked a lot like brown to me. Take it from me: When building the ARK 40, measure the value of the resistors you’re not sure of before soldering them in place.

The kit contained many surprises. The 10k and 1k resistors are packaged separately from the rest of the resistors. This way, you don’t have to keep wading through the pile looking for them. The same can be said about the capacitors: All the 0.1 and 0.01 capacitor packages are separate from the other capacitors. You have no idea how much time that saves in building the ARK 40.

The layout of the PC boards allows you to stuff the board like you’re reading a newspaper. Starting from the top left, you go down the board until you hit the bottom, then start back up at the top middle and repeat until all the parts are installed. This way, you won’t spend all day long looking for R34 after you install R33. That’s because they’re right next to each other on the way down the board. This procedure holds true on both the PC boards, with some slight differences.

On the foil side of the synthesizer board you must install four surface-mount capacitors. They’re mighty small, but if you follow the instructions you’ll have no trouble soldering them in. S & S Engineering even gives you an extra cap in case you cook one. Don’t open the packages holding the surface mount caps until you’re ready to install them. There is no way you’ll be able to tell one value from another once they are out of their packages. Open only one value at a time, solder them in, then open up the other package.

Cables and Toroids

No one I know of likes to wind coils. So, you can relax with the ARK 40 as all the coils come pre-wound and each type comes packaged in its own little bag. You won’t have to count turns of wire on a toroid to determine if it’s T4 or L6. In fact, some of the transformers come with the leads pre-formed so you won’t get the phasing out of whack. If you do get confused, then you can always go to the oversized drawings which show you how to double-check the coils and install them properly.

Wiring the front and back panels consumes a lot of time with this kit (and with most kits, for that matter). Take your time and you’ll have no trouble with the connections. The wiring harness is color coded; it makes connections to the controls and the PC boards easy. Waxed cable lacing cord keeps the wiring from the front and rear panels to the PC boards nice and neat. I cheated here a bit and used nylon cable ties on the rear panel only. The front panel wires I laced up. Cable lacing adds a touch of class to the kit.

The Manual

Any kit worth its salt must have a strong manual. S & S Engineering should be very proud of the ARK 40 manual. There are the usual step-by-step instructions, but the manual doesn’t go into such fine detail as Heathkit does for installing components like electrolytic capacitors.

The manual features fold-out schematics for both the transceiver and the synthesizer. Oversized PC parts placement guides, as well as full side only overlays, are included. These overlays come in very handy when installing the surface mount parts. S & S Engineering printed their manual on quality paper and bound it with a spiral binding so it will lay flat on your workbench. There are plenty of oversized drawings to clarify the mounting of many parts. This is especially useful with the transformers used on the transceiver board. Full-sized photos complement the drawings, so you won’t install a wire in the wrong place. I found the photographs especially helpful when soldering the thumbwheel to its small PC board. If you get this part backwards (and that would be easy to do) it would be almost impossible to fix. The photographs show exactly how it’s installed on the thumbwheel.

But, even with the manual as good as it is,
there were several spots that confused me. Watch carefully the placement of the IC sockets on the transceiver board. The control relay IS mounted in a socket.

Also, I would like to have seen the step-by-step assembly instructions moved from the back of the manual to the appropriate area in the text. For example: The synthesizer board starts on page 3-1, but the check-off list for parts begins on the very last few pages. I had to flip back and forth between the steps up front and the parts check list in the back.

The manual has a very good section on theory of operation on both the synthesizer and the transceiver boards. It's well worth your time to read through these chapters. There's even a chapter on soldering!

There are also several pages on troubleshooting the rig. I would like to have seen an overlay of the PC boards, with transistor voltages listed, to help track down problems.

**Alignment and Tune-Up**

Although you can align the ARK 40 without fancy test gear, it would be worth your while to have a frequency counter and perhaps a scope, too. A good DVM is required, as is a power supply capable of 2 amps. A wattmeter and a 50 ohm dummy load will be required for tuning the transmitter. Alignment is very simple and straightforward. You simply check for the proper operation of the translation oscillator and the loop oscillator. A counter is best here.

The transceiver PC board requires minor tweaking to get it to operate. There are only two coils to adjust and two small trimmers to tweak. Again, a frequency counter would come in real handy to set the BFO frequency.

**Sometime the Dragon Wins**

The tune up went smoothly until I reached the transceiver board. The receiver showed no life at all. I could hear my test signal in the speaker, but that was all she wrote. After doing some rough tests, the receiver's mixer seemed to be dead. The audio chain worked and all the inputs from the synthesizer were there. But a call or two to S & S Engineering brought a quick solution to my troubles. Several areas were pinpointed and I went back to the workbench armed with new knowledge.

After a bit more looking I found the problem. It turned out to be a super-thin slice of copper on the PC board on one of the pads touching the ground foil, shorting out the input to the mixer. The pad is sooooo close to the ground foil that during the board's etching process a tiny piece did not etch away. A sharp knife cut the sliver away from the ground trace. That fixed the receiver and I was golden. Give S & S Engineering an "A" for support.

I notified S & S Engineering about the sliver and they promptly checked all in-house kits for the problem. No others were found, but this shows the attention this company pays to customer service.

**On the Air**

Operating the ARK 40 is, by design, simple! With only two controls, volume and RIT, you select the frequency you want with the push-buttons, then transmit. It really is that simple. Oh, but it does take some getting used to pushing buttons to change frequency, instead of twisting a knob. I found moving the 1 kHz button up and down the best way to hunt for stations. The buttons are small, and it's easy to go past what you want to tune in. After awhile, tuning with the push-buttons kin-
da grows on you. However, the ARK 40 is a not a contest machine.

This is the only QRP rig in the home-brew club that will allow you to QSY up or down the band with any precision. If you're asked to move up 2 kHz, you can! You can plan a schedule with a buddy back home while you're out in the field and not worry about mistuning the frequency. If you agree on 7.0335, that's exactly where you can go. There is no guessing as to what frequency you're on. It's amazing how stable the receiv-
er is. The ARK 40 does not drift, thanks to the synthesizer. It genuinely is "rock-solid." Of course, some will say even a synthesized rig drifts. That's true, but you would never notice unless you broke out the test gear on the ARK 40.

The MHz digit does not appear on the front panel. So, to "push up" 7.040 MHz, the front panel buttons would read "0400." If QRM is getting rough, then flip on the audio filter. Adjust the RIT to center the signal into the filter, and that's it. The RIT is very smooth and allows you to fine-tune the signal right into the center of the filter. The QSK keying works very well. However, the relay is a tad on the loud side.

Every station I worked commented on the nice CW tone. The ARK 40 keys very well. The sidetone is pleasant to listen to, even af-
ter a long-winded CW contact.

The front end keeps most unwanted sig-
als from creeping into the receiver. The matched crystal filter did an effective job on the 40 meter band. Signals seem to pop out of the air. Switching in the audio filter proved useful in pulling stations out of the QRM 90 percent of the time. The ARK 40 sounds so good on receive that I leave it on all the time.

The ARK 40 would be quite happy at home or in a backpack. On receive, it draws 380 mA and my unit produced a fat 5 watts at 1.12 amps. The supply voltage is 13.8 volts. Of course, on a 12.5 volt battery, you'll get a little less RF output. You could run the ARK 40 with one or two 7 amp/hour gel batteries in the woods. A small solar panel is all you would need for long-term use in the field.

With its extruded aluminum case, the ARK 40 is military-grade solid. One would have to try hard to damage it. In fact, had the front and rear controls been waterproofed, I'd take it white water rafting and leave the baggage at home.

So what's the bottom line? The ARK 40 is exactly what the QRP enthusiast (or any ham, for that matter) needs: a simple-to-use monoband rig. S & S Engineering provides you with a rig that produces enough kick to make contacts with less than perfect anten-
as, while providing the luxury of a fully syn-
thesized transceiver. If you enjoy building kits and like operating with today's technology, you can't go wrong with the ARK 40.

What I would like to see next is a small an-
tenna tuner and switching power supply in the same size case as the ARK 40. A pipe dream? Perhaps, but then who knows?
The JRL-2000F is the world’s first MOSFET HF linear amplifier, designed using the same high technology found in JRC’s professional high-power radio transmitters. Featuring a heavy-duty power amp that incorporates 48 RF power MOSFETs to ensure low distortion and clean output up to 1,000 watts (100% duty cycle, 24 hour) SSB/CW, plus a high-speed automatic antenna tuner with memory capacity of 1820 channels for instant QSY. Plus a high efficiency switching power supply (80V-264V) with power factor correction to suppress AC line currents, an automatic antenna selector for up to four antennas and a wireless remote control unit.
Amateur Radio and Amateur Solar Astronomy

There’s going to be an annular solar eclipse on 10 May 1994. Solar eclipses are spectacular astronomical events in which the moon passes between the earth and sun, temporarily blocking the sun’s rays from reaching earth. For a few minutes, the swath of the earth along the eclipse path is bathed in darkness. A total eclipse occurs when the perceived diameter of the moon is such that the sun is totally covered, except for the corona. An annular eclipse, such as the one next May, occurs when the apparent diameter of the moon is smaller than the sun, leaving a ring of light hanging in the sky. Radio propagation is affected by the solar eclipse because, for a brief period of time, the source of energy that causes ionization is interrupted so the average electron (e-) density changes. The e-density in the F-layer determines the maximum usable frequency (MUF), while the e-density in the D-layer determines the lowest usable frequency (LUF). Figure 1 shows the path of the annular eclipse that will be seen next May . . . note the times are in U.T. (i.e., GMT or “Zulu” time).

What Kind of Ham Experiments Can Be Done?

A review of the amateur radio literature shows that a number of formal experiments and observations have been performed during eclipses over the years. As you will see, there’s plenty of real science that you can do with your radio.

Schellenbach (1970) describes observations made on the 40 meter ham band during the eclipse of March 7, 1970. He erected a 13, horizontally polarized wire antenna that had four main lobes spaced at 54 degrees from the wire. The antenna was erected at a height of 1/2 in order to place an elevation lobe at about +30 degrees to optimize D-layer observations. Schellenbach observed a 25 kHz portion of the 40 meter band, working stations and observing signal level changes as the eclipse passed over the land.

Another observation of the 1979 eclipse was reported by Kennedy, et al. (1972). This experiment was performed on the 75 meter amateur band, using CW emissions. Stations 190 km apart arranged to use identical special transmitter keyers that would produce a two-second signal on 3,570 kHz every four seconds; the two stations alternating sending signals to each other. The receivers of the stations had the automatic gain control (AGC) function turned off. Output levels were measured with an AC multimeter connected across the speaker connections. As a precaution against ground wave contamination of the data, the antennas of the two stations were oriented end-to-end, so ground-wave signals would be off the nulls of the antennas. The data collected consisted of groups of 10 two-second transmissions, spaced four seconds apart, at intervals of one to two minutes. The 10 pulses in any one group were averaged, and the averages of the groups were compared. A maximum signal change of 17 dB was noted. The two stations took data for a week prior to the eclipse in order to establish a normalized data set.

Menzel (1976) discusses potential observations of the effects of the eclipse of 23 October 1976 on propagation in the upper HF region, i.e., the 10 through 20 meter amateur radio bands. It was noted by Menzel that during the period of the eclipse there would be a brief return to nighttime propagation conditions for communications paths along, and either side of, the eclipse totality path. This same type of observation is open to short-wave listeners (SWLs) as well as ham operators. The ham operators have a definite advantage, however, because they can schedule contacts with stations in the regions of interest, and don’t have to wait stations of opportunity to appear. Like Kennedy, Menzel recommends that amateur operators set up schedules for a week prior to the eclipse, at the same time of day, in order to establish a baseline of signal level averages. Otherwise, the measurements made on the day of the eclipse would be less usable.

Johnston and Johnston (1979) performed radiosolar observations of the 26 February 1979 eclipse that crossed the northwestern United States and the western provinces of Canada. They were part of an experiment that used the 75/80 meter band. A set of 12 stations participated, six transmitting in rotation on a two-minute schedule, and six monitoring the others. The transmitting stations sent a five-second identification (call-sign), followed by a two-second quiet period to establish ambient noise level, and then held the key down for 12 seconds to establish signal levels.

Figure 1. Path of the solar eclipse (from a NASA publication).
Receiver S-meter readings were used to establish levels. They observed the effects for three hours, keeping time records in universal coordinate time (UT) through radio station WWV transmissions.

An alternative to using amateur transmitting stations was reported by Smith (1979). He used observations of WWV and several 50 kW AM broadcast band stations to study the propagation effects of the eclipse.

Lewis (1979), in a report preceding the 1979 eclipse, reported on his own literature search. He reported that a Canadian team of scientists at Fort Churchill, MB observed the 20 July 1963 eclipse. In that event, 94 percent of the solar disk was covered. The Canadians used sounding rockets sent to an altitude of 200 km to measure electron density, temperature, ultraviolet and X-radiation. They found that the electron density in the D-layer dropped proportionally to the percentage of the solar disk eclipsed, starting within approximately three minutes. In the E and F1 layers, however, it was found that the electron densities decreased but it was NOT proportional to the percentage of eclipse. The team believes this non-linearity is due to the fact that X-radiation is emitted largely by the sun's corona, which is not eclipsed. Such radiation is largely attenuated by the time it reaches the D-layer, so the effects in that region are more linear.

A group in Urbana, Illinois, USA, used a 2.66 MHz ionosonde instrument to observe a 60 percent eclipse on 10 July 1972. They noted a large decrease in e- at distances of 75-80 km.

### Observing solar eclipses by eye can be very dangerous!

Don't look directly at the eclipse, even briefly. Indirect methods can be found in amateur astronomy books.

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Australian researchers observed the eclipse of 23 October 1976 (see also Menzel 1976, above). The Australian observations measured the angle of arrival of 2.5 MHz signals from a station 69 km away. They noted a "...pronounced oscillating tilt" of the E-layer at 100 km, which lasted some 40 minutes.

Some General Radio/Solar Observation Advice

When looking for shortwave fade-outs from SIDs, take advantage of the fact that absorption varies with the square of the frequency (F2), so observations should take place on a frequency as close as practical to the D- or E-layers of the ionosphere. Lewis recommends using frequencies that are most affected by D-layer, so he prefers frequencies in the 75/80 meter band, or near 5 MHz. He claims that the greatest signal enhancement will occur just before totality reaches the receiver observation site.

**WARNING!**

Observing solar eclipses by eye can be very dangerous! Don't look directly at the eclipse, even briefly. Indirect methods can be found in amateur astronomy books. Every time an eclipse occurs, it seems that we hear stories of people who look directly at it, only to have the image burned into their eyeshine forever. And if they use a telescope or binoculars to look at the eclipse, then immediate destruction of the eye-sight will occur. If you absolutely MUST look at the eclipse, consult an ophthalmologist for advice on methods and materials that will save your eyesight.

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References and Notes:

- Kennedy, Jim; John Schaubie; Jerry Almoch; and Don Roberts; "D-Layer Absorption During a Solar Eclipse," QST, July 1972, p. 40.
- Smith, Roy E.; *Beacons Provide Eclipse Propagation Data*, QST, July 1979, p. 16.
Getting Started with TCP/IP

This article explains how to set up a working TCP/IP station. This first installment will sell you on the idea; next month we'll get started with the software itself. The software needed is all available free from many sources (relayed ones might be listed where available). Much of it will be available from the 75 BBS (603/924-9343), though those of you with access to Internet FTP are much better off using it when possible. Some of this first installment is a review of things you may have seen before—for this I apologize. I wanted to be sure that the series was complete.

So many of you have written—by paper mail and electronically—asking about TCP/IP and ham radio that I have decided I had better write something about how to do it before you start showing up at the door. This series of columns is designed to give you an introduction to TCP/IP over radio, and some how-to-do-it information.

The best way to get started in TCP/IP is to find someone who is already using it, but I’ll do my best to explain the ins and outs to the shy and isolated out there.

What is TCP/IP?

TCP/IP (Transport Control Protocol/Internet Protocol) is a networking scheme developed by ARPA (The DoD’s Advanced Research Projects Agency) to make possible the huge collection of computers, cables, routers, and all sorts of other boxes known as the “Internet.” The Internet (note the big “T”), is worldwide and carries a mind-boggling amount of data each day. Nearly every university, large company, small technology company, and government agency is connected to the Internet.

Amateur radio is also connected to the Internet, and amateurs worldwide use the resources available there for communications and database services. In fact, as amateurs we have our own network: 44.xx.xx.xx. Any IP address starting with “44” is some sort of amateur station. (We’ll look at how addressing works later.)

This 44.xx.xx.xx network lets amateurs send mail to (and connect to) stations all over the world. Internet-based services such as the Ottawa conversant bridge—which allows real-time chat among hams from all over the world—and the Call Sign database, SUNY Buffalo—containing up-to-date callsign records for all US hams—count on the Internet connectivity of the Internet to bring you their services.

Some amateurs will tell you that TCP/IP is no ham radio because it uses landline-based resources. To these self-appointed guardians of the ether I say, “Phooey.” (Pretty eloquent, eh?) If you don’t like it, don’t use it—but leave those of you who want to use the 20th century alone. Those of you running full-service BBSs take note: The Internet moves packet traffic fast! More and more stations acting as gateways from the landline-based Internet to the various radio LANs across the country mean fast, error-free routes for your forwarding, if you know where to look.

All of these resources and more are available through TCP/IP protocol suite. TCP/IP is a protocol—a set of rules—by which communications of various types can be accomplished. If you are familiar with the idea of “diplomatic protocol”—the set of rules that govern the behavior of government representatives dealing with each other—then you have some idea of what I am talking about. With TCP/IP, stations have a way of contacting each other, establishing a communications channel, and packaging data for transmission.

What About Amateur TCP/IP Over Radio?

In 1989, Phil Karn KA9Q released a program called NOS to the ham community. This program was a first attempt at implementing TCP/IP for use on IBM/PC compatible machines for use over radio. It was—and in many respects still is—an experiment. KA9Q’s NOS still provides the kernel—a technical term for the heart of an operating system—for the various implementations of TCP/IP hams use today. Since Phil provided the source code to NOS, many ham programmers looked at the toehold and began to develop variants. Today, the resemblance to the original can be remote, but we owe thanks to Phil for his original work—It started a revolution.

Two things make TCP/IP a very powerful networking scheme for amateur radio. One we have already discussed—the wealth of the Internet. When we use TCP/IP over the air, the use of the landline-based Internet resources is automatic and transparent—like going to a cafe in France and ordering in French. The other is the protocol itself. TCP/IP is based on the idea of services. Each of its various features is a service, and is accessed through a port or socket. This arrangement makes everyone both a client (user) and a server (provider) if they want to be.

TCP/IP Services

There are four services which amateurs will find themselves using most frequently. These provide ways of connecting to other stations and transferring data. These services are the same no matter how you get to them—phone line, Ethernet network, or radio.

Telnet

The telnet service is the workhorse of the TCP/IP environment. Telnet allows a client to start a terminal session at a remote server across the network. In other words, you can login to a remote machine—wherever it happens to be—if it is reachable from your network. In the ham community, telnet is generally reserved for accessing database servers and the like. (See Figure 2 for an example. Telnet was used to reach this Internet resource.) Telnet can also be used to login to another ham’s station in order to use the mailbox or other resources that might be provided. To continue the call server example, some NOS implementations now support CD-ROM-based callbooks. This could be accessed via telnet.

FTP

The File Transfer Protocol Service allows clients to download or upload files (binary or text) from an FTP server. This is an interactive system and allows the client to change directories, list them, and select file(s) to receive. Batch downloads are supported. If you have tried to download files from an AX.25 station you know it can be frustrating. FTP works like a charm. Recently, a friend downloaded about a quarter of a megabyte of files from my machine—at 1200 baud—in about an hour.

Finger

The finger service allows a client to get information about a particular system or user. The command

```
... connected to 128.205.32.2:2000
Callbook v.1.3 Bug reports to bowen@cs.buffalo.edu Type
'help' for help
>> call whnd
Call-Sign: W9SD
Real Name: WAYNE GREEN II
Birthday: SEP 3, 1922
Mailing Address: WOE CENTER, PETERBOROUGH, NH 03458
Valid From: AUG 11, 1987 To: AUG 11, 1997
```

Figure 1. A typical Sunday afternoon on the conversate bridge. It's very late in Europe, or you would see more stations from there. Thanks to the Internet, local conversate bridge programs from all over the world are linked together in a big party line. See the text for more.

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finger n1evo@k9iu.ampr.org

will cause the client machine to connect to the finger server at K9IU and make an inquiry about N1EWO. K9IU will then return an informational message about the user N1EWO, providing an informational message whose content is dependent upon K9IU's configuration.

Finger can also be used to provide other sorts of information. For example:

finger weather@lugate.iugu.indiana.edu returns a weather report for Central and South Central Indiana.

Converse

This service is VERY popular. You can see an example screen from the Ottawa converse bridge in Figure 1. The converse bridge can be a local service, or it can be linked with other bridges over whatever comm link is available. This service is a great deal of fun, and can be truly useful for emergency nets when administered properly. (Those of you who have Internet connections already will find the bridge at 44.135:96:7:3600. You must connect from the amateur net: 44.xx.xx.xx. Connections attempts from any other net will be ignored.)

Yet Another Service . . .

One more service to mention is called SMTP (Simple Mail Transfer Protocol). Through SMTP, amateur stations can forward their own mail! No more need to login to some remote machines on it. This means that Internet resources, like list servers which automatically route messages to special interest groups, are available the ham.

Once again we are in France—these two protocols come from the Internet, and so work perfectly across it and with the Internet.

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More on the Amiga

I have been taken to task, I admit it, and I accept the criticism, and I will tell you all about it.

In July, I related the remarks of a ham who told us about his "friend who has a confirmed satellite QSOeer. This guy has very elaborate radio equipment, but is using a C-64 for tracking and logging. Now, the bit rate has not exceeded 1200 baud, so he has been able to get away with a C-64. Soon, however, things are going to change. The new packet satellites will operate at 9600 baud, and my friend will have to change computers.

"This person will not use a computer for anything other than amateur radio. Therefore, I would like the changeover to be as inexpensive as possible. It is possible that a Commodore 128 could read and write ASCII at 9600 baud! If this were possible, I believe that he might be able to continue to use his disk drive and printer.

"I feel certain that an Amiga A500 could do it, but I hesitate to recommend a computer which is now an orphan. Please roll this around and let me know what you think. Perhaps there are readers of the column who are facing the same choice."

In my response, I indicated that a PC clone would be a good choice. One of our readers, who wishes his name not be printed, is using our "lack of knowledge about Amigas."

"First of all, the Amiga is most definitely NOT an orphan, not even the A500. There are upgraded machines and an improved operating system. Because of the Amiga operating system's construction, NONE of them have been orphaned. The new AGA (Advanced Graphic Architecture) models are the Amiga 1200, and the Amiga 4000, which Commodore has just spent millions to develop. The older models are the 500, the 2000, and the 3000. Ask the video industry about the Video Toaster . . . they will be surprised to know that the Amiga is an orphan, which is what your column implied. Almost all software that is written for the new Amigas will work on the older models, including terminal programs, ham radio software, graphics software, etc.

"He goes on to elaborate on published reports of the "death" of the Amiga which, as with the case of Mark Twain's death, are apparently exaggerated. In all, he makes a strong case for the Amiga as a capable machine, with a mature multitasking operating system, and a plethora of features built in.

"Now, I would like to point out that it was not I who called the Amiga an orphan—I was quoting a reader, much as I quoted our supporter this month. As to why I have not written more about the Amiga to date, I have heard precious little about it from the readers of this column. Wayne has mentioned the Amiga in his editorials, including the Video Toaster.

"I looked back over the last few years of "RTTY Loop" to see just what coverage the Amiga has received. In March 1988 I printed a simple terminal program for the Amiga. In August 1988 a copy of a public domain program for the Amiga was offered for a blank disk and a mailer, through another reader. November 1989 brought the note that "Amiga users are also on the rise, with Amiga Users Nets on 10 and 75 meters, as well as a number of Amiga users on 6 meter AMTOR." Another user was highlighted in March 1990 with the comment that "hams using Amiga computers seem a bit more versed on the intricacies of this mode." A listing of shareware and commercial RTTY programs for the Amiga was given as well.

"So, look! I have not ignored the Amiga. For that matter, if you look back in this column, I have not ignored much. How much coverage I give to a given system is directly proportional to how much input from the readers, and even from manufacturers, I get. So, stay tuned, be vocal, and let me hear from you!

Other Questions

Here's a question, for example, from George Lestern WM50YP of Falls Church, Virginia. He wonders where one can get a diagram for the Doveaton adjustable filter RTTY demodulator, model MPC-1000. Somehow, I am sure that some reader, somewhere, can help you out.

"He also asks about the HAL ST-8000 spectrum display. He'd like to make a scope display which would give an indication of the modulation frequencies and/or FSK type modulation. Once again—anybody?

"Finally, here's another request for help, this one from the other side of the globe. Michael Mihailovic VK2OZ in Sydney, Australia, tells of his recent acquisition of a 1984 vintage Kantronics Universal Terminal Unit. He needs help finding a terminal program to run the unit, one with transmit buffers and a type-ahead facility. He wonders if anyone is still using this decade old unit.

"He also relates that although he has the operator's manual, he is missing the "Introduction To Operation of AMTOR" book that originally came with the Kantronics UTU. He would like to have this book to get onto AMTOR, but is having no luck locating a copy. Kantronics told him to contact a local Australian agency, which had no idea what he was talking about. If a copy of this book, one would presume even a photocopy, is lying around, this is one amateur who would be very grateful. I would be happy to forward any such material to him, and look forward to hearing from you, out there, who can help.

One of the programs in the RTTY Loop Software Library may well be at least the software answer to Michael's problems, or even yours. The collection continues to grow, with three discs of RTTY/ham software and one of archiving utilities. I try to always include the latest versions of programs available, so even some of the basic disks are subject to updates. A self-addressed, stamped envelope, or an Email note, will get a listing of all programs and disks. Each collection pretty well fills a 1.44 Mb disk, and is available for $2 per disk to be filled, sufficient blank media, and a self-addressed, stamped disk mailer for return to you. As always, Email me on CompuServe (ppn 750036,2501), Delphi (internet name MarcWA3AJR), or America Online (screen name MarcWA3AJR) is the quick and easy way to reach me. Postal service hard copy to the above address is fine, too. Just be sure to enclose a self-addressed, stamped envelope if you would like a personal reply. If you would like to put your two cents in, and don't want your name printed, that's fine too, as long as you tell me who you are! I won't print or pay much attention to an anonymous letter, but I will respect your request for privacy if you like. Above all, write me! This column reflects the interests of its readers, and I read those interests through your letters. I look forward to hearing from you.

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Radio Direction Finding

Foxhunt Fun at the Friendship Games

"An unstable weather pattern is returning to southwestern British Columbia," the weather radio voice coming from my wife April's scanner was discouraging as we awoke on Wednesday, June 23, our first full day in Victoria. Summer showers are the rule rather than the exception on the western Canadian coast, but we were hoping for better conditions for the 1993 Friendship Radiosport Games (FRG-93), just two days away.

Heavy rain had pounded our rental car as we waited for the ferry from the mainland to Vancouver Island the previous day. Such a storm during the FRG-93 radio direction finding contest (the foxhunt) would not be welcome.

To the green-thumbed residents of Victoria, abundant rain makes this provincial capital a perfect place to live. Flowers are everywhere. You see them on lawns, in gardens (called "rockeries") and hanging in uncountable numbers of baskets. We admired them as we made a get-acquainted trip to Thetis Lake Park, the foxhunt venue. We then drove to the Carey Road campus of Camosun College, where special events station VE7G had been active for several weeks.

Station Manager Al Faat VE7XZ was proud of VE7G, but April and I wanted to visit another of his hamshacks that is just as special. After a short drive we arrived at VE7GRH, in the rehabilitation unit of Gorge Road Hospital. Al introduced us to two of the patients who put this station on the air regularly using voice, CW, and packet.

Like other stations in Victoria, VE7GRH was using the special X07 prefix made available for the Friendship Games. Al and his friends had installed special adaptive equipment such as oversize switches, voice-read-out rotor controls, and puff-sip keyers to make this station accessible to anyone, even those having no use of their arms and legs (Photo A).

The Mini-Summit

Now it was time to begin last-minute preparations for the Games. We had been invited to the home of Perry (VE7WWW) and Anne Creighton to dine and to finalize rules and procedures for the FRG-93 foxhunt.

"It's only a couple more places at the table," Perry told us, referring to his current house guests, Evgeny Stavitsky UWOCA, wife Olga, and interpreter Raisa Kucheryavenko UA6GJO. Evgeny is president of the Friendship Amateur Radio Society (FARS) chapter in Khabarovsk, Russia. He led the 15-member Russian delegation to these biennial Games.

Raisa is not only excellent at her translating duties, but is also a superb conversationalist in her own right. Anne insisted that all radio talk be postponed until after dinner, so we spent two delightful hours getting acquainted and learning about our respective lifestyles.

After dessert, we got down to business. Although Perry had never entered nor witnessed a ham radio foxhunt, he had agreed to organize this event, as Vice President of the hosting FARS Victoria chapter. Evgeny represented the Russians, and I represented Foxhunt Team USA.

We agreed to follow the International Amateur Radio Union (IARU) guidelines for foxhunting championships as

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Scoring is determined primarily by the number of transmitters found, and secondarily by elapsed time. Contestants are individually timed. They start at five-minute intervals, each contesting with the start of fox #1 transmissions. This scatters the contestants on the course to minimize "follow the leader" problems.

Successful foxhunters pay attention to the bearings of all transmitters at all times, plotting them on maps provided by the organizers. They also eye their watches, since exceeding the three-hour time limit means disqualification. In other words, it is better to return after 175 minutes with only one fox found than to find all five in 185 minutes.

Each country may field one or more teams of three to five contestants each. Team score is a function of the best three individual scores. Team members not completing this age group have another team on the course. In addition to team medals, corporate sponsor Advanced Electronics Applications provided medals for the top three individual entrants.

IARU rules for foxhunt championships call for separate categories for seniors (males under 18, women age 55 and over) and for "old-timers." Only seniors are required to find all five transmitters in IARU European/Asian events; others need find only four. Because there was only one junior (Photo B) and two women (Photo C) among the contestants, we agreed that there would be no special categories in FRS-93. Everyone must attempt to find all five transmitters.

The Russians fielded two teams of

Photo B. Ben Young VE7ATJ, the youngest competitor, has just found his first fox and is looking for #2 with one of the Japanese RDF sets.

Photo C. Svendall Boltskogn UAOCNE, one of two YLs participating in the foxhunt, leaves the starting corider. She used a three-element Russian RDF set.
four members each. The three-member Canadian team was joined by Yoshiko Yamagami JQ1LCW, the only participant from Japan. Kevin Kelly N6QAB, J. Scott Bovitz N6MI, and Randy Seybold K5TTE competed from the USA.

By the time our rules were finalized, it was getting late. After the traditional toast of Russian vodka to seal the agreement, it was time to go.

Testing...

Perry was admittedly no foxhunt expert, but he had obtained expert assistance. He had called the VictOriOrients, who hold regular outings in Theiss Lake Park. Alan Philip, one of the organization’s leaders, volunteered to help, and brought several other members for timing and Course duties. No one knows the park better than Alan, who was chief cartographer of the beautiful 1:15000 topographical map supplied to the contestants.

At orienteering events, contestants navigate their way through unfamiliar wooded terrain using only a topo map and compass, looking for previously placed controls (red and white flags) at locations marked on the map. Radiosport foxhunting is similar to orienteering; locations of flags coincide with the fox transmitters. (But foxes aren’t marked on the map, of course.)

Alan had suggested five fox sites, which we tested Thursday. Total distance around the course would be 4-1/2 kilometers. That’s not easy, but it’s much less than the 12 km courses common in European championships. Evgeny UW0CA and April UAOCZ supplied the foxhunting gold medal were (left to right)

Igor Krivosheev UA3CCZ, Mikhail Zavarakhin UW2CN, and Alex Sevin UA0CDX. They accepted the award at the Saturday night banquet.

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These dual-antenna units, which work on the time-difference-of-arrival (TDOA) principle, give only direct indication, without strength information.

TDOA sets are susceptible to bearing errors caused by multiple signal paths (multipath). The direct signal competes with reflections from nearby objects, such as hills and trees. When using a TDOA RDF set, it is necessary to keep moving and take bearings very frequently to average out these multipath effects.

The Russians volunteered to provide the competed RDF sets for FRG-93. They brought 10 receivers (model Alai-145) from the Barnaul Radio Factory in their country. Alai receiver circuits are clearly built into the boom of two- or three-element beam of flexible steel tape for safety in the field. There is an AM detector (which also works on FM signals) and a pseudo-BFO that serves as an audible strength indicator for distance estimation.

Alai sets were available for all contestants to use, but some chose to use others. There were a couple of Japanese RDF sets with HICBCU two-element arrays and two of the TDOA units. Russian and Japanese hams have only 144 to 146 MHz into 2 meters, so course transmitters were modified to operate on 145.725 MHz. With no crystal or ceramic filter, the single-conversion Alai receivers are rather broad. But they worked well on this hunt, except for minor QRM from local packet operations on 145.69 MHz.

Banking Signals Off the Lakehouse

It was our intent that the 1993 foxhunt course be less arduous than 1991’s, giving better scores. All foxes were placed near established trails in the southeast corner of the park. The Russian RDF sets picking the proper 4-1/2 km trail loop would pass close to each one.

Foxhunt Friday brought perfect weather and no malfunctioning of equipment. But to everyone’s surprise, scores were poorer than in 1991, overall. Only three competitors found all five foxes. The average was 2.1 foxes found per contestant.

The Russians were clear winners, though they averaged only 3.1 foxes each (Photo E). No doubt their familiarity with European/Asian style foxhunting and the RDF gear gave them an advantage. But they are also in very good physical condition, when you consider that their team’s average age is 40.

Hunters who didn’t do well were probably users of signal reflections again. This time, however, the bounces came from more distant points. The signal path from fox #1 to the start was unobscured, so most hunters found it. But the direct path from #2 to #3 to #1 was blocked by 200-foot hills.

Sometimes the signal propagated from foxes #2 and #3 by passing over a big lake to the west of the course or a marsh to the northwest, then bouncing off hills on the opposite bank to get back to hunters at the start or at fox #1. In such cases, the classic principle of RDF comes into play: “Your RDF set indicates the direction of incoming signal, which may or may not be in the direction of the fox.” Often, it wasn’t. Hunters following reflected signals were drawn into the vast interior of the 2200-acre park. Perry says there is a nude beach somewhere on the lake shore. I wonder if any of the contestants discovered it!

Try It Blindfolded

If North American hams are going to hold our own in future European/Asian style foxhunts, we must make them regular events here, to gain experience and to train future champions. To encourage the hams of Victoria, the Russians put on a demonstration Sunday at the FRG hamfest grounds.

To make it more interesting at this flat, treeless campus, attendees were invited to try finding a fox while blindfolded, using only the audible indications of a Russian RDF set to get bearings (Photo D). What fun—maybe this should replace transformer tossing and GLF (left-foot CW sending) contests at our summer hamfests!

Beautiful scenery, friendly competition, exercise, radio talk, and international goodwill—FRG-93 had it all. I could go on about the CW sending and the pile-up contest, the special events station, and the N6MI/KSTTE QRP Field Day in the park, but I want to leave room for plenty of photos to inspire you to add on-foot foxhunting to your club’s RDF activities.

The hams of Khabarovsk, Russia, are hosting the next Friendship Radiosport Games in 1995. You’re invited. It’s not too early to start training. Let’s win some medals and help bring the big FARS traveling trophy back to the USA!
HAMS WITH CLASS

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NASA Resources
There is such a plethora of books, pamphlets, videos, and other resources out there for teachers to avail themselves of that it sometimes seems like an overwhelming task just to categorize and zero in on where to begin looking for needed classroom materials. With that in mind, I'm dedicating this month's column to helping teachers and instructors of amateur radio to quickly locate some of the resources that NASA has to offer.

With more and more schools participating in SAREX projects, the need for highly motivational lessons and materials about space travel and communications is becoming greater. Ever since my school's SSTV contact with Tony England WOORE on board the Challenger in August 1985, I've always included a unit on space and communications in my ham radio curriculum. The materials are always current and overlap very nicely into science and current events studies. My sixth-, seventh- and eighth-graders really love this portion of the curriculum, and it provides fabulous follow-up and enrichment activities in the classroom.

On March 2, 1993, NASA's education staff met with five aerospace education organizations for an overview of each of their programs and a discussion of how NASA can work with them in supporting NASA's Strategic Plan for Education. All five organizations have programs complementary to NASA and all support pre-college education.

1. For eight years now, The Young Astronaut Council has targeted students in the K-9 age group. The YAC supplies space-themed curriculum packages and a teacher's handbook for $40 annually. Chapters are often funded by community groups such as the PTA, Kiwanis Club, Civil Air Patrol, and Air Force Association. The Council now offers a "distance learning" program using satellite technology to beam space curriculum programming three days a week from their Spokane, Washington, uplink. The Council also recently developed a curricula, specifically targeted to reach minority students, through funding from the National Science Foundation. For further information, contact The Young Astronaut Council, 1308 19th St. N.W., Washington DC 20036; (202) 692-1899.

2. U.S. Space Camp, a nonprofit educational organization, is open to students in grades 4-12, and to educators who may participate in graduat or in-service teacher training, workshops, and conferences. The main goal of Space Camp is to motivate students to study mathematics, science, and other high-technology subjects. More than 150,000 students have graduated from Space Camp programs since 1982. Space Camp tuition ranges from $440 to $750, excluding air fare. Scholarships are available in three categories: scholastic achievement, ethnic background, and financial need. For further information, contact: U.S. Space Camp, P.O. Box 070015, Huntsville AL 35807-7015; (800) 635SPACE.

3. The U.S. Space Foundation is a nonprofit educational organization promoting public awareness of America's space programs. It serves as a national resource for research and educational information on all aspects of space. The Foundation, in conjunction with the U.S. Air Force Academy, offers a five-day graduate level course, "Getting Comfortable Teaching with Space." Shorter in-service courses are also available in local school districts on request. Members of the Foundation's "Project First Step" designed an innovative middle school science curriculum using astronauts and other scientists as role models. For more information, contact the Foundation at 2860 S. Circle Dr., Suite 2301, Colorado Springs CO 80906-1484; (719) 576-8900.

4. The Challenger Center for Space Science Education is an international network of facilities and programs founded by the families of the seven crew members of Challenger flight 51-L to continue the crew's educational mission. Currently, 14 high-tech space simulators are located in space centers, museums, and school districts across the U.S. and Canada. The simulators fly middle school students through two-hour missions where they learn science and develop problem-solving and communication skills. The Challenger Center has developed a wide range of student and teacher programs, which are often led by members of NASA's "Teacher in Space Program." The Center also offers live international teleconferences. For further information, contact The Challenger Center for Space Science Education, 1055 North Fairfax St., Suite 100, Alexandria VA 22314; (703) 699-5740.

The Astronaut Memorial Foundation was established in the aftermath of the Challenger accident to honor all 16 astronauts who have lost their lives in the line of duty. The Space Mirror National Monument was established at the Kennedy Space Center by a joint resolution of Congress. In addition, the foundation is creating a Center for Space Education on six acres of land adjacent to the memorial to further enhance NASA's education program. The center will also explore and develop new learning techniques and environments for the future. Plans for group and individual activities run the gamut, including: demonstrations, discussions, conferences, workshops, symposiums, and lectures. The center will also provide films, satellite transmissions, and

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curriculum materials to support the learning process. Funding for the center will come from the sale of Florida Challenger license plates, and from corporate, foundation, and individual contributors. For further information, contact the Astronaut Memorial Foundation, John F. Kennedy Space Center, Mail Code AMF, FL 32899 (407) 268-0272.

Be sure to let me know about any creative new innovations you come up with to help bring space science into the classroom. Sharing innovative lessons with other teachers and ham radio instructors remains the primary goal of this column. Please join us on The CQ All Schools net this fall when school begins. Listen for us on Tuesdays and Thursdays at 17:30 UTC on 28.303 MHz for 10 minutes. If you don’t hear anything, after 10 minutes go to 21.325 MHz. After 10 minutes look for us on 14.325 MHz.

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Marjorie Swain with Grand Prize won at 1992 Symposium - a Kenwood TR-751A all-mode 2 meter transceiver. OM Carroll W7DU seems pleased with her good fortune.

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This month's project started when I decided to clean up my workbench. I started working on a schematic while the soldering iron cooked on the workbench. This is a project that just begs to be changed and modified. In fact, I'd be upset if no one modified it for their own use. The schematic is shown in Figure 1.

The project began as a transmitter at 18 MHz but, lacking a proper crystal, the transmitter ended up on 10 MHz instead. Also, I built this project on a single piece of double-sided PC board using the ugly construction method. If you've never tried this method before, you're in for a surprise. Normally, you use high-value resistors (1 megohm or higher) as tie points for the various connections. I didn't take this route; I used sky wiring instead. In sky wiring, the connections between components just tangle in the air. This does make for a few problems, the biggest of which is having the different connections short out against one another. I fixed this problem by using small pieces of pretzel crumbs on my workbench. And no, I have no idea what the capacitance of a length of pretzel is.

You'll also need at least two sizes of soldering irons. A large, 35 watt iron is needed for soldering to the copper foil. The copper foil is a very good heat sink and a smaller iron (15 watts or less) does not have enough umph to make a good solder joint on the copper foil. You'll still need a smaller iron, though, to make connections between the individual parts.

To keep the cost down to almost nothing, the antenna connection is simply soldered directly to the output filter. Likewise, the crystal is soldered directly to the VXO capacitor, without a socket. Be careful when soldering to the crystal—too much heat and you'll end up destroying it.

The Circuit

A VXO is used for frequency control. They're simple to build and give you an ideal method of frequency control, without the drift of a VFO. The supply voltage to the oscillator is regulated in two different ways. First, a 78L08 regulator provides a stable +5 volts to the collector of the oscillator's transistor. Second, a red LED is used to supply 1.5 volts of bias to the base of the transistor. A red LED makes a cheap and dirty regulator (and there were plenty laying around my bench).

By adding a small amount of inductance in series with the crystal, we can expand the range of the VXO. The value is not especially critical, so don't get overly concerned with the number of turns to use and on what core. Depending on the crystal, the amount of inductance may need to be changed to get proper VXO action.

---

Photo A. The junk box rig on 30 meters. Note the pretzel between the buffer and the driver transistor.

Figure 1. Schematic for the junk box 30 meter pretzel rig.
The main tuning capacitor I have listed as 50 pF on the schematic. In my version, the capacitor I used looks like it may be only 20 or 30 pF. Even with this small value, I'm able to go from 10.115 MHz to 10.122 MHz with a crystal marked 10.116 MHz. That's not too bad, as this range puts me right about in the middle of the action on the 30 meter band. Depending on the value used for your tuning capacitor, crystal and series inductors will determine the frequency swing. Some crystals will bend more than others, giving you greater VXO swings.

The oscillator runs all the time; it is not keyed. The supply voltage of the oscillator must be removed or you'll hear its signal in your receiver. If you plan on using this oscillator for a direct conversion receiver you'll need to keep it running. If you want, a second low-value capacitor may be used to couple some RF into a mixer for your receiver.

Energy from the oscillator is coupled to the buffer via a small capacitor. In my model, I found a 33 pF cap on the bench, so that is what I used. Reducing the value of this couple capacitor will reduce the amount of RF coupled into the buffer. The smaller the value, the less pulling of the oscillator during keying. To a lesser extent, this will affect the amount of output power, too. Don't go too low or you'll end up with a QRN transmitter. On the other hand, don't use too much capacitance either. It will load down the oscillator and give you no more output at the antenna. Values between 20 and 100 pF should work just fine.

The buffer consists of another 2N2222 transistor. The 2N2222 I used is in the metal-case style. These seem to be a bit harder to kill and I've found you can get a bit more power out of these metal-cased units than the popular plastic jobs. A transformer decouples the RF from the collector of the buffer and a small amount is then placed at the base of the driver transistor.

The driver uses a 2N3053 transistor in the TO-5 case. This stage is tuned by the 2-40 pF trimmer on the collector of the driver. The trimmer I used seemed to be a bit too small, so another 37 pF capacitor was soldered in parallel with the trimmer. The driver is the only stage that is keyed. Keying is done by applying +12 volts to the driver. The transmitter keys very well. There are several bypass capacitors on the collector to keep RF out of the VCC line. In most cases a PNP keying transistor would be used here. I could not find one, so I keyed the rig by the "arm-strong" method—I used a clip lead! Figure 2 details a keying transistor and how you would interface it to the project. I did not use a heat sink on this driver transistor, but one wouldn't be a bad idea.

RF from the driver is coupled via the transistor's link turns to the PA transistor. A 47 ohm winding resistor on the base of the PA transistor helps stabilize this stage. You'll need to use a heat sink on the PA transistor. The output filter is of a standard design using tee toroids. Silver mica capacitors would be my capacitors of choice, but I used ceramic capacitors without any noticeable trouble.

By changing the input impedance of the filter we can get more RF out to the antenna. Normal input impedance is 50 ohms. This was exactly the case in my version. Instead of using the standard value capacitors in the first stage, I changed the input impedance of the filter. I started with 140 pF and, by adding small-value capacitors in parallel, I steadily increased output power. After I got done, I had over 3 watts of clean RF going to the antenna, and a real mess with all those capacitors soldered in parallel! Three watts is about one S-unit over the normal 1.5 watts you'll get. The values shown in the schematic [not shown] work quite well. With a 1.5 watts output power of 1.5 watts. It's up to you to play with the output filter impedance and thus change the output power of the rig. The transistor used in the PA is somewhat critical. Because the leads are rather long, it's best not to use a transistor with a lot of gain, especially in the UHF range. That means don't even think about using a 2N3866! I used a junk box version of a 2SC799. A transistor pulled from a junk box CB would be a fine choice too.

As I mentioned earlier, this is a project just begging to be changed and added to. The only points to worry about are the lead lengths on the PA transistor and the driver. Try to keep them as short as possible. This is especially true of the emitter lead of the PA transistor.

Remember, the case of the driver and the PA are connected internally to their collectors. Therefore, they are also connected to the VCC line. Don't allow them to contact the copper foil or you'll end up with fireworks and melted transistors. Have a good time with this project.

Even if you don't get it to work, it's great practice in radio theory. If nothing else, find out why something won't work. Learning is also a process of correcting mistakes.

Clear the Pretzels Off the Bench! One of the reasons I had to clean up my workbench was to start construction of the ARK 40 transceiver. This is really a slick project, especially if you're tired of the usual VXO- or VFO-controlled NET402 transceivers. The ARK 40 will produce a hefty 5 watts output on the 40 meter band. Yes, the ARK 40 is a fully synthesized rig on the 40 meter band. It's simple to operate and a joy to use. You can find a complete review of the ARK 40 elsewhere in this issue of 73. Next month, I'll have some details about computing the values for the output filters. Until then, remember, use wifs instead of wats.

Figure 2. Schematic for an optional keying transistor and how you would interface it to the project.
ATV from Mt. Diablo

Just east of the San Francisco Bay Area lies a majestic mountain called Mt. Diablo that rises over 3,800 feet above the surrounding terrain. From the top of Mt. Diablo you can see most of the Bay Area (Berkeley and parts of the East Bay are shielded), as well as an unobstructed view of the Sacramento Valley. On a clear day you can see the snow-capped peaks of the Sierra Nevada range over 100 miles to the east, stretching from northern Sacramento nearly down to Fresno. Mt. Diablo would seem to be the ideal site for an ATV repeater.

Don Smith W6KNF certainly thought so! In 1961 he installed his ATV repeater on a site near the top of the mountain. Don's system was a bit unusual since the Bay Area has a unique problem. It turns out that there is a military base near Sacramento that operates an over-the-horizon radar system called Pave Paws. This radar transmits microwave pulses in the 420-450 MHz range that blanket the Bay Area, particularly the top of Mt. Diablo. Since any input in the 450 MHz band would be constantly wiped out by the radar, Don chose to put the input on the 1200 MHz band with the output on 427.25 MHz. He even worked out an agreement with the Pave Paws operators to keep the 427.25 MHz frequency clear from the radar signals. The repeater's output corresponds exactly with cable-ready channel 98 and allowed many folks to view the repeater using just a simple antenna and cable-ready VCR or TV set.

The W6CX ATV Repeater

Currently owned and operated by the Mount Diablo Amateur Radio Club, the Mt. Diablo ATV repeater has an input on 1253.25 MHz AM with an output on 427.25 MHz (both vertically polarized). The repeater's antennas are mounted near the top of a 190-foot tower near the mountain peak and provide a 360-degree view of the region. With a range of over 100 miles, the repeater covers most of the San Francisco Bay Area, as well as the Sacramento Valley from north of Sacramento to south of Stockton and into the foothills of the Sierras. There are around 40 active members on the air (and many more who monitor the repeater via cable-ready VCRs). Two of the members reliably access the repeater from over 90 miles away. Occasionally the Black Mountain group will retransmit the Mt. Diablo output through their repeater in the San Jose area so that those in the East Bay could view the activities.

Every Thursday evening at 8 p.m. Pacific time, an ATV net is held on the 147.06 repeater and usually generates a lot of activity. This repeater and the 224.78 repeater are generally used for the ATV talk frequency in the region.

PACIFICON'93

Sponsored by the Mt. Diablo ARC, this year's PACIFICON convention (held October 22-24 at the Concord Hilton hotel) will again feature a live ATV demonstration console (see the photo). The ATV group plans to cover featured speakers, special events and highlights of the convention through the use of multiple cameras, videotape and remote feeds. This footage can be seen on the hotel's in-house cable system and will be transmitted through the ATV repeater as well.

One highlight this year will be an ATV balloon launch. Bill Brown W6BELK and Don Smith W6KNF will be sending up the balloon between 10 a.m. and 11 a.m. on Saturday from the Concord Airport (Buchanan Field), just one mile from the convention. The balloon will feature a live TV camera transmission on 434 MHz, with on-board telemetry overlays. An on-board GPS receiver will relay the balloon's position to aid in tracking and recovery. In addition, a simplex repeater will operate on 2m (144.34 MHz) and a beacon can be heard on 283.322 MHz. At the peak altitude of 110,000 feet, anyone within 400 miles of the Bay Area should be able to see the balloon's video and work through the repeater.

The chase team T-hunt group will be led by Syd Furman W6QWK and anyone with DF gear is invited to join in the chase effort. If all goes well with the Saturday launch, a second flight is tentatively scheduled for Sunday morning as well.

The Future

A 1200 MHz output for the Mt. Diablo ATV repeater is in the works (in addition to the 427.25 MHz output). Also, plans are being made to eventually establish a microwave linkup with Southern California.

It's great that you're looking to see the real deal in the North Bay area, just drop on by for the Thursday night net and watch the action. With over 50 watts output power (soon to be 100 watts), you should be able to see the repeater with modest equipment (cable-ready VCR/TV and just about any outside antenna) as long as you're line-of-sight to the mountain.
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not worthless idiot lights that tell you "YOUR BATTERY IS NOW DEAD." The
voltmeter can even be used to measure voltages of other sources.

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20 GHz SSB QRP Transceiver

This month I thought I would describe a 20 GHz SSB QRP rig in its simplest form, then later show you how to modify it into a very formidable station. The improvements to the basic SSB converter can be added easily to make it buildable from the components you have. By following the basic layout you should be able to duplicate this rig at various stages of evolution—from the very basic to the more complex 20 GHz SSB system. The IF frequency used in each case is 2 MHz.

This design process might look a little awkward but be assured, this rig is quite formidable in operation. Last month we discussed some of the reasons why reduced bandwidth systems are high performers. This month we will discuss this basic 20 GHz SSB system, which delivers high performance yet is constructed from minimum components. Then with this same basic circuit you can add components as you find them. I will attempt to describe several modifications or steps that will guide you in modifying the original unit shown in Photo A. Don't be afraid to make changes—what you build really depends on what you want to spend. The different levels of complexity are offered in an attempt to vary the design to suit your needs.

The main ingredients needed to construct a 20 GHz system include a local oscillator, a Frequency West brick-type amplifier, and the mixer (an orthogonal waveguide-type unit). The RF port of the mixer is connected to a 20 GHz antenna and, with a 2 meter transceiver set to low power, is connected to the IF port. This simple setup will be capable of making narrowband contacts on 20 GHz. See Figure 1 and Photo A, both showing an operating simple system for 20 GHz. This setup will work quite well and is capable of making either narrowband FM or SSB contacts. This, of course, is dependent on the type of meter rig you use for the IF transceiver. My rigs are an ICOM 202 and a San tec LS-202A multimode HT. Both rigs were used. They're both older radios but, they perform quite well. The San tec has been my main radio for SSB operation.

The design of this system is what I prefer to call a "COAXIAL" based system, differing from a "WAVEGUIDE" based system, such as in wideband FM. Components can be added to this system as desired to improve its capabilities. Each component added to the system can increase its complexity and cost. However, each has specific attributes giving system performance improvements that far offset the costs involved. The first improvement to be considered is the RF preamplifier and associated coaxial switch that is needed for a dual role for the amplifier. More on that later.

The preamplifier that we use is a dual-stage amplifier using two MGF-1402 FETs. The amplifier PC board for this amplifier is 3/4" by 1" and constructed on 0.031 Teflon PC board. Figure 2 shows a schematic for this preamp. The source leads are connected to ground on the board with a very short lead length (actually no lead) and upside down. With the case inserted in the hole cut in the PC board (with the FET upside down), the ground foil is soldered directly to this gold metalization of the case, making for almost zero lead length. This is the biggest secret in construction of this PC board amplifier zero lead length of the source lead, making for minimum inductance in the source path to ground. Please note that some designs require some inductance in the source leads; however, this design does not. At lower frequencies, FETs give increased gain, and this further increases as frequency is reduced. FETs that have an F* (frequency total) of 80 GHz or so become unstable at very low frequencies. That's why some source inductance is necessary at low frequencies to help make the design stable. At high microwave frequencies this is undesirable and will make a design function better as an attenuator than as an amplifier. The thing to remember is that the extreme towards minimum is necessary at upper microwave frequencies.

The rest of the construction is basic in that good microwave components are necessary for low loss. That mandates that chip resistors and chip ceramic capacitors be used in the preamplifier. If you wish to design your own amplifier, a program called PUFF is available from CALTECH that will allow you to design your own custom PC board with the FET of your choice.

Figure 1. A 10 GHz QRP rig suitable for narrowband FM or SSB.
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designs require a simple bias supply to function. It can be as simple as a "double A" (AA) flashlight cell connected up to supply negative gate bias current. An additional positive regulator is required as well for the drain supply. Normally this voltage is near +4 volts. We have built both simple supplies and ones that use ICs to generate the negative voltage. Either will work well.

The bias (negative) is adjusted to give the required drain current for your FET. This can be adjusted for a minimum noise figure or increased for higher current for slightly more power output. Check your FET's specification sheet for exact current requirements. For the MGF 1402 FETs we adjust the first low-noise stage (between 10 and 15 mA) for minimum noise. The second stage is set (to 20 mA) for best gain. Next comes the relay switching. We could live without them and dedicate the amplifier for either receive or transmit. But, in this case I decided to use the same amp for receive and transmit and switch it with relays.

The relay used at 10 GHz must be rated for 10 GHz operation. As such, the circuitry internal to the coaxial switch resembles a transmission line, providing for low losses at microwave frequencies. A dual relay can be used: the SPDT (single-pole double-throw) type, or the transfer type. Several SPDT relays would have to be used but only one transfer relay is needed to work in the simplest configuration. I have used each method and they both work well.

For simplicity, the transfer relay is the easiest to use, that is if you can locate one. It is most suitable as only one relay is required, allowing the preamplifier to be used for both receive and transmit amplification. You can usually tell a transfer relay from its standard counterpart by the four coaxial connectors on the transfer relay, versus three for a standard SPDT type coaxial relay.

Let's look into the construction of each and see what is going on. In the SPDT type (miniature SMA type relay) there are two sets of contacts, as shown in Figure 4. This relay can best be described as having balanced pole operation, like a teeter-totter. One section makes contact with half of the common center pin and the other contact (let's call it normally closed). The other section is off balance or down to ground making no contact to any coaxial connector, maximum isolation.

When the relay is energized, the normally closed contact toggles and becomes the one that is now grounded or off-balanced and the other section (the normally open contact) is now making connection between the other half of the center contact and the normally open contact. SPDT operation.

The operation in a transfer relay is quite different in some respects in that it has four (coaxial connector) contacts. It has a modification of the teeter-totter operation in that there are four contact bars while the SPDT type has two. The toggle operation occurs between two of these bars diagonally positioned inside the relay. What happens is that the relay makes contact along the top and bottom of the relay, leaving the side bars in the open position. When the relay is activated the top and bottom release their connections and the left and right side bars make contact. See Figure 5 for details on the transfer relay and its schematic switching application.

With either relay system in place, switching an amplifier from receive and transmit is quite easy. It can become complex if and when we add additional components into this switching loop. For a basic SSB unit with switching, this is all you need for an operational SSB 10 GHz narrowband system using 2 meters as an IF. Drive

![Figure 3. A DC bias supply for the 10 GHz amplifier. The battery should last for a couple of months.](image)

![Figure 4. A SPDT relay.](image)
power should be held to +10 dBm maximum to the mixer.

This system, with a 10 GHz FET amplifier (home-brew), can boost output power on transmit to somewhere near the +5 to +8 dBm power level. That's a power output of 4 mW to 7 mW (0.007W). Don't scoff at that power as it is quite capable of driving other higher-power amplifiers, such as traveling wave tubes, to full power of 10 watts or more. These do not need to be added now but can be as time and money allow. The simpler low power rig will work quite well with the lower power level. Additional gain can be quickly realized through passive antenna gains.

Realize that 0.007 watts is real QRP power and can give exceptional operation using SSB. Comparing operation on 10 GHz QRP levels and system gains in respect to lower frequencies such as 2 meters, you can draw comparisons by noting that with lower frequencies antenna gain is markedly reduced. A 30° dish antenna on 10 GHz can exhibit 35 dB gain, making for quite a punch, even when using a QRP rig. That's a lot of gain advantage even when compared to a good 2 meter antenna which can run in the 10 to 15 dB range. You would have quite an antenna farm at 2 meters for similar gain as this small dish at 10 GHz.

That's one factor which makes QRP levels workable with reduced bandwidth SSB microwave operation: very high antenna gain and very low power systems. Comparing even further: At 24 GHz the same approach is used, making more power gain in the antenna than is usually in the amplifier at this level. Most rigs today for 24 GHz are limited to very low QRP levels; that is, before antenna gains. This passive antenna gain is what gives microwave low power level rigs quite a boost in radiated power. This gain in power is the most inexpensive to accomplish in short order. The bad news, at least on 24 GHz, is that the equipment is difficult to obtain even in the land of plenty here in California. If there is inexpensive equipment for 24 GHz then it should be advertised because it would sell.

So much for QRP antennas. The main point is that at a very low QRP level, stations at microwave frequencies are still very effective. The 10 GHz QRP station described above, with or without the preamplifier, is an effective system. Don't let yourself be locked into the design that I presented in the example given. The local oscillator does not have to be a waveguide type of system to mate with an orthogonal type of waveguide mixer. In this case use a waveguide to coaxial transition to accomplish the connection in and out of the mixer. There are many different methods that you can use to make adjustments in system construction and still have a great rig.

Mailbox

Steve Roberts N8VKD of Suffield, Ohio, is looking for others in the Ohio area who are interested in 1.2 GHz and above. He remarked that "If you asked for a Gunn you might get a response like 0.22 or 0.45 caliper." Well, the same mystique abounds here in California. I have difficulty with the knowledge gap, so when you get on discussing the electron effect in Gunn devices being negative resistance... well, you can just imagine the eyes glassing over. It's a hard hill to hoe without some moral support, especially when you know that you are well-founded in scientific fact. Trying to convince someone that negative resistance is a true phenomenon is about as easy as teaching a pig to sing. What we did here was to set up a sign and an operating 10 GHz simple wide-band two-way system at our local ham swap meets and we were able to get quite a response to our pleadings. Later we formed the San Diego Microwave Group.

I think all that is needed is a little prodding and a lot of advertising, similar to the methods we used. Club meetings and such are a good example and I am sure most are looking for a good program to provide for their members. Sure, you won't interest all the members attending, but a good well-rounded information session on your part of the frequency spectrum as it applies to amateur radio in general can come off well. Raymond N8RE writes that ever since I published the material on converting the 3.7 GHz LNA amplifiers he has been looking for some to modify. Could we steer him in the right direction? Well, I can only offer some likely sources for you to try. The first is the newspaper—look in the classified ads for satellite antenna installers and also in the Yellow Pages under satellite and TV shops. I made several calls to local shops and most wanted to sell me brand-new units. In bigger shops try to get by the salesman and talk to the repair technician. When I was able to do that I was able to line up some prospects that might prove interesting. One calls to a local high profile installer was met with the usual "sell, sell," but when he found out that I wanted older units for amateur applications and not satellite use, he stated that he was licensed also.

I have yet to visit him, and don't expect to be given a box full of units. But, rather, I have found out that for a reasonable (small) dollar amount he would be willing to part with some used units. The price discussed was less then $15 each, but somewhat higher than the $5 or so I was accustomed to paying at swap meets. However, his units seemed to be a better bet, as the swap meet prices do not include a guarantee of any kind. It just goes to show that you have to go beyond the normal scrounging attempts and get behind the screens of most bigger companies and talk to the people doing the work to locate parts. Give it a try.

Richard KBOOMR of Aberdeen, South Dakota, writes: "Where can I buy a TWT amplifier similar to the ones you described in the July 1993 issue of 73 Amateur Radio Today?" Well, Richard, they're not the easiest to locate and when amateurs have found them they were not always careful to get matching power supplies and tubes with them. That's the main reason I wrote the article—to inform our readers about what is available in surplus. From time to time I have a spare unit and they have sold for less than $200 for a working unit. I feel that the price in surplus outlets is far too high and they don't even guarantee that they will function. I guess they're looking for a customer who is willing to pay the high price for exactly what he wants.

At this moment, I don't have a source for these materials. Components used to come out of Surplus Sales for Collins Electronics in Richardson, Texas. If I locate a source I'll print it; if anyone knows of one please drop me a line.

Well, that's it for this month. As always, I will be glad to answer questions concerning microwave and other amateur related topics. Please send an S.A.S.E. for a quick response.

![Figure 5](image5.png)

**Figure 5.** This four-contact transfer relay effectively reverses the amplifier. It is wired with the amplifier in to terminal 1; amplifier out to terminal 4; antenna to terminal 2; mixer out to terminal 3. Normal (not energized) state: contacts 1-2 & 3-4 closed. When energized, the relay opens 1-2 & 3-4 and 1-3 & 2-4 connect.

![Figure 6](image6.png)

**Figure 6.** Full implementation of switching with 4 SPDT coax relays, switchable preamp, and 10 watt high power TWT amplifier.

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ASK KABOOM

Your Tech Answer Man

Michael J. Galier KB1UM
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More Mobile Operation

Last time, we were discussing mobile ham radio installation and operation. Let’s continue.

The Real Thing

OK, you got a few bucks together or you got lucky at a hamfest, and you bought yourself a real mobile rig. What can you expect? Well, it sure will work a whole lot better than an HT. Now you’ve got anywhere from 10 to 50 watts of power, tremendously greater audio output and, hopefully, a tougher receiver.

Installing a mobile rig is pretty easy, but there are a few things to consider. First of all, you need good, clean DC power at anywhere from 5 to 15 amps. As I mentioned last time, there is no such thing as clean power in a car; it’s always loaded with junk. Luckily, mobile rigs, being designed for car use, take that into account and usually have their own internal power filters. Here’s a good way to tell: If you have alternator whine, either in transmit or receive, you need an external filter. If not, then don’t worry about it.

If your rig puts out 15 or 10 watts, your power requirements probably aren’t that heavy. Most likely, you don’t need more than 5 amps. You should be able to get that from the fusebox. A good place to hook up is on the fused side of the line powering your car stereo. Heck, you’re not going to be blasting it at high volume and transmitting at the same time, so you’re not likely to blow the fuse. And even if you do, there’s no big harm done. Just be sure to connect up to the correct circuit. Never run any radio gear (or anything else, for that matter) from an unfused line. The damage you can do to your car just isn’t worth it. Of course, if your rig’s power cord has its own fuse, then you can hook it up wherever you want. Just keep in mind that any short before the fuse can still cause trouble. In particular, run the wires so that they won’t be cramped by the car’s brackets or other body parts.

If you have a high-power rig which puts out, say, 40 or 80 watts, you’re gonna need some real juice to run it. At 50 watts output, you may need up to 15 amps, and that ain’t peanuts, especially because your rig is PM and runs that power continuously while you transmit, unlike an SSB HF rig, which only demands high current on voice peaks.

Getting that much current through your car’s electrical wiring is asking trouble. The preferred method is to go directly to the car battery, but that can be tricky. Your car battery can deliver hundreds of amps on demand, and that kind of current is dangerous. Shorting a car battery even for a moment will cause serious sparks and possibly melt the wiring or the battery. The battery may even explode as its internal gasses quickly build up under the heat of its chemical reaction. You can be disfigured, blinded or even killed by an exploding car battery, so please, play it safe.

How?

First of all, get approved high-current wiring from an autosound or auto parts dealer. Whatever you do, don’t use coax cable as DC power wiring. Yes, it’s shielded and seems to work well, but it is not designed for high DC current, nor is it meant for the temperatures under the hood of a car. The result is that, over time, the inner conductor’s plastic jacket will deform and eventually melt through, causing precisely the kind of disastrous short I just discussed above. The risk of an underhood, car-destructing fire is large.

Whatever kind of wire you use, it must be rated to carry the intended current. Also, you must fuse it right at the battery so that shorts anywhere down the line will not cause a disaster. Another fuse right at the radio is a good idea, but that alone will not protect you if, say, the wire shorts at the firewall or comes in contact with the engine or radiator and melts.

When connecting things to the car battery, be sure to disconnect the battery’s negative terminal first so that there can be no return circuit through the car body. That simple precaution can prevent serious injury. Remember, there’s enough current there to take your finger off, should it inadvertently connect through a ring you’re wearing. It has happened.

Ground?

Obviously, there’s no real “ground” on a moving car. But to the circuit, ground is the car body and chassis. Where do you hook the negative lead up? Well, for low-current radios, just about any metal screw in the passenger compartment will do. To check for suitability, use an ohmmeter to be sure the screw is grounded out to the chassis. Especially on late-model cars, many screws are set in plastic, which, obviously, won’t do.

In high-current applications, it is best to ground the negative to a large screw in the engine compartment, somewhere fairly near the battery. Check the spot where the battery itself connects to ground; what could be better?

Where Does It Go?

In today’s small cars, it can be hard to find a good place for your rig. Look for a spot where you can easily operate the controls without interference to your driving. Also, the mike cord has to...
reach your mouth without getting tangled in the steering wheel or gearshift lever. And you have to have unobstructed access to the foot pedals. Finally, make sure you don't mount the rig where you will smash into it with a knee or other body part in the event of an accident. If you just can't find such a location, consider buying one of the new rigs which let you separate the control head from the rest of the radio. The small heads fit just about anywhere.

The Skyhook

Many hams use magnetic-mount antennas because they're easy to remove and hide, and they don't require any installation. They work well, but they do have a tendency to scratch the car's paint. When you put the antenna on, be sure to wipe the mount's bottom off first, because the powerful magnet often picks up little metallic bits and those can really eat your paint away. When the antenna is in the car, be sure to put it somewhere where it can't be seen, and also consider how close you are putting that giant magnet to your stereo, recorded tapes, the rig and other equipment. I keep mine in the back, away from everything.

The coax cable usually exits through the door seal, a window, or perhaps the trunk or hatch. The main considerations are that the cable doesn't get crimped (which could result in a transmitter-damaging short) and that rain doesn't get into the car at the entry point. Luckily, most cars have big enough rubber seals that these problems don't occur.

For permanently mounted antennas, just follow the manufacturer's directions. If you're going with a permanent roof mount, it may be best to let a professional shop do the drilling and mounting. I tried it myself once, and it was very difficult to drill through the roof. Mine eventually worked out fine, but it is possible to have serious leakage problems which result in rust damage.

The Ultimate

Mobile VHF/UHF is plenty of fun, but nothing compares with talking around the world on HF while tooling down the highway. Installing a mobile HF setup is much like installing a high-power VHF/UHF rig, but there are a few extra considerations.

You will need lots of current. Assuming the standard 100 watt rig, figure on 20 amps. Some HF rigs are very tolerant of varying voltage, while others tend to "FM" and pull off frequency or experience other problems if the voltage swings as you talk. So, be sure to use extra-heavy DC wiring and go directly to the battery; forget connecting to the fusebox. All the same guidelines for high-power installation I discussed above apply. With SSB, AM or CW, though, your receiver is amplitude-sensitive, and engine and alternator noise problems will be much worse. You can buy shielded high-current power wiring, and it's probably a good idea. But again, don't use coax, no matter how tempting it may seem. Your rig won't be much use to you if the car burns up.

There are various kinds of mobile HF antennas, but most are designed for bumper mounting. I have had the best results with a standard bumper mount, a whip spring and a guy string. I keep the string tied to the back of my seat and run it out the hatch window to hold the antenna in place. If you have a trunk, you can run it out the top of the trunk after tying it to an internal support.

Running the antenna coax can be a problem. Look at the bottom of your trunk or under your hatch area and you probably will find a few rubber plugs. You should be able to remove one and run the cable through the hole. Be absolutely sure to use some silicone sealer to plug the hole back up, though, or you will have leakage problems. When routing the cable underneath the car, keep it away from the muffler, exhaust pipes and gas tank. Finally, be sure to ground the antenna mount to the car and use some coax sealer to weatherproof the connection. Don't expect to do an HF installation in an hour or two. Usually it takes an entire afternoon.

Well, there's a little more to cover, but I'm running out of room. Before we go, let's see if a letter:

Dear Kaboom,

I'm a 22-year-old sailor in the U.S. Navy. I've enjoyed listening to HF DX since I was 12 years old and hope to soon have my General Class ham license. I've never really known any ham operators and have lots of questions regarding operating practices, RTTY, packet and such. Is there anybody you could steer me to to get my feet wet? Also, could you tell me which products I should buy to set up a station?

Signed,
Ready To Go

Dear Ready,

I see that you are stationed in Japan. You are lucky to be in the highest per capita ham population in the world. There are over a million hams there and plenty of clubs. Also, you have some serious ham magazines. Unfortunately, you will need to speak Japanese! Lots of U.S. ships have ham facilities because many of the radio operators are hams. Have you checked this out? Perhaps the help you need is right there on the ship! If not, consider getting an English-speaking Japanese friend to show you around or take you to a club meeting. Finally, keep reading 73! As for product recommendations, I'm not in a position to do that. Most of the companies make good gear and the choice is really up to you. The best thing you can do is get your license and get on the air. Once you do, you'll find more opinions and advice than you ever wanted. I hope to hear you on the HF bands!

Until next time, safe and happy modeling from KB1UM.
INTERNATIONAL

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

Notes from FN42

More good stuff for this month including, the FAIRS trip to Bangladesh (S21land) to train more amateurs there, and a report from Mike Shakhov UA9MT on the DXpedition to Bering Island in 1992.

I am also very happy to report that Lorenzo Gaston DU1CH/6 has volunteered to become the Hambassador to the Philippines. He enclosed several great articles, but there was not enough room in this issue to print any of them, so look forward to one of them next month.

Since space was a bit short last month, let me brief you so more info can make it across the press, 73, Arnie N1BAC.

Roundup
Bangladesh FAIRS Bangladesh Trip Report: An international group of FAIRS (Foundation for Amateur Radio Service, Inc.) members planned an amateur radio training program in Dhaka, Bangladesh, during early 1993. The training was to help develop a group of amateur radio operators that could lead to the development of a disaster preparedness amateur radio network in Bangladesh. A DXpedition to help provide training by actual amateur operation was planned. The DXpedition operators hoped to make thousands of radio contacts worldwide. These contacts would give great visibility and support for amateur radio and FAIRS in Bangladesh.

The results of two years of planning and almost three weeks on location in Bangladesh exceeded our most optimistic goals. The international team of three Americans (one American traveled from Taiwan), two Ukrainians, and three Russians arrived on schedule with over half a ton of training and radio equipment. A five-day training program in amateur radio for 30 Bangladeshis was well-attended. A total of 17 of the 30 participants passed the USA amateur license examinations, which showed there were some highly motivated individuals interested in becoming radio amateur operators. Training for government personnel was provided by Mr. Richard Baldwin, the president of the International Amateur Radio Union (IARU). Mr. Baldwin presented a five-day workshop to about 12 staff members of the Bangladesh Telephone and Telegraph Board (BTTB). His workshop included: the history of amateur and commercial radio, development of international regulations, why amateur radio is good for a country and its citizens, how to develop regulations for governing the use of amateur radio and how to develop amateur radio license procedures. Mr. Baldwin's workshop was independent from FAIRS; however, it was coordinated by FAIRS, the ARL, and the IARU.

These two training programs made a very significant and positive effect on the interest and awareness of amateur radio in the government.
BERING ISLAND

4K4NN

4K4WS

Country: Ukraine
Location: Bering Island

After covering the distance of nearly 4,000 miles with baggage weighing about 2,000 pounds, we reached Bering Island, a Pacific Ocean island which has a land area of about 600 square miles. Its coordinates are 52° N and 166° E, IOTA AS-25. The expedition was organized by the Western Siberian DX Club with support from the Russian Geographic magazine "Witur." The radio shack was situated 100 yards from the ocean shore in a little house which was kindly placed at our disposal by the island meteorological station. Having started to operate, we expected to have a great time for ten days. But their antenna service was banned.

Russia HELLO FROM BERING ISLAND! From August 25 to September 7, 1992, four members of the West Siberian DX Club operated a station located on Bering Island, coordinates 55 North and 166 East, IOTA AS-39. The expedition was organized with some support and direct participation of the Russian geographic magazine Vitur.

The expedition was devoted to the 250th anniversary of the discovery of the Comodore Islands by Russian explorers under the leadership of Captain Vitus Bering. The radio DXpedition was comprised of four radio amateurs from the city of Omelk, oblast 146: Valey Matsumi UA9NN, chief of the WSDXC; Alexander Ernst UA9MR; Igor Suprunov UA9MFW; and Mike Shakhrov UA9MI. After traveling a distance of 4,000 miles with around 500 kg of baggage, we reached the Pacific Ocean island of Bering. The island is about 600 square miles of land area and has a population of 1,500 people. Our license gave us permission to operate as 4K4NN and 4K4West Siberia. We were going to operate with the latter call in the All Asian Contest.

The radio shack was situated 100 yards from the shoreline on the first floor of a small house which was kindly placed at our disposal by the island meteorological station. Our equipment included Yaesu FT757GX and ICOM 701 transceivers, a 1 kW amplifier, and an MFJ-949D tuner. Due to a good choice of a clearing with green grass, and the sunny weather, we quickly put up the antennas, a three-element yagi on the 15 and 20 meter bands, a full-size ground plane on 40 meters, and a longwire for the other bands.

We operated 24 hours a day with the best propagation to the USA.
and Japan and some good openings to the South Pacific. The propagation to Europe was fair in the morning and evening. Most signals to all locations were only about S3 to S5. The best propagation was at the end of August, but beginning in September the propagation abruptly deteriorated. Unfortunately, we failed to operate on the 10 and 12 meter bands while propagation was good in August. During that time, we worked on the 30, 40, and 80 meter bands.

On the 5th of September, hurricane force winds hit the island! The winds gusted up to 80 miles per hour, and the temperature dropped to 0 degrees C, or about 30 degrees F. The wind raged for two days and destroyed all of our antennas and our plans for future operations! Luckily, the building where our shack was located did not suffer any damage.

It must be said that the author of these lines, as well as the other members of the DXpedition, were shocked with the rage of the hurricane. It was the first time that we had witnessed this natural phenomenon. Because of the hurricane, we were not able to carry out our plans to take part in the All Asian Contest or launch a balloon with a longwire for the 160 meter band. We had also planned to operate from Medny Island (Cooper), a smaller island in this group.

On Tuesday, the 8th of September, we left our troubles and the debris of our antennas on the island and flew in a small airplane back to the continent. It took us 48 hours to get back to our homes in Omsk, Russia.

We made over 10,000 QSOs during the DXpedition, with 140 DXCC counties on SSB and CW, including the WARC bands. The following totals will tell the story: 80m—504; 40m—2061; 30m—463; 20m SSB; 17m—431; and 15m—167.

In conclusion, we wish to thank all of the hams who worked us, and we are especially obliged to our QSL managers, Ken KC4UG and Walter DK8FS for spiritual and material support. We also want to thank MFJ Enterprises for the 1278 multimode controllers, which helped us to make plans for the DXpedition.

(Many thanks to Ken Carpeniter KC4UG, PO Box 586, Vernon AL 35592, for this report from Mike and group. Ken reports that he has operated Mike’s home station in Omsk and it is awesome, consisting of a TS-400, 2 kW amp, and seven elements on 15 and five elements on 20 meters. The antennas are on a tower in his 10-story apartment building. Ken would be glad to help arrange for a U49M callsign for anyone who would like to travel in that direction. Mike’s info is Mike Shakinov US61M, PO Box 2056, Omsk 644119, Russia.—Amel)

ISRAEL
Ron Gang 4X1MK
Kibbutz Urim
D. Negev 85530
Packet: 4X1MK @ 4Z4YJ.ISR.MLE
Techsat, Israel’s first radio satellite project, continues full steam ahead at the Technion Technical University in Haifa. Launch of the bird, which will feature an orbiting packet radio mailbox for hams, is slated for 1995.

Its BBS software has already been written, and it should soon be in operation (terrestrially) from Beresheet. This will give people a taste of what it will be like connecting to your bird and will no doubt set their appetites for the real thing. The simulated satellite BBS will be on AFSK FM, at first on 1200 baud and later switching to the faster 9600 baud rate. As with the Mode J type of operation slated for the satellite, those wishing to connect to the BBS will have to transmit on 2 metres and receive on 70 centimetres. The computer for this project has been donated by the Haifa Rotary Club. In a future report, we hope to have a more detailed re-
REFLECTIONS ON THE "WORLD'S BEST" IN HAM RADIO BOOKS AND PUBLICATIONS

THE WORLD'S BEST

There was also a Special Event Station set up at the expo. The call-sign will be 6K9Exp during the EXPO '93 run. I am happy to report that I will spend some time at the operator's position and will be very happy to say "Hi" to my many friends.

RUSSIA

Gennady Kolmakov UA9MA
PO Box 341
Mosk-99
Russia

There are serious troubles looming on the horizon for the amateurs of the former USSR. Obsessed with "market economy," people in change this doesn't look like much ($1 = 500 rubles), but it sets a dangerous pattern—pay for what once was free and expect an increase any time. The opinions of hams were not even requested, it seems.

In addition, getting contest certificates via the bureau would cost five rubles, receiving a single card via the bureau now costs 50 kopecks, sending a single card abroad via the bureau would cost two rubles 15 kopecks.

An airmail letter from Russia to anywhere in the world now costs 75 rubles. Since the majority of hams can't afford to send airmail letters (the average salary now stands at 3,000-4,000 rubles per month) in quantity, and because the foreign mail isn't getting through to Russia, those U-Cards will become very rare indeed very soon. Moscow hams report piles upon piles of incoming OSLS at Box 68 that aren't even processed. The bureau is broke, can't pay employees and its own mailing expenses. Again, hold onto your C3 cards, don't mail them over here until the situation is resolved.

On a related subject, January 1993 was set as a time frame for the changeover of current amateur call-sign allocations to a new system. 95% of all Ukrainian calls will change and a substantial amount of Russian calls, if the new system is implemented. Other republics will see a full 100% change of existing calls. As was announced earlier, the new allocations were assigned without any consultations with hams, thus the amateur community of the former USSR republics is in a state of turmoil. Nobody knows what will take place, when and how. Letters were sent to the ITU, trying to stop the new assignments. Government offices responsible for communications were petitioned without any obvious results. There is talk about having hams retain the present call-sign system, while commercial and utility calls would be converted. At this time, it is all pure speculation and no decisions on this explosive topic were rendered. There would be no special calls assigned within the CIS for 1993, I was told, pending the outcome of the above.

As always, I will provide more details as they become available. 73 de UA9MA.
73’s DX Dynasty Award

This is the current list of DXDA award winners. The DX Dynasty Award is the most enjoyable DX award around. Any correspondence concerning DXDA should be addressed to DXDA, c/o 73 Amateur Radio Today, 70 Route 202 N, Peterborough NH 03458.

### BASIC AWARD — 100 COUNTRIES WORKED

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### ARRL

- Any correspondence concerning DXDA should be addressed to DXDA, c/o 73 Amateur Radio Today, 70 Route 202 N, Peterborough NH 03458.
**Ham Help**

Number 30 on your Feedback card

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 lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters I or i, or even the number 7. You may also upload a listing as E-mail to Sysop to the 73 BBS, (603) 924-9343, (8 data bits, 0 parity, 1 stop bit, 2400 baud), on Special Events Message Area #11. Specifically mention that your message is for publication. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

---


I'd like to exchange schematics/project ideas with other homebrewers. Please send a list of your projects, and I'll send a list of mine; or if you don't have a list of your own, please send an SASE and I'll send you a list of my projects (some have been published). Klaus Spies, Lock Box 48185, Niles IL 60714-0165.

Wanted: Knight R100A Receiver. Thank you. Walter J. Stanis, Box 231347, San Diego CA 92194.

---

I need manual/assembly instructions/schematic for VHF Engineering "Synthesizer II." This was how you made a rig programmable in the '70s. Will pay reasonable copy costs. Joel S. Look W1KCR, 35 Goff Ave. Apt. 507, Pawtucket RI 02860.

Wanted: Source info of antenna materials, such as tubing of various lengths and diameters; various types of element insulators; whip antenna rod material (such as one would find in commercially available HAM units). Ham is involved in the designing, experimenting and building of antennas. Ron Zemjak N7LDQ, 140 Maude 'S' Canyon, Butte MT 59701.

---

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- Automatic Gel-Cel Charger
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- Mini Field Strength Meter
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- THIS SYSTEM CAN BE EXPANDED AT THE TIME OF PURCHASE OR CAN BE AN AFTER PURCHASE ADD ON. THE ADD ONS ARE—HIGHER POWER, 110/220 VAC POWER SUPPLY, IDENTIFIER, AUTO PATCH, OR COMPUTER CONTROLLERS. IN ADDITION TO THESE ADD ONS AN ADDITIONAL RECEIVER AND TRANSMITTER CAN BE MOUNTED INTERNALLY FOR USE AS CONTROL LINKS, REMOTE BASE OR DUAL BAND OPERATION, ETC.

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SPECIAL EVENTS

Ham Doings Around the World

Number 24 on your Feedback card

Lists are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check Special Events File Area #11 on our BBS (603-924-3343), for listings that were too late to get into publication.

OCT 2-3

OCT 4

OCT 5

OCT 6

OCT 7

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VIRGINIA BEACH, VA Tidewater Radio Conventions, Inc., will present their 18th annual Virginia Beach Hamfest at Computer Fair/ARRL Virginia State Convention/Popular Communications SWL Convention, at the Virginia Beach Pavilion from 9 AM-5 PM Sat., and 9 AM-4 PM Sun. Speakers are Gordon West WB6NOA, and Roy Neal K6OUE. VE Exams, Flea Market, Tailgating, Forums, and more. Talk-in on 146.97. Order tickets with SASE from Stanley Steiner KD4OR, 3612 Olympia Ln., Virginia Beach VA 23452. Tel. (804) 340-6105. Get Commercial info from Lewis Steinbold W4BLO, 1008 Crabbers Cove Ln., Virginia Beach VA 23452. Tel. (804) 489-3800.

ASHLAND, OH The North Central Ohio Hamfest will be held from 8 AM-3 PM at Ashland County Fairgrounds, Flea Market, Forums. 2m Foxhunt. Talk-in on 147.055. Contact Wally Green, 3 East Liberty St., Ashland OH 44805. Tel. (419) 281-3003.

WARMINGTON, PA The AM City Air/ZZW Radio Club, Inc., (Pack Rat's) will sponsor their Hamarama at the Rt. 61 Drive In. Talk-in on 146.52 (simplex). Gates open at 7 AM. Contact K6CC, 6 AM. Contact K6CQED, (215) 742-3312.

OCT 8-9

OCT 9-10

OCT 10-11

OCT 11-12

OCT 12-13

OCT 13-14

OCT 14-15

OCT 15-16

OCT 16-17

OCT 17-18

OCT 18-19

OCT 19-20

OCT 20-21

OCT 21-22

OCT 22-23

OCT 23-24

OCT 24-25

OCT 25-26

OCT 26-27

OCT 27-28

OCT 28-29

OCT 29-30

OCT 30-31


WARREN, MI The Utica Emergency Com. Assoc. will hold their USECA Swap from 8 AM-2 PM, at Student Community Center (K-Bldg.), Macomb Community College, South Campus. VE Exams (required). Talk-in on 146.52 MHz. Advance registration required with a SASE to: Warren Amateur Radio Club, P.O. Box 172, Warren MI 48090. Contact B. Shurley, K8L, (517) 744-5251.

WESTMINSTER, MD The Radio Clubs of America Hamfest at Mt. Pleasant Park, will be holding the 4th annual Mason-Dixon Computer & Hamfest at the Carroll County Ag Center, starting at 8 AM. VE Exam registration begins at 8 AM, pre-registration required. Contact Page Evans NE3P, (717) 359-7610.

EAST LAM, CT The Tri-City ARC will host its annual Fall Auction at the Senior Citizens Center, Waterford Municipal Complex, from 10 AM till sold out. Bring your equipment to be auctioned. Talk-in on 146.875 Rpt. For info call K1AB at (203) 569-8880.

FREDERICKSBURG, VA VE Exams will be given at the Rappahannock Library in Fredericksburg. For details, call ACA5K at (703) 373-7076, or ACA4BM at (703) 891-5581.

ST. PAUL, MN The Hamfest Minnesota & Computer Expo, sponsored by the Twin Cities FM Club, will be held in the Main Arena at the St. Paul Civic Center, 1434 West 4th St. VE Exams. Educational and Fun Seminars. Talk-in on
- Packet Radio - Portable & Affordable!

Model BP-1 Packet Modem Made in U.S.A.

Whether you're an experienced packeteer or a newcomer wanting to explore packet for the first time, this is what you've been waiting for! Thanks to a breakthrough in digital signal processing, we have developed a tiny, full-featured, packet modem at an unprecedented low price. The BayPac Model BP-1 transforms your PC-compatible computer into a powerful Packet TNC, capable of supporting sophisticated features like digipeating, file transfers, and remote terminal access. NOW is the time for you to join the PACKET REVOLUTION!

PacTOR / AMTOR Without a TNC

G4BMK's BMK-MULTY software, in addition to unequaled AMTOR performance, now does PacTOR with any ordinary RTTY terminal unit such as CP-1, CP-100, TU-170, ST-6, ST-5000, ST-6000, etc., plus we now have an adapter for PK-232. IBM-PC or compatible required.


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Radio Fun!
NEVER SAY DIE

Continued from page 4
What do you talk about when you make a contact? Are you actually talking about anything, or is your mike fright so bad that all you can do is list the model numbers of your equipment and antenna? And what about the weather, spell out your name and turn it back? Go get a life! For heaven's sake do something you can talk about! I don't give a damn what rip you're using. I don't care what brand of antenna you were able to afford. I don't care that it's raining. I want to know something about you.

No, I don't want to sit and listen while you rant about something you're emotionally disturbed about. That's no fun. But I would be interested in anything interesting ham adventures you've had. If you've read my editorials for any time you know about everything I'm interested in. I'm into all kinds of hobbies and several active sports. I read a ton of books and magazines and will be most interested in anything you've read and found interesting that I might have missed. I love getting letters from readers giving me leads on books I'll enjoy reading or music I might enjoy hearing.

What I don't need is to get on a repeater where there's some resident retired old codger who rambles on endlessly about nothing, month after month. You've got one of those around, right? Heck, I'd even get bored listening to someone like this year's Ham O' The Year award winner and his obsession with me and my admittedly adventurous life. These old guys must have something that interests them other than ham radio. Or, if they have never done anything in their lives outside of hamming, isn't there something interesting they've done in amateur radio?

I've told you how much fun I had hamming from the demilitarized zone between North and South Korea as H68WGC. right? Or getting on the air as 7P8CA from Lesotho. You can surely get a good QSO going by asking if they've read what that arrogant, egotistical asshole Wayne Green wrote this month. Well, don't use those exact words. They might offend some Ner­vous Nelly listening in. We've enough garbage-stuff going on without you contributing to the mess. The language you use on the air is a clear announce­ment of your class in society. After a few words we know right where you fit in, so if we hear you using bad language and fractured grammar, we wonder why you aren't on CB where you belong. How did an ignorant slob like that get a ham ticket? Maybe that code test isn't enough of an operation.

I suppose I'm preaching to the choir. The wags who need my advice the most wouldn't read 73 if their life depended on it. Not with all that ARRL bashing they think I do. Of course they've never read 73, so they're going by word of mouth about my writing.

I keep trying to get you to break loose and go on a DXpedition. That'll give you something interesting to talk about for years. You might even get into to slow-scan just so you can show your slides. And I'll love watching 'em. Yes, I know, you can't afford anything like that. Unless you're really into poverty as a way of life, there are plenty of easy DXpedition places to visit and have the time of your life.

Heck, you can drive to Nova Scotia and take a boat or plane to St. Pierre for a surprisingly few bucks. It's a bargain place to visit and they love visiting hams. I'm frugal, and I've never cared much about making money, and hate spending it. At least on myself. I've spent millions helping other people start businesses.

The Caribbean is another bargain place to visit and there are a dozen or so fairly rare spots you can activate. You can get there in a day, so don't even need to have more than a week off to have a ball. Try it. Then write and thank me for pushing you. Also, let's see an article for 73 or Ra­dio Fun.


Many years ago I suggested we set up some net times and frequencies for hams with similar interests to meet and talk. Nothing came of it. One problem with nets is that once you have more than two or three stations involved there's a reluctance to say much. The result is that a bunch of ops check into the net and say hello. And that's about it.

There's a weekly submarine nets. I called in a couple times. Now, I've got hours of interesting submarine yarns to tell, but I never found an opportu­nity. So I stopped checking in. The net was on 26m, which meant that half of the checkins couldn't hear the other half, which puts a real chill on talking for any length of time. Interest groups should stick to 80m and maybe 160m, where everyone can hear everyone else. Or perhaps 2m via a repeater.

Always try to be your very best at anything you do. So when it comes to hamming, invest what it takes to make you the most interesting ham on the band to talk with. Work hard at it. Tape yourself and take the time to critique it. Be upbeat. No one likes a sour apple, so gripping and negative will have people avoiding you the next time around. I get letters from hams who obviously are devoting their lives to making as many people unhappy as possible. I sure hate when I run into 'em on the air.

That last QSO... was that the very best you're able to do?

Trivia

One of the ham rags made a great big deal out of a TV production outfit

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communications medium of the 1920s and 1930s. Looking back lovingly at our archaic license structure, which is collapsing around us. Our national society is a radio relay league, aptly named when relaying was the only way to cover much distance by radio... around 80 years ago. Bummer.

New Hampshire and the 21st Century

An invitation came from Congress­man Dick Swett (D-NH) to a meeting in nearby Keene proposing the organi­zation of a 1994 National Information Technologies Conference at Keene State College. Swett spoke to (and with) the group via satellite video from Washington. We could see him, but the video was one way, so he couldn’t see us. We could hear him just fine, but he had trouble hearing us, and then the audio link was lost.

There were around 25 business and education leaders present. We struggled to try and understand just what Swett or anyone involved in the project thought an Information Tech­nologies Conference would involve... what the benefits would be and to whom... and who was going to pay for all this. There seemed to be a good deal of confusion about this. Swett read a long, prepared Beltway lan­guage speech... a lot about pro-ac­tivity. I’m pretty good at translating var­i­ous American dialects into plain En­glish, but I got lost. So did everyone else. Fortunately, I’m not exactly sure what pro-activity is, but I’m all for it, and it describes me to a tee.

There were some vague references to information technology somehow benefiting local businesses, which is almost obvious enough not to have to be defended. And there was the need for Keene State College to start pro­ducing the information technology work force local businesses are going to need.

The hope was that Keene State and the local business leaders would work together to organize the confer­ence. There were some muddling around getting federal funding, but first they needed $50,000 from the busi­ness community as seed money to get the project started. This would take care of the next three months, when they hoped federal funding would kick in. Hmmm. Fifty big ones for three months? The obsfuscation almost smothered us, but I think what they had in mind was sending someone or a small group around the world to look into information technology elsewhere. There was some mention of site selec­tion. I quickly offered to handle the site seeing part of the project for them as soon as they had the $50G, pointing out my extensive qualifications and contacts in the communications community everywhere in the world. I didn’t think they heard me. Perhaps they al­ready had some volunteers with their eyes on the $50G.

Far’s I could see, the local business community was much more interested in the fruit and cheese plate than do­nating to this phantom project. But hey, you never know. The last two times I volunteered to go on expenses­paid around-the-world trips I won out, so my foot seems to automatically ex­tend at the slightest hint, looking for any running boards to climb on... so to speak. You remember running boards, right? You’ve seen ’em in the old movies, with gangsters hanging on, shooting.

Yes, it would be nice if Keene could attract some of the coming high-tech manufacturing that the communica­tions and information technology indus­tries will make possible. And if Keene State could help provide high­tech career workers, the chances are good that the area would benefit from this by attracting such businesses. They’d better start working out some methods for helping to finace these startups though, otherwise they and the workers will go where the money is.

Of course adding some technical courses to a state college isn’t going to do squish. They’ve got to train teach­ers and get the New Hampshire K-12 schools to change. Big change. You don’t become much of an engineer, technician or scientist with a couple years of college. You need to get start­ed when you are in the 5th grade if you’re going to go anywhere and do anything. That’s why I keep nudging you to visit your local schools and fire up the 5th graders. Get ’em excited. Get these noisy, bothersome little nuis­sances to your ham club and poison their dirty little minds with our fascinat­ing hobby. It happened to me, and like all such addicts, I want to spread the misery.

Swett promised that if we organized a national conference he’d try to get Clinton to come. And if he failed with that, to get him for us via TV. Failing that, he’d push for some other high of­ficial to come or at least address us via closed-circuit TV. Let’s see, who’s the new junior at the White House? I still haven’t a clue as to what the site investigation team was expecting to find out on their $50G trip. I did miss out on a great opportunity. I wish I was faster on my feet on these things. I should have jumped up and started a collection plate around, pledging $10 to get the fund going. My life is full of missed opportunities like that.

You Read It Here First!

Some time back, when I wrote about homosexuals in amateur radio, I got several heated letters from Bible-thumping religious fanatics. They were incensed I’d suggested that there was a genetic element to this devia­tion from the norm. By the way, homo­sexuality is just one of a wide variety of deviations which cause people trou­blesome. Being too tall, too short, too stupid, too intelligent, too ugly, too pretty, too skinny, too fat, too buxom, too flat-chested, and so on... all the “too’s”... are deviations that we don’t
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take with grace and understanding. We also make fun of deviant ears, noses, hairlines, and so on. Ask Percol.

The overwrought were upset at gays (aka homo, queers, fags) advertising in ham magazines, seeking mates for their gay ham society. Lambda. I pointed out that science had shown that there seems to be a genetic predisposition for gyness and that my own research in the field had shown that the gays I worked with had had these feelings from their earliest memories. In my work I've been able to trace back virtually all psychological abnormalities to specific triggers during painful childhood and even prenatal experiences. A few were resolved by taking a tolerant approach to past life "memories." But gyness, in the cases I worked with, didn't fit into the normal psychological trigger pattern. It seemed to have a genetic basis. It's therefore interesting that recent scientific genetic research has confirmed this.

Now, I'm not by any means saying that all gay activity is genetically manifested. If you're at all read in history you know that in societies where homosexuality was condoned. It was widely practiced, so obviously there's a strong psychological component involved. So, though we may abhor the practice of homosexuality as a cultural bias today, we can't help being sympathetic to those who are genetically driven, despite society's censure. It's the male homosexual lifestyle that attracts the most outrage and the least sympathy when AIDs strikes. Kinsey's research showed that while the average lesbian has less than 10 sexual partners, the typical male homosexual in America has had over 500! We know that male sexuality is much more destructive than female when not controlled. Men rape, not women. Only men engage in feticides. Only men are sexually sadistic.

It was Judaism that changed things. Judaism, and its spin-off, Christianity. Up until then homosexuality was accepted. It was excised in Greece, commonly accepted in Rome, and is still popular in the Arab world. It was prevalent among the pre-Columbian Americans, the Celts, Gauls, pre-Norman English, Chinese, Japanese, and Thai (see The Public Interest #112). So here in America we've been inculturated with the Jewish/Christian beliefs. I'm not sure that even recognizing that we've been brainwashed by our religious training will allow many of us to be tolerant.

So we harms are outraged when we learn that some of our outstanding hams have been convicted of molesting a young boy. Indeed, one of our best-known repeater pioneers was convicted of this, as was one of our major ham convention luminaries. And so we naturally react with suspicion when we see acts aimed at attracting youngsters to a homosexual hangout.

And now we're learning that Catholic priests have been having sex with and even raping altar boys without any significant reaction by the church when it's reported... other than to transfer the offenders to a new area... much to the frustration of the families involved.

The militant feminists haven't helped things. Men and women have some powerful basic differences, which many feminists try to deny. For instance, men, when they are born, are much less amenable to socialization than women. They're four to six weeks behind neurologically, and need more care. They're more likely to be hyperactive, autistic, color-blind, left-handed, and prone to learning disorders. They tend to be much more affected by the mother's prenatal use of drugs such as tobacco and alcohol. In every society men play more roughly, drive more recklessly, and fight more than women, and these traits appear early in life. Archaeology tells us that in prehistory about 25% of all males died in fights... about the same as anthropologists have found in recent years with primitive tribes.

Men, as they grow up, are much more likely than women to cause trouble in school. Male alcoholics or drug addicts, and commit crimes. By and large there's no historical evidence to show that there's ever been a society ruled by women.

The anti-militant feminists are prone to name-calling, so are many of the militant homosexuals. They use the term "homophobic," yet no such phobia exists in any medical list of phobias. This is demagoguery and makes as much sense as shouting back that they're women-phobic. It's McCarthyism repeating itself.

Judaism was a breakthrough religion in that it took on the family. Its prohibition of non-marital sex changed the world. This was carried on later by Christianity. Both religions condemn homosexuality, incest, and bestiality.

If we look to biology as a guide, where one of her basic rules is to be fruitful, homosexuality fails. So I have no personal problem with consenting adults enjoying what pleases them as long as they don't mess with unsuspecting adults or children.

Having served for four years in the Navy, I had a good laugh over the spot Clinton got himself into by catering to the militant gays and promising them out-of-the-closet military careers. Clinton, not having served in our military, didn't know what he was getting into. And sexuality being what it is, anyone who's read much about our prisoners knows, announced homosexuals in the military could easily create trouble.

I went to sea for five war patrols during WWII with a crew of about 80 other sailors. We were all men and good buddies. We still get together every year to remember the good and bad times we had 50 years ago. But if we'd had some gays sleeping right next to us in those crowded quarters, it could have created tremendous tension. And probably fights... something we sure didn't need on a sub marine.

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ARRL At It Again

Once again, I am forced to inform you of a continuing situation in Newington. Like so many of their actions in the past, actions made on your behalf, you won't be reading about this in the QST. Unfortunately, I don't have to keep doing this, but I feel that it is important the amateur radio community gets an accurate picture of the organization that supposedly represents all of us.

As you may remember, the FCC now has authority to allow a private organization to administrate the issuing of special club and military call signs. The rules state that any organization seeking the right to issue these special call signs must (among other requirements) be tax-exempt under the IRS educational designation and exist for the purpose of furthering the Amateur Radio Service, demonstrate that its membership constitutes at least 1% of FCC-licensed operators (that would be about 6,140, as of this writing) and process applications without regard to race, sex, religion, national origin or membership status in any particular organization. Pretty simple, right? Not according to the ARRL.

The ARRL (surprise, surprise) thinks they should be the only organization and issue these call signs. They tried to get the law written in such a way that would exclude all other organizations, but their sneaky tactics have failed in the courts. To add insult to injury, they now have a computer error, because I'm sure the ARRL would have made every endeavor to inform their members of such a situation.

The FCC received applications to issue club call signs from five organizations: the ARRL, W51-VEC (whose tax-exempt status has been accepted by the IRS, but a number has not yet been issued), the Quarter Century Wireless Association (remember, it was the QCW who ticked off the League by coming up with a simple, elegant and workable no-code proposal, which effectively killed the ARRL's convoluted and complex plan), the Southeastern Repeater Association and the National Amateur Radio Organization. On August 6 of this year the ARRL also filed a 24-page "Opposition to Requests for Designation of Certain Entities as Club and Military Recreation Station Call Sign Administrators." In this document the ARRL objects to the four competing organizations' applications.

The League doesn't like W51-VEC because its tax-exempt status has not yet been issued. The League also objects to the fact that W51-VEC changed its corporate status from two separate corporate entities to one, the same company to two separate corporate entities, one of which is to be tax-exempt. I'm surprised that the ARRL used this flimsy objection, since it is similar to what they had to do, as publishers of license testing literature, when they wanted to start the ARRL-VEC (another new in the recent past when the League tried and failed to block all other organizations from participation). The ARRL doesn't like QCWA because it is a social club and, according to Newington, is organized for pleasure and recreation rather than education. The League also mentioned that it doubted the QCWA could handle the assignment of club call signs with a single employee.

The Southeastern Repeater Association is being blackballed by the FCC in Connecticut because they filed their application by fax at a time when the FCC offices were closed for the evening. The League also states that a facsimile transmission does not constitute a legal signature, and that the SRA doesn't have the required 1% of all licensed amateurs as members.

The ARRL questions The National Amateur Radio Association's membership of over 7,000 and it's function as more than anything a very limited magazine publisher, subscription to which constitutes membership. The ARRL move by the ARRL to block any other group from administering any part of amateur radio is not new. Time and time again, the League has spent your dollars to light their own personal battles and agenda. Only when the League is successful do the members hear about how the all-knowing and benevolent ARRL has wrought something wonderful. When the League fails at their power graps (as in the case of the VEC program and the authorization started 22, this call sign administration program), the members are never informed.

I have been accused of being a League-basher. This is simply not the case. Most of the people who I come in contact with who work for the League are great folks. Realy! The problem is the folks at the top. Realy. Remember, the fish always stink from the head down. I'm sure that all the folks at the upper echelons of the ARRL are nice people. But the arrogant, self-righteous, people who are kind to small children and puppies, say "please" and "thank you" and always remember their mothers on Mother's Day. I do not question the personal qualities of any individual. The organization as a whole has lost its way. They have stopped looking out for the interests of amateur radio and are now only concerned with the interests of the ARRL. Unfortunately, they long ago convinced themselves that the two are the same thing.

The ARRL must be accountable to the very people it claims to serve. I don't think any criticism I've ever leveled at the League has been ungrounded. I've received a lot of mail about my opinion of the ARRL, but never once has anyone presented evidence to show that I was wrong. My deepest hope is that, with the passing of the old guard, a new generation of hams will rise forth to reclaim a once-glorious heritage.

Until that day arrives, a simple question remains: Since the ARRL claims to be "of, by and for the radio amateurs", how come so much of their time and money is spent on fighting for control of amateur radio instead of solving the problems of amateur radio?
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