

73[®] Amateur Radio Today

MARCH 1999
ISSUE #462
USA \$3.95
CANADA \$4.95

Talk About a Cold Reception!



AL7PJ, page 30

QRP Kit Survey (Y2K precaution?)

Ferrite Loop Xmtg Antenna (yep!)

Filter Design for Dummies

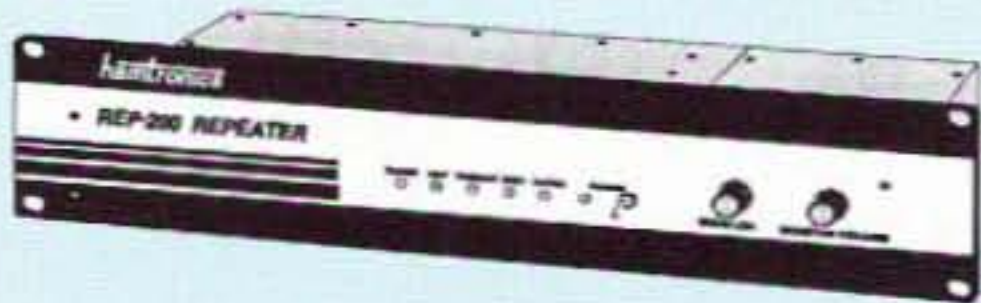
CW: A Better Fist

CW: How to Have More Fun



Get more features for your dollar with our REP-200 REPEATER

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



- kit still only \$1095
 - factory assembled still only \$1295
- 50-54, 143-174, 213-233, 420-475 MHz. (902-928 MHz slightly higher.)
 * FCC type accepted for commercial service in 150 & 450 MHz bands.

Digital Voice Recorder Option. Allows message up to 20 sec. to be remotely recorded off the air. Play back at user request by DTMF command, or as a periodical voice id, or both. Great for making club announcements! only \$100.

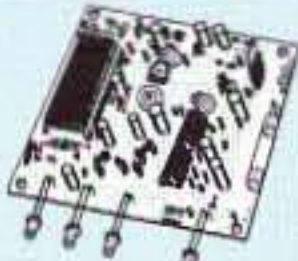
REP-200C Economy Repeater. Real-voice ID, no dtmf or autopatch. Kit only \$795, w&t \$1195.

REP-200N Repeater. Without controller so you can use your own. Kit only \$695, w&t \$995.

You'll KICK Yourself If You Build a Repeater

Without Checking Out Our Catalog First!

Hamtronics has the world's most complete line of modules for making repeaters. In addition to exciters, pa's, and receivers, we offer the following controllers.



COR-3. Inexpensive, flexible COR module with timers, courtesy beep, audio mixer. only \$49/kit, \$79 w/t.

CWID. Traditional diode matrix ID'er. kit only \$59.

CWID-2. Eprom-controlled ID'er. only \$54/kit, \$79 w/t.

DVR-1. Record your own voice up to 20 sec. For voice id or playing club announcements. \$59/kit, \$99 w/t.

COR-4. Complete COR and CWID all on one board. ID in eprom. Low power CMOS. only \$99/kit, \$149 w/t.

COR-6. COR with real-voice id. Low power CMOS, non-volatile memory. kit only \$99, w/t only \$149.

COR-5. µP controller with autopatch, reverse ap, phone remote control, lots of DTMF control functions, all on one board, as used in REP-200 Repeater. \$379 w/t.

AP-3. Repeater autopatch, reverse autopatch, phone line remote control. Use with TD-2. kit \$89.

TD-2. Four-digit DTMF decoder/controller. Five latching on-off functions, toll call restrictor. kit \$79.

TD-4. DTMF controller as above except one on-off function and no toll call restrictor. Can also use for selective calling; mute speaker until someone pages you. kit \$49.

SUBAUDIBLE TONE ENCODER/DECODER



Access all your favorite closed repeaters!

- Encodes all standard CTCSS tones with crystal accuracy and convenient DIP switch selection.
- Comprehensive manual also shows how you can set up a front panel switch to select tones for several repeaters.
- Decoder can be used to mute receive audio and is optimized for installation in repeaters to provide closed access. High pass filter gets rid of annoying buzz in receiver. ☺ New low prices!
- TD-5 CTCSS Encoder/Decoder Kit now only \$29
- TD-5 CTCSS Encoder/Decoder Wired/tested \$49

LOW NOISE RECEIVER PREAMPS

LNG-() GAAS FET PREAMP

STILL ONLY \$59, wired/tested

- Make your friends sick with envy! Work stations they don't even know are there.
- Install one at the antenna and overcome coax losses.
- Available for 28-30, 46-56, 137-152, 152-172, 210-230, 400-470, and 800-960 MHz bands.



LNW-() ECONOMY PREAMP

ONLY \$24/kit



- Miniature MOSFET Preamp
- Solder terminals allow easy connection inside radios.
- Available for 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, and 400-500 MHz bands.

TRANSMITTING & RECEIVING CONVERTERS

No need to spend thousands on new transceivers for each band!



- Convert vhf and uhf signals to & from 10M.
- Even if you don't have a 10M rig, you can pick up very good used xmtrs & rcvrs for next to nothing.
- Receiving converters (shown above) available for various segments of 6M, 2M, 220, and 432 MHz.
- Rcvg Conv Kits from \$49, wired/tested units only \$99.
- Transmitting converters for 2M, 432 MHz.
- Kits only \$89 vhf or \$99 uhf.
- Power amplifiers up to 50W output.

WEATHER ALERT RECEIVER

A sensitive and selective professional grade receiver to monitor critical NOAA weather broadcasts. Good reception even at distances of 70 miles or more with suitable antenna. No comparison with ordinary consumer radios!



Automatic mode provides storm watch, alerting you by unmuting receiver and providing an output to trip remote equipment when an alert tone is broadcast. Crystal controlled for accuracy; all 7 channels (162.40 to 162.55). Buy just the receiver pcb module in kit form or buy the kit with an attractive metal cabinet, AC power adapter, and built-in speaker. Also available factory wired and tested.

- RWX Rcvr kit, PCB only \$79
- RWX Rcvr kit with cabinet, speaker, & AC adapter \$99
- RWX Rcvr wired/tested in cabinet with speaker & adapter \$139

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A very sensitive wideband fm receiver optimized for NOAA APT & Russian Meteor weather fax on the 137MHz band.

Designed from the start for optimum satellite reception; not just an off-the-shelf scanner with a shorted-out IF filter!

Covers all 5 satellite channels. Scanner circuit & recorder control allow you to automatically capture signals as satellites pass overhead, even while away from home.

- R139 Receiver Kit less case \$159
- R139 Receiver Kit with case and AC power adapter \$189
- R139 Receiver w/t in case with AC power adapter \$239
- Internal PC Demodulator Board & Imaging Software \$289
- Turnstile Antenna \$119
- Weather Satellite Handbook \$20

SYNTHESIZED FM EXCITER & RECEIVER MODULES



We recently introduced new vhf fm exciters and receivers which do not require channel crystals. NOW... uhf modules are also available!

Exciters and Receivers provide high quality nbfm and fsk operation. Features include:

- Dip switch frequency selection.
- Exceptional modulation for voice and ctcss.
- Very low noise synthesizer for repeater service.
- Direct fm for data up to 9600 baud.
- TCXO for tight frequency accuracy in wide range of environmental conditions.
- Next day shipping. No wait for crystals.

EXCITERS:

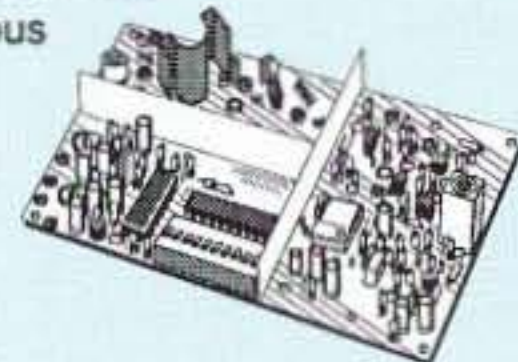
Rated for continuous duty, 2-3W output.

T301 VHF Exciter: for various bands 139-174MHz*, 216-226 MHz.

- Kit (ham bands only) ...\$109 (TCXO option \$40)
- Wired/tested, incl TCXO...\$189

T304 UHF Exciter: various bands 400-470 MHz*.

- Kit (440-450 ham band only) incl TCXO ...\$149
 - Wired/tested...\$189
- * for gov't & export use.



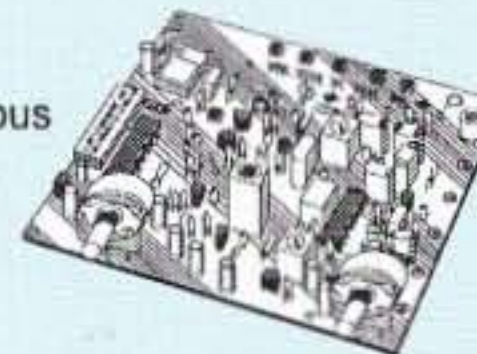
RECEIVERS:

R301 VHF Receiver: various bands 139-174MHz*, 216-226 MHz.

- Kit (ham bands only) ...only \$139 (TCXO option \$40)
- Wired/tested ...\$209 (includes TCXO)

R304 UHF Receiver: various bands 400-470 MHz*.

- Kit (440-450 ham band only) incl TCXO ...\$179
- Wired/tested...\$209



TRADITIONAL CRYSTAL-CONTROLLED VHF & UHF FM EXCITERS & RECEIVERS

FM EXCITERS: 2W output, continuous duty.

- TA51: for 6M, 2M, 220 MHz kit \$99, w/t \$169
- TA451: for 420-475 MHz. kit \$99, w/t \$169
- TA901: for 902-928 MHz, (0.5W out) w/t \$169

VHF & UHF POWER AMPLIFIERS.

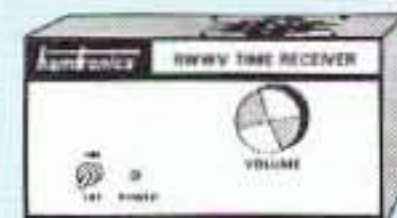
Output levels from 10W to 100W..... Starting at \$99

FM RECEIVERS:

- Very sensitive - 0.15µV.
- Superb selectivity, >100 dB down at ±12 kHz, best available anywhere, flutter-proof squelch. For 46-54, 72-76, 140-175, or 216-225 MHz. ... kit \$129, w/t \$189
- R144 RCVR. Like R100, for 2M, with helical resonator in front end..... kit \$159, w/t \$219
- R451 FM RCVR, for 420-475 MHz. Similar to R100 above. kit \$129, w/t \$189.
- R901 FM RCVR, 902-928MHz \$159, w/t \$219

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Get time & frequency checks without buying multiband hf rcvr. Hear solar activity reports affecting radio propagation. Very sensitive and selective crystal controlled superhet, dedicated to listening to WWV on 10 MHz. Performance rivals the most expensive rcvrs.



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- RWWV Rcvr kit with cabt. spkr, & 12Vdc adapter \$89
- RWWV Rcvr w/t in cabt with spkr & adapter \$129

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May 14, 15, 16, 1999

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Dayton Hamvention® is something that all hams should experience!

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A family event! At Hamvention®, you are among friends, other hams just like you that have come to Dayton to enjoy the show.

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	73 1 2 3 4	
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Shop-A-Round, Saturday	@ \$5.00	= \$ _____
Cooking Class, Saturday	@ \$20.00	= \$ _____
Make It and Take It, Saturday	@ \$5.00	= \$ _____
Gardening Class, Saturday	@ \$3.00	= \$ _____
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SWITCHING POWER SUPPLIES

	CONT.	ICS	WT.(LBS)
SS-10	7	10	3.2
SS-12	10	12	3.4
SS-18	15	18	3.6
SS-25	20	25	4.2
SS-30	25	30	5.0



SS-25M With volt & amp meters
SS-30M With volt & amp meters

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

SPECIAL FEATURES

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

PERFORMANCE SPECIFICATIONS

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

SL SERIES



• LOW PROFILE POWER SUPPLY

MODEL	Colors		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
	Gray	Black				
SL-11A	•	•	7	11	2 5/8 x 7 1/8 x 9 3/4	12
SL-11R	•	•	7	11	2 5/8 x 7 x 9 3/4	12
SL-11S	•	•	7	11	2 5/8 x 7 1/8 x 9 3/4	12
SL-11R-RA	•	•	7	11	4 1/4 x 7 x 9 3/4	13

RS-L SERIES



• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-4L	3	4	3 1/2 x 6 1/8 x 7 1/4	6
RS-5L	4	5	3 1/2 x 6 1/8 x 7 1/4	7

RM SERIES



MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RM-12A	9	12	5 1/4 x 19 x 8 1/4	16
RM-35A	25	35	5 1/4 x 19 x 12 1/2	38
RM-50A	37	50	5 1/4 x 19 x 12 1/2	50
RM-60A	50	55	7 x 19 x 12 1/2	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5 1/4 x 19 x 8 1/4	16
RM-35M	25	35	5 1/4 x 19 x 12 1/2	38
RM-50M	37	50	5 1/4 x 19 x 12 1/2	50
RM-60M	50	55	7 x 19 x 12 1/2	60

RS-A SERIES



MODEL RS-7A

MODEL	Colors		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
	Gray	Black				
RS-3A		•	2.5	3	3 x 4 1/4 x 5 3/4	4
RS-4A	•	•	3	4	3 3/4 x 6 1/2 x 9	5
RS-5A	•	•	4	5	3 1/2 x 6 1/8 x 7 1/4	7
RS-7A	•	•	5	7	3 3/4 x 6 1/2 x 9	9
RS-10A	•	•	7.5	10	4 x 7 1/2 x 10 3/4	11
RS-12A	•	•	9	12	4 1/2 x 8 x 9	13
RS-12B	•	•	9	12	4 x 7 1/2 x 10 3/4	13
RS-20A	•	•	16	20	5 x 9 x 10 1/2	18
RS-35A	•	•	25	35	5 x 11 x 11	27
RS-50A	•	•	37	50	6 x 13 3/4 x 11	46
RS-70A	•	•	57	70	6 x 13 3/4 x 12 1/2	48

RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4 1/2 x 8 x 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 x 9 x 10 1/2	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13 3/4 x 11	46
RS-70M	57	70	6 x 13 3/4 x 12 1/2	48

VS-M AND VRM-M SERIES



MODEL VS-35M

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

MODEL	Continuous Duty (Amps)			ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt. (lbs.)
	@13.8VDC	@10VDC	@5VDC			
VS-12M	9	5	2	12	4 1/2 x 8 x 9	13
VS-20M	16	9	4	20	5 x 9 x 10 1/2	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13 3/4 x 11	46
VS-70M	67	34	16	70	6 x 13 3/4 x 12 1/2	48
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5 1/4 x 19 x 12 1/2	38
VRM-50M	37	22	10	50	5 1/4 x 19 x 12 1/2	50

RS-S SERIES



MODEL RS-12S

• Built in speaker

MODEL	Colors		Continuous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt. (lbs.)
	Gray	Black				
RS-7S	•	•	5	7	4 x 7 1/2 x 10 3/4	10
RS-10S	•	•	7.5	10	4 x 7 1/2 x 10 3/4	12
RS-12S	•	•	9	12	4 1/2 x 8 x 9	13
RS-20S	•	•	16	20	5 x 9 x 10 1/2	18
SL-11S	•	•	7	11	2 3/4 x 7 1/8 x 9 3/4	12

THE TEAM

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www.waynegrain.com

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design73@aol.com

On the cover: Randy AL7PJ kept his cool while sending "Signals From the Ice" (page 20). Photo by KL7JR. We are always looking for interesting articles and cover photos—with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* You couldn't use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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NEVER SAY DIE

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How Come?

Yeah, how come Wayne is writing all these long editorials? One thing I haven't done in all my 48 years of writing editorials is give some background as to how I happened. Well, I figured my readers would be more interested in what I had to say about things than about me personally.

I was born in 1922 in Littleton, New Hampshire. My mother was a commercial artist and my dad was an aviator with the Army Air Force, stationed at Langley Field, Virginia. He took me up in a Martin bomber when I was about two months old, so I got an early start.

My great grandfather was a pioneer in homeopathy. He was the town doctor in Littleton, where my father also was born. A Green published the first Bible in America, and Greens founded Greene County, NY and Green County, MI. A Greene also founded Rhode Island, but it's a small state, so that probably isn't very important.

By an odd coincidence, all of my ancestors, from every branch of the family, came over here before 1700. Pioneers.

My grandfather was an inventor. A successful inventor. It was his inventions that got Citgo started back in 1910, and during the depression in the 1930s he turned Continental Can around, saving them from bankruptcy.

So I was ripe for amateur radio when I was a kid and started building radios when I was 15. By 16 I was busy making contacts on 40m CW. But it was the frontiers of amateur radio that attracted

me. Pioneering blood, maybe. By 1939 I'd built a 2-1/2m walkie-talkie. This interest in radio naturally got me into a technical university, Rensselaer. And then, when World War II came along, into the Navy as an electronics technician. I volunteered for submarine duty, where I served from 1943-1945. Then they transferred me to the submarine school in New London, CT to teach electronics.

After the war I went back to college, where I was the president of the radio club and founded WRPI, the campus radio station. Today that's the biggest student activity.

After college I worked as a radio engineer and DJ, then as chief cameraman at WPIX in New York and as a TV director at KBTB in Dallas and WXEL in Cleveland.

I got certificated and worked as a professional psychologist. I worked on a color organ on a Guggenheim Grant, and as the Secretary of the Music Research Institute, where I wrote my first book, *Music For Your Moods*.

But I was more interested in pioneering new ham modes, so when I heard about narrowband FM in 1946, I immediately got on the air with it. That's now the standard for VHF communication.

When sideband came along, as the editor of *CQ*, I pushed that.

I don't want to turn this into a full-fledged biography, so I'll end there. I just wanted to give you an idea of how I got the way I am.

Iconoclast

My dictionary defines an iconoclast as someone who

attacks conventional or cherished beliefs and institutions as being false or harmful. Hey, that's me! I am definitely an iconoclast! And the more I look into things (that's called research), the more I find I'm disbelieving conventional institutions. And yes, these institutions and beliefs are harming us. And they're false. But we've all been hoodwinked (a.k.a. brainwashed, hypnotized) into believing in them.

We are taught from the earliest childhood by our parents, our peers, neighbors and the media to believe in the goodness of mom and apple pie. We're thoroughly inculcated with beliefs that are making us sick, robbing us of 20-30 years of life, and keeping us from making much money.

We believe in our school system. Oh, we know it has some problems. More money might fix them, right? And we believe in doctors. Sure, there are some quacks. We believe in our food suppliers who are providing us with "enriched" and "lite" products, and we're protected by the FDA. Most of us don't believe our government would lie to us about really important things. Of course there are a few conspiracy nuts who are forever trying to make trouble over the Fed, the Illuminati, the National Security Council, the New World Order, and so on. And we have a few atheists who (gulp!) don't believe in God. That reminds me of the atheist in the funeral parlor — all dressed up and no place to go.

Then there are the government cover-ups such as the

UFOs and ETs, and the Amelia Earhart disappearance, which I knew personally about. Could the Apollo Moon visits have all been faked?

We're being bought off with entertainment to keep us too busy to figure things out. How much of your life is spent working, sleeping and being entertained? The average family, according to the latest research, watches TV seven hours a day!

As a registered iconoclast I question the conventional wisdom (stupidity?) about farming, the food industry, the IRS/FDA/AMA/ADA, our money, the American Cancer Society, doctors, hospitals, NASA, Congress, Clinton, the pharmaceutical industry, immunization, alternative health, the military, the war on drugs, the war on poverty, public schools, colleges, religions, the music industry, sports, radio, TV, newspapers, news magazines, the dangers of pot, insurance, banks, psychiatry, milk, sugar, white flour, cooking, dental amalgam, NutraSweet, big business, lawyers, judges, most jobs, prisons, UFO/ET debunking, unions, fluoridation, global warming, the ozone hole, tobacco, liquor, coffee, property taxes, Social Security, environmentalism, freon's hazards, the pyramids' age, dowsing debunking, reincarnation debunking, foreign aid, public water supplies, Medicare, and so on. I'll think of more.

Unless you're a newcomer to these pages, you've read my exposés of all of the above. And more.

Opportunity

There it is, knocking again — quick, get your ear plugs. Say, what does it take to get you off dead center? Out of that couch with the TV turned off? Hello?

There's a great opportunity that's wide open right now that could be started with a micro loan and built into an international multi-billion dollar chain. Please don't make me do it! I want to keep doing

73 and my cold fusion journal, and write books. Oh, I'd like to have the freedom to visit another 70 countries, to ski and scuba dive around the world. So please don't, through your laziness and lack of motivation, force me to get this business started myself. I have this problem with seeing something that "someone" should do and, lacking a someone, I say what the hell and do it.

Okay, let's get down to business here. Look, there are tens of thousands of day care centers, so who needs more, right? Only any parents who have a serious interest in the development of their children. Sometimes I get the feeling that all too many parents find their children a terrible nuisance. They let day care centers babysit them during the day and hire a babysitter at night. Then, when they get to be five, they put 'em into kindergarten and let schools do the day care. They even provide transportation.

I don't mean to be critical (I'm lying), but if you'll spend a crummy seven bucks and get the Pocket Book *How to Raise a Brighter Child* by Joan Beck, you'll find out that if a child is provided with the right learning materials and stimuli at the right time for the child's brain and coordination development, it's easy to increase a child's IQ by 20 or more points. This is early learning that's not available in many (if any) day care outfits.

You say your child's day care center is excellent? Sure, then tell me how many languages your child was taught between the ages of one and three. That's when kids are able to learn just about any number of languages, to speak them without an accent, and to think in each of the languages, switching from one to the other with ease. After three, this learning opportunity is over. Zip, gone.

There are similar periods in a child's development when it quickly and eagerly learns certain things that will never be as easy to learn later. Windows of learning and devel-

opment opportunity are opening and closing (permanently) while you are putting it in storage at a day care center.

The super day care center of the 21st century will check your child to see when it is ready to learn what, and then give it the attention and exposure needed to build those skills. It will have native-speaking people to teach the children a dozen or so languages. Kids can (and will love to) learn to read and write by four, if permitted. And so on it goes, but only if the kids have the attention they need.

In these days when it takes both parents to make as much money as one used to make, day care centers are needed. Virtually no parents are equipped to teach their children a dozen languages, so there will be a need for that, if nothing else.

Children love to learn. They're interested in everything and, if permitted, will absorb an amazing amount of information. Kids love to learn to identify flowers and trees, animals, stars, and so on. They want to know about everything they can see, hear, feel and taste. It's natural. Instead, many parents imprison their kids in playpens or cribs during the time when their learning ability is trying to explode outward. They sedate and stupefy them with TV. If your kid has an opportunity to play with a piano or other musical instruments at three and four, the opportunity should be there. When I was six, I wanted to learn to play the piano and my father almost had to beat me to stop that nonsense. Later, friends heard of my interest and gave me their old piano. My dad had it hauled off and thrown away so he wouldn't have to listen to me practice. Oh well, I guess there isn't any big need for another composer anyway.

That's an extreme case, but are you doing something similar to your kids?

So how about getting together with some other parents and starting a super day care center? And then cloning it!

I've found several more superb books on the subject you'll want to read if I can get you off the couch.

Medical Research

Yesterday a ham whom I'd met at the Peoria Hamfest stopped by to visit, bringing along two radionics machines and a colored light system. He had a long list of amazing cures he'd achieved with them. So, how much do you know about radionics? They're similar to Hieronymus Machines, which were first described in *Analog* back around 1956. Hulda Clark explains how to build one in her *A Cure For All Illnesses*. That's a book that I don't recommend, by the way. I've written about these gadgets in the past, but I don't recall ever getting any encouraging reader feedback. How about using colored lights to cure illnesses? How can that possibly work?

Today I talked with a couple of people who are using Rife technology machines and also claim to be having some consistent cures for illnesses. I've written about Royal Raymond Rife, his incredible microscopes, and his approach to curing illnesses before, too, so I won't go into all that again. Basically, Rife found that specific radio frequencies would demolish pathogens.

I've also some books on the Lakhovsky Multi-Wave Oscillator, citing some remarkable results using it.

I've a friend who is achieving cures and healing with magnets.

What I don't have are any scientific double-blind studies of these approaches to healing. If any of them work, our medical establishment should investigate them and develop their designs and applications.

The medical establishment has a long and virtually unblemished history of ignoring new ideas for as long as possible, and crucifying their proponents. The pharmaceutical industry, which has a tight hold on the medical industry's jugular when it comes to implementing any cost-cutting developments, has

a basic rule — if we can't patent it and charge top dollar for it, you ain't gonna get it.

So, what do you know about radionics? Rife machines, Lakhovsky MWOs, magnets, colored lights, and other alternative devices which may be able to help repair our bodies for us?

Perhaps I should add stuff like carbon dioxide, hydrogen peroxide, UV light, the Bioelectrifier™, silver colloid, and other such healing technologies. Well, they all should be honestly investigated and tested, no matter how crazy they seem.

Between our paying around double what any other country has to pay for health care and getting poorer results than some third-world countries provide, it's time for some group to blow the whistle. Congress, whose kitty is well fed by the medical industry lobbyists, isn't about to rock the boat. Perhaps we need to set up a consumer's cooperative which could then bring a class action suit against the AMA, FDA, our hospitals, and the pharmaceutical industry for a couple trillion dollars for malpractice.

The fact is that we have a long way to go in understanding the mysteries of our bodies. Microelectric currents and magnetic fields seem able to even help regrow bones.

There's dowsing, which has been scientifically proven to work, but for which we have no logical explanation. And that is also true of psychokinesis, psychometry, precognition, remote viewing, and so on.

You don't even have to take my word, or the word of the researchers on whom I'm depending for my data, that all these things are real. You can learn to dowse, or any other of the above things you would rather reject as crazy. It's an ability that everyone seems to have. A latent ability that thrives when exercised. Look here, cheapskate, spend \$7 for Bevy Jargers' new pocket book on the subject. It's an instruction manual that

Continued on page 59

LETTERS

From the Ham Shack

Dave Miller NZ9E. I agree completely with your editorial take on the illegal drug problem ("Never Say Die," January 1999, page 60). By making buying and possessing drugs a crime, the government has only escalated the price, made drugs more appealing to those who enjoy the dare and the danger, and increased the possibility of an addict buying poorly handled or tainted drugs. It hasn't done a thing to solve the real problem.

The government doesn't seem to *get it*. Illegal drug usage isn't a crime, it's a vice.

There's a big difference between a crime and a vice. A crime occurs when an innocent victim is the *object* of the action—such as in robbery, rape, or murder. The innocent party is directly targeted. With a vice, the victim is oneself. Excessive drinking is a vice, so is smoking, overeating, gambling, prostitution, and any other self-destructive behavior. But they're not crimes. Even though people will say, "Isn't it a crime that so and so is involved in that," that's just an expression. It isn't a crime against society, it's a self-abusive vice. Our leaders have to come to terms with the distinction. As you wrote in your editorial, Prohibition—which made manufacturing, selling, buying and using alcoholic beverages a crime back in the '20s—was a complete flop. Why? Because alcoholism is a vice, not a crime. The government finally realized that (albeit 13 years after passing the Prohibition amendment).

Criminalizing vices is always unproductive and often cataclysmic, as we're now finding out with the War on Drugs. Education, along with recognizing and treating addictive personality traits, is a much better answer. We're finally at the point

where we recognize that eating disorders, gambling addiction and alcoholism are treatable illnesses. When will we recognize illicit drug addiction as the same?

Switzerland is now doing just that. The Swiss have a program in place that will supply (for virtually no money) hard drugs to addicts who come to the approved clinics for their "fixes." The Swiss are still coming down hard on the street sellers, but those street sellers will no doubt soon disappear because of the practically free alternative. The addicts themselves are of course happy with the idea, but also say that they're striving to get off of drugs because it's no longer "fun"—the daring and "coolness" is gone. And that's exactly what the Swiss authorities want, to make drugs "uncool." The Swiss are handling drug addiction as a treatable vice, not a crime. Selling drugs is a different story, but using them is looked at as a human weakness, not a criminal act. The victims are the users themselves, just as with any other vice.

Oh sure, there are innocent victims associated with vices, too—the innocent parties that can be killed when an alcoholic is driving drunk, the family members of an addicted gambler who can't afford to put food on the table, even those who suffer the effects of second-hand smoke from cigar and cigarette smokers, but these victims are not the direct targets of the vice—the fallout they suffer is primarily unintended. In a crime, the victim is the object of the crime; in a vice, any second or third party victimization is accidental, that is to say, they're not the target of the action. A vice is perpetrated on oneself. It's time that our government faced that fact in its "War on Drugs."

And just look at what our politically-inspired drug war has done to countries like Mexico and Colombia! The huge drug profits our government has made possible has poisoned the politics and economies of many Caribbean countries, as well as high officials in American agencies. If you think I'm exaggerating even a little, please read the well-researched book I recommended, Drug Crazy ... Wayne.

Frank Rumph KD4DZI.

There was a woman in the local paper who had AIDS. She was in the paper about a year ago, too. I called her and offered to give her my Bioelectrifier™. She asked for the information first, so I sent it to her. It's been a month now and I haven't heard from her. If I had an incurable disease I would try anything that came along. I don't understand people like her who are waiting for a miracle cure that may never come. In the meantime she is taking a diet of pills just to live. A year ago I offered it to the local AIDS group and never heard any more.

Frank, now you know how frustrated I feel! Between the Bioelectrifier for emergencies and a change of diet, I'm now convinced that any illness can be overcome — as I explain in my Secret Guide to Health ... Wayne.

The New Machine!

When Les Earnshaw demonstrated the new Kachina at Dayton, you can bet that the competition was all eyes, ears, and cameras. Well, this is the first really new development in ham gear in about 30 years — since the advent of sideband, solid state, and synthesized tuning. How long will it take before we see Japanese copies?

What I'd like to get is some letters from Kachina users — from the kind of hams who are the first to try new technologies, while everyone else waits. How

totally has our public school system killed the pioneering spirit which got our country started just over a couple hundred years ago?

How about it, guys? Are you having a ball with your Kachina? Tell us about it! Let's see some letters.

For that matter, I'd love to see letters from any of you who are trying new stuff. Are you having a ball with slow scan, packet, RTTY, or what? Help me to get others out of their ruts and enjoying the excitement amateur radio has to offer! ... Wayne.

Micheal D. Smith, Sr. WD4KMP. The "QRPeanut" of James Fisher (73, December 1998) is a great idea, but, as he said, acts as a high-pass filter and will not attenuate harmonics. There is a simple and easy solution: Add a variable capacitor in parallel with the shunt inductor.

This is mentioned in Joseph Carr's *Practical Antenna Handbook* of 1994, on page 401 (illustration 19-7).

I know that many people will build and enjoy this easy-to-make circuit. They'll enjoy it even more when this simple modification gets rid of the harmonics (and FCC pink slips!). 73

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Cutbacks in Connecticut

The ARRL is cutting back the size of *QST Magazine* as amateur radio's dwindling numbers take their toll, according to a message to Section Managers from League Field Services Manager Rick Palm K1CE. Several areas of the magazine will be cut back; the space allotted for Section News will be reduced by 15%.

Palm's message paints a grim picture for amateur radio as it faces the next century. Palm said the annual number of new licensees has dropped dramatically over the past two or three years. As a result, overall VEC exam activity is down about 25% from last year, and there are other signs of the decline, including the bitter economic conditions amateur radio equipment dealers face, as evidenced by the many businesses that have closed during the past three years.

Since March 1997, Palm says that the ARRL has seen its overall membership numbers fall by more than 14,000 or about 8%. He says the reasons for this drop are varied, and include the traditional reaction to a dues increase. But more challenging to amateur radio's future are strong indications that Technician class licensees are not finding much to keep them interested in amateur radio or to compel them to be members.

Two years ago, Palm says, hams were joining the League in large numbers in response to spectrum threats. But a year later, almost 50% have not renewed. Palm says there could be several reasons—a combination of the last dues increase, the perception that the threats to the spectrum have abated, a lack of interest by hams in what the ARRL is offering—or just simply defections from amateur radio.

But Palm does leave the Section Managers with an optimistic note. He says that once the uncertainty surrounding FCC license restructuring is past, the situation should improve. In the meantime, though, the ARRL has to take action in the wake of falling numbers.

Austerity moves include the cancellation of the long-running VHF and UHF Spring Sprints. These mini-contests are traditionally held during April and May. ARRL contest branch manager Dan Henderson N1ND cites a lack of participation for the change. He says that in 1998 only 200 people submitted logs and those submitted were spread across the seven frequency bands covered by the Sprints. With so few people taking part, the sprints are just too expensive to subsidize in these tight economic times.

And in another cost-cutting move, the ARRL has merged its Field Services and Educational Activities departments. The new Field and Educational Services Department came into existence on January 4th. The new department brings

together staff members with a similar mission: the support of ARRL volunteers who, in turn, promote ham radio on a local and regional level.

Like the decision to abandon the VHF and UHF Sprints, this move also was designed to reduce expenses in the face of a decline in both ARRL membership and overall amateur radio licensing and activity over the past few years. Former Educational Activities department manager Rosalie White WA1STO has assumed the title of Educational Services Manager. She will oversee day-to-day operation of the new department and will continue as the primary staff contact for amateur radio in space issues.

From ARRL via *Newsline*, Bill Pasternak WA6ITF, editor.

Hams Respond As Killer Tornadoes Rake South

Hams in Tennessee and Arkansas responded as unusual tornadoes threatened, then struck, in January. A call went out January 22nd for additional ham radio volunteers to assist emergency operations in Tennessee in the storms' wake.

Tornadoes in the Jackson, Tennessee, area January 17th killed eight people. Another eight died when tornadoes struck in the vicinity of Little Rock and White County, Arkansas, January 21st. The National Weather Service called it "an unprecedented outbreak of tornadoes for January."

Arkansas Section Manager Roger Gray N5QS, in Searcy, reported that he was up all night and observed four or five funnel clouds, but he estimated that at least 30 tornadoes swept through the area. Gray has been actively managing the ARES operation. "We have had an incredible response from the amateur community," he said. He estimated that up to 60 hams were active on VHF and HF nets. Amateur radio filled the gap as long-distance telephone circuits have become overloaded.

"Another wild night in Arkansas," said ARRL Vice President Joel Harrison W5ZN, in Judsonia, who reported "lots of damage" in his area. "I have to tell you, in my 41 years of living here I have never seen storms like we had last night," he said the following day. Harrison said the first line came through around 5 p.m., "then another, and another, and another, for what seemed like every half hour till about 10:30 p.m."

"The damage in a 10-mile radius around my home is horrible," Harrison said. Arkansas State University in Beebe—where his son, Mark, attends school—had extensive damage. "There is considerable damage in Little Rock, even to the governor's mansion," he added.

Mark Harrison KC5YNE said most of the town of Beebe was damaged or destroyed, and eight tornadoes hit White County alone. He reported that the family had spent an anxious night. "It was a relief when the storms finally quit, and everything was fine here," he said.

Meanwhile, Delta Division Vice Director Henry Leggette WD4Q, in Memphis, Tennessee, reported considerable ham radio activity in the Jackson area, as well as in Clarksville, where twisters struck early on the morning of January 21st. Leggette said he planned to visit the Jackson area over the weekend to assist.

Tennessee SEC Jim Jarvis WD4JJ, in Bristol, relayed a request for amateurs with mobile units to assist at the Clarksville/Montgomery County Emergency Operations Center. Hams willing to volunteer may contact the EOC directly on the 147.39 MHz repeater, he said. "The police department and city hall have been completely demolished, and the downtown area is a complete wreck." Jarvis also reported damage in Humphreys County, as well as in McEwen, Waverly, and Camden counties. He estimated that up to three dozen hams were active in providing emergency communication in the Clarksville/Montgomery County area.

In the aftermath of the earlier storms, Jarvis reports that EC Kenny Johns AB4EG, in Jackson, was rounding up volunteers to assist the Red Cross with damage assessment in the seven counties hit in mid-month. Johns said a SKY-WARN net was activated Sunday, January 17th, but the tornadoes were unexpected. After the storms struck, more than two dozen ARES members handled health-and-welfare traffic at the EOC for 22 hours.

From the ARRL, via the February 1999 issue of *Radio Flyer*, UBET ARC newsletter, Dennis Hardy KC7MCR and Mike Bignell KC7SWH, co-editors.

California Ham Instrumental in Arrest of Dangerous Road Rage Suspect

A member of a California ham family was indispensable in helping police to arrest an angry motorist who had seriously injured another motorist after being cut off on the freeway last December.

According to an account in *The Orange County Register*, the irate motorist followed the other driver for miles before confronting him on a busy city street. He allegedly shoved his victim under an accelerating big rig tractor-trailer and then kicked him even after he had been run over.

The account says that the furious driver and his two co-workers drove off. They were caught later in the morning when Ed Greany KB6DOL, of Corona, heard a broadcast description of the vehicle and then saw the men pass by. He notified police via ham radio. They arrested Richard

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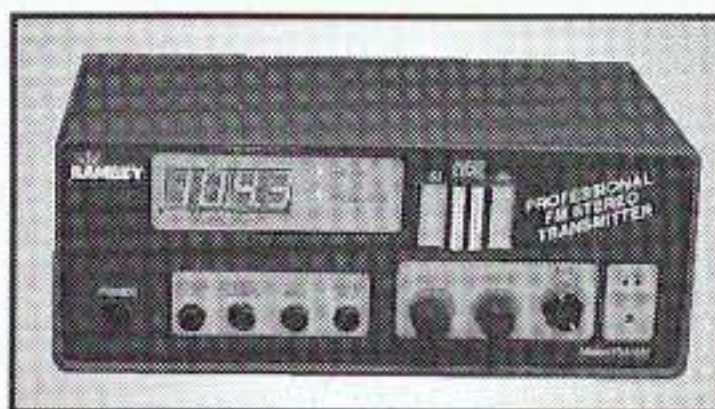
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We also offer a high power export version of the FM-100 that's fully assembled with one watt of RF power, for miles of program coverage. The export version can only be shipped outside the USA, or within the US if accompanied by a signed statement that the unit will be exported.

- FM-100, Professional FM Stereo Transmitter Kit.....\$299.95
- FM-100WT, Fully Wired High Power FM Transmitter.....\$429.95

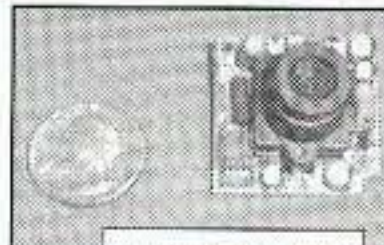
AM Band Radio Transmitter



Ramsey AM radio transmitters operate in the standard AM broadcast band and are easily set to any clear channel in your area. Our AM-25, 'pro' version, fully synthesized transmitter features easy frequency setting DIP switches for stable, no-drift frequency control, while being jumper settable for higher power output where regulations allow. The entry-level AM-1 uses a tunable transmit oscillator and runs the maximum 100 milliwatts of power. No FCC license is required, expected range is up to 1/4 mile depending upon antenna and conditions. Transmitters accept standard line-level inputs from tape decks, CD players or mike mixers, and run on 12 volts DC. The Pro AM-25 comes complete with AC power adapter, matching case set and bottom loaded wire antenna. Our entry-level AM-1 has an available matching case and knob set for a finished, professional look.

- AM-25, Professional AM Transmitter Kit.....\$129.95
- AM-1, Entry level AM Radio Transmitter Kit.....\$29.95
- CAM, Matching Case Set for AM-1.....\$14.95

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B&W Camera



Color Camera

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- IR-1, IR Illuminator Kit for B&W cameras.....\$24.95
- IB-1, Interface Board Kit.....\$24.95

FM Stereo Radio Transmitters



Microprocessor controlled for easy frequency programming using DIP switches, no drift, your signal is rock solid all the time - just like the commercial stations. Audio quality is excellent, connect to the line output of any CD player, tape deck or mike mixer and you're on-the-air. Foreign buyers will appreciate the high power output capability of the FM-25; many Caribbean folks use a single FM-25 to cover the whole island! New, improved, clean and hum-free runs on either 12 VDC or 120 VAC. Kit comes complete with case set, whip antenna, 120 VAC power adapter - easy one evening assembly.

- FM-25, Synthesized FM Stereo Transmitter Kit.....\$129.95

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rules and regulations. Connects to any cassette deck, CD player or mixer and you're on-the-air, you'll be amazed at the exceptional audio quality! Runs on internal 9V battery or external power from 5 to 15 VDC. Add our matching case and whip antenna set for a nice finished look.

- FM-10A, Tunable FM Stereo Transmitter Kit.....\$34.95
- CFM, Matching Case and Antenna Set.....\$14.95
- AC12-5, 12 Volt DC Wall Plug Adapter.....\$9.95

RF Power Booster

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- CLPA, Matching Case Set for LPA-1 Kit.....\$14.95
- LPA-1WT, Fully Wired LPA-1 with Case.....\$99.95

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- TF-1, Treasure Finder Kit.....\$39.95

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We came across these nice binoculars in an importers close-out deal. Not some cheap in-line lens jobs, these beauties have roof prisms, a super nice rubber armored housing over light weight



aluminum. 10 x 25 power with fully coated optics. Includes lens cleaner cloth, neck lanyard and nice carry case. For extra demanding use in bright sun, choose the EX module with ruby coated Objective lens. First quality at a close-out price! We've seen the exact same units with the 'Bushnell' name on them being sold for \$30 more!

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- SS-70A, Speech Descrambler/Scrambler Kit.....\$39.95
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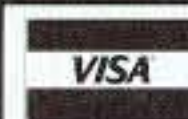
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The Pluck of the Irish

Was Wee Mac a leprechaun or a pirate—or both?

Guy Slaughter K9AZG
753 W. Elizabeth Drive
Crown Point IN 46307

Never work a leprechaun. If you hear one on frequency, QSY. If he's calling you, QRT. Quickly!

I wish someone had told *me* that before I got involved with Wee Mac. It could have saved me a lot of grief.

So, you ask, how can you tell a leprechaun when you hear one? Rule of thumb: Shun all falsetto-voiced phone ops with AC hum on their signals, and avoid all funny-fisted CW guys with rough and chowpy notes.

It's not *only* leprechauns, of course, who sound like that, but abstention from contacts with *all* such ops is the safe way to go. Besides, it'll make our bands better. See, if we boycott non-leprechaun lids because they *sound* like leprechauns, we'll motivate them to force their voice registers downhill, to improve their CW, to clean up their signals, and thus to upgrade into non-lids.

Leprechauns, however, can't do this. Their vocal cords are too teensy to vibrate in human-voice ranges, their fingers are too dinky for our keying devices, and they can't prevent their magnetic-flux auras from hum-modulating RF.

What the little buggers *can* do, though, is give you trouble. Let me tell you about mine.

I was on 20 CW when I heard this rough and chowpy signal calling me as I was wrapping up a QSO with a DL2. It signed an EI call. I was tempted to ignore it, intending to shut down the rig in favor of a trip to the bathroom. Instead, I came back to the caller, thanked him for the shout, and gave him a 597C report. That was a tragic mistake.

"RR Guy in Indiana/ur 589 589 in Dublin Dublin/nyme is Mac Mac/why the T7C? AR BK," the EI said, chowping along at around 25 words per with a really rotten fist and a terrible AC growl on his note.

"BK sri Mac fer the bum rpt," I told him. "I thot ud want to knw ur loud sig is a lil ruff and chirpy here. BK."

"Ur rcvr always block on strong sigs?"

"No no no/rcvr not blocking/other strong sigs snd FB. BK."

"In ur nose with a ruddy hose/AK SK," says the EI, and he's gone.

I mentally tagged the guy a sore-head, punched the QSO data into the log, hit the big switch, and headed for the bathroom, wondering why I was suddenly sneezing so hard that my nose began to bleed.

Two hours later, with my nosebleed finally stopped, I heard the EI on again. This time his note was clean and chirpless. I gave him a 589X when he acknowledged my call, adding, "Ur sig DC Mac/no sign of chirp/note clean and pure/K."

"TU fer rept," says the EI. "Name is Jigger Jigger in Dublin Dublin/why the big deal on the DC sig? BK."

"Thot op was Mac," I say. "This a club station? BK."

"No no no/personal station in my home/op is Jigger Jigger/pse who Mac?"

"Beats me," I say. "QSO'd your call earlier today/note was chirpy es buzzy/op with funny fist sed his name Mac."

"Was not me," says the EI. "Been getting QSLs for QSOs not in log/cards say TU Mac/spose I have pirate?"

"Bet on it," I say. "Too bad/GL es hpe CU agn/DX es gud rpts/73 AR SK."

And that was that, right? Wrong.

The next day, I was wrapping up with an HB9 on 15 sideband when I heard a high-pitched voice calling me in a thick Irish brogue. He had a terrible AC growl on his signal. He signed that same EI call.

"Hi, Jigger," I said, coming back to him. "I'm glad to see you again so

soon. You're five-by-nine with AC hum in Indiana. Name's Guy, golf uniform yankee. We've worked before on CW. You find your pirate yet? Go."

"Me nyme is Mac," the EI warbles, his voice a good octave above high C. "Poirate, indade. Air ye sayin' Oi've got me a poirate nyme o' Jigger workin' me stayshun when Oi'm not about?"

"Maybe yes, maybe no," I tell him. "An op named Jigger signing the same call said *he's* got a pirate named Mac. Could you be it?"

"In yer oye with a monster stoy," my contact says, falsetto voice, the hum modulation making his words doubly harsh. "Over 'n' out, me smart-mouthin' bucko."

And even while I observed the amenities by mumbling my best 73 and wishing Mac a nice weekend anyway, my vision started to blur, my left eyelid began to swell, and the pain came. Though I had never had a sty before in my life, I was growing a beauty now. In minutes, my lower lid swelled up so big I had to stand on tiptoe to see over it.

The cure cost me 60 bucks and a couple of sleepless nights. The doctor, to whom I didn't mention Mac, said it was an infection of a sebaceous gland, not uncommon in a polluted world. He seemed surprised at my questions, and declined to attribute my eyelid problem to a hex, a voodoo, a hoodoo, or self-induced psychosomatic auto-hypnotic anxiety.

It was a month later, the day before St. Patrick's Day, when I ran across the EI again on 15 sideband. He was chatting with a W1. His voice was baritone, his modulation crisp and clean. I waited for him to clear, and gave him a shout. It was Jigger. He didn't remember me until I asked him if he still suspected he had a pirate.

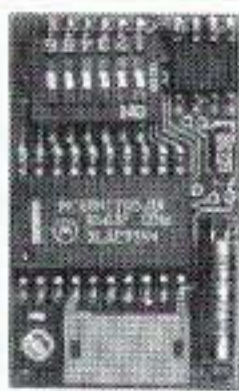
"Not suspected," he said. "Had me one. Caught 'im in the bleedin' shack. Over."

"In your shack?" I asked. "Not only using your call, but actually working your rig?"

"Affirmative," Jigger said. "Repeatedly,

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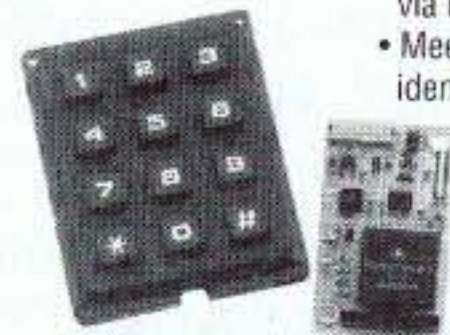
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Continued on page 12

CIRCLE 184 ON READER SERVICE CARD

I kept comin' 'ome from the office to find 'im 'ere."

"That's incredible," I said.

"Agreed," said Jigger. "But I'm pretty sure I got rid of 'im fer good, finally."

"You had him arrested?"

"Who can arrest a wee one?"

"A wee one? He was a kid? A midget?"

"Negative. Nayther a young one near a small one. A *wee* one."

"You mean like a goblin? An elf? A gnome?"

"A leprechaun," Jigger said. "Wee Mac's a bleedin' leprechaun. It's been nice. Hope to see you again, old man. Seven-three." And he was gone.

That, as I said, was the afternoon before St. Patrick's Day. I wrote a little note in my log questioning the mental condition of the EI who figured he'd gotten rid of the leprechaun he imagined had taken over his shack, and went upstairs to dinner.

When I came home from work the next day, I noticed the tribander was pointing south. I usually leave it aimed northeast so the elements are end-on to the prevailing wind. I must have goofed, I figured. My wife was setting the table in the kitchen. She looked startled when I came in.

"I thought you were in the basement," she said.

"Nuh uh," I said brightly. "I'm right here. How was school?"

"Okay, I just got home, myself. I thought I heard you in the shack."

"Premature *déjà vu*," I told her. "You're about to. I need to swing the beam around."

My shack is at the far end of the basement from the kitchen stairway. I leave its door open for heat circulation. Now it was closed. I could see a crack of light beneath it. I could hear the bleeping of my transceiver's CW sidetone, its note strangely rough and chirpy. Curiosity and anger tumbled through me in waves. Surely Jigger's pirate wouldn't have the gall ...

I flung open the door. The sidetone halted in mid-chirp. I caught a glimpse of a doll-sized figure standing on my chair, leaning across the operating table to grasp the keyer paddle on its far edge. Then the apparition was

gone. For an instant I doubted my own senses. The station speaker came to life, emitting a "QRZ?" in CW followed by, "Sri OM/lost U/SK."

"Hey," I said, snapping off the station's master power switch and peering around the shack. "Where'd you go?"

"Oi'm roight 'ere," a familiar, high-pitched voice said from behind me. I turned to see a skinny, leggy little figure sitting atop the file cabinet along the rear wall of the room. It was dressed all in green, from the pointed leather slipper to the diminutive derby. The eyes were glaring at me. The facial features were those of a mean old man.

"Ye startled me nairly outta me shoes," the figure said. "Ye'd be Goy, roight?"

"And you've got to be Wee Mac," I acknowledged, mentally apologizing to an EI named Jigger for having thought him demented. "What the hell are you doing here?"

"Plyin' me 'obby," Wee Mac said. "Workin' me rig."

"Your rig?"

"Our rig, if ye prefer," the little man grinned. "Oi'm willin' to share."

I reached for the creature. He disappeared. I peered around the shack, under the table, behind the computer. Nothing.

"I wouldn't be doin' that agin," the falsetto voice said from behind me. "Next toime ye try to grab me, bucko, it'll be loights out fer ye." My zulu clock rose from the operating table, flew toward my head, missed me by an inch, and smashed against the wall behind me.

"Cut that out!" I yelled. "You can't come in here and take over my shack and tear up my gear!"

"Who says?"

"When I get my hands on you ..."

"Ye get no pot o' gold," the high voice interrupted from another part of the room. "That's blarney. An' ye couldn't be a hangin' on if ye did catch ahold o' me."

My DXCC certificate flew off the wall beside the doorway and sailed toward me, its frame and glass smashing as it hit the floor.

"Hey," I said in anguish. "Please don't tear up the shack any more!"

"Oi'll do ye a deal," said the voice from behind me. I turned to see the little man seated in my chair at the operating table. His head came just to tabletop height. "Ye leave me to work the rig in payce 'til midnight, alone and unbothered, and Oi'll be outta here."

I said, "I must be losing my mind. I can't really be haggling with a ... with a *leprechaun* over use of my *own* equipment!"

"Sure, ye can," said the leprechaun. "How 'bout it, me bucko. A deal?"

I sighed. "A deal. I leave now. You leave at midnight. And you don't come back. Right?"

"Roight. Not 'til next S'n' Paddy's anywoys," said Wee Mac.

I left him there, shut the door behind me, and made my way upstairs. He was gone when I checked next morning. And after a couple of days, I began to believe I dreamed the whole thing.

Then came the notice from the FCC inviting me to explain why my ticket shouldn't be lifted for transgressions committed on March 17 last that included but were not necessarily limited to: (1) operating in that portion of the 20-meter CW band prohibited to General-class licensees; (2) generating keyed continuous-wave signals illegally broadened and distorted by alternating-current modulation and/or lack of proper power-supply filtering; (3) using profane and obscene language in violation of good taste, international treaty, and domestic law; and (4) maliciously interfering with other communications by emitting a hum-modulated, continuous-wave band signal on 14,017,016 hertz for at least 117 consecutive seconds, presumably while tuning up.

"Oh, Lord," I told myself. "Wee Mac's not only cost me my license, but my finals to boot."

He hadn't, as it turned out. I talked my way out of the FCC jam, blaming it on a shack-invading leprechaun. (The harried-looking hearing officer, obviously anxious to get this over with and go home, said there was a lot of that going around, initialed a forgiveness form, and sent me away to sin no

more.) And thank heaven the 6146s are tough little bottles. So for a long time, I thought it was all behind me. But then came the next St. Patrick's Day. And back was Wee Mac.

I knew he was there when I turned into my driveway after work and saw that the beam was pointed south.

I made a lot of noise on my way downstairs so I wouldn't startle him again. He was working sideband when I walked into the shack.

"Hi," I said. "I thought we had a deal."

The little green man held up a hand to silence me. He was standing on the seat of my swivel chair. His waist was level with the operating table in front of him. He bent forward as the speaker went quiet, placed his left palm on the push-to-talk bar in the base of the mike, and leaned on it.

"A foine S'n' Paddy's Day to ye as well," he said into the mike, signed my call, released the PTT switch, and swung around to face me.

"How come you're back?" I demanded.

"Oi loike yer setup," he said. "'Tis one o' the few shacks Oi work where Oi can raych everythin' without strainin' meself."

"How about Jigger's station? Don't you use it anymore?"

"Not after he started kaypin' a snike in it," the little man said. "Can ye imagine any self-respectin' Oirishman kaypin' a snike in his digs?"

"Sure I can," I said, remembering Jigger's comment that he'd gotten rid of his visiting pirate for good. "And a self-respecting third-generation Dutchman like me, as well. I've got a pet snake of my own upstairs, and I'll be moving it down here directly."

"Ye wouldn't!" Wee Mac said, and disappeared.

I haven't seen him since. I lied, of course. I'm no fonder of snakes than St. Patrick himself, but I want Wee Mac to think I've got a great big nasty serpent living beside my rig. I'll find out if he believes it come this March the 17th.

Meanwhile, if you hear an operator with a high-pitched voice or a funny fist with a hum on his signal or a chirp in his note, don't come back to him. It could be just another lid, but it might be a leprechaun. And who needs either one? **73**

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Little has been published in the amateur radio press on the subject of ferrite rod transmitting loop antennas. I have been experimenting with these, off and on, for around 30 years.

Here we will look at some earlier background problems, frustrations, and pitfalls first, and then get into a practical 80/160 m design. It is my hope that other amateurs will also experiment along similar lines to produce even better loops, and get some real "on air" activity going. This should more rapidly increase the rate

of practical design progress, in a field which heretofore seems to have been mostly limited to defense development and a few commercial activities.

It was way back around 1960 when I first became interested in the workings of the ferrite rod loop or loopstick. At that time, the usual assembly was an eight-inch-long by three-eighths-inch-diameter ferrite rod, built into a broadcast receiver operating on the medium wave band (and long wave in Europe).

I first wound a coupling coil onto a ferrite loop antenna to enable it to be used as an external antenna coupled to the receiver with coaxial feedline, as in **Fig. 1**. This is now accepted practice.

The next move was to reduce the number of wire turns so that the loop resonated in the 160 and 80 meter bands. The results were encouraging, although progress was slow.

It seemed logical that, using the **Fig. 1** circuit, the process could be reversed—that is, RF fed into the coupling coil via the coaxial feedline—to produce a transmitting loop antenna. My first results were somewhat encouraging, but initial efficiency was very low.

I approached a ferrite rod manufacturer and asked for a quotation for a quantity of six pieces of every eight-inch rod of all available materials, together with materials specifications. The result was a quotation for a minimum order of 5000 pieces in two types of materials—nickel-zinc and magnesium-zinc. Not very helpful!

Later, I inquired as to whether they had any information/experience on the subject of using ferrite rod loops for transmission purposes, or knew where such information might be obtained. The reply was ambiguous (neither yes nor no). In effect, they said they were not prepared to discuss the subject. I took this to indicate that such work was indeed being undertaken, but they could not or would not talk about it.

This only increased my determination to carry on experimenting with ferrite TX loops, with only limited facilities, and without any help or advice from rod manufacturers.

Gradually I gained experience by trial-and-error methods, reaching the conclusion that an effective transmitting ferrite loop antenna could eventually be designed and produced.

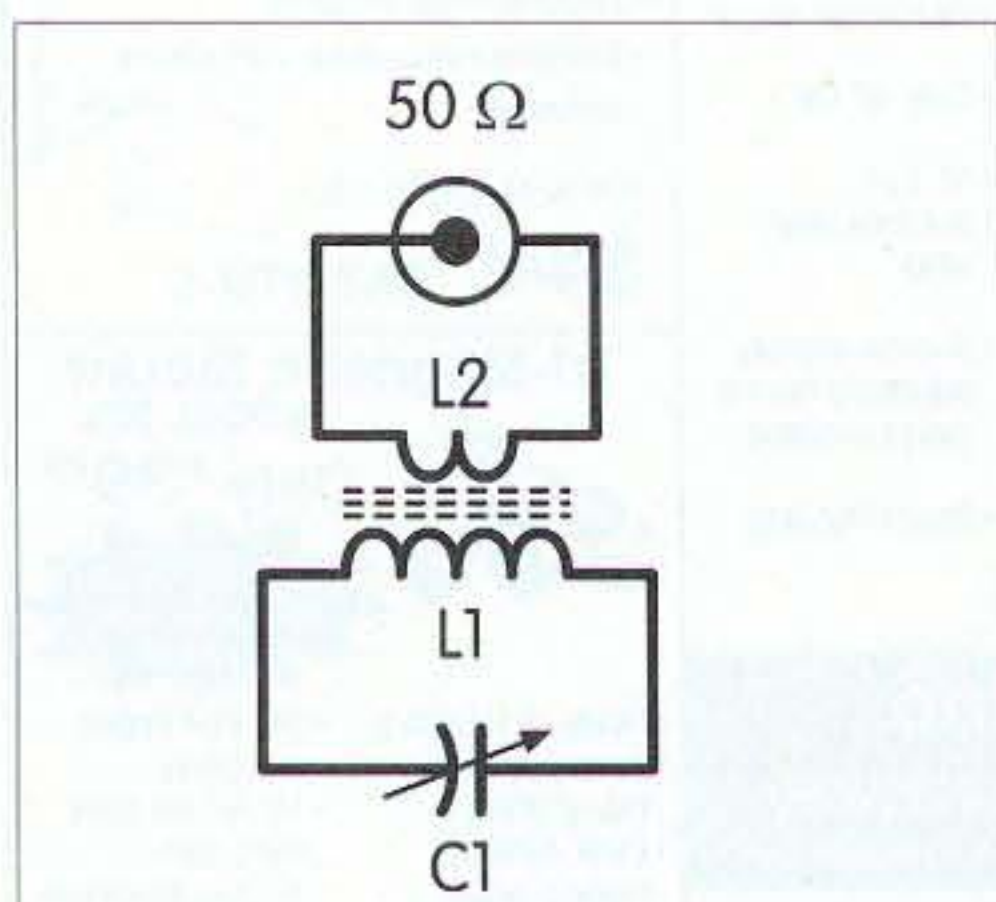


Fig. 1. The conventional ferrite loop. OK "on receive" only.

In the early 1970s, I moved to Minnesota (USA) to live, work, and operate (G2BZQ/WØ). There, nickel-zinc ferrite rods were readily available, as well as Type 61 material in half-inch-diameter rods. Now I was able to make further progress. The circuit in Fig. 2 gradually took the place of Fig. 1, and I was able to produce a good input-to-output ratio using single rods.

Design challenges for 80 and 160 meters

- Selection of suitable rod materials and dimensions.
- Difficulty of matching/coupling the loop to the TX.
- Core saturation.
- Producing a radiated signal.

Core saturation

When RF is applied to a TX ferrite loop antenna, a point is quickly reached, as power is increased, at which core saturation manifests itself. This is accompanied by a sudden increase in core temperature; a sudden decrease in radiated output signal; and general instability and the production of harmonics, especially the third.

The ferrite rod transmitting loop is essentially a low-power device. Fortunately, this means you can experiment using small-dimension assemblies along the lines of those from the modelmaking hobby, which can be played with in the comfort of your home, irrespective of the weather outside! The basic equipment you need is a field strength meter, a large neon bulb, and a portable receiver.

Ferrite rod selection

Ferrite rods can be divided into two main material groups: manganese-zinc and nickel-zinc. You can obtain each in various "mixes," for different applications. Unfortunately, both types are the same in appearance, so you have to be careful in trying to identify surplus rods.

Experimenting in the 80 and 160 meter bands will teach you that a nickel-zinc rod with an initial permeability of between about 126 μ and 220 μ will be the best. There is every indication that this permeability changes

considerably under TX loop conditions. Because we will have to use commercially available rods, our choice will have to be restricted to Amidon Type 61 and MMG Type F14 (with permeabilities of 125 μ and 220 μ , respectively). Manganese-zinc rods (e.g., Types 33 and 43) appear in quantity on the surplus market at attractive prices, but they should be avoided at all costs. They have an initial permeability of maybe 800/850 μ and are quite useless for ferrite loops above VLF and LF.

Experience also has taught me that antenna gain and directivity increase as the rod diameter and/or the rod length is increased. The maximum nickel-zinc rod diameter is one-half inch, with lengths of up to eight inches. You can lengthen rods by adhering two or more of them together, end to end, just as you can increase the diameter by affixing two or more together side by side. The spacing between wire turns, and between wire turns and the ferrite core, is critical.

Some practical TX ferrite loop designs

Over the years I have tried a great many permutations of the ferrite loop antenna for transmitting, with results ranging from quite useless to quite encouraging.

The antenna shown in Fig. 2 produced some interesting and unexpected results. I experimented with variations of this design in the 1970s and 1980s. The input/output power ratio was my best up to that time.

I started with a simple seven-and-one-half-inch-long by one-half-inch-diameter Type 61 rod, which I later lengthened to 15 inches by cementing two of them end to end. The TX power was gradually increased, and saturation set in at about 18 watts on the 3.5 MHz band using CW.

At 18 watts, the core temperature increased on a thermometer bulb cemented to the rod, and the radiated output (on a field strength meter) suddenly fell off. Up to about 15 watts, no significant harmonics were detected.

Continued on page 16

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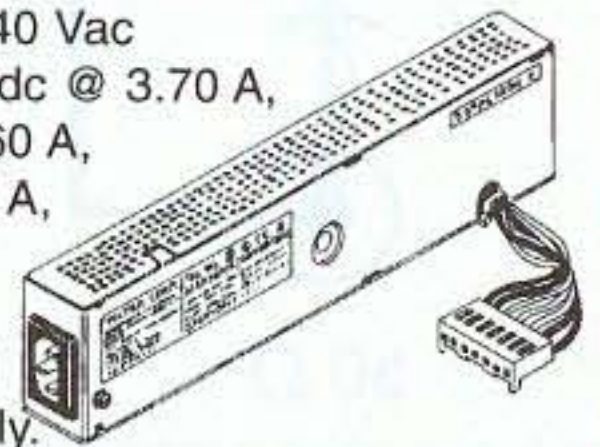
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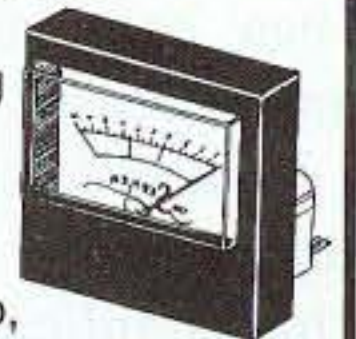
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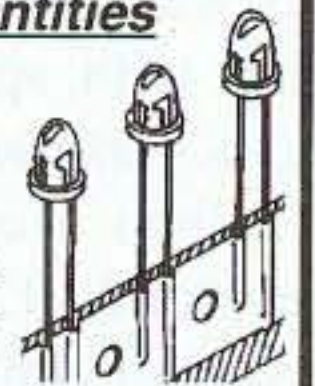
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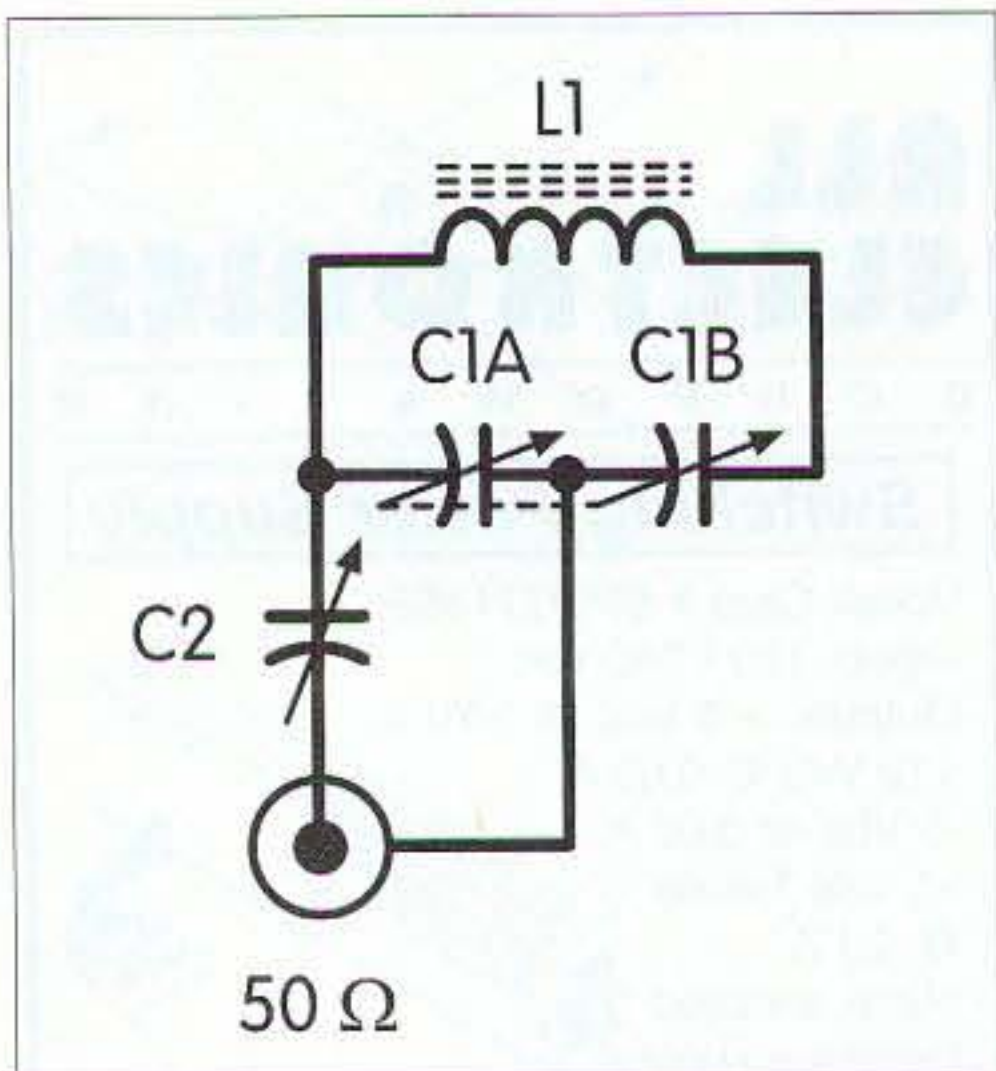


Fig. 2. An earlier TX ferrite loop. Successful, but very difficult to adjust and QSY.

Ferrite Transmitting Loop for 80/160

continued from page 15

Then harmonics appeared as power was increased.

I adhered a second 15-inch rod alongside the first, and rewound L1. This significantly increased the radiated signal, and the saturation point rose to about 22 watts. As an exercise, an electric blower fan was turned onto the L1/rod assembly, and the saturation point was thus increased to about 25 watts. In all cases, interturn spacing, with spacing between wire and core, was used.

I then tried it on the air, using the regular 10/12 watt CW TX, and an occasional QSO was made. The problem was that when QSYing, to answer a CQ call, the loop had to be carefully readjusted to the other station for maximum received signal, and then C1A and C1B and C2 carefully readjusted on transmit. This operation took between one and two minutes, by

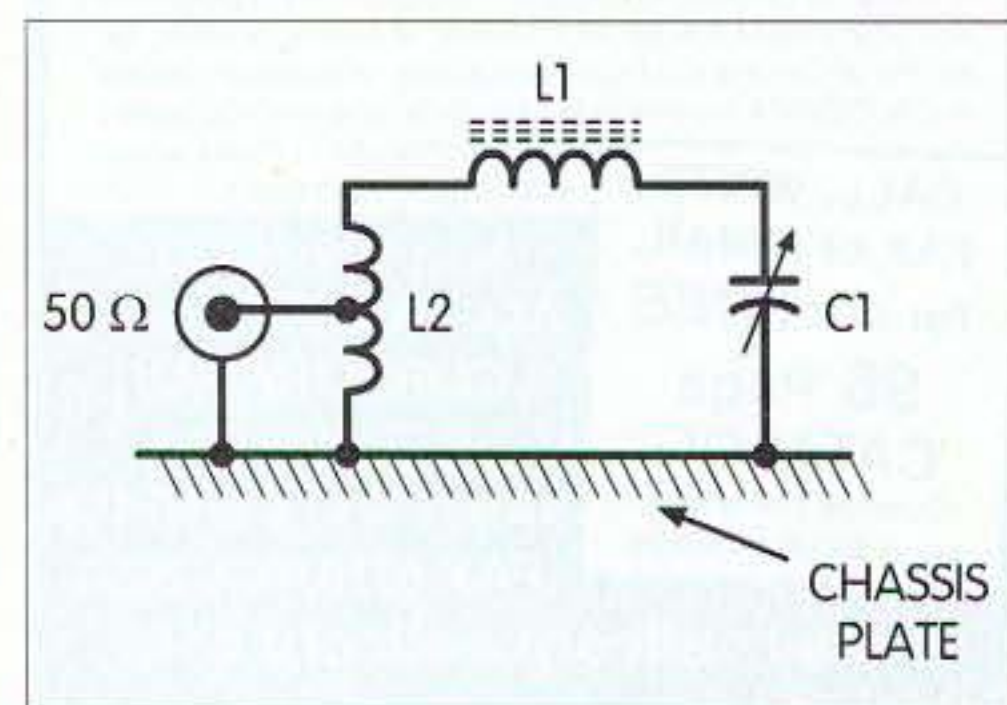


Fig. 3. A successful TX ferrite loop. Much easier to adjust than Fig. 2.

which time the other station was well into a QSO with someone else.

However, early one morning in January 1987, when the band was quiet, a random CQ was sent at 3560 kHz and a reply received from SMØCOX in Stockholm—an estimated 900 miles! It was not a hoax, as he had often been worked regularly on the normal antenna. A careful check was made to ensure that the 54-inch feedline was not accidentally radiating. The only explanation was that it was a case of two stations being on the right frequency at the right time and on the right day. These results were never repeated.

Later, I scrapped the Fig. 2 circuit. I used the rods for the Fig. 3 one. I wound L1 with well-spaced 5 A wire turns, and had it well spaced from the core. L1 was resonated by C1, and the coaxial feedline tapped, for 50 ohms impedance, onto air-cored L2. This could perhaps be described as a helical hairpin matching.

This TX ferrite loop was much more docile than the previous one (Fig. 2), and relatively quick QSYS could be carried out. With limited operating time between 0430 and 0515 hours, using 10/12 watts CW between 3560 and 3580 kHz, I was able to make some occasional QSOs.

More recently, using my substantial (or at least hard-won) background of practical know-how accumulated over many years, I arrived at the following design.

Ferrite transmitting loop for the 80 and 160 meter bands

This design uses a 12-inch-long by three-quarter-inch-diameter fabricated ferrite rod of either Type 61 or Type F14 material.

The schematic in Fig. 4 shows L1 suspended above a metal base plate, and resonated by variable capacitor C. The 54 inches of RG-58 coaxial feedline is tapped onto the opposite end of L1, for a $Z = 50$ ohms match. With the specified turns and construction of the loop, it covers both the 80 and 160 meter bands, although I intended it primarily for 80 m CW. Fig. 7 shows the general layout built onto a metal baseplate 13 inches long by six

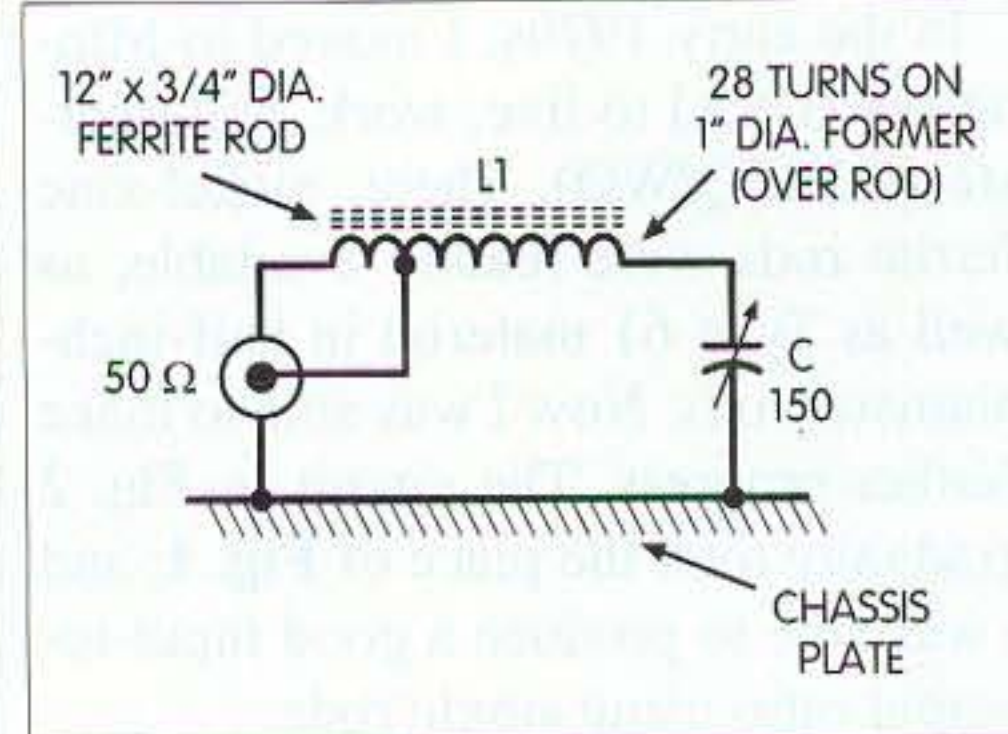


Fig. 4. Schematic of author's 1997 80-160 m ferrite TX loop. L1 = 28 spaced wire turns tapped 2-3/4 turns for $Z = 50$ ohms. $C = 150$ pF small, TX-type variable.

inches wide, with an overall height of four and one-quarter inches.

Construction

Fig. 4 shows a 12-inch-long by three-quarter-inch-diameter ferrite rod fabricated from three 12-inch-long by three-eighths-inch-diameter rods (Amidon Type 61 or MGM Type F14) cemented side by side.

Each 12-inch rod is made from two six-inch rods or three four-inch rods, adhered end to end (Fig. 5A). You can cut the rods to length with a small hacksaw. The ends of the rods should be lightly cleaned off with very fine abrasive paper, and cemented end to end using cyanoacrylate adhesive, which is very fast-setting.

The three resulting 12-inch rods are adhered together, side by side, effectively producing one solid rod, as in Fig. 5B. You must carry out this operation with speed, as it takes only a few seconds for the adhesive to set. Wear a pair of plastic/rubber kitchen gloves to avoid a rod securely glued to a finger, and a trip to the emergency room to separate them!

The format of the 12-inch by three-quarter-inch-diameter rod assists with core cooling, as you can see from the obvious vents shown in Figs. 5B and 5C.

I wound L1 onto a seven-inch-long by one-inch-internal-diameter thinwall cardboard tube (ex-household foil). The wire used was PVC-covered 24/0.2 mm copper with an overall diameter of 2.05 mm and a rating of 6 A at 1000 volts RMS. Any similarly rated

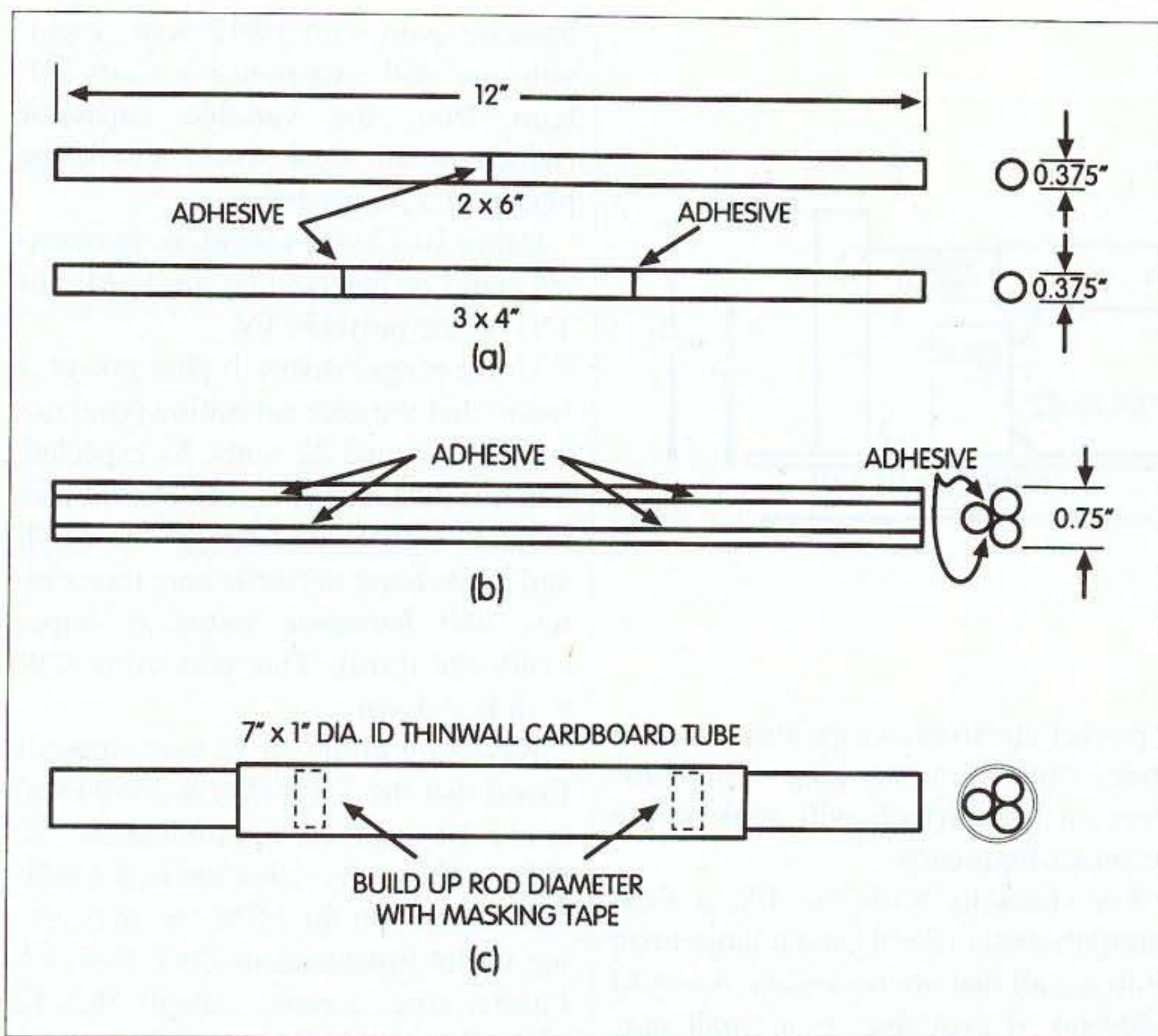


Fig. 5. Assembly of 3/4" ferrite rod and coil former for L1. (A) Fabrication of 12" x 3/8"-diameter rods. (B) Fabrication of 12" x 3/4"-diameter ferrite rod. (C) Assembly of coil L1 former on "B".

PVC-covered wire would no doubt suffice, providing the overall diameter is the same.

The L1 winding consists of 28 turns of the above wire, wound counterclockwise, evenly spaced approximately one wire diameter between turns (Fig. 4). The right-hand wire drops down to the variable capacitor C (Figs. 4, 6, and 7). The 50-ohm tap is taken from two and three-quarters turns in from the opposite end. Spots of adhesive should hold each turn to the coil tube. The 54 inches of RG-58 coaxial feedline is connected to the tap as shown in Figs. 6 and 7.

L1 is slipped over the center of the ferrite rod as shown in Fig. 5. Two bands of masking tape are built up to hold the coil and rod firmly in position (Fig. 5C).

The 150 pF variable capacitor should be a widely spaced, larger, well-insulated receiving type, or a small TX type. On the prototype, I used a Jackson type E, with mounting feet.

The whole assembly is mounted on an aluminum base plate 18 inches by

six inches (Figs. 6 and 7). Two hardwood pieces one-half inch by one-and-three-quarters inches by four and one-half inches high support the L1/ferrite rod assembly. In each a three-quarter-inch-diameter hole is bored for a one-quarter-inch depth as shown.

The right-hand wood support is mounted with base screws and a small bracket, as shown in Figs. 6 and 7. You then insert the coil rod end into the three-quarter-inch-diameter bored hole; the left-hand wood support is put over the other rod end; and the outline of the support base is marked, with a pencil, on the baseplate. It can now be fitted to the baseplate with base wood screws, and a small bracket (Figs. 6 and 7).

The variable capacitor is secured to the baseplate with base foot brackets or a small metal bracket, depending on the type of variable capacitor used. It should be positioned as shown, so that it is near the coil end. You then fit an insulated extension shaft and a large knob. Secure wiring connections are essential. The RG-58 feedline is connected

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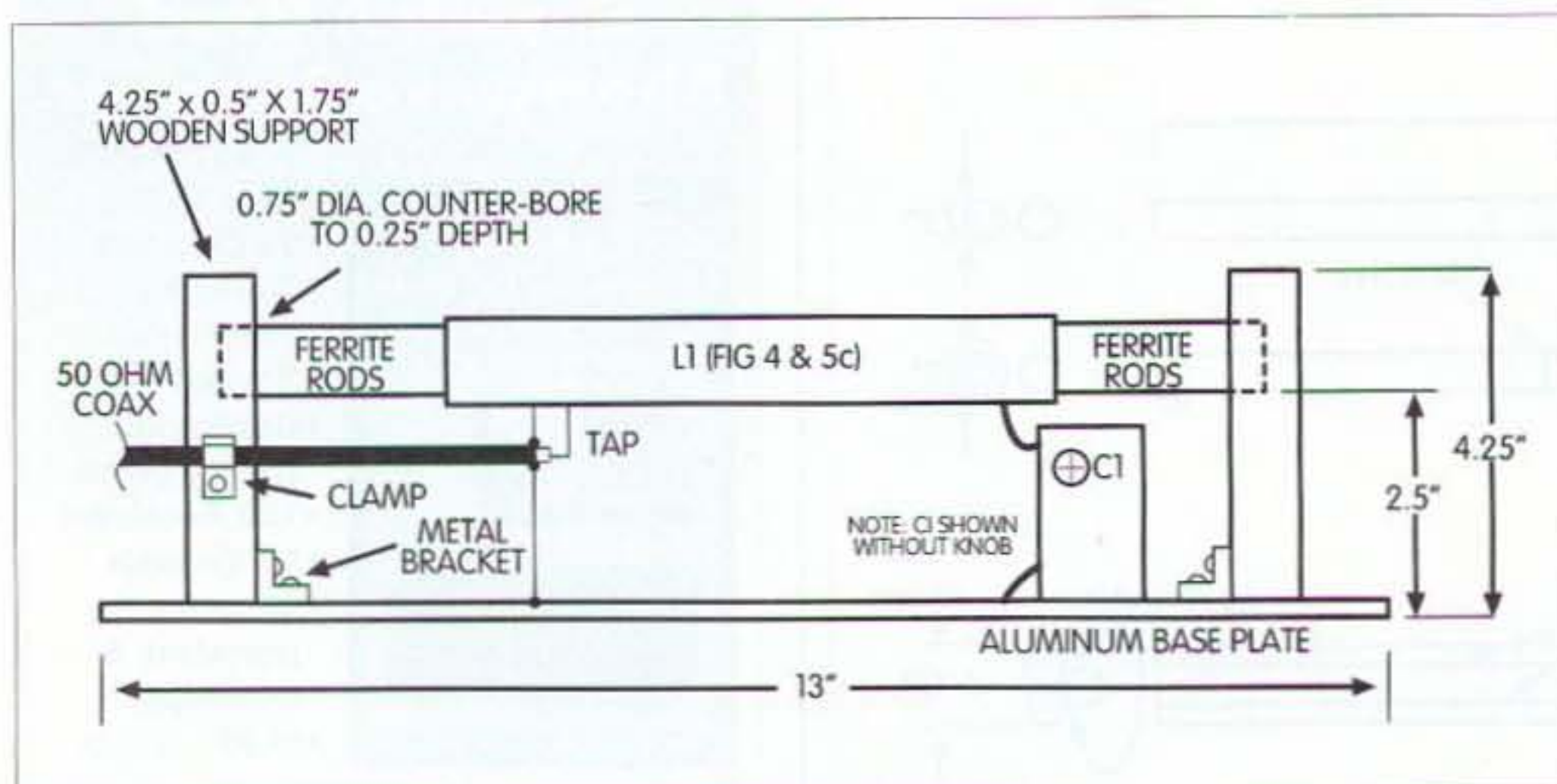


Fig. 6. Assembly, side view.

as shown. The drop down wire, from the coil end, should be rigid 16-gauge tinned copper wire.

Testing and operation

The prototype covered from 1800 kHz to 4000 kHz, with a small overlap at either end. So it covers both the 80-meter and 160-meter bands, though all "on air" tests were between 3550 and 3580 kHz, using CW.

The loop should be connected to the TX and RX combo, with a short length of coaxial feedline. A 54-inch section was used on the prototype, just long enough for the loop to rest on a small table alongside the operating position. Grounding is at the TX/RX, and not at the loop.

The frequency range of the loop should be checked against a calibrated receiver. In the absence of signals at the time, a noise signal can be generated by

a pocket electronic calculator placed a short way from the loop. This produces a hash which will peak at the resonant frequency.

For checking with the TX, a field strength meter (FSM) and a large neon bulb are all that are necessary. A useful addition, if available, is a small portable TV nearby, as a back-up check for TVI.

On the prototype, both the RX and TX were tuned to 3560 kHz. The loop was first resonated with the RX. The TX tuned up on a dummy load, and then connected to the loop, and 10/12 watts fed into it. This produced a reading on the FSM placed nearby. Only a minor adjustment was needed on the loop resonating capacitor to peak the FSM reading.

Placing the neon near the loop coil showed, as expected, a high RF voltage at the variable capacitor end—and zero at the feedline end. Note: Take care,

because even with 10/12 watts input, you can still experience a nasty RF burn from the variable capacitor (which in an ideal world should be placed in a plastic box).

Using 10/12 watts input, no harmonics could be detected on the FSM, nor TVI on the portable TV.

Using progressively higher power, I found that the core saturation point occurred at around 22 watts. As expected, this was indicated by a dramatic drop in radiated signal indicated on the FSM, and an increase in ferrite core temperature and harmonic radiation (especially the third). This was using CW with key-down.

Reverting to the 10/12 watts input, I found that the TX VFO (at 3560 kHz) could be retuned approximately 12 kHz, without any reduction in the radiated signals on the FSM and thus giving useful instantaneous QSY facilities. Furthermore, a move outside this 12 kHz "bandwidth" required only a quickly executed minor adjustment to the loop tuning capacitor. This removed all the previously described operating difficulties experienced with the circuit in Fig. 2.

Remember, it is essential to be able to rotate the directional loop towards the other station, as indicated by maximum signal on the receiver.

On-air activity for me at this QTH is normally limited to 30 to 60 minutes on 80 m CW four or five days per week, terminating with a short regular QSO at about 0510 GMT with a friend in Stuttgart, Germany, maybe about 250 miles distant. On some mornings, in good conditions, I have been able to use this ferrite loop for this QSO.

Conclusions

I hope that some other amateurs will take up my challenge, make up this ferrite TX loop antenna, and then proceed to improve it. I also hope that someone can try it outdoors or in the attic, with remote tuning and rotation facilities.

We all know that it will only be by many more amateurs experimenting with such ferrite transmitting loops that their true potential will ever be realized.

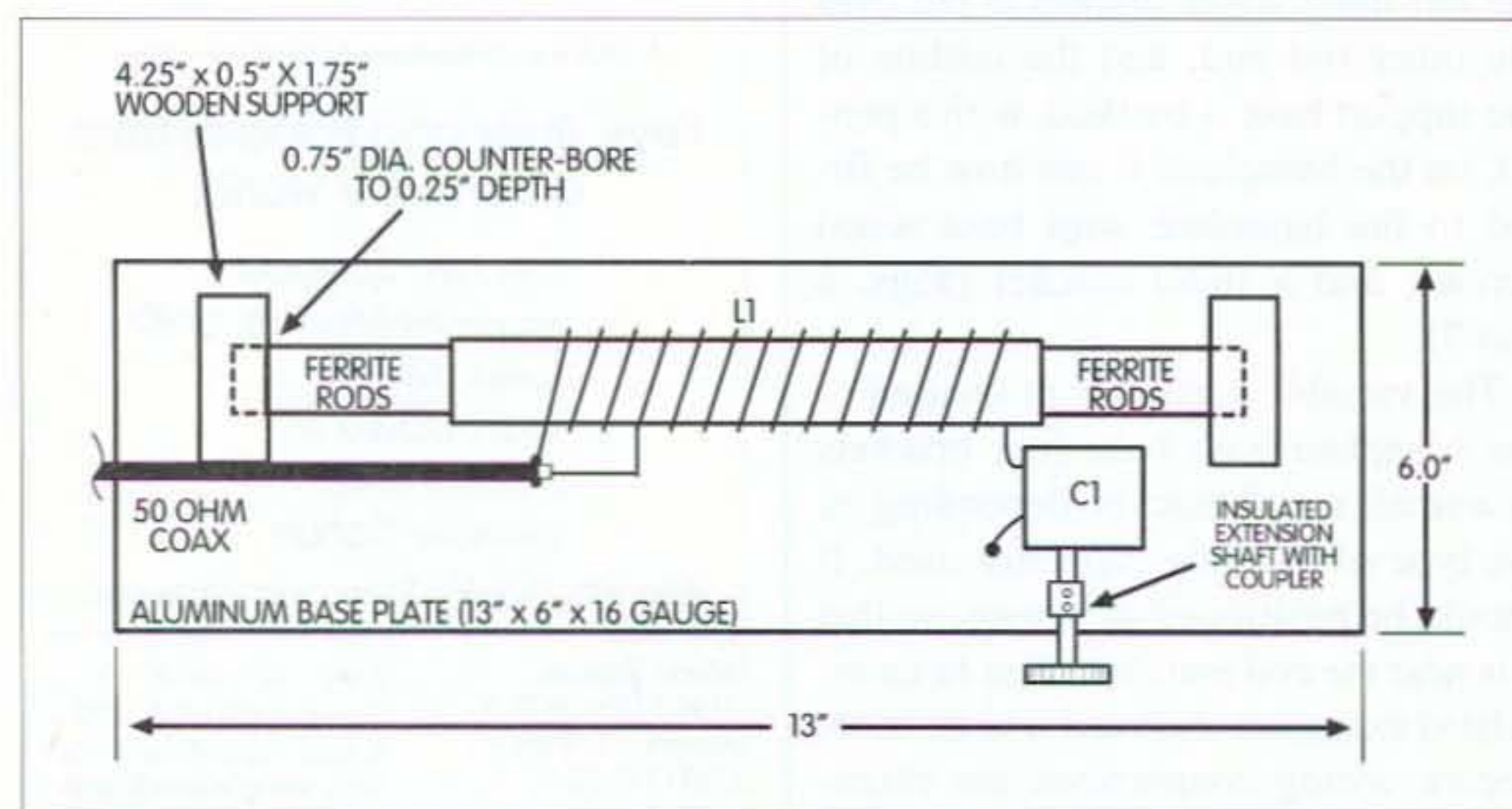


Fig. 7. Assembly, top view.

Ferrite rod suppliers

Type 61 material:

Amidon Inc.
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Further reading

"The Fe-One Experimental Compact Transmitting Antenna," Richard Q. Marris G2BZQ. *Practical Wireless*, January 1989.

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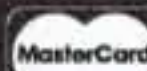
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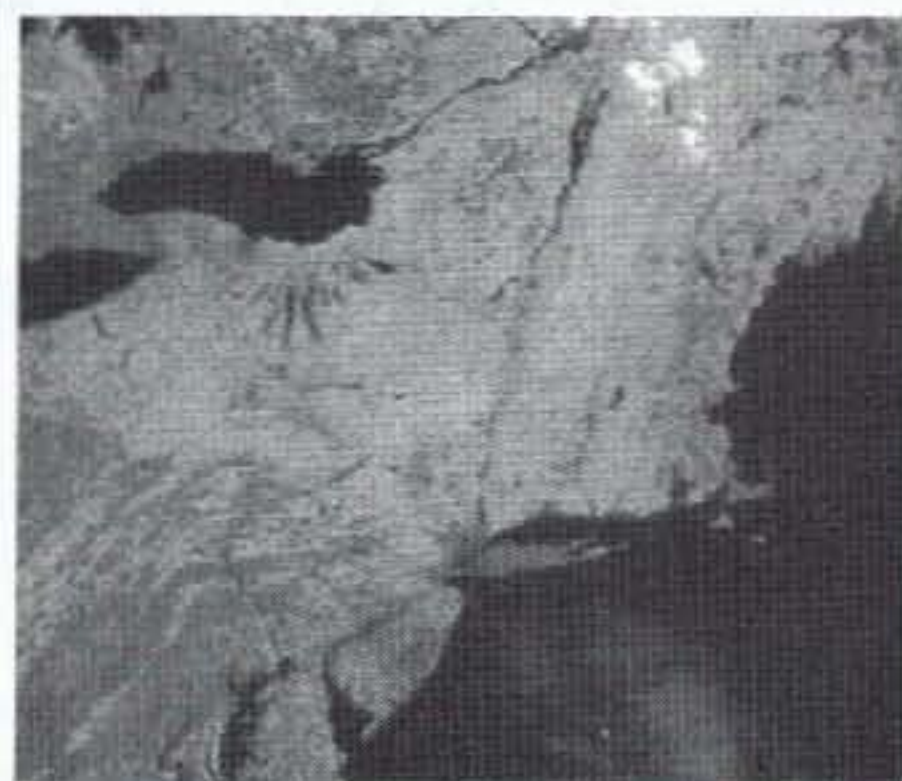
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Signals From the Ice: Now That's Really Cool!

Here's what happens when hams meet Alaska's Matanuska Glacier.

John Reisenauer, Jr. KL7JR
P.O. Box 4001
West Richland WA 99353

Few things get my blood racing like portable amateur radio operations in Alaska. I reminded Kent KL5T (ex-NL7VJ) that we hadn't done any HF outings, besides Field Day, for a couple of years. Kent and I are members of the South Central Amateur Radio Club (SCARC) in Anchorage. Kent is the current president; I'd had the privilege in 1993.

When I said, "We should do something unique, like operate from a glacier," I got one of his "you must have been out in the sun too long" looks. I think Kent's memory was still fresh with visions of our last ARRL Sweepstakes contests from the Yukon—when it was 40 below zero (NL7VJ/VY1, 1991 and VY1QST, 1993). Kent said, "We'd better test the gear (he wasn't

too excited about my proposed antenna!) and we may as well take my Zodiak™ to give out an island or two at the same time."

A practice run

It didn't take long to slip the Zodiak (a rugged inflatable boat) into the murky water for Kirsten's Island, in Anchorage, near Cook Inlet. Kent worked on setting up the station, a TS-570D transceiver sitting on a plastic cooler for a table, while his daughter Kirsten helped me assemble a 20-meter vertical antenna made from a length of half-inch copper pipe with a CB whip hose clamped to the tip. Shortly after 0130Z on a beautiful September 9th, 1998, evening, we came on 20 meters as KL5T portable.

Propagation was incredible, as we logged one station after another and exchanged 5/9 reports both ways. The vertical was mounted in a fishing rod holder bolted to the beached Zodiak. We were using Westchester Lagoon for a ground plane. An hour later, with microphone still in hand, Kent suggested we move to another nearby island. Mosquitoes? Hordes of them made operating interesting at times from these



Photo A. KL5T and daughter Kirsten on "practice run" from Kirsten's Island. All photos by KL7JR.

spongelike grass-knoll islands slam full of goose droppings.

Kent, a/k/a "Mr. CW," is having an FB time on phone! Still maintaining our popularity on 20-meter phone, the contacts continued to flow. On battery power, we racked up another 100 Qs all over the US and the following countries: VE, KL7, HK, LU, XE and UA. Kent's Island was also registered for the US Islands Awards (USI) program. Kent was convinced this simple antenna design works DX! On the way home we discussed the glacier outing and who else we could entice to join us.

Journey to the ice

Three days later, I picked up Randy AL7PJ (SCARC treasurer), and we set out for Matanuska Glacier, 100 miles northeast of Anchorage. Kent KL5T had been called out of town by Uncle Sam (he's stationed at Elmendorf AFB in Anchorage) and would miss out on all the fun.

A primitive land lay before us. We gazed across the massive Matanuska Glacier's awesome blue and white ice formations and had an eerie insight into what the Ice Age must have looked like. Ice along the glacier surface melts, meltwater streams are formed. In their search for low ground, these streams carve impressive tunnels and sculptures of all sizes and shapes, throughout the glacier.

The enormous blue river of ice is located one mile off the Glenn Highway in a fertile valley of rushing waterways. Covering an area 27 miles long and four miles wide, this is the largest road-accessible glacier in Alaska; in fact, Randy informed me, a *Star Trek* movie was filmed on Matanuska Glacier a few years ago.

The giant glacier originates from vast mountain ice fields 13,000 feet in elevation in the Chugach mountain range. We couldn't help but wonder how propagation would be with the Chugach Mountains to the south and the Talkeetna Mountains to the north.

It was a drizzling rainy September afternoon when we arrived. The sky was an ominous dark gray, with just a sliver of sunlight poking through, illuminating



Photo B. Matanuska Glacier, meltwater streams and terminal moraine.

the glacier, aqua-blue on one side and a pale green on the other. We knew we'd have our work cut out for us, besides the quarter-mile hike to the glacier. The going was slow. We made our own trail, winding around the glacial streams and massive rock boulders deposited as moraine (dirt, rock, and other dragged debris) thousands of years ago by the glacier. We had to trek about a quarter of a mile out over the slippery black ice (young ice, 350 to 500 years old) and climb about 100 feet before we reached the blue ice (old ice, 5,000 to 7,000 years old) where we'd operate.

Glaciers advance and retreat, depending on the weather and snow accumulation as they grind their way over the land. Glacier trekking is dangerous and should never be attempted alone or without proper safety gear. The basic safety gear should be crampons, ropes, ice axes, and a survival kit of some sort. While Randy and I are not novice glacier hikers, we didn't venture far onto the ice either.

Crevasses (deep cracks in a glacier) infested the face of Matanuska Glacier. Some glacier crevasses are large enough to accommodate a 10-story building or easily hide a downed aircraft! A few times we stopped to listen to the hollow lowing sounds emanating from the groaning, creaking ice beneath us.

After finding something of a level spot on the ice, we immediately put the

station together. While Randy was hooking up the radio, I mounted the copper pipe antenna to a wooden stand anchored with rocks (moraine). Four quarter-wave-long ground radials were spread out on the ice to complete the installation. Much to our surprise, the rain had stopped—but black storm clouds were moving in. We were now ready to battle the mountains and approaching storm.

Cool DXing with K7ICE and KL7Glacier

Randy started off using K7ICE, the club call of the North Country DX Association, which was chartered to promote amateur radio in the north. Conditions on 20 meters were terrible, compared with a few nights earlier from the islands. Contest QRM ruled and most signals were weak. It took an hour to make the first contact.

After a few more hard-earned QSOs, Randy called Jim KL7CC in Anchorage on his cell phone to listen for us on 20 meters. How's that for ingenuity? We barely heard Jim, and he had no copy on us. Next, Randy called Del KL7HF, who spotted us on packet as "K7ICE/KL7 on Matanuska Glacier." That helped. Calls from W6 and W7 started to come in. We also enjoyed a short opening to W1-W3.

Packet radio again proved to be a valuable asset. An Oregon ham replied, "K7ICE is camped on a glacier—now

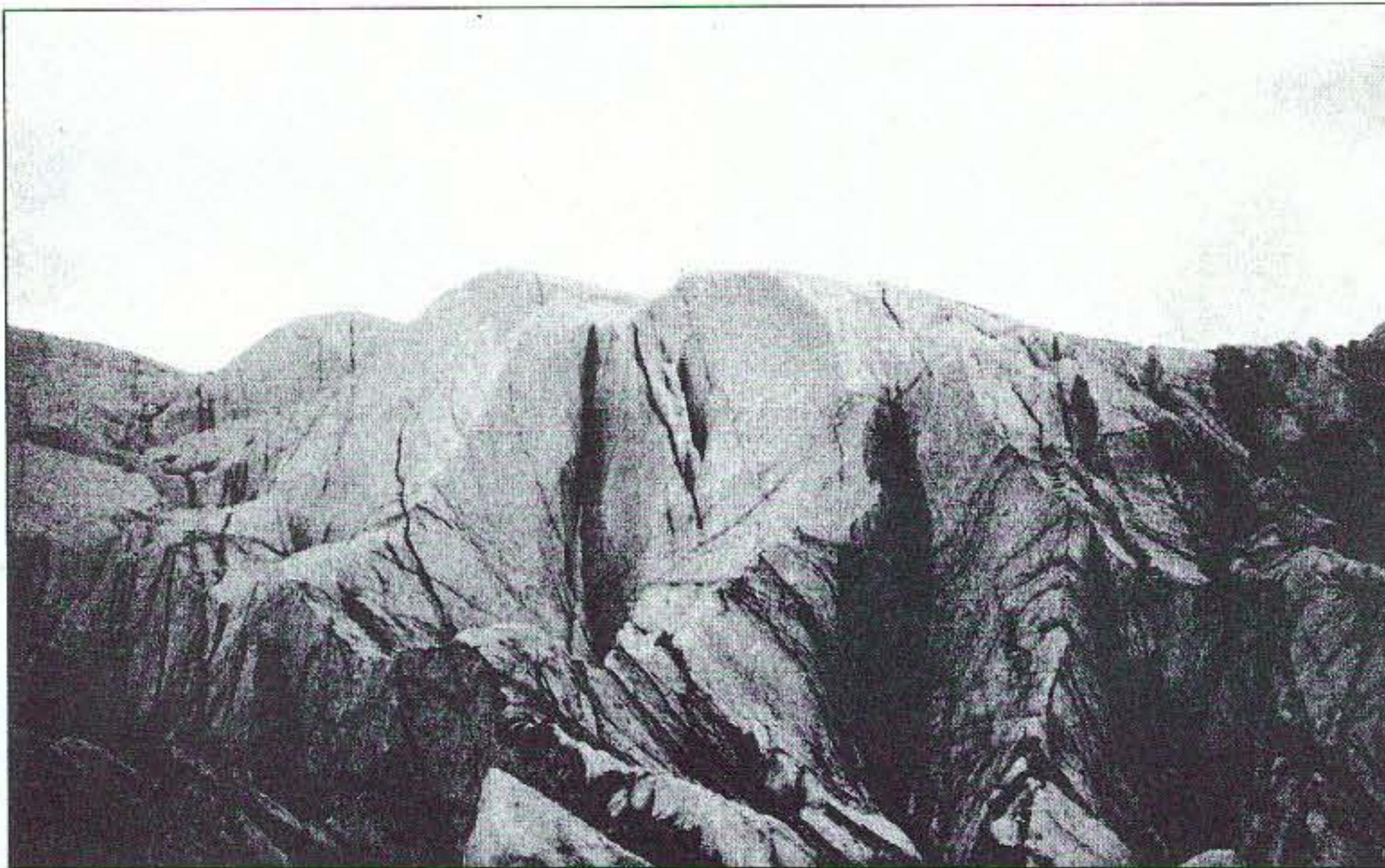


Photo C. Crevasses on Matanuska's face.

that's really cool!" We thought so, too. The most-often asked questions about our expedition were "Why are you there?" and "Why are glaciers blue?"

Well, Randy and I shook our heads about the first question and replied "because operating HF from an Alaskan glacier was probably a first for amateur radio, if not a first for us, and we thought that warranted our efforts."

As for the second question, I read aloud a paragraph from a brochure obtained from the Matanuska Glacier Lodge which went into detail in explaining why glaciers appear blue in color. I had known that question was sure to pop up. For those who want to know, here it is: Glaciers are blue because the ice crystals are extremely dense. After many centuries of pressure, hardly any cracks or air bubbles are present to reflect light. The old (compressed) ice crystals reflect only the short blue wavelengths of light and

absorb wavelengths of other colors. The older the ice, the bluer it appears, especially on overcast days.

We weren't working any stations outside North America, so we relocated our station to a higher spot on the ice and switched to SCARC's club call, KL7Glacier. Band conditions were improving. We were visited by other glacier hikers who were curious about the noise we were making and our antenna. One guy said, "You must be taking sonar readings of the ice or something." He commented "Far out," when we told him we had just talked to Italy and that we were bouncing HF signals off the ice.

IU2P said, "Working a glacier is a first for me." K6JOX commented, "You're on packet as DXing from a glacier in Alaska—bet you're having an adventure."

Just when we thought we were the only hams around for probably a hundred-mile radius, we were floored when this stranger, out of the blue, asked, "How's propagation on 20 meters, guys?" We turned around and eyeballed with W5EGF, who said he was vacationing in the area. He also told us he'd had that call since he was eight years old!

If that wasn't bizarre enough, I finally made contact with Leif JW2PA, on Spitzbergen Island, who said he had visited Matanuska Glacier just two weeks before. Leif was surprised to learn we'd been calling him for an

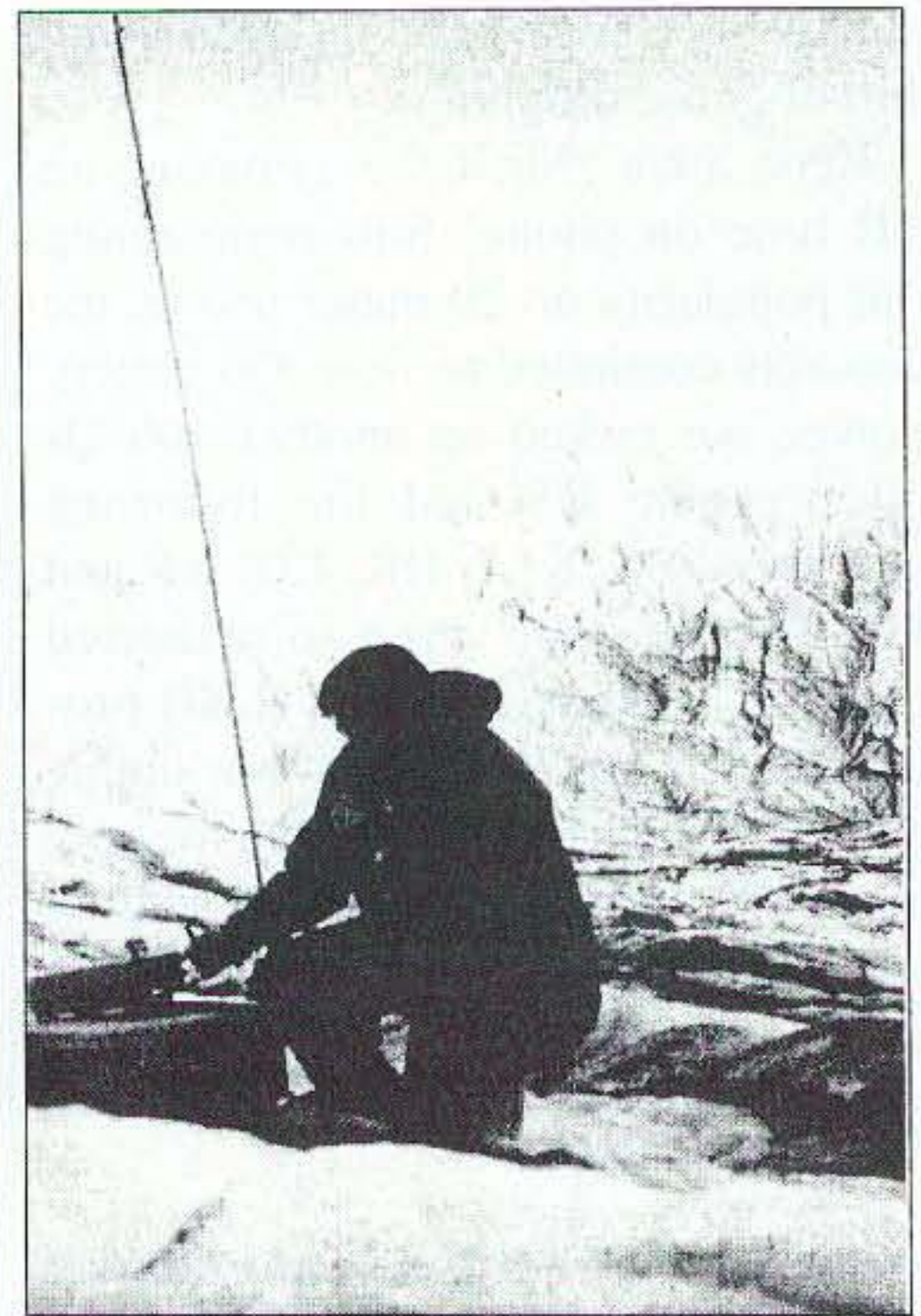


Photo D. AL7PJ operating as K7ICE/ Matanuska Glacier.

hour when he gave us a 5/7 report. We had a nice rag-chew about his Alaska trip. I told Leif that if he was on E-mail, we'd send him photos of our glacier operations. Randy brought his digital camera and naturally I had two 35 mm cameras along. Many signals were 5/9 now.

After four hours on the glacier, a cold wind picked up, making operating highly uncomfortable. We decided to call it a day. We hadn't done too badly, working six countries and having an exciting adventure, too! Shortly after we arrived back in Anchorage, Randy E-mailed the photos of our ice station to Leif and me. It's amazing what you can do with amateur radio—and from where!—in the great state of Alaska!

I'd like to thank all who contacted us, especially other SCARC members; Jim KL7CC, for the use of his TS-570D; TJ KL7TS, for the tools and hardware; Kent KL5T, for the gel cells, coax and island operation; Del KL7HF, for the packet radio spots; and Randy AL7PJ, for teaming up with me. The North continues to call me. Those who understand are shaking their heads in silent understanding. But for now, from mosquito-infested islands to bone-chilling blue ice, another fun-filled amateur radio adventure "up here" is history.

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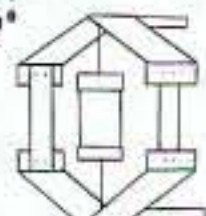
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Anti-Metric?

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Don Hillger WDØGCK
Colorado State University
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[hillger@cira.colostate.edu]

The United States has been in the process of converting to the metric system (called *metrication*) for over 20 years. In the mid-1970s, most British Commonwealth countries made the metric transition, leaving the United States in the company of other officially nonmetric countries such as Liberia and Myanmar (Burma). In fact, the US is the *only* industrialized nation not predominantly using metric. Even Britain is largely metric, but still uses miles on road signs and pints for beer. Closer links to the European Union have caused Britain to adopt metric much faster than the US.

So why are we not metric?

The reason we are not metric is a combination of limited opposition and a much larger portion of apathy. The fact that metric is not the "native" measurement system for most Americans breeds resistance. Some people refuse to change, mainly out of fear of the unknown. But that fear can be overcome with a better understanding of the simplicity of the metric system, a system that is much easier to use than our existing hodgepodge of units.

The apathy part comes from those who may know the benefits of metric measurement, but are unwilling to take steps toward that goal. They want someone else to change first. In this article we'll see how many products and services are already metric or have changed to metric in recent years. Because of these, we are more familiar with metric units than we may realize.

When most of us encounter metric units, it's often through conversion factors between inch-pound and metric units. Conversion factors, such as 3.28 feet per meter, only serve to cloud the simplicity of the metric system, where conversions between units use factors of 10. Dual units, however, are only a temporary inconvenience, since if we were fully metric, we would not be converting between metric and inch-pound units and would not encounter such odd conversions. This is a major advantage of having one unit system throughout the world.

The benefits of the metric system

The metric system is a decimal system, like our monetary system. In fact, the US pioneered decimal coinage in

1786. All other currencies in the world are now decimal. In Great Britain, the former system consisting of pounds sterling, shillings, pence, and farthings was abandoned in 1971. Now the British use a pound unit of currency that is divided into 100 pence. In the late 1960s and early 1970s all other countries using the former British system changed to decimal currencies as well, leaving behind the days of nondecimal monetary systems. The last country, Nigeria, changed in 1973.

In 1996, the Canadian Stock Exchange was decimalized, and the US stock exchanges are finally going decimal soon after the year 2000. As an intermediate step toward that goal, stock prices are now quoted in sixteenths, or 6.25 cent increments, down from eighths, or 12.5 cents. The switch to decimal trading will bring the US in line with the rest of the world's major exchanges.

Some people may argue the benefits of base 2 (binary) and base 12 (duodecimal) systems for measurement, as opposed to decimal. However, neither of these matches the world's existing decimal counting system, and would thereby suffer a major disadvantage if

used with decimal coinage and decimal measurement systems.

The metric system is more universal and international than the common units most Americans use. And we know well that amateur radio is an international hobby. Far more people use metric than not. When we talk on the air to anyone outside the US, do we expect them to understand our measurements in miles, feet, and inches, or our temperatures in degrees Fahrenheit?

In fact, the US is the only industrialized nation that still uses Fahrenheit in weather reports for surface temperatures. Upper air temperatures have always been measured and reported in degrees Celsius worldwide. And, as of July 1996, the international standard code for hourly and special surface weather observations (METAR) now uses degrees Celsius for the temperature and dewpoint fields.

The metric system is based on the idea of one base unit for all similar types of measurements, such as the meter for length. The meter can be subdivided into decimal parts by using prefixes, arriving at centimeters, millimeters, and micrometers. Or the kilo prefix can be applied to arrive at kilometers for larger distances. These units are factors of 10, 100, or 1000 different, and lengths can be converted in scale merely by moving the decimal marker. No need for numerous units for length such as inches, feet, yards, rods, and (statute and nautical) miles, where the conversion factors between units are all different. The units we use are not as well known as some people claim they are. Quick, what's the definition of an acre?

Most Americans do not realize that the metric system was made legal for all purposes in the US in 1866. Then, in 1893 our common inch-pound units were first defined and standardized in terms of metric units, which are regarded as the fundamental and internationally-accepted standards of length, mass, etc. Much later, in 1958, the definition of the inch was finally standardized *worldwide* as 25.4 millimeters exactly. Previously the definition of the inch varied among the major inch-

using countries: the US, Great Britain, and Canada. The difference was enough to cause confusion, inefficiencies, and difficulties during World War II in attempts to interchange various precision products.

The pound and the gallon are also defined in terms of metric units (the kilogram and the liter) by US law, but to a larger number of significant figures than the inch. Before the metric system came along, there were numerous standards for most inch-pound units. These units varied greatly in some cases, causing problems in daily commerce. This problem still exists for some units, such as the foot, where the international foot (based on the standard 25.4 mm inch) and the survey foot (based on an older definition of the inch used by the US, which differs by 2 parts in 10^6) are both still in wide use.

This leaves us with two definitions of the mile, one based on the international foot and the other based on the survey foot. Although this may not seem like a big difference, it causes the two definitions of a mile to differ by about one-eighth of an inch, or 100 miles to differ by over one foot!

How we already use the metric system

Don't think that the metric system is strange. We use metric units in many ways now—possibly in many more ways than we realize.

The electrical units we currently use are part of the metric system. The ampere is a base unit in SI (the International System of Units). Other electrical units such as volt, watt, joule, ohm, farad, and henry are all derived metric units (combinations of base and/or other derived units).

Amateurs also use meters, centimeters, and millimeters for wavelengths. We have frequency allocations on the 160 meter through 23 centimeter bands. For higher frequencies we generally speak in terms of megahertz and gigahertz frequencies, which are metric units for multiples of cycles per second.

When building a dipole antenna, why struggle with the formula in feet?

You Be the Judge

(answers at bottom)

Question A: Which column would you rather add?

(The two sums are the same.)

1 yard 2 feet 3-1/4 inches

1 foot 11-3/16 inches

2 feet 5-1/2 inches

3 yards 1 foot 6-5/8 inches

1.607 meters

0.589 meters

0.749 meters

3.216 meters

Question B: A room measures 15 feet, 3-3/4 inches by 21 feet, 7-1/2 inches (4.667 m by 6.591 m). What is its floor area in square yards?

What is its floor area in square meters?

Question C: In designing a calendar, you wish to divide an area of 7-1/4 inches by 11 inches (184 mm by 279 mm) into 35 rectangles (that is, you wish to divide 7-1/4 inches by 5 and to divide 11 inches by 7). What are the dimensions of each rectangle in inches? What are the dimensions of each rectangle in millimeters?

Answer A: 6 yards, 2 feet, 2-9/16 inches, or 6.161 meters

Answer B: 36.79 square yards, or 30.76 square meters

Answer C: 1-29/64 inches by 1-37/64 inches, or 36.8 millimeters by 39.9 millimeters

When using the formula in meters, the half-wave antenna length relates nicely to the radio wavelength. For example, on the 20 meter band, the half-wavelength is approximately 10 meters long, a more logical solution than converted to 33 feet. And for a vertical ground-plane antenna, the length is approximately one-quarter of the radio wavelength. For the 10 meter band, the quarter-wave antenna length is approximately two and a half meters,

again more logically related to the wavelength than when converted to eight feet.

Amateurs use kilograms for satellite mass (weight) and kilometers for satellite orbits. Kilometers are also used for best terrestrial distances for VHF, UHF, and microwave contacts—and how about low-noise amplifiers used for satellite reception? Such receivers are rated by temperatures in kelvins, an SI unit equal in size to the degree Celsius (the metric scale used for everyday temperatures), but on a scale with the zero point at absolute zero of temperature rather than at the freezing/melting point of water.

Surface mount chips are making the transition away from inch-based pin spacings to millimeter-based contact spacings. And many new electronic connectors use millimeter pin spacings.

Look at many other examples of metric usage that surround us:

In photography, we have 28-, 35-, and 70-millimeter (IMAX) width film. Lens and filter sizes are given in millimeters, as are eyeglass lenses and glasses frames. Stamps and stamp collecting supplies are measured in millimeters. Almost all pharmaceuticals and vitamins come in grams, milligrams, and micrograms. Many cosmetic containers are in rounded metric sizes. Most garden seeds are packaged in grams or milligrams. All food packages are required to have the net weight statement in both metric and non-metric units, and an increasing number of them are coming in rounded metric sizes. Nutrition fact labels on food packages show the mass of fat and other constituents in grams. Liquor and wine are bottled and sold in milliliters and liters exclusively.

Nearly all automobiles, trucks, motorcycles, and bicycles are now built using metric standards and components. The same is true for farm and construction equipment. Skis and snowboards are measured in centimeters, and soaring and sail planes use metric measurements for most applications. Olympic events are measured in metric units. Running race distances are mostly in kilometers, as are cross-country ski trails, rowing events, and most track and field events.

Those 3-1/2-inch computer diskettes are actually 90 millimeters in diameter, and compact videotapes are eight millimeters wide. CDs and DVDs have metric diameters as well. Light bulb power is measured in watts and light output in lumens. Mechanical pencil lead comes in 0.5 and 0.7 millimeter widths. Wallpaper often comes in five- and 10-meter lengths and metric widths. Construction adhesive and caulk are now packaged in 300 milliliter tubes. Several brands of dental floss come in metric (50 m and 100 m) lengths, as do all cigarettes. Luggage weight for international flights is measured in kilograms. And you thought metric units were only used outside the US! (Oh ... and don't forget your metric tool set!)

The metric system is not dead in America. After our initial steps toward metric in the 1970s, there has been some delay, but progress is currently being made in the areas of federally-funded road and building construction. The US is considering allowing metric-only labels on products to accommodate the export of those products to Europe, whereas dual labeling is presently required on all consumer products in the US.

Arguments for converting

Often we don't realize how much more difficult we make simple arithmetic problems by *not* using metric units. Our educational system spends numerous hours teaching our collection of units, fractions, and the conversion factors we need with these units. How many needless conversions are required to solve a problem like: There is a container four feet 11-13/16 inches tall, five feet 5-3/4 inches wide, and eight feet 3-3/8 inches long. How many gallons does it hold?

Or try this one: There is a field one mile 64 chains two rods three feet three inches by two miles 50 chains one rod two feet five inches. How big is the field in acres? Or how big is the field in square feet? Many of us do not even know the definition of a chain or a rod!

It is much simpler to solve these problems using the metric system,

rather than with our nondecimal inch-pound units.

Also, *what if* we were already a metric country and people understood it, and *then* someone suggested that we change to new-fangled inch-pound units. That is when people would say: "What! You mean we should adopt a system where the ratios between the units are 12, 3, 1760, and 5280 for common lengths alone?!" Or: "You mean we need to use fractions!" Or even: "You mean we should measure temperature and put the freezing point of water at 32, and put the zero point at a place that has little or no meaning?" They would also say that this or that new unit is too small or too large, a common argument when converting to metric. Most people would think that such a proposal to change away from the metric system to a less logical system was absurd, and it is, because we don't see any countries doing that.

For more information

The metric system has been around since the late 1700s and in its modern SI form since 1960. Yet some Americans may not realize that most of the world uses metric. That's partly because our news media conveniently convert measurements in the foreign news, shielding us from metric usage that is prevalent in the world. Anyone who travels outside the US soon realizes that our nonmetric units are not used in other countries. On the other hand, much of the world either speaks or understands our English language, a trend that cannot be denied. Would it not be much simpler if the whole world spoke one language (but that's another story) and used one measurement system (metric)?

Many details on the metric system and its proper use are not included in this article. The US Metric Association (USMA) maintains a Web site which contains a wealth of information on the metric system, references to metric standards documents, as well as current information on the status of the metrication in the US. The URL is: [<http://lamar.colostate.edu/~hillger/>] or [<http://www.metric.org>].

The USMA also publishes a bimonthly newsletter titled *Metric Today*. 73

Everyman's Guide to Active Filter Design

Now you know.

David Cripe KC3ZQ
RR 2 Box 263
Camp Point IL 62320

Filters? Who needs filters? The answer is, everybody needs filters! Or at least every *radio* needs them! Electronic filters serve to pass signals within a desired band of frequencies, and reject signals lying outside this range. The most basic crystal radio contains at least one filter, and today's modern transceivers contain dozens.

The ability to design filters for a given custom application is a valuable skill for the home-brew hobbyist. Good audio filtering on both the transmit and receive of your rig can really make a difference in the intelligibility of your signals. However, filter design is a topic not thoroughly covered in *The ARRL Handbook*, nor, for that matter, in many electrical engineering curricula. Designing any filter based on an existing circuit is a math-intensive process which is frightening enough, but to design a filter from scratch usually requires circuit optimization computer software which most hams will not have available. So what are we to do?

Luckily, the hard mathematical work involved in filter design has already been done for us. In the early days of digital computers, it was recognized

that standard tables of filter components would be extremely valuable for those engineers not wanting to derive these quantities for themselves. So, authors such as Blinchikov, Zverev, *et al.*, have compiled wonderful books containing design information covering every conceivable filter you could imagine.

Texts such as these contain tables of component values allowing the designer to construct filters consisting of inductors, capacitors, and resistors. The filter designer will discover, to his dismay, that the large-valued inductors required to construct a filter operating on signals in the audio frequency range are *not* stocked at the local Radio Shack®—nor anywhere else! This is where active filters are so valuable, as they allow the construction of filter networks composed of resistors, capacitors, op amps, and *no* inductors.

Since it has not always been easy to come by information on how to convert a passive filter design, such as those contained in the filter design handbooks, to a more easily constructed active filter, I have had to figure much of this out for myself. I now have quite a bag of tricks allowing me to design an active filter, quickly, of

nearly any topology I might select. Looking back at how much time this information could have saved me years ago before I derived it, I am now sharing this so that others may benefit.

Background

There is a certain vocabulary of terms used to describe filters, and it is useful to become familiar with them. A given filter has a *passband*, that range of frequencies it is designed to pass, and a *stopband*, that range of frequencies it is intended to attenuate. The *frequency response* of a filter is its ratio of output to input voltage versus frequency. The frequency at which a filter's output power is one-half that at the center of the passband is regarded as the point of transition between the passband and stopband, and is referred to the *-3 dB frequency*.

There are a number of different types of filters for different applications. The *low-pass* filter serves to pass signals below a given frequency, and block those above this. A *high-pass* filter, conversely, blocks low-frequency signals, and passes high-frequency ones. A *band-pass* filter passes only those signals lying between

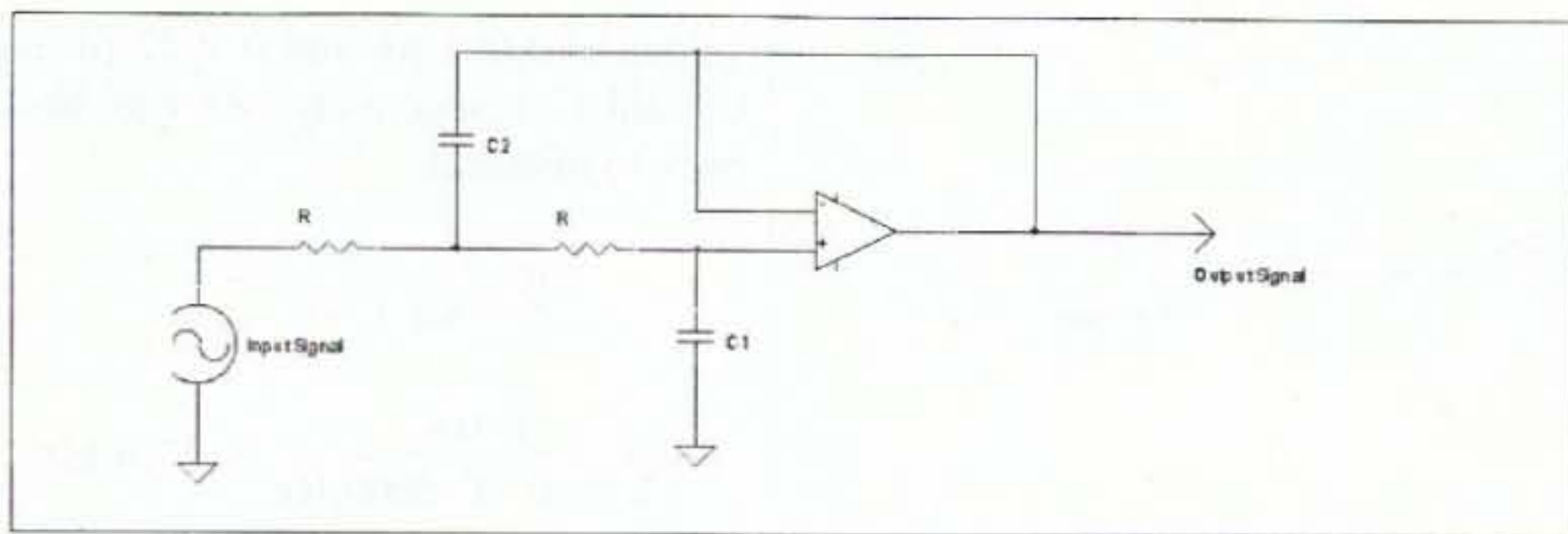


Fig. 1. Two-pole Sallen-Key low-pass filter.

two frequencies, while a *band-reject* filter serves to notch out those signals lying in a certain range.

Additionally, filters are further defined by the shape of their passband frequency response curves. A filter having the flattest possible frequency response within its passband is called a Butterworth filter. This is the most common type encountered in electronics design. A filter with the steepest possible transition between the passband and the stopband is called a Chebychev filter. However, this improvement comes at a price—the Chebychev filter exhibits ripple in its passband frequency response. The amplitude of the passband ripple of a given Chebychev filter, in dB, is used to describe it. A Bessel filter possesses a gradual roll-off of frequency response between passband and stopband. The Bessel filter frequency response is optimized for its time-domain response—which is to say that it does not “ring” in the manner of other filter shapes, such as the Butterworth and Chebychev. Consequently, the best CW filters are of the Bessel type.

The amount of attenuation a filter provides within the stopband is a function of the number of inductors and capacitors it contains. For a simple

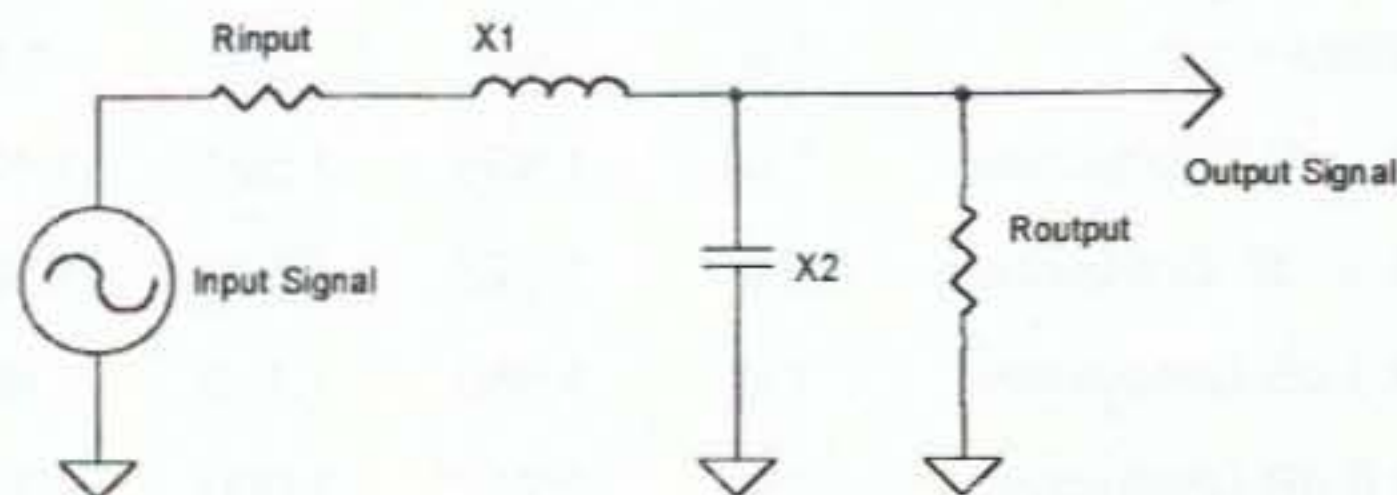
low-pass or high-pass filter, the total number of reactive components (Ls or Cs) is the number of *poles* the filter contains. For a low-pass filter, the increase in attenuation for each octave of frequency increase in its stopband is 6 dB times the number of poles. In other words, a one-pole filter cuts the voltage of the signal passed in half each time its frequency is doubled. A three-pole filter cuts the signal voltage to one-eighth with each doubling of frequency, etc. Consequently, the higher the number of poles a filter possesses, the higher the rate of attenuation within the stopband.

The filter design information contained in the filter handbooks is generally in a *normalized* format. These tables contain the values for capacitors and inductors for low-pass filters fed from a one ohm impedance source, terminated in one ohm at the output, and with a -3 dB point of $1/2\pi$ Hz. This information is given for Bessel, Chebychev, and Butterworth filter shapes containing any given number of capacitors and inductors. From this normalized information, it is possible to derive component values for passive filters of any -3 dB frequency, whether

Continued on page 28

SHAPE	R_{input}	X_1	X_2	R_{output}
Butterworth	0	1.414	0.707	1.0
	1.0	1.414	1.414	1.0
0.1 dB Chebychev	0	1.404	0.829	1.0
0.3 dB Chebychev	0	1.383	0.935	1.0
1.0 dB Chebychev	0	1.301	1.195	1.0
3.0 dB Chebychev	0	1.063	1.819	1.0

Table 1. Normalized filter coefficients for two-pole filters.



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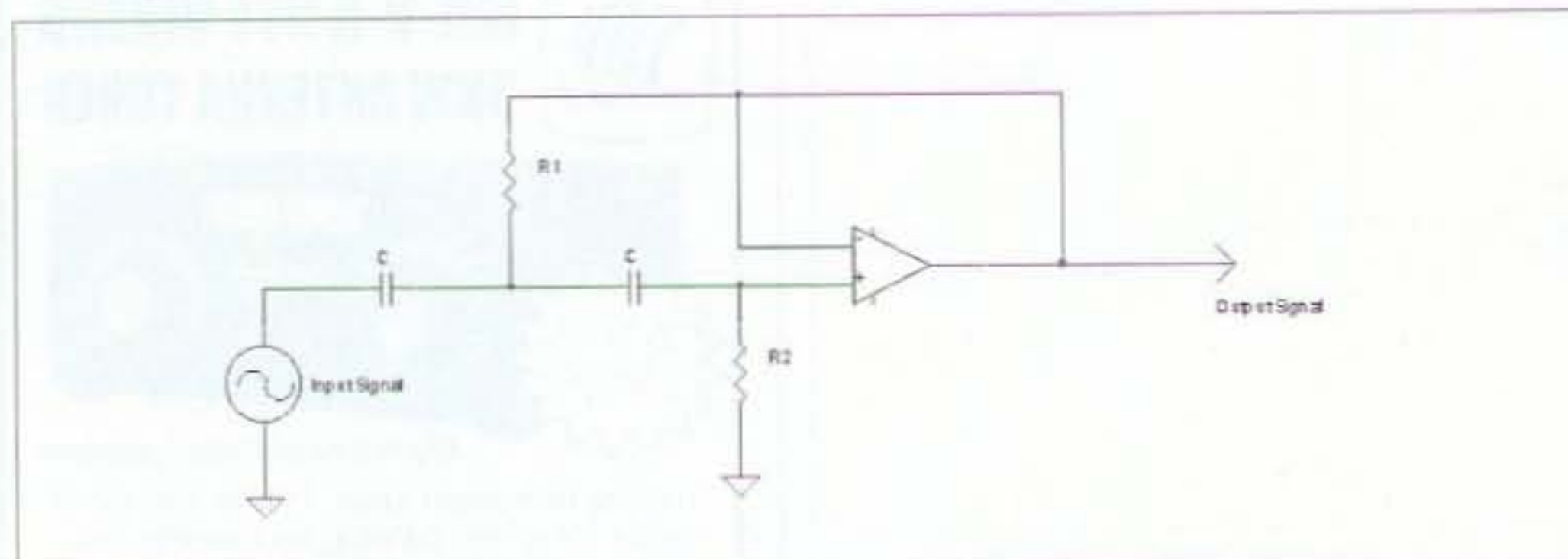


Fig. 2. Two-pole Sallen-Key high-pass filter.

Everyman's Guide to Active Filter Design

continued from page 27

of low-pass, high-pass, band-pass or band-stop types.

I have included **Tables 1** through **4**, which contain normalized low-pass filter component values for filters containing two through five total capacitors and inductors, in frequency responses having Bessel, Butterworth, 0.1, 0.3, 1.0, and 3.0 dB passband ripple Chebychev curves. (Notice that for the two- and four-pole filters, values are listed for an input impedance of zero ohms. This is because, for mathematical reasons, even-numbered-pole Chebychev filter responses cannot be attained with equally-terminated filters.)

So much for theory! Are we ready to do some real designing?

The most common type of active filter is depicted in **Fig. 1**. It is a two-pole low-pass type, with two resistors, two capacitors, and an op amp. This very simple, easy-to-design circuit is referred to as a "Sallen-Key" filter, after

its inventors. To convert from the normalized, low-pass values of **Table 1** to an actual working filter, we select the shape of the filter desired (Butterworth, Chebychev, or Bessel) using the singly-terminated values. After selecting the value of the -3 dB cutoff frequency, f_{-3dB} , the value of capacitor C_1 is given by:

$$C_1 = \frac{X_1}{4\pi \cdot R \cdot f_{-3dB}}$$

and the value of C_2 is given by:

$$C_2 = \frac{X_2}{\pi \cdot R \cdot f_{-3dB}}$$

Let's try designing a 3 kHz, Butterworth low-pass filter, such as might be used in an SSB receiver circuit. From **Table 1**, we see that the normalized value for X_1 is 1.414, and the value for X_2 is 0.707. With a little algebraic manipulation of the equations above, we obtain:

$$\frac{C_1}{C_2} = \frac{X_1}{4 \cdot X_2}$$

Thus, we see that for these values of X_1 and X_2 , $C_1 \div C_2 = 1/2$. Approximating this ratio using common junk box

values of 0.001 μF and 0.0022 μF for C_1 and C_2 respectively, we can work back to obtain R:

$$R = \frac{X_1}{4\pi \cdot C_1 \cdot f_{-3dB}} =$$

$$\frac{1.414}{12.6 \cdot 10^{-9} \text{ F} \cdot 3000 \text{ Hz}} = 37.4 \text{ k}\Omega$$

This is not a standard resistor value, but we may use the next closest, 36 $\text{k}\Omega$, which is less than 4% off.

That was easy enough! With these formulas and a calculator, anyone can design a low-pass filter. Now, how about a high-pass filter? Just as easy! For the Sallen-Key topology, a low-pass filter can be transformed into a high-pass filter simply by exchanging the resistors and capacitors. The same formulas hold true—just exchange the Rs and Cs! See **Fig. 2**:

$$R_1 = \frac{X_1}{4\pi \cdot C \cdot f_{-3dB}}$$

and

$$R_2 = \frac{X_2}{\pi \cdot C \cdot f_{-3dB}}$$

Let's try designing a 300 Hz, two-pole Butterworth high-pass filter. If we pick $C = 0.01 \mu\text{F}$, then from the equations immediately above, $R_1 = 37.4 \text{ k}\Omega$, and $R_2 = 75.0 \text{ k}\Omega$.

The Sallen-Key active filter circuit is widely used for two-pole filter implementation. If, however, a filter with more than two poles is required, the design procedure for a Sallen-Key circuit implementation becomes much more difficult. Therefore, other circuit

SHAPE	R_{input}	X_1	X_2	X_3	R_{output}
Bessel	1.0	1.557	1.027	0.511	1.0
Butterworth	1.0	1.0	2.0	1.0	1.0
0.1 dB Chebychev	1.0	1.435	1.594	1.435	1.0
0.15 dB Chebychev	1.0	1.523	1.523	1.523	1.0
0.3 dB Chebychev	1.0	1.686	1.400	1.686	1.0
1.0 dB Chebychev	1.0	2.217	1.090	2.217	1.0
3.0 dB Chebychev	1.0	3.352	0.713	3.352	1.0

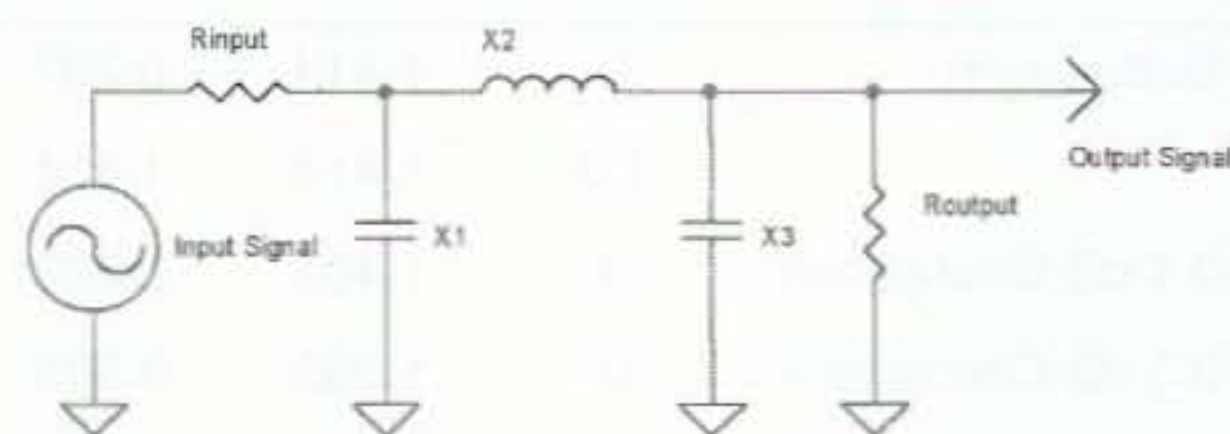


Table 2. Normalized filter coefficients for three-pole filters.

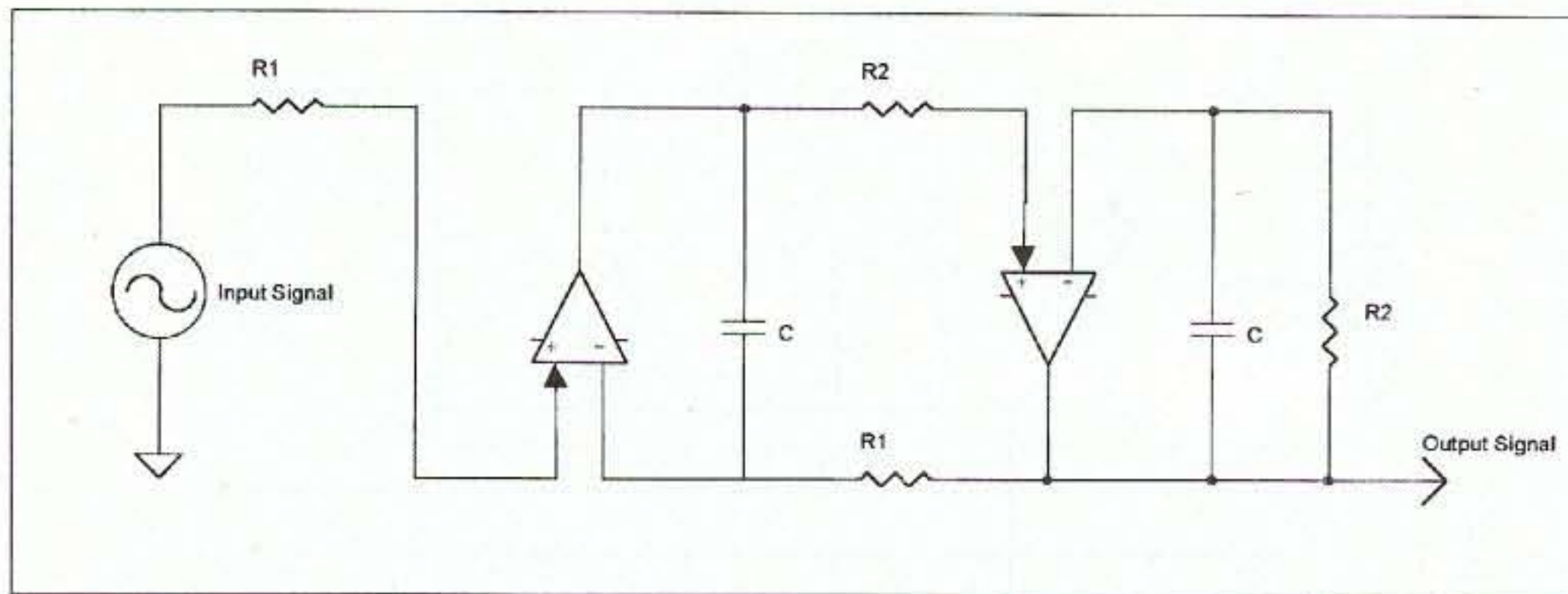


Fig. 3. Two-pole low-pass filter using Norton op amps in leapfrog topology.

topologies can be considered for these higher-order filters.

At this point, an introduction to a very useful op amp is appropriate. This is the Norton op amp, of which the type LM3900 is the most commonly used example. Whereas conventional op amps amplify the difference in voltage applied to their inputs, the Norton amplifier amplifies the difference in current applied to the input pins. The input pins of a Norton op amp have low impedance to ground, and so can be considered current sinks—the only caveat being that the input currents cannot be negative. Further, the LM3900 Norton op amp is designed to operate from a single supply voltage, so it is well suited for application in portable, 12-volt-operated equipment.

Fig. 3 depicts the Norton op amp configured in a two-pole low-pass filter constructed in what is referred to as a *leapfrog* topology. Here, each capacitor or inductor in the passive filter prototype circuit is replaced by an op amp, a capacitor, and two (or three) resistors. The beauty of the leapfrog filter topology is that the formulas for

calculating component values are very straightforward, allowing anyone with a hand calculator and filter tables to design a high-order active filter. While leapfrog filters can be constructed using conventional op amps, to implement a given filter it requires 50% more op amps and resistors than with Norton op amps. So for this discussion, we shall use Norton amplifiers.

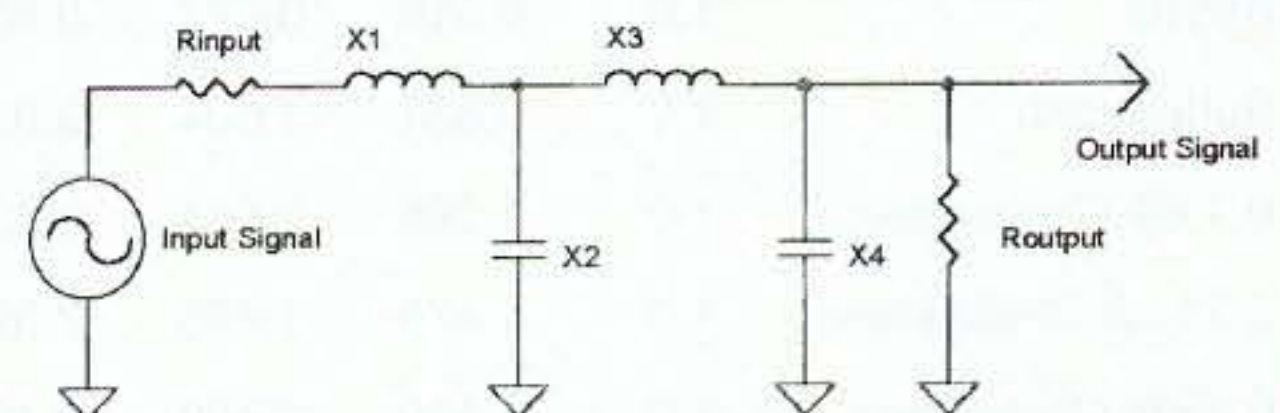
We can now use this basic circuit to derive a series of equations to allow the design of an active filter. Selecting normalized filter values from Table 1, 2, 3, or 4 and cutoff frequency, f_{-3dB} , we then select a capacitor value for use throughout the filter.

Unlike resistors, high-precision capacitors are not always easily available. However, capacitors of the same value, from the same manufacturing run, are usually matched in value unit-to-unit better than the stated tolerance, and so can be used to obtain the necessary precision.

We refer to Fig. 3. The first op amp models the action of the first inductor in the passive low-pass circuit. The value of R_1 is defined as:

SHAPE	R_{input}	X_1	X_2	X_3	X_4	R_{output}
Bessel	0	1.540	1.114	0.855	0.400	1.0
	1.0	1.736	1.629	0.780	0.613	1.0
Butterworth	0	1.532	1.581	1.087	0.389	1.0
	1.0	0.766	1.850	1.850	0.766	1.0
0.1 dB Chebychev	0	1.516	1.776	1.461	0.675	1.0
0.2 dB Chebychev	0	1.503	1.819	1.503	0.706	1.0
0.3 dB Chebychev	0	1.485	1.853	1.527	0.822	1.0
1.0 dB Chebychev	0	1.377	2.053	1.519	1.129	1.0
3.0 dB Chebychev	0	1.102	2.635	1.281	1.793	1.0

Table 3. Normalized filter coefficients for four-pole filters.



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$$R_1 = \frac{X_1}{2\pi \cdot C \cdot f_{-3dB}}$$

If the filter is doubly terminated (i.e., having a resistor at the input), this first capacitor is paralleled by a resistor equal to R_1 .

The second section of the filter mimics the action of the capacitor and resistor at the filter output. The value of resistor R_2 used in this section is given by:

$$R_2 = \frac{X_2}{2\pi \cdot C \cdot f_{-3dB}}$$

At this point check to see that these values are realistic—try to keep any values of R between 33 k Ω and 3.3 M Ω for best filter performance using the LM3900. If not, adjust the value of C accordingly, and try again.

This same technique can be extended to filters containing any number of poles. For a filter with more than two poles, we simply cascade successive sections, as is shown in

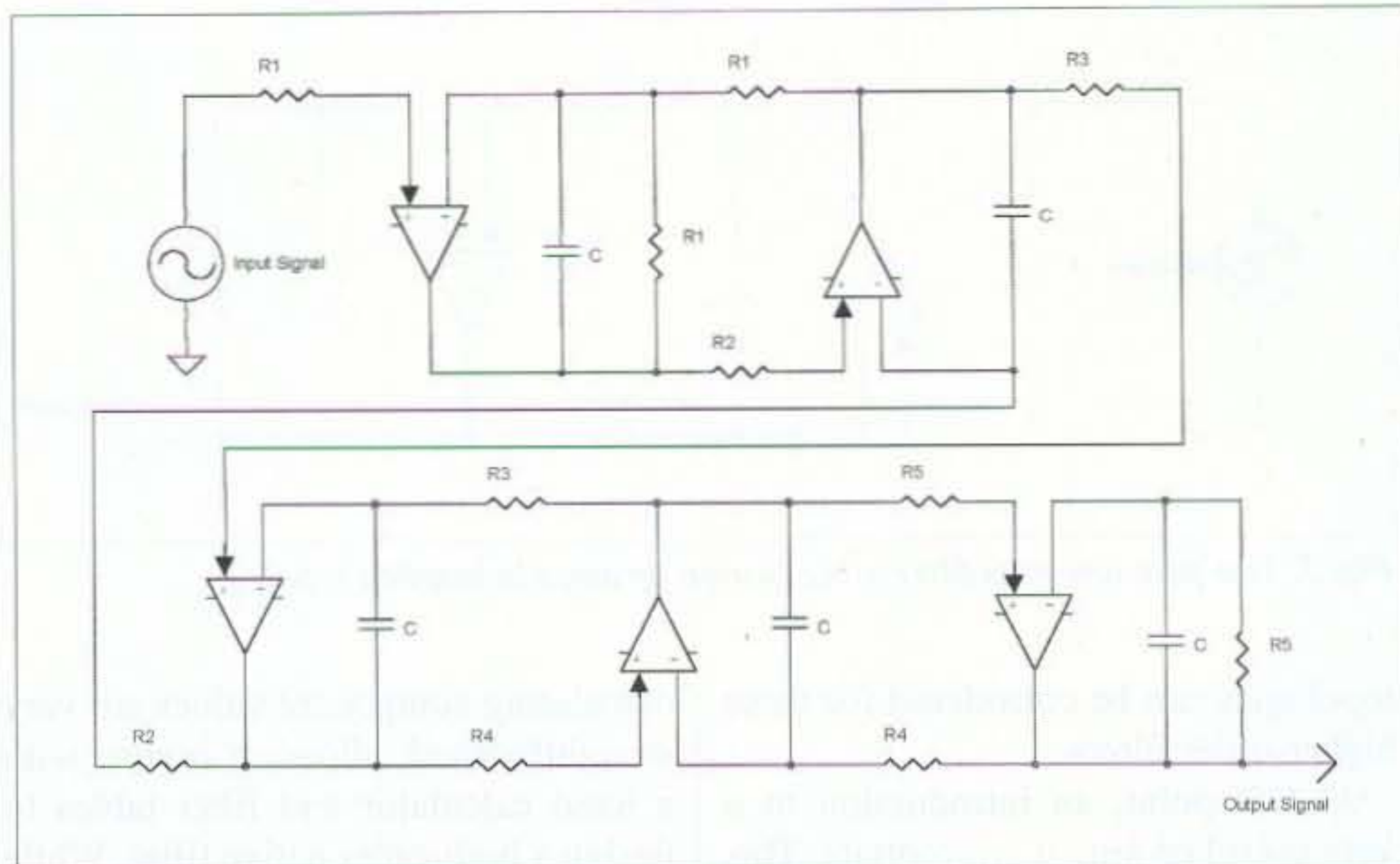


Fig. 4. Five-pole low-pass filter using leapfrog topology.

Fig. 4. Let's try a more complicated example: a five-pole low-pass filter having a 0.21-dB-ripple Chebychev response, and a 3 kHz cut-off frequency. Let us also pick C to equal 0.0022 μ F. From Table 4, we see that the five-pole, 0.21-dB-ripple Chebychev has the unique property that four of the five component values in the normalized filter are the same. This makes the design procedure very easy, as we only need to calculate two component values!

Using our very first preceding equation to calculate R_1 , R_2 , R_4 , and R_5 :

$$R_1 = R_2 = R_4 = R_5 = \frac{X_1}{2\pi \cdot C \cdot f_{-3dB}} =$$

$$\frac{1.475}{6.28 \cdot 2.2 \cdot 10^{-9} \cdot 3 \text{ kHz}} = 35.6 \text{ k}\Omega,$$

or the next closest standard value, 36 k Ω . Recall that for this equally-terminated

filter, both the first and last capacitor in the circuit are paralleled by a resistor of this value.

We calculate R_3 the same way:

$$R_3 = \frac{X_3}{2\pi \cdot C \cdot f_{-3dB}} =$$

$$\frac{2.393}{6.28 \cdot 2.2 \cdot 10^{-9} \cdot 3 \text{ kHz}} = 57.4 \text{ k}\Omega,$$

or 56 k Ω , the closest standard value.

This information should provide the average ham with the ability to design pretty much any filter he might need. This article is in no way an attempt to cover this topic fully—there are entire texts on the design of filters—and there is a limit to the quantity of material that can be presented in a magazine format. However, here's a starting point from which the novice filter designer may proceed on his own. Have fun—it's easy!

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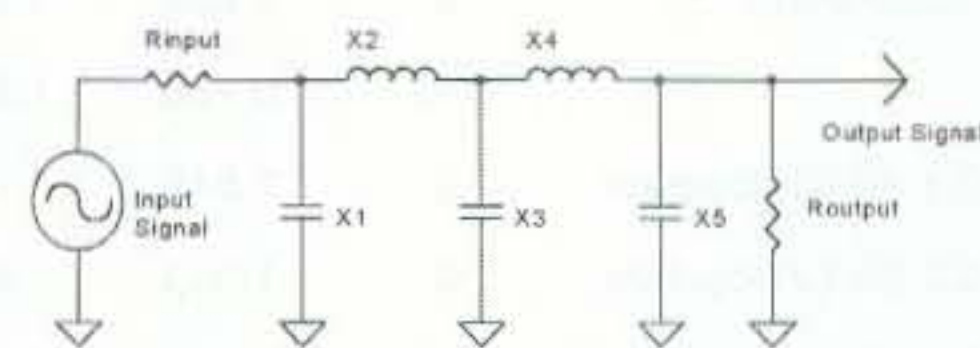
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SHAPE	R_{input}	X_1	X_2	X_3	X_4	X_5	R_{output}
Bessel	1.0	0.318	0.877	0.809	2.417	0.953	1.0
Butterworth	1.0	0.631	1.604	2.032	1.604	0.631	1.0
0.1 dB Chebychev	1.0	1.298	1.564	2.230	1.564	1.298	1.0
0.21 dB Chebychev	1.0	1.475	1.475	2.394	1.475	1.475	1.0
0.3 dB Chebychev	1.0	1.600	1.406	2.495	1.406	1.600	1.0
1.0 dB Chebychev	1.0	2.207	1.130	3.104	1.130	2.207	1.0
3.0 dB Chebychev	1.0	3.483	0.763	4.540	0.763	3.483	1.0

Table 4. Normalized filter coefficients for five-pole filters.



Keys to Good Code

Unlocking the secrets of sending precise Morse code.

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Have you noticed how some operators send CW (Morse Code) so that every letter and word is unmistakable, while others send so many words that are hardly readable? There are good reasons for the latter difficulty and some simple remedies. But first, there are six devices to discuss, all of which have been or are being used to send CW. These are the:

- (1) straight key, or hand key;
- (2) sideswiper key, cootie key, or double key;
- (3) semiautomatic key, or bug;
- (4) electronic keyer;
- (5) Boehme-head type machines; and
- (6) keyboards and computer circuitry.

All of these can be used to send perfect or nearly perfect code, but in many cases the code does not come out all that well. I've spent many years teaching hundreds of operators how to send both the International and the American Morse codes, and I hope the information in this article will help every reader improve his or her sending.

The straight key

The original and simplest key is the straight key, also known as a hand key.

It is used to send at slower speeds, usually in the five to 18 word-per-minute (wpm) range. With skilled operators, it can put out very good 20 to 25 wpm code. There were some very skilled operators in the past who could vibrate their hand and fingers in such a way as to send at 35 wpm! However, there are few people—if anyone—who can do this anymore. A speed of 25 wpm is really pushing it with a straight key for most operators. A side view of a basic straight key is shown in **Fig. 1**. Pushing the knob down closes the keying contacts that are normally connected to the keying circuit in a transmitter, or possibly to a practice oscillator. The contact gap should be about 1 millimeter (mm), a little less than 1/16 of an inch. This is the key for anyone, beginner or old-timer, who wants to learn to send code correctly. It was widely used by professional shipboard radio operators because it produced the easiest to copy CW through QRN or over long distances and because it provided no difficulty when the ship was rolling. It should be the first key to be mastered by anyone, because it is the best one with which to learn to hear and understand the extremely important requirement

of proper spacing between dots and dashes, letters and words.

Spacing

If there is any one most important thing to learn about sending CW, it is proper spacing. There is probably only one chance in perhaps 10 that operators (you?) space properly. If the proper spacing is not used, a receiving operator may not be able to guess what is being transmitted. There is nothing more discouraging to hear than a string of well-made letters, with no spacing to indicate where one word stops and another starts!

The theory of the timing of dots and dashes is simple enough. The length of a "dot" is the basic time element or "unit" of code sending. A "dash" is three units long, never two, although four or even more is quite readable to the human ear (long dashes can give the code its well-touted and interesting "swing," but computers hate it). The spacing between a dot and a dash in a word is one unit long. The spacing between any two letters in a word is three units long. The spacing between any two words is seven units. Between the end of a word and a comma or period

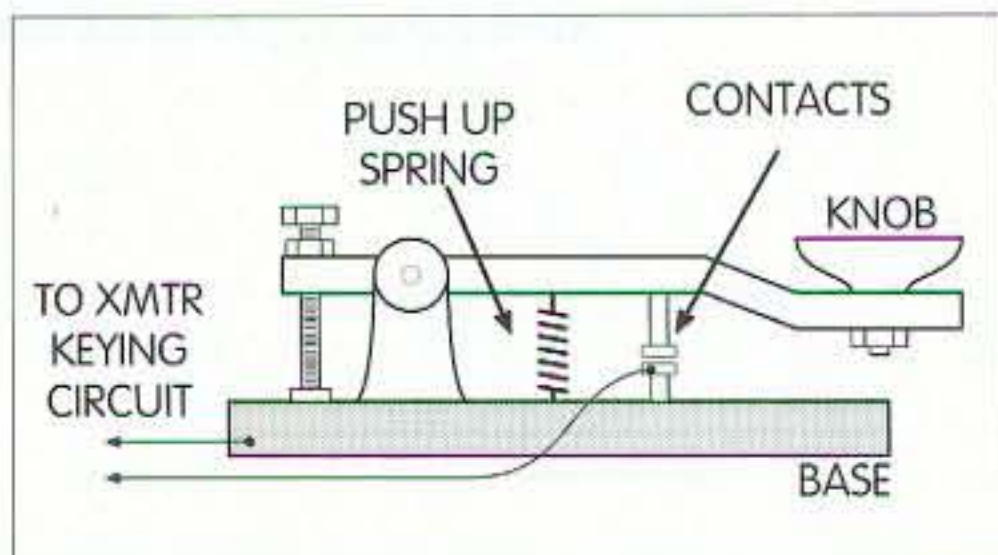


Fig. 1. Essentials of a straight key.

there should be three units, not seven units. Punctuation marks should be spaced as they would be when typing them on a keyboard.

A good practice to develop a feeling for spacing for anyone trying to learn, or to improve sending, is to make a letter and then with your little finger tap the desktop before sending the next letter of that word. Between any two words, tap the finger twice on the desktop. Later, after you develop reasonable speed and ability, only tap the desktop between words. Eventually the sense of proper spacing will be ingrained in the subconscious and no more desktop tapping should be necessary. By that time, each letter should be made as one simple or complex sound. A 10-letter word should be heard as 10 simple or complex sounds, all forming one tied-together complex group of sounds, with no audible long (or lack of) spacing anywhere.

Using the straight key

A desirable way of using a straight key is to place the tip of the first finger on the key knob at a position of about 12 o'clock, with the thumb lightly touching the underside of the knob at about seven o'clock. Flip the three other fingers downward about halfway to the desktop. This should close the

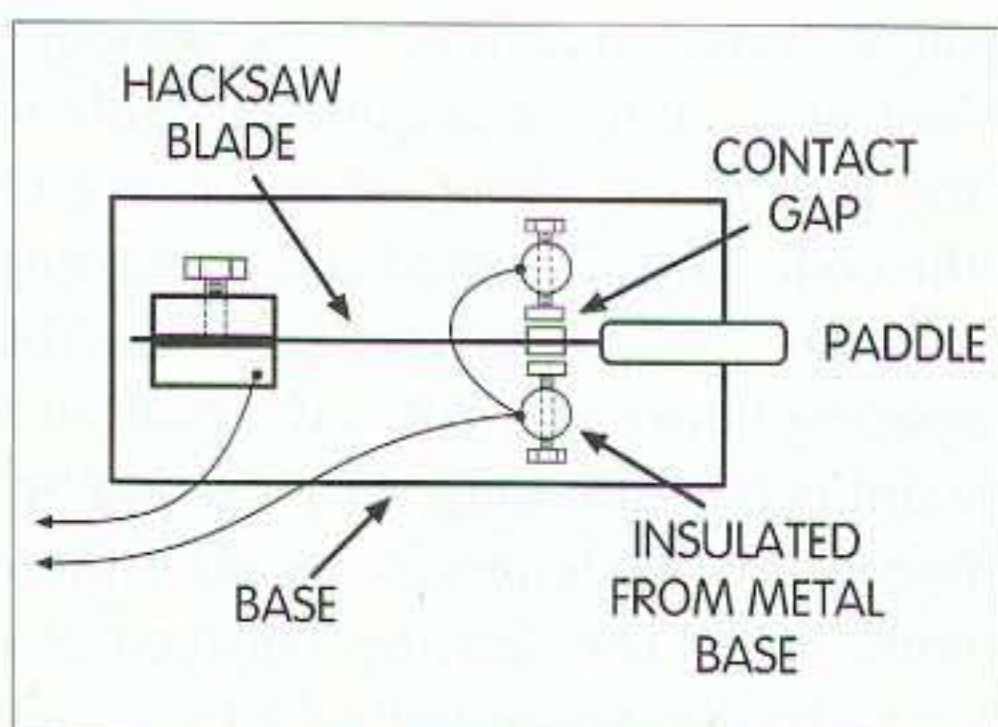


Fig. 2. Essentials of a sideswiper key.

key and open it again as the fingers swing back upward. Note that the wrist will push upward as the fingers go down. This is a correct way to make a dot. If the wrist goes down when the key goes down it is the arm that is doing the keying. Fingers are so much less tiring to use! (I once sent messages with a straight key for five hours with no stopping, from the Yangtze River to San Francisco, after my ship was bombed—but that's another story.) Flip the fingers downward twice rapidly for two dots. Three times for three dots, etc. Practice making some eight-dot groups. All dots should come out with equal timing. Note the wrist: Make sure it goes up when the fingers go down.

To make dashes, flip the fingers downward farther and hold the knob down for at least three times as long as with dots. Practice making dashes in groups of eight or more. Note the wrist action with dashes—it should move farther upward than when making dots.

Practice making a string of 10 dot-dash (• - • - • -) groups strung together. Then practice making a string of 10 dash-dot (- • - • - •) groups strung together. The next practice is 10 •• - •• - groups strung together. Then 10 - - • - - • groups. This exercise will provide practice in starting and making most letters and numbers.

I assume that you already know the International Morse code. Here are some practice exercises for learning to send letters, words, sentences, and numbers. Concentrate particularly on spacing properly.

A QUICK BROWN FOX JUMPS
OVER THE LAZY DOG, 1234567890.

PACK MY BOX WITH FIVE
DOZEN LIQUOR JUGS, 0987654321.

These two lines contain all of the English letters and numbers, plus commas and periods. When you can send these correctly with proper spacing between letters and words, with no hesitation anywhere (which takes quite a while), try sending them backward. When this can be done both forward and backward *without any errors*, you should be able to send fairly well with

a straight key! With a beginner the speed may be only five or six wpm. With practice, the speed should come up to well over 10 wpm, and eventually to perhaps 16 to 20 wpm. To compute code speed, five normal letters plus a space is considered one word. If the standard word PARIS can be sent 10 times in 60 seconds, with proper spacing between words, the sending speed is 10 wpm.

The sideswiper key

This is a very old but simple form of a speed key, first used by American Morse railroad telegraphers, probably sometime around the mid-1800s. It is far easier to operate than a straight key and with it the code can be sent about 50% faster. It is also called a "cootie key," and sometimes a "double key," because it works like two straight keys fastened bottom to bottom. The origin of the term cootie key seems to be unknown, but very possibly had some tie-in with the "bug" first used as a symbol on early-day Vibroplex® semi-automatic keys.

A double key can be constructed by using two straight keys, fastened base to base, and mounted at 90° from their normal position. Another way to make a sideswiper key is to mount a three-inch piece of hacksaw blade solidly at one end, so the free end can swing back and forth between two fixed contacts at its near end. An insulating-material paddle should be fastened to the free end of the hacksaw blade. A top view of a basic sideswiper key is shown in Fig. 2. If a metal base is used, the right-hand and left-hand contacts must be insulated from it. The gaps between both fixed contacts and the flexible arm should each be about one millimeter with the arm in its resting position.

To operate a sideswiper key, the first finger presses the paddle toward the thumb to make the flexible arm hit the stationary left contact. (Explanations are for right-handed operators. Lefties will know what they should do.) A quick motion in that direction makes a dot. If the contact is held at least three times longer, a dash is made. An appreciation of the difference in time

between a dot and a dash learned with a straight key is important. The finger could be used to key dots and dashes the same way as is done with a straight key, but with a sideways instead of up-and-down motion.

Now comes the interesting part! The thumb can press toward the first finger, moving the paddle to the right against the right-hand contact. If it makes only a quick movement, it will produce a dot. If the contact is held three times as long it will make a dash. Code can also be sent horizontally with the thumb this way. To send the letter "A," which is *dot-dash*, the first finger can make the dot and the thumb can *immediately* be pressed in the opposite direction to make the dash. However, if the thumb is used to make the dot, the first finger must immediately be pushed to the left to make the dash! Every letter or number can be started by either the thumb or the finger! It is up to the operator to be able to make the proper length dots and dashes whether they are being made by thumb or finger. Care must be taken to maintain all spacings properly. These are tricky keys to use. The straight key should be mastered first to ensure properly-learned spacings. Sideswiper keys usually produce heavy dots. If you like challenges, make yourself a sideswiper and try sending with it!

The semiautomatic key

Around the turn of the 20th century,

the semiautomatic key, or bug, was developed. It has been made in many forms by many people and companies. Most of these keys are made to operate horizontally, but some operate vertically. Basically, a bug, which seems to be a generic term used today for semi-automatic keys, is somewhat like a

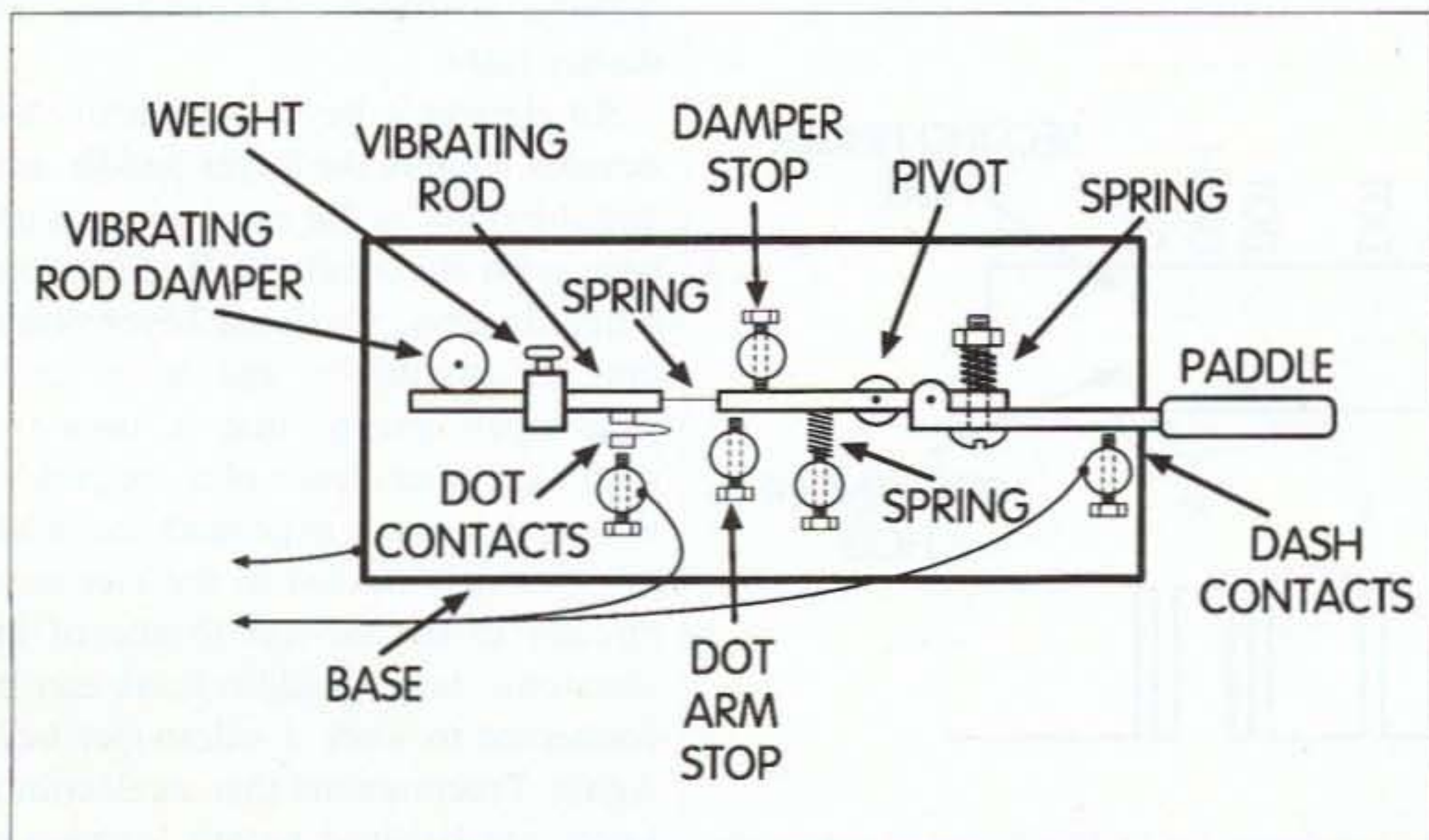


Fig. 3. Essentials of a semiautomatic key.

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sideswiper key, but is much better than the simple old cootie key. A top view of a basic bug is shown in **Fig. 3**. When the first finger is pressed against the paddle, it can be worked the same as the first finger on a sideswiper key to make dashes. A horizontal form of straight key sending can also be produced with the first finger as with a cootie key.

When the thumb is pressed against the paddle, it moves the near end of the main pivoted bar or shaft to the right. The far end of the bar moves to the left because of the pivot. Attached to the main bar on the far side of the pivot is a short piece of spring steel; attached to the end of that is the weighted vibrating rod. As the weighted rod vibrates from side to side, it makes and breaks a connection as its springed contact hits and rebounds from the fixed dot contact, thereby producing a series of dots. So, the thumb determines how many dots are made and the first finger must make all of the dashes. It is up to the operator to determine how long to make the dashes so that they are at least three times the length of the dots. It takes a trained ear to do this, an ear that is usually developed by properly-learned straight key operating.

As long as receiving operators are copying by ear, longer-than-normal dashes will sound OK, but short dashes will produce a poor-sounding code. The spacing between the dash contacts, and the travel between the bar to the dot-stop when the paddle is pushed to the

right, should both be about one millimeter. The thumb and finger should travel reasonable distances and strike the paddle fairly hard. (This was very important when bugs were used on ships during times when the seas were heavy and the ship was rolling.)

Where the movable weight is placed on the vibrating rod determines the speed of the rod vibrations and therefore the speed of the dots. The farther the weights are out toward the far end of the vibrating rod, the slower the vibrations ... and the slower the dots. You will find that if the stationary dot contact is moved up against the vibrating contact so that only about 10 to 12 dots are made before the dot contacts settle into a constant contact, the dots will be made at a desirable hearing length. Theoretically, the space between dots should equal the dot length. However, for the receiving operator it is better if the dots are a little longer than the space between them. These are known as "heavy dots." As mentioned before, "light dots" mean that the space is longer than the dots, resulting in poor-sounding code that may also be hard to read at a distance or under poor conditions, and may not be read properly by computer keyboards. I recommended that a bug not be tried before learning to space properly with a straight key first.

Most good bug operators send and receive in the 20 to 35 wpm range. High-speed bug operators may get up into the 40 to 50 wpm range. Some may think they are operating their bugs

correctly at these higher speeds, but if checked with "slip tape" (explained later), most will find that their spacing is almost always rather poor. If they were using an electronic keyer their letter spacings might be much better.

The electronic keyer

To improve on the vibrating dots of bugs, which usually have some variation between the first and last dots in letters like H or the numeral 5, there were many magnetic vibrator-type bugs built in the early decades that worked fairly well. Around the 1950s, it was found that vacuum tube vibratory circuits could be used to produce perfect dots, spaces, and dashes. Then the small size and low voltages needed to operate transistors allowed them to take over the modern types of electronic keyers. There are a variety of these devices available today. Basic electronic keyers are improved semi-automatic keys. They use a square-wave electronic oscillator to produce perfect, constant-speed dots and spaces when the paddle is pushed by the thumb. They use the same oscillator with divide-down counter circuits to produce perfect, constant one-third-speed dashes (three times longer). The operator of this type of key does not have to worry about the length of dots or dashes—just the spacing between dots and dashes in letters, the spacing between letters, and the spacing between words. When the control is advanced to increase the oscillator frequency, it makes dots, spaces, and dashes faster.

An electronic keyer is basically two devices. One is the keyer paddle unit, and the other is the electronic circuits unit, with its oscillator, dividers, and other circuitry. The basic keyer paddle unit is essentially the same as a sideswiper, except that it uses two separate contact leads plus the paddle-arm lead (usually at ground potential), all of which are fed to the electronic circuits in the device. (Some of the electronic keyer paddle units can be connected to work a sideswiper key.) Again, I recommend that an electronic keyer not be used before learning to operate a straight key properly. An

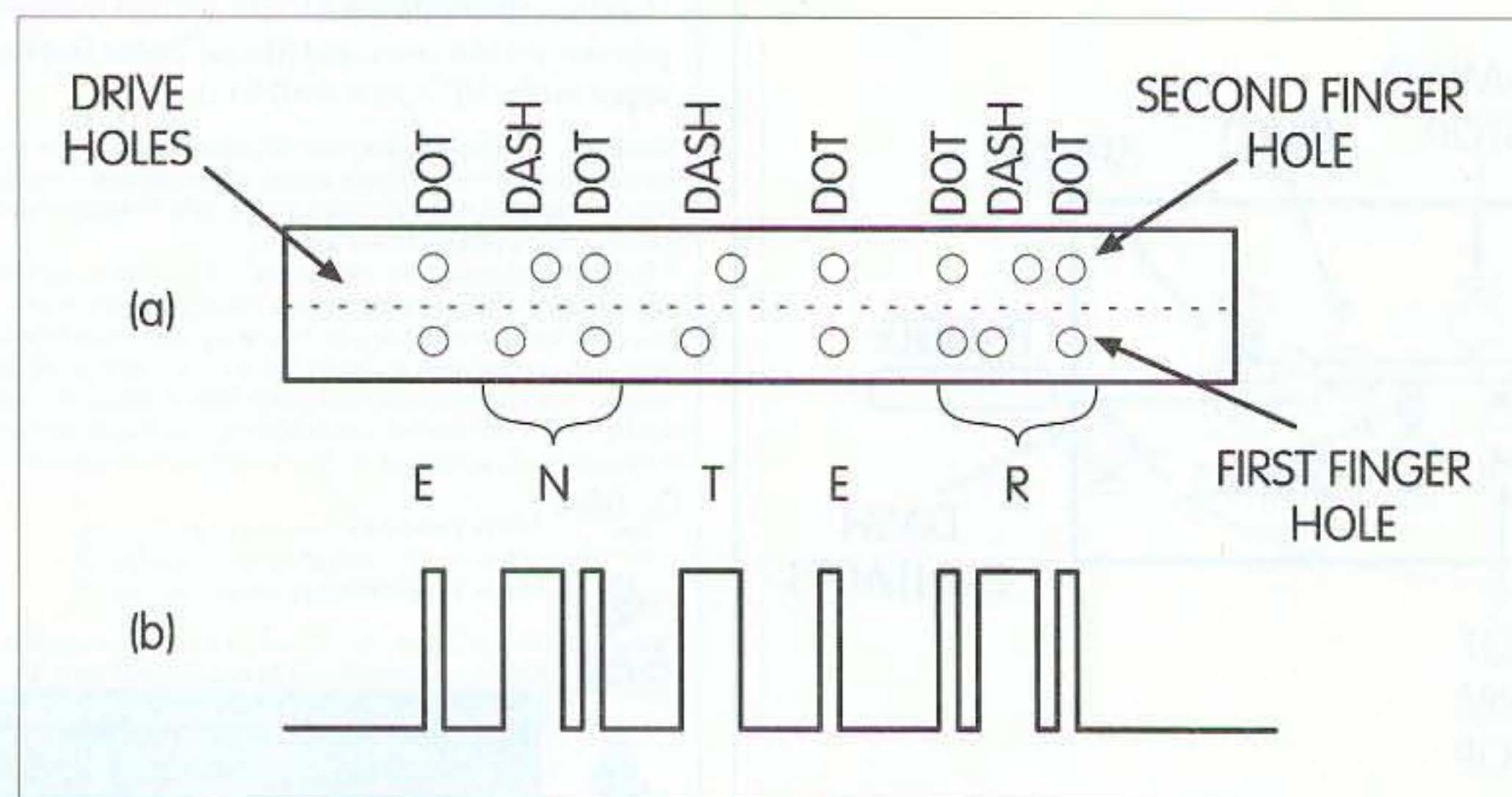


Fig. 4. (a) "ENTER" punched onto a Boehme-head tape. (b) "ENTER" inked onto a slip tape.

electronic keyer can produce the perfect sending once produced only by the old-time commercial Boehme-head code machines.

The Boehme-head-type machines

The Boehme-head and other similar machines were used from the 1920s to the 1960s to transmit perfect high-speed radio code. They were nicely machined little units about six inches square and two inches thick, driven by an adjustable-speed electric motor. Their punched waxed-paper tapes were produced on a special typewriter-like keyboard tape-punching "perforator" machine. The letters punched into these transmitting tapes came out as properly spaced holes. Boehme-head machines sent their perfect code at speeds determined by the driving motor's speed. Code at well over 100 wpm was easily produced.

The tapes they used had three sets of holes punched into them by the perforator. The center perforations were drive holes used to pull the tape along over two little pins that were alternately pushed up and pulled down against the moving tape from underneath. One pin was on one side of the center holes; the second was directly across the tape on the other side of the driving holes. When the first pin came to a punched hole, it would move up through its hole, starting an electrical connection. When the first pin went back down and the second pin pushed up, if this pin also found a hole in the tape it would move up through it, which shut the electric connection off, thereby keying a dot for the transmitter. If the first pin went up through a hole and started an electric connection, but the second pin found no hole, there was nothing to shut off the keying circuit. When the first pin came up again, it could do nothing since the electric connection was still made. However, if the second pin came up again and found a hole to go through, it shut off the electric circuit. In this case, since there were three pin motions between the start and the stopping of the electric circuit, it would key an electric circuit duration three times as long as was keyed for a dot, resulting in a dash

being sent. Fig. 4(a) shows a five-letter word punched onto a Boehme-head tape.

Tapes were usually punched and fed into a tall box. They were then either wound on a spool or were fed back into a second box so that the first punched material was available to feed into the Boehme-head machine. When slower-speed transmissions were to be made, the tapes could be punched by the operator and fed directly into the Boehme-head, although with a couple of feet of sag in the tape so that the Boehme-head machine would not get ahead of the tape puncher.

Slip-tape machines

Dot and dash tones received on radio receivers could be rectified, and the current developed by them could magnetically pull an inked pen up and down on a moving unwaxed paper "slip-tape" machine. With no signal being received, a straight line would be drawn by the pen along the bottom of the tape. When a dot was received, the ink pen was pulled up and then fell down at the end of the received dot, producing a narrow vertical pulse on the slip-tape, as shown in Fig. 4(b). When a dash was received, the line was pulled up but was held there for the duration of the received dash before dropping back down. Operators ran the slip-tape along the front of their typewriter at a speed controlled by a foot pedal, usually at greater than a 40-wpm reading speed. The received letters and spaces were visually recognized and typed as letters and words on the typewriter keyboard.

Using a slip-tape device is probably the best way to check radio code sending. Any dot, dash, letter, or spacing made improperly is shown visually and permanently, allowing scrutiny and analysis. I have used such a device to graphically illustrate to students what they were doing wrong with their sending (but I also had to demonstrate to them what proper sending should look like).

Before computer-programmed keyboards were developed in the late 1970s, some Boehme-head machines were used on the amateur bands. Boehme-heads

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produced perfect code, but they used up an awful lot of paper tape!

The computer keyboard

When a computer keyboard (KB) operates with a Morse Code software program, plus a data controller unit to key the transmitter, it is capable of producing code transmissions as perfect as that from a Boehme-head machine. Besides not requiring the handling of dozens of yards of paper tape in one busy evening, a computer keyboard system has no moving parts other than the KB itself, and is soundless. The monitor screen of the computer shows the letter and words being typed and transmitted. The program can be adjusted to transmit Morse code at any speed desired, from very slow to very fast. With such systems in common use, amateurs can easily produce perfect code practice transmissions at high speed. As a result, some amateurs have learned to copy in their heads up to—and even above—100 wpm! At such speeds they are probably learning to recognize many whole words, such as “the,” as complex sounds instead of hearing their separate letters. They copy in their heads because trying to type out copy at speeds near 100 wpm is quite difficult.

I highly recommended that all CW operators learn to copy in their heads as soon as they find they can write down most of what they hear. It is really the only way to enjoy CW communicating. Those who talk down Morse code operating have probably never learned how much fun it can be when Morse code is copied properly. Commercial operators copy in their heads but always type several letters behind those being sent. This way, if the sending operator makes a mistake in sending, the error sign that is sent stops the receiving operator and the improper letter(s) is not typed onto the message blank. Copying behind by several letters is the sign of a good radio operator.

With a proper software program, computers can also be used to copy code off-the-air and display it on the screen. But the code must be sent almost perfectly. There is a little latitude in the length of dots, spaces, and dashes, but not a lot. If hand sending is not nearly perfect, the displayed copy may not be very good. With computerized transmission and reception, assuming no QRM or QRN, the displayed copy of previously typed information held in memory can be perfect to well over 100 wpm. Printouts may also be made of what is shown on the screen.

Few amateurs can handle a KB well enough to put out proper code at 50 to 100 wpm, so real-time transmissions made at such high speeds usually sound broken up to listeners. The overall transmission speed will be only the typist's typing speed. For a hunt-and-peck keyboard typist, 25 wpm is not an uncommon overall sending speed, although the letters might be set to transmit at 50 wpm or more. This would not be considered good communications transmitting—the result sounds jerky to any operator listening and trying to copy the transmission.

Very readable computer monitor displays can be produced by an electronic keyer, provided the transmitted dot, dash and inter-word spacings are good.

Keyboard transmissions are expected to sound perfect, but if words are mistyped, are misspelled, or if they are broken up with unwanted spaces while desired keys are being looked for, poor copy will result for radio operators who are trying to copy by ear or in their heads. To produce proper-sounding code, KB systems should not be set to transmit at a speed faster than the typist can type well.

If KB transmission circuitry involves magnetic relays, there is the possibility that the transmitted dots will turn out to be quite light, resulting in less-than-desirable emissions. Some keyboard circuits have built-in “weight” controls by which the length of dots and dashes can be adjusted to reduce light dot transmissions.

Similar KB and computer equipment can be used to transmit and receive radio teletype information on the ham

bands. However, many old-timers wax nostalgic for the clatter of the old machines and the yards of yellow paper, or printed tape, that spewed out of the machines.

Some very new amateur transceivers have been developed that are operated by the keys on a KB coupled into the transceiver. There are no dials to rotate to select frequencies. All of the functions of sending and receiving CW, RTTY, packet, etc., are controlled either with the KB keys or with a mouse. CW can be sent by using the keys on the KB, or by plugging in any type of key desired into the transceiver. Phone? Just plug a microphone into the transceiver.

Punctuation

Regular amateur CW communications use very few punctuation marks. The exceptions to this are KB communications. Since all of the punctuation marks are available on all keyboards, they are becoming more common.

In general, amateurs use BT as an end of a thought, or to indicate that the sending operator is thinking about what is going to be sent next. (The overlining of the BT is used here to mean that B and T are sent together as one character with no spacing between them, to sound like dahdididah.) Some of the CW punctuation and operating signs heard on the bands are:

Period—AAA
Comma—MIM
Question mark—IMI
Fraction-bar or slash—DN
Quotation marks—AF
Parenthesis—left KN, right KK
Dollar sign—SX
Apostrophe—WG
Error sign—HH
End of a message—AR
End of a QSO—SK
Wait—AS
Start your transmitting—K
Received OK—R

The key to the key

Regardless of the type of device an amateur uses to produce CW, sending it correctly will always be a challenge. One rule never changes, though: Practice makes perfect!

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QRP Temptations

Here's a roundup of low-power kits out there today.

Robert S. Capon W3DX, ex-WA3ULH
107 Cavalier Drive
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Kit-building continues to build momentum as hams rediscover the joy of building their own equipment. Such enthusiasts have been treated again this year with the introduction of two major multiband transceivers, and the reintroduction of a single-band transceiver kit with an important new companion course.

This article describes the three latest transceivers that have become available, along with a roundup of my favorite "classic" kits.

I hope you'll discover the joy of building your own radio. Your knowledge of amateur radio will be greatly enhanced, and you'll discover that a QSO made on a home-brew rig is more satisfying than 10 QSOs made on a commercial transceiver.

K2, by Elecraft

The K2 is the most high-tech amateur radio transceiver kit known to mankind; it was designed by Wayne Burdick N6KR and Eric Swartz WA6HHQ. Wayne is known primarily for his NorCal QRP Club and Wilderness Radio designs, including the NorCal 40/40A, Sierra, and SST transceivers, as well as multifunction accessories including the KC1 and KC2. He was also recently inducted into the QRP Hall of Fame. Eric is a talented

engineer/entrepreneur who has been involved in several highly successful startups in Silicon Valley. The K2 is a synthesis of their different styles, emphasizing both big-rig performance and QRP efficiency.

The K2 is a microprocessor-controlled 10- through 160-meter CW/SSB transceiver with a built-in digital display and a dazzling array of features more typical of a major league commercial rig. These include a PLL synthesizer; dual VFOs capable of working split frequency; direct keypad entry of frequencies and operating parameters; RIT/XIT; 10 memories (each with A/B VFO frequencies and other operating settings); back-lit LCD; built-in speaker; memory keyer with multiple message buffers and auto-repeat; variable CW crystal filter (250–1200 Hz); and bar graph S, RF, SWR and ALC meters. Whew!

The K2 also offers an optional antenna tuner, noise blanker, and internal 3 Ah battery.

The radio embraces design values and objectives that are common to other radios designed by Wayne. It is small, measuring only 2.9 x 7.8 x 8.2 inches, and can be configured to draw as little as 100 mA, making it ideal for use on Field Day or on battery-powered expeditions. The radio is also ideal for fixed station use.

Despite the robust set of features offered by the K2, the radio was designed for ease of construction and testing. Like the Sierra, the radio uses "no-wires" construction, with most controls mounting directly to the PC board. The user's guide is written with incremental assembly and testing, so that modules can be tested in stages, avoiding the dreaded "smoke test." In addition, the radio has built-in test equipment, so the K2 can be aligned with only a digital voltmeter. The K2 even includes a built-in frequency counter.

There are so many novel features included in the radio that it is impossible to adequately summarize them in this brief article. I encourage you to visit the Elecraft (that's "ele" as in "elegant")

Continued on page 38

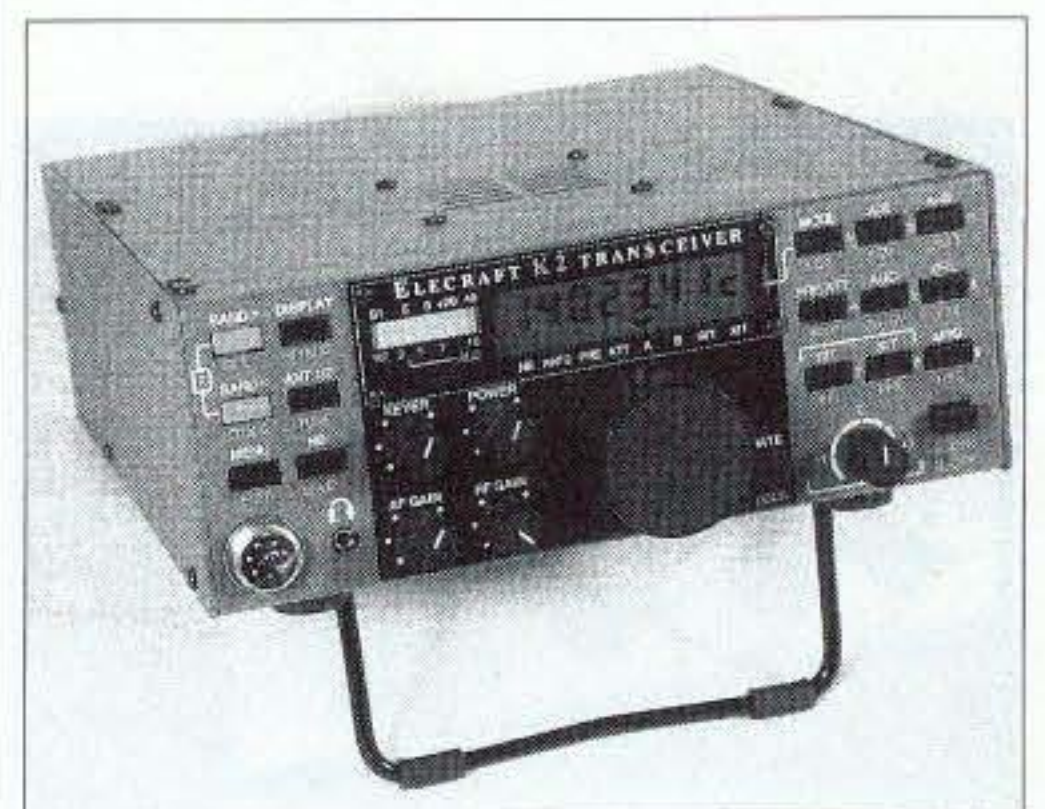


Photo A. Elecraft's K2 transceiver.

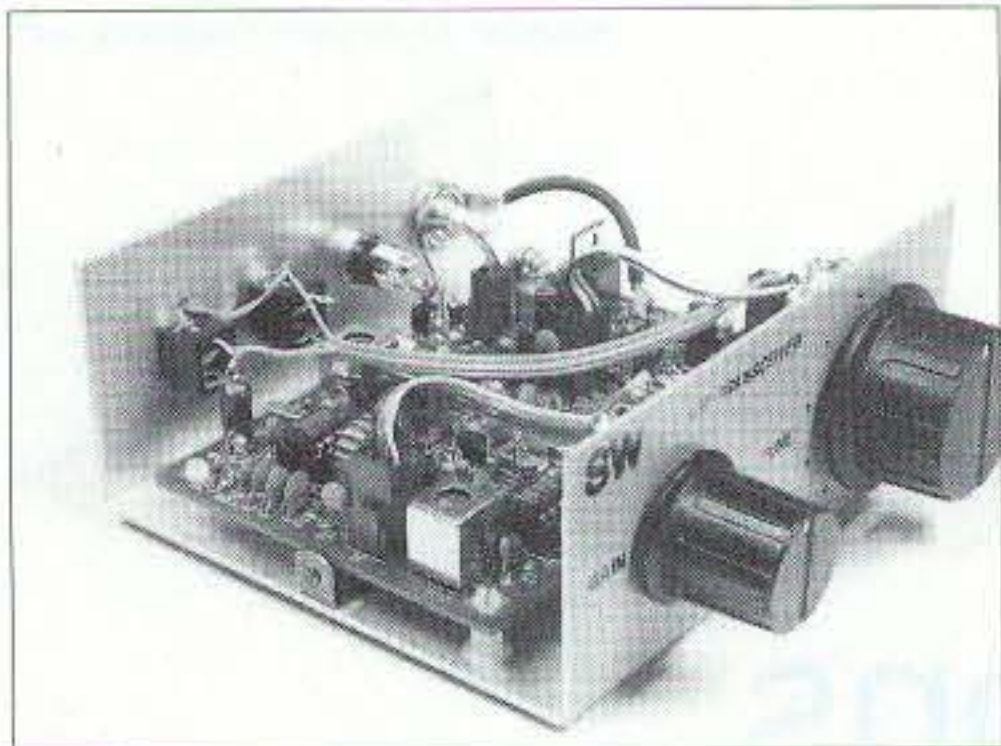


Photo B. The SW+ series is made by Small Wonder Labs.

Web site (see URL at end) for more details.

As of this writing, the K2 was being put through possibly the largest and most ambitious field test program ever used with an amateur radio kit, with dozens of builders around the world (including me) interconnected by a discussion group over the Internet set up by Elecraft.

The K2 basic configuration sells for \$549. Pricing for options is as follows: SSB with speech compressor, \$79; 160-meter with second receive antenna, \$29; noise blanker, \$29; internal antenna tuner, \$125; and internal 2.9 Ah battery, \$79.

OHR 500, by Oak Hills Research

The OHR 500 is a new five-band CW transceiver for intermediate to advanced builders. The rig is an upgrade of the classic OHR 400 fourbander. The radio is excellent as a base station QRP transceiver, because it is switch-selectable for operation on 80, 40, 30, 20, and 15 meters, and band changing is thus effortless. The OHR 500 comes with a built-in analog dial, but you can soup it up with the companion DD-1 "digital dial" outboard LED display.

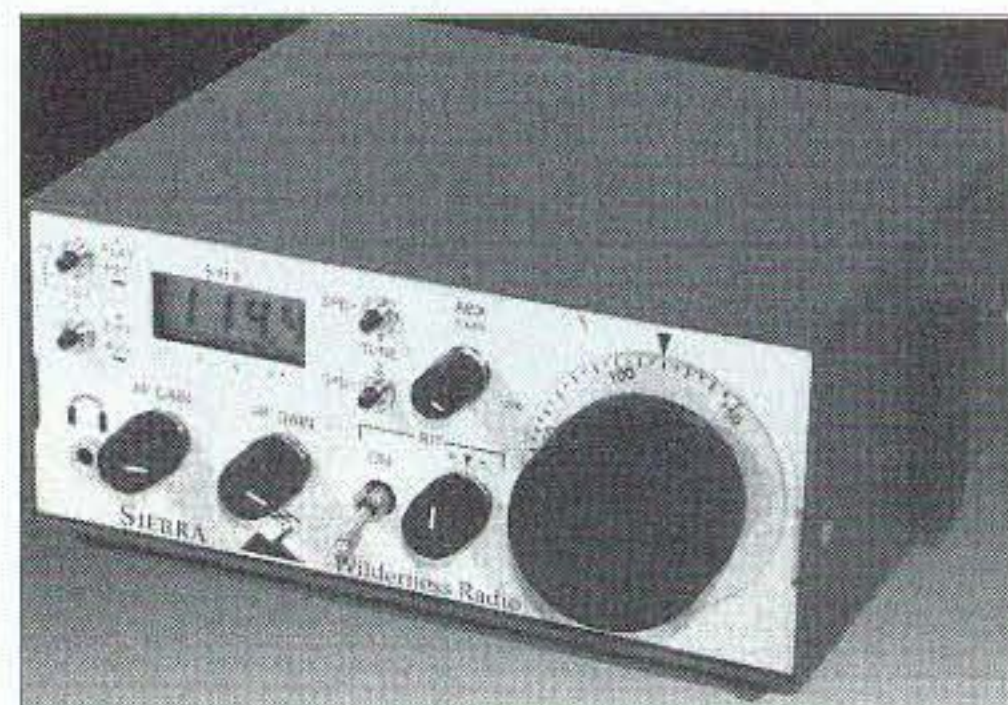


Photo C. Wilderness Radio's Sierra model.

The OHR 500 has a super receiver with QSK and a diode ring mixer. The radio really excels at copying very light signals. But the OHR 500 is not ideal for backpacking; it has a hefty cabinet measuring 8.25 x 8.25 x 4 inches (weighing almost four pounds), and the radio draws approximately 270 mA on receive, slightly less current than its predecessor.

The OHR 500 comes with excellent documentation, and was a pleasure to build. I really took my time with the radio, and savored the experience of building the kit. The radio has three printed circuit boards that mount on a solid internal aluminum chassis. The boards are the oscillator, receiver, and transmitter. Interconnecting the boards and panel components is accomplished with approximately 40 point-to-point color-coded wires. Again, the documentation for performing the wiring is first class, but this amount of wiring should typically not be attempted by first-time builders. (Oak Hills offers the OHR 100, which is ideal for beginners—see below.) The OHR 500 has built-in RF probes, so the unit can be aligned with a digital voltmeter and an accurate frequency source such as the companion DD-1 digital dial.

The OHR 500 features RIT, AGC, narrow CW filter, and full QSK, and delivers 5 to 7 watts on all bands except for 15 meters, where it delivers 3.5 watts. The kit comes with a punched and screened enclosure, jacks and knob set, and silk-screened printed circuit boards. It has many nice finishing touches, including a phono jack on the back with VFO output for hooking up the digital dial, a front panel power level control, and an LED lamp. However, the radio does not include a built-in speaker.

The OHR 500 retails for \$349, and the digital dial sells for \$74.

SW-40+, by Small Wonder Labs

The SW+ transceiver series is a modest single-band radio with a bold new mission: The kit is now available with the "Elmer 101" course published by the Northern California QRP Club. The course enables the SW+ to become a laboratory for learning the fundamentals of amateur radio design and kit-building.

The Elmer 101 course comes in the form of an 82-page book published by NorCal as the club's "Autumn 1998 QRP Special Issue." The book provides step-by-step lessons for building the SW+, instructions for testing the kit as you build, circuit theory and analysis, and test bench procedures.

The course is filled with experiments, so that builders can see the results of changes in parts values and circuitry; it also incorporates in-depth questions and answers.

The SW+ is a single-band transceiver for either 80, 40, 30, or 20 meters. The rig features a superhet design with crystal filtering. The radio delivers approximately 2.5–3 W output, and draws a meager 16 mA on receive. Construction uses a double-sided silk-screened circuit board, and requires modest wiring to connect the case components.

In addition to the "Elmer 101" course, the SW+ series has been updated and re-designed, and features a new optional enclosure. The new design resulted in the number of toroids dropping from eight to five.

Congratulations to NorCal and Small Wonder Labs for teaming up to create this robust kit-building laboratory.

The SW+ transceivers retail for \$55, and the optional enclosure sells for \$35. Small Wonder Labs sells an optional RIT for \$18, and an optional "FREQ-Mite" PIC-based Morse frequency counter device for \$20.

Oldies but goodies

In addition to the new kits above, be sure to think about building one of these great "classic" projects:

WM-2 QRP Wattmeter, by Oak Hills Research

The WM-2 measures forward and reflected power, with power ranges of 10 W, 1 W, and 100 mW. The WM-2 replaces the WM-1. The WM-2 comes in a smaller package, and provides users with the option of using a battery or an external 13.8-volt source. \$84.

OHR 100A, by Oak Hills Research

The OHR 100A is a series of single-

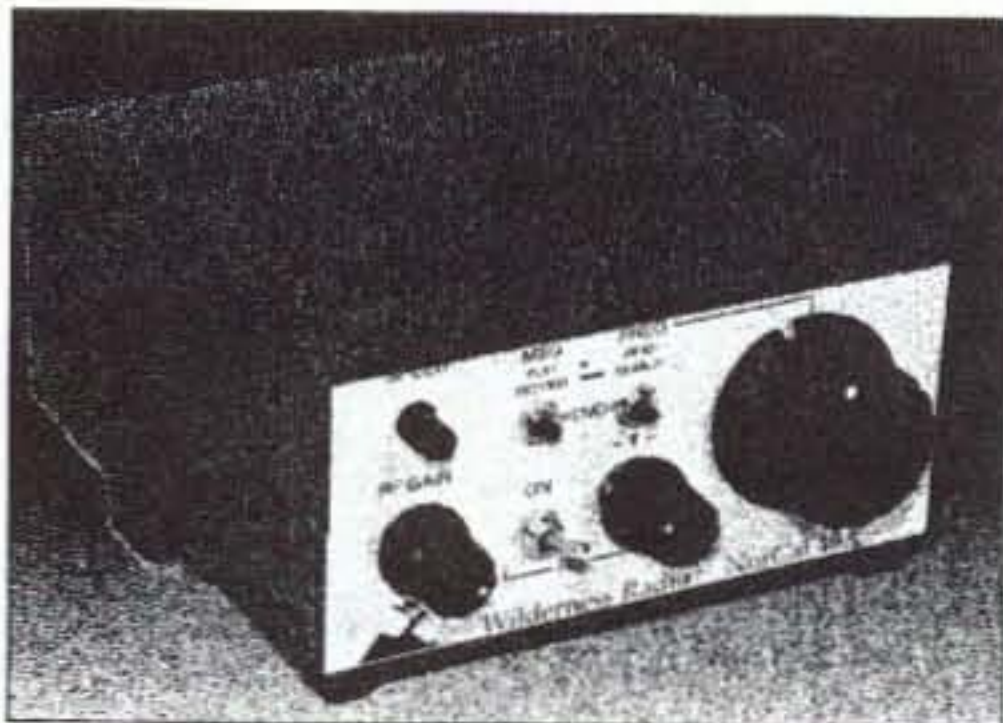


Photo D. The NorCal 40A, also by Wilderness.

band transceiver kits for either 40, 30, or 20 meters, covering 70 kHz of each band. The radio features RIT, AGC, variable bandwidth CW filter, variable power output, and full QSK, and delivers five watts output, a full QRP "gallon" which is useful for Field Day. The kit is excellent for first-time builders. It features a silk-screened printed circuit board, screened and punched enclosure, simple wiring using Molex connectors, and on-board DC test points, so that the radio can be aligned without an oscilloscope. \$119.

Logikeyer III Memory Keyer, by Idiom Press

The latest in the Logikeyer series, the Logikeyer III now features six memory locations and nonvolatile storage memory in EPROM. The postage-stamp-size Logikeyer III has a robust array of superlative keying features and options, such as automatic sequencing of serial numbers for contests. \$58.

Sierra, by Wilderness Radio

The Sierra is a multiband superhet transceiver with up to nine interchangeable band modules for operation on 10–160 meters. Despite its tremendous sophistication, the Sierra also has characteristics that make it an excellent kit for intermediate builders. The jacks and switches mount directly to the board, so there is no point-to-point wiring. The Sierra is ultra portable, measuring only 5.5 x 6.5 x 2.5 inches (weighing less than two pounds), and has an extremely low current drain of 35 mA. So the Sierra is ideal for portable and backpacking use, and ideal for battery operation and Field Day. The Sierra features RIT,

AGC, variable bandwidth CW filter, and full QSK, and delivers two to three watts output on all bands. The kit comes with a punched and screened latched enclosure, jacks and knob set, and silk-screened printed circuit board. \$295 for the basic kit with three band modules.

NorCal 40A, by Wilderness Radio

The NorCal 40A is an ideal kit for beginners. The jacks and switches mount directly to the board, so there is no point-to-point wiring, making the radio very easy to build. I assembled mine in just two evenings. The NorCal 40 comes in a tiny 4 x 4 x 2-inch enclosure (weighing less than one pound) with a very snazzy two-tone blue paint job. The kit comes with a punched and silk-screened latched enclosure, jack and knob set, and a first-class silk-screened printed circuit board. This 40 meter superhet CW transceiver has been optimized for extremely low current drain of only 15 mA on receive. The radio features RIT, AGC, 400 Hz CW filter, and full QSK, and delivers three watts output. Wilderness offers another ideal kit for beginners, the two-watt Super Simple Transceiver (SST), which comes in an even smaller enclosure than the NorCal 40A. The NorCal 40A sells for \$129, while the SST sells for \$85.

KC2, by Wilderness Radio

The KC2 is a multifunction accessory with an LCD digital frequency counter, memory keyer, S-meter, and wattmeter! Measuring only 1.1 x 2.9 inches and drawing only seven milliamps, the KC2 has become the first accessory that I put in each of my home-brew QRP rigs. The KC2 has a respectable memory keyer, but lacks the dazzling array of keying features (like automatic sequencing of serial numbers) found in the Logikeyer III. Keyer memories are stored in nonvolatile memory; however, memories do not have separate buttons for each partition. The KC2 is an ideal companion to the Sierra, and Wilderness Radio offers a replacement front panel for the Sierra to accommodate the LCD display. \$75.

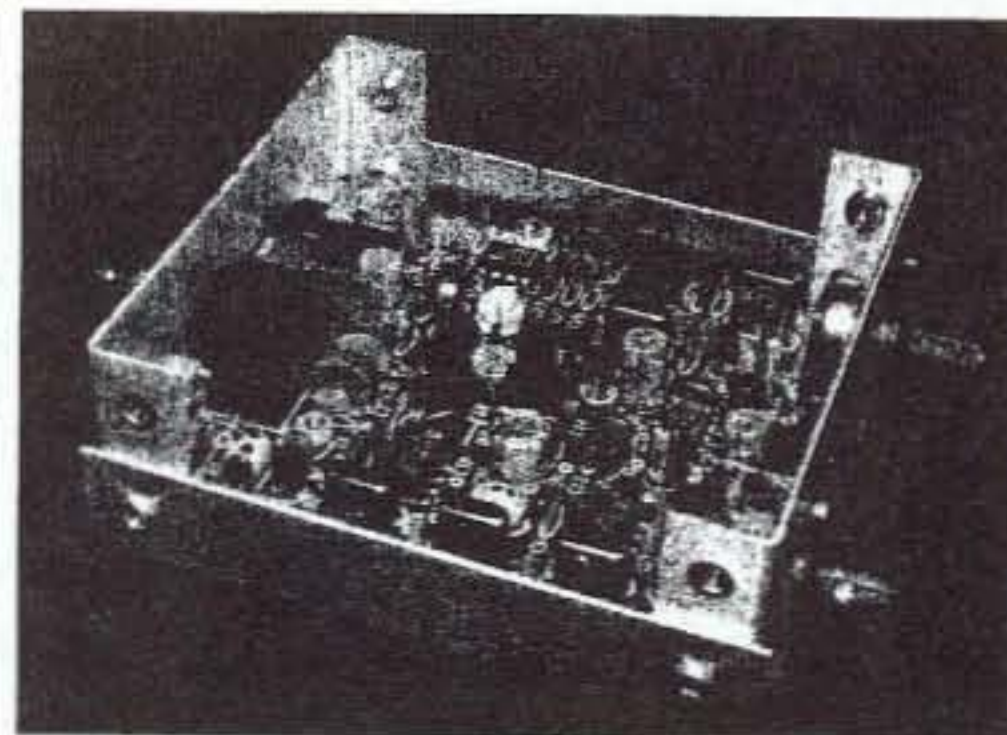


Photo E. Wilderness' Super Simple Transceiver (SST).

Automatic QRP Tuner, by LDG

This novel kit is a subminiature automatic antenna tuner for QRP operation. Measuring 5 x 6.5 x 1.3 inches,

Continued on page 40

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CIRCLE 64 ON READER SERVICE CARD

QRP Temptations

continued from page 39

and weighing in at only 15 ounces (with enclosure), the tuner is able to tune most antennas to an SWR of better than 1.5:1 in less than 1.5 seconds. The device is microprocessor-controlled, and uses tiny relays to switch toroids and capacitors to achieve a match. The LDG tuner features a built-in SWR meter using a bank of four LED lamps. \$125 with enclosure. If you want to install the tuner inside your favorite radio, it's available without the enclosure for \$100 and tips the scales at only four ounces.

I hope this article encourages you to build your first amateur radio kit. Why not discover the joy of making a contact or working a new DXCC country

on a radio that you made yourself? Happy building!

This article is dedicated to the memory of Ernie Schnitz (SK) AD4VA, who assisted me with the on-air testing of many of my kit projects.

Sources

Oak Hills Research
20879 Madison Street
Big Rapids MI 49307
(616) 796-0920
[<http://www.ohr.com>]

Idiom Press
Box 1025
Geyserville CA 95442-1025

Elecraft
P.O. Box 69

Aptos CA 95001-0069
(831) 662-8345
[<http://www.elecraft.com>]

LDG Electronics
1445 Parran Road
St. Leonard MD 20685
(410) 586-2177
[<http://ldgelectronics.com>]

Wilderness Radio
P.O. Box 734
Los Altos CA 94023-0734
(415) 494-3806
[<http://www.fix.net/jparker/wild.html>]

Small Wonder Labs
80 East Robbins Avenue
Newington CT 06111
[<http://www.fix.net/~jparker/sml/freqmite.htm>]

73

QRX

continued from page 8

Snyder and two others on suspicion of attempted murder.

The newspaper reported that Snyder had a string of previous convictions, and his driver's license had been suspended. The injured motorist was treated at a Los Angeles area hospital.

From *The Orange County Register* and the ARRL, via *The Minuteman*, newsletter of the MMRA (Marlboro, Massachusetts), Andy Morrison N1BHI, editor.

"Worst Blizzard Since 1978"

A major winter storm paralyzed much of the Midwest over the past New Year's holiday. Heavy snow that accumulated to more than a foot began falling on New Year's Day. The accompanying winds caused drifts of up to three feet in some locations. On top of that, warming temperatures on Saturday afternoon, January 2nd, caused the snow to turn to rain. Then the temperatures dropped again below 30° F, causing the formation of ice that evening.

This scenario caused officials in southwest Ohio to issue a Level 3 Emergency Alert. Under a Level 3 Emergency Alert, all non-essential motorists are ordered to keep off highways, under threat of arrest and vehicle confiscation.

Even in the worst blizzard conditions, there are some people whose jobs are essential; hospital workers, for example, must get to work. The Kettering Medical Center Amateur Radio Association, near Dayton, Ohio, was called out to assist

with communications and logistics of moving essential hospital personnel to the hospital facility: amateurs with four-wheel-drive vehicles participated in transporting hospital personnel or rode with non-amateur volunteers to provide them with communications.

The Kettering Medical Center was not the only hospital needing assistance. Green County Memorial Hospital, in nearby Xenia, requested the assistance of X-WARN—the Xenia Weather Amateur Radio Network. Green County amateur radio operators with four-wheel-drive vehicles lent a hand to transport hospital personnel to and from work. Green County Memorial Hospital in Xenia requested assistance and half a dozen ham-radio-equipped vehicles were pressed into service, along with amateurs at the hospital who acted as communications officers. In Springfield, Ohio, the Clarke County ARES provided amateur radio assistance to Mercy and Community Hospitals.

In Clarke County, Springfield radio amateurs were out on the roads transporting hospital and rest home personnel. In one case, they transported a kidney dialysis patient home after treatment. In addition to driving their own four-wheel-drive vehicles, amateurs also manned the Clarke County Emergency Communications Center.

Ten inches of blowing snow and freezing rain put Indiana into a state of emergency, too. By early Saturday morning, January 2, most Hoosier counties had declared snow emergencies, forcing people to stay home. Roads, airports and shopping malls were closed.

Local hospitals declared a need for drivers with four-wheel-drive vehicles to transport dialysis patients to and from local hospitals. Many central Indiana amateurs met the need—not only with the vehicles—but with communications during the first trying hours of the storm.

Indiana State RACES Coordinator Dave

Crockett WA9ZCE said that weather and road reports were updated using high-frequency amateur radio links. Most of the affected midwestern states found the MID-CARS Net an efficient way to share vital road and weather conditions. As one amateur radio operator put it: "It's nice to know that amateur radio can still get out when your local world comes to a sliding halt."

From *Newsline*, Bill Pasternak WA6ITF, editor.

Swiss No-Code

Switzerland's national amateur radio society has done an about-face on the issue of abolishing Morse code testing.

Last November the society's journal published a statement regarding the code. It said that Morse code testing in the amateur service no longer serves any useful purpose.

The commentary by the Swiss angered the neighboring Germans. Their Deutscher Amateur Radio Society—the DARC—was more than a little uneasy about the Swiss society's position and made its displeasure widely known.

After some discussion, the Swiss have backed away and issued a new statement. This one says that the Board of Directors of the national society have not yet reached any definitive decision on the future of Morse testing.

But even here there seems to be a bit of controversy, because last November's magazine article was the result of a vote at the annual meeting of the organization's regional presidents.

At that gathering, all of them voted to urge the abolishment of code exams.

From *Newsline*, Bill Pasternak WA6ITF, editor.

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SPECIAL EVENTS

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

MAR 13, 23, 27

ST. LOUIS COUNTY, MO All-Day SKYWARN Weather Observation Training will be offered by the St. Louis County Police, Office of Emergency Management, Sat. March 13th, and Sat. March 27th. SKYWARN Level 1 classes will be presented in the morning, and classes resume in the afternoon with the Level 2 program. Level 1 classes are also available on the evening of March 23rd. For locations, call the *Severe Weather Info Line*, (314) 889-2857, for a taped message and additional info. All are welcome, including those from outside the area. Free parking. Certification provided for R.A.C.E.S. and SKYWARN, all at no cost. One need not be a ham radio operator to attend and participate in the program.

MAR 14

INDIANAPOLIS, IN The Indiana Hamfest & Computer Show will be held at Indiana State Fairgrounds, Indianapolis IN. See advertisement in Jan. 73, page 59, or Feb. 73, page 27.

STERLING, IL The Sterling-Rock Falls ARS 39th Annual Hamfest will be held at the Sterling High School Fieldhouse, 1608 4th Ave. Free parking, including areas to accommodate self-contained campers and self-contained mobile homes. There will be a large indoor flea market featuring radio, electronic, computer, and hobby items. Tickets are \$3 in advance, \$4 at the door. Tables are \$5 without electricity, \$6 with electricity. Bring your own cord. Setup Sat. 6 p.m.–9 p.m. and on Sun. beginning at 6 a.m. Doors open to the public at 7:30 a.m. Sun. Use only the north doors on Miller St. Talk-in on 146.25/.85 W9MEP rptr. For info and advance tickets/tables, contact Lloyd

Sherman KB9APW, Sterling-Rock Falls ARS, P.O. Box 521, Sterling IL 61081-0521; or call (815) 336-2434. E-mail [lsherman@essexl.com]. Advance ticket deadline is Mar. 1st. Please include an SASE with payment.

MAR 20

STUART, FL The Martin County ARA will hold its 23rd Free Hamfest on March 20th at the Martin County Fairgrounds in Stuart. Free admission, free tailgaters, generous prizes. MCARA supports an active recruiting, training, and testing program for new amateurs, and supports the scholarship program for amateur students. For more info, contact the MCARA, P.O. Box 1901, Stuart FL 33495.

MAR 20-21

MIDLAND, TX The Midland ARC will hold their annual St. Patrick's Day Hamfest on March 20th and 21st from 9 a.m.–5 p.m. on Sat., and from 8 a.m.–2:30 p.m. on Sun., at the Midland County Exhibit Building. Features include a flea market, dealers, tailgate area, T-hunts, and a full service concession stand with hot meals. VE exams will be given at 1 p.m. on Sat. Pre-registration is \$7, \$8 at the door. Tables are \$12 each for the first four, and \$17 for each additional table over four. Contact the Midland ARC, P.O. Box 4401, Midland TX 79704; or E-mail Larry Nix N5TQU at [oilman@lx.net]. You can also see a hamfest flyer and download a registration form at [http://www.lx.net/edge].

MAR 21

JEFFERSON, WI The Tri-County ARC will present "Hamfest 1999" at the Jefferson County Fairgrounds Activity Center, Highway 18 West, Jefferson WI, 8 a.m.–2 p.m.

Vendors admitted at 7 a.m. VE exams for new licensees and upgrades. Electricity available. Equipment test table. Handicap accessible. Talk-in on the 145.49 rptr. Admission \$4. Six-foot table \$5, eight-foot table \$6. To reserve tables, send your SASE to TCARC, W9MQB, 711 East St., Ft. Atkinson WI 53538. Phone (920) 563-6502 eves.; E-mail [tricityarc@globaldialog.com].

MAUMEE, OH The Toledo Mobile Radio Assn. will hold the 44th Annual Hamfest/Computer Fair 8 a.m.–2 p.m. at the Lucas County Recreation Center, 2901 Key St., Maumee OH. For details send SASE to Paul Hanslik N8XDB, P.O. Box 273, Toledo OH 43697-0273. Phone: (419) 243-3836.

HAMILTON TOWNSHIP, NJ "Hamcomp '99" hamfest will be sponsored by the Delaware Valley Radio Assn., and held at the Tall Cedars of Lebanon picnic grove, Sawmill Rd., Hamilton Twp., NJ. Take I-95 North to I-295 South; exit 60A to I-195 East; exit 2 to Yardville; South Broad St. to end, approx. 3.7 miles; go left at Yield onto Old York Rd., next right onto Sawmill Rd. The site is 1.1 miles on the right. Open to sellers at 6:30 a.m. Open to buyers at 8 a.m. Admission is \$6, non-ham spouses and children admitted free. Tailgating space \$10, includes one admission. Free parking, ARRL table. Covered table space \$15, includes one table and one admission, some electricity. Advance covered space reservations are available. Talk-in on 146.67(-). More info available at (609) 882-2240 or [www.slac.com/w2zq]. Send payment with SASE to Hamcomp '99, DVRA, P.O. Box 7024, West Trenton NJ 08628.

YONKERS, NY The Westchester Emergency Communications Assn. will hold its annual winter "WECAFEST" at the Yonkers Raceway, Yonkers NY. I-87 from the north, exit 4. I-87 from the south, exit 2. Doors will be open from 8 a.m.–2 p.m. Admission \$7. Features include new and used equipment, vendors, forums, VE exams, demonstrations, and a tech table. Talk-in on the WECA rptr. 147.66/.06 PL 114.8 (2a). Contact Tom Raffaelli WB2NHC, (914) 741-6606; or the WECA Web site at [WWW.WECA.ORG].

MAR 27

MICHIGAN CITY, IN The annual Michigan City Hamfest and Computer Flea Market will be held Sat., Mar. 27th at Michigan City High School, 8466 W. Pals Rd., Michigan City IN, 8 a.m.–1 p.m. CST. Early setup provided for vendors. Admission is \$4, children under 12 admitted free with a paid adult. Table reservations and general info is available from Ron Stahoviak N9TPC, 5802 N 400 W, Michigan City IN 46360. Phone (219) 325-9089.

WATERFORD, CT The Radio Amateur Society of Norwich will sponsor their 27th Ham Radio Auction, starting at 10 a.m. Setup at 9 a.m. The auction will be held at the Waterford Senior Center. From Hartford, take Rt. 2 south to Rt. 11 to Rt. 85 south. From the shoreline, take Rt. 95 to Rt. 85 north. Talk-in on 146.730(-). Bring your gear to sell (10% commission to RASON). Free admission. Free parking. Contact Tony AA1JN at (860) 859-0162, or see the RASON Web page at [www.ims.uconn.edu/~rason].

MAR 28

MADISON, OH The Lake County ARA will hold its 21st annual Hamfest on Mar. 28th, 8 a.m.–2 p.m., at Madison High School on Burns Rd. in Madison. The hamfest will feature new and used amateur radio, computer, and assorted electronic equipment, amateur-radio-related forums, an equipment test bench, and VE exams for those interested in earning an amateur radio license. Admission tickets are \$5 at the door. Table space for vendors is \$8 for a six-foot table; \$10 for an eight-foot table. Reserve tables by calling Roxanne at (440) 256-0320. Talk-in on the LCARA 147.21 rptr.

APR 10

SPOKANE, WA The Eastern Washington Hamfest and Electronic Show, hosted by the Lilac City ARC, will be held at Spokane Community College, 1810 N. Greene St, Spokane WA. Open 9 a.m.–5 p.m. Setup Fri. 5 p.m.–8 p.m., Sat. 6 a.m.–9 a.m. Advance tickets \$5, children under 12 free. Eight-foot seller's tables \$12, 10 x 10 commercial booths

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A rechargeable alternative and the dancing buzz

If you're going to have a hidden transmitter hunt, the first thing you need is a transmitter to hide. Some hams call it the fox or the "bunny" (not to be confused with the pink furry creature beating the drum on TV). It's more fun when the fox is truly hidden, not just someone sitting in a car with a big antenna on top. That means you need a self-contained transmitter/controller/IDer and enough portable power to keep it going (... and going ...) for the duration of the hunt.

Fox transmitters are not one-size-fits-all. For a Sunday-in-

the-park foxhunt where everyone starts only a few hundred feet away, a micro-T running a few milliwatts and concealed in a pill bottle or soda can is great fun. At the other extreme, for the multi-state "All-Day" hunts in southern California, hiders have used big beams, 600-watt RF amplifiers, and gasoline generators. In between are foxboxes using ordinary handie-talkies and mobile rigs. The usual source of power for them is a rechargeable battery pack with either nickel-cadmium (NiCd) or lead-acid (Pb) chemistry.

Both types are popular because they store lots of energy in small packages. But both are plagued with high rates of self-

discharge, especially if stored at elevated temperatures. If you don't use your foxboxes for a few weeks, you'll probably find that the batteries are flat when you need them, or they operate for only a few minutes and quit. What's more, if you allow a lead-acid battery to sit in a discharged state for a few weeks, it becomes "sulfated" and won't accept recharging. In other words, it turns into an expensive paperweight!

NiCds have features that make them the most popular choice for powering portable ham gear. Terminal voltage stays relatively constant (about 1.2 V/cell) from near full charge to near full discharge. They can be recharged hundreds of times if it's done properly. Their low internal resistance permits high discharge currents, so high power handie-talkies and portable soldering irons thrive on them. On the down side, such high load currents can cause reverse charging and cell failure in battery packs of unevenly matched cells, when the pack is operated with a high current

load in the near discharge state. NiCds self-discharge on the shelf and in the drawer, losing about 1% per day.

The energy available from a NiCd or Pb cell, or pack of cells, is specified in ampere-hours (Ah) or milliampere-hours (mAh). It's the product of the current and time that is available before the terminal voltage falls below the specified discharge point. For instance, a 1 Ah (1000 mAh) pack can be expected to drive a 50 mA load for 20 hours. So it should also provide 1 A for one hour, right? Not quite, because capacity diminishes somewhat for high-current loads.

NiCds don't tolerate sustained overcharging, which causes dissociation of hydrogen and oxygen in the electrolyte and opening of the vent, drying out the cell. It may also cause the terminal voltage to drop to a plateau of about 1.1 volts early in the next discharge cycle. When that happens, the effect is often mistakenly termed "memory." On the other hand, true memory, brought on by repeated shallow discharges to the

\$60 (includes one additional person, N/C). Some features are: dealers, factory reps, seminars, VE exams, and DXCC field checking. Contact Warren Kelsey, S. 1405 Crestline, Spokane WA 99203. Tel. (509) 534-8443. Make checks payable to Lilac City ARC. Talk-in on 146.52 simplex and 147.32 rpt.

APR 10, 14

ST. LOUIS COUNTY, MO SKYWARN will offer all-day classes Sat. April 10th, with Level 1 training in the morning and Level 2 training in the afternoon. Level 1 classes will also be held the evening of April 14th. For locations, call the Severe Weather Info Line at (314) 889-2857, for a taped message and additional info. R.A.C.E.S. and SKYWARN certification is provided at no cost. Everyone is welcome. Training is sponsored by the St. Louis County Police, Office of Emergency Management.

APR 11

RALEIGH, NC The Raleigh ARS will present its 27th Hamfest and Computer Fair in the Jim Graham Building, NCS Fairgrounds, Sun. April 11th, 8 a.m.–4 p.m. Wheelchair access. There will be ARRL, MARS, APRS, ARES, NTS, QRP and DX meetings. Advance tickets \$5, \$6 at the door. All activities inside. Tables and booths avail. Free parking, RVs welcome. Hospitality party Sat. night. VE exams, W4VFJ, (919) 556-8551; pre-register. Direct inquiries to Wilbur Goss WD4RDT, 4425 Watkins Rd., Raleigh NC 27616; (919) 266-7883. Talk-in on 146.64/.04.

DELOIT, IA The Denison Repeater Assn. of Denison IA will host the 1999 Deloit Amateur Radio Swap Meet on Sun., April 11th, at the Deloit Community Building, 320 Maple St., Deloit IA. Doors will open at 7 a.m. Admission will be \$2, tables for sellers will be \$2. Tables may be reserved by con-

tacting John Amdor KD6MXL, (712) 388-8042; packet KD6MXL@WAØZQG.#WIA.IA; or E-mail [johnmxl@radiks.net]. Talk-in on the 147.090 rpt (+600). Info will be on the Web at [http://www.radiks.net/~johnmxl/deloit.html].

MONTGOMERY, NY The Orange County ARC will hold a hamfest, 8 a.m.–2 p.m., at the Valley Central High School, 1175 State Route 17K, in Montgomery. Take Interstate Rt. 84 to Exit 6 (Rt. 17K & Montgomery); take Rt. 17K west to the high school on the left-hand side. Admission is \$5 in advance, \$5 at the door. Tables \$10 if provided by the club, or \$8 if you bring your own. Tailgating space, weather permitting, is \$7. Talk-in on 146.160/.760, 100 Hz PL tone. Contact Edward J. Moskowitz N2XJI, 123 Harold Ave., Cornwall NY 12518-1701; (914) 534-3492. E-mail [N2XJI@BANET.NET] or [EMOSKOWITZ@BEAR.COM]. Check the Web at [www.IDSI.NET/~MSHOVANI].

SPECIAL EVENT STATIONS

MAR 27

MACON, GA The Macon ARC will operate W4BKM 1500–2300 UTC on Sat. Mar. 27th, at the 17th annual Cherry Blossom Festival in Macon GA. Phone: 7.235, 14.240 and 21.335; CW 7.135, 14.035 and 21.135. For a certificate, send your QSL and a 9 x 12 SASE to Macon ARC, P.O. Box 4862, Macon GA 31208.

APR 10–11

GREEN VALLEY, AZ The Green Valley ARC, N7GV, will operate 1800Z Apr. 10th–2100Z Apr. 11th, in the 8th annual commemoration of the closing of all Titan 2 missile sites. CW: 14.045, 28.145. SSB: 7.272, 14.272, 21.372, 28.372. A certificate is available; send an SASE to GVARC, 601 N. La Canada, Green Valley AZ 85614. 

same point in the discharge cycle, was a problem in early satellite batteries but is rare in today's cells.

Now imagine rechargeable batteries with double the energy density (capacity per unit of weight and volume) as NiCds, and no one ever uses the dreaded term "memory" when talking about them. They exist, and you can find them and their chargers at your local discount store. But are they a good choice for powering the fox for your club's next hidden transmitter hunt? What about other uses around the home and shack?

The lowly alkaline gets renewed

For radio use, ordinary alkaline batteries (primary cells) don't get much respect. Once discharged, they go into the trash. But for high energy density and long shelf life, it's hard to top them. They have higher internal resistance than NiCds, so they can't put out very high current. But for moderate current applications, they provide far more on-air time than NiCds of the same size. They have higher terminal voltage, and they weigh less, too. They aren't made with cadmium or mercury, so they are safe in landfills.

Rechargers for primary alkalines have been marketed, but haven't been successful because the recharging process usually causes shorts, gas buildup and leakage in them. Five years ago, Rayovac introduced Renewal® Reusable Alkaline™ batteries, which are especially designed to be recharged. I seldom hear of T-hunters using them, but they deserve a closer look for many RDF applications.

Unlike NiCds, which have about the same Ah ratings for all loads less than the one-hour current, the available energy of alkalines varies significantly with load and duration of use. The lower the current and longer the rest period between transmissions, the higher their capacity. Capacity per charge of rechargeable alkalines decreases

with each use, eventually becoming so low that it's time to throw them away.

Here's a practical example with which to compare these battery choices. My ICOM IC-2AT in the low power mode (300 milliwatts) draws 200 mA at any operating voltage above 6.5 volts. The low-battery light comes on at 5.65 volts (0.95 volts/cell). A six-pack of AA Energizer® NiCds is rated at 650 mAh, providing about 13 hours of total hidden-T time for the IC-2AT, assuming a 15-seconds-on/45-seconds-off cycle and ignoring the receiver drain between transmissions. In the same setup, a six-pack of AA primary alkalines provides about 1950 mAh, three times as much. In the first cycle, you can expect 1200 mAh from a six-pack of Renewals. After 25 charge/discharge cycles, the NiCds and Renewals will each give about 650 mAh. At cycle 100, the Renewals will be down to about 450 mAh, still enough to put on a nine-hour T-hunt.

At a local discount store, a package of four AA-size Renewals costs about \$6.50, compared to \$2.75 for non-rechargeable Rayovac alkalines. The two most famous brands of primary cells cost a bit more. (They have to pay for all those bunny and anti-bunny ads somehow.) Energizer NiCds cost \$9 for four.

If the Renewals are thrown away after 100 cycles in the above example, they will have provided a total of 1200 hours hunt time (0.8 cents per hour), compared to 1300 hours for NiCds (1.0 cent/hr). Primary alkalines cost 3.8 cents/hr for their single cycle of 39 hours.

At lower currents, Renewals perform even better. A 75-milliwatt micro-transmitter drawing 50 mA from a three-cell pack (above 1.1 volts per cell) should get 1700 mAh from them on the first cycle. After 100 cycles, capacity drops to 600 mAh.

A different charger

The chemistry of alkaline batteries mandates a special

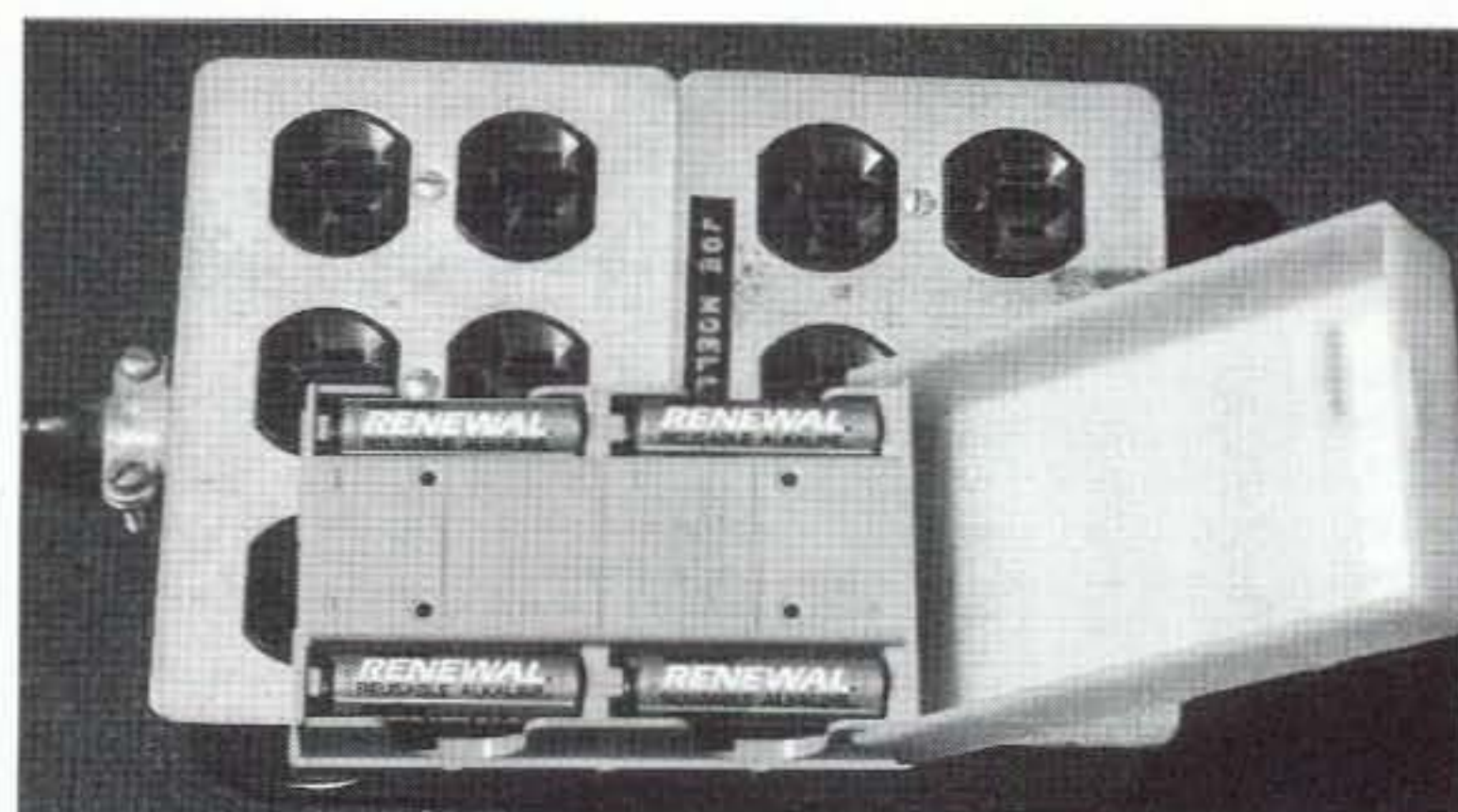


Photo A. This Renewal charger refreshes four AA or AAA batteries at once. Each cell is separately monitored.

charging system. NiCds and lead-acids are readily charged with continuous or pulsed current. The endpoint of their charge cycle is sensed by measuring the terminal voltage while current is being applied, sometimes augmented by current slope and/or temperature sensors. The higher internal resistance of alkaline batteries makes it impossible to properly sense the end-of-charge point that way. Terminal voltage must be measured between pulses of charging current.

Although you could build your own charger, it is probably not economically advantageous, since a Renewal four-cell (AA or AAA) charger costs only about \$10 at a discount store (**Photo A**). It's actually four chargers in one, because each cell holder has its own charge, sense and shutdown circuits. (Unlike other rechargeables, Renewals can't be successfully charged in a series string.) Smart electronics inhibit charging if a cell is completely dead or inserted backwards. A special holder and connectors prevent it from charging primary alkalines. (Renewals have a unique top design with a larger positive terminal area.)

For experimenters wanting to build a Renewal charger into a home-brew project, special ICs are available from Benchmarq Microelectronics of Dallas that support multiple cells, regulate the current pulses for charging, and include a charge rate sensor to detect charge completion. Incidentally, Benchmarq's line

of battery-management ICs includes chargers and "gas gauge" sensors for all types of batteries. Some chips communicate with the host microprocessor in the using device to support an easy-to-understand "time remaining" display in hours and minutes. Which ham radio handie-talkie manufacturer will be the first to implement this feature?

Renewals are not suited for very high current loads due to their higher internal resistance. NiCds would be better in your handie-talkie if you run high power most of the time. Renewals are also not suited for devices in which the battery will be drained to near exhaustion, such as flashlights and clocks. Make sure that you stop using a Renewal-powered device as soon as the LOW BATTERY indicator appears.

For me, Renewals really shine when used in products that require near-maximum voltage for proper operation. These devices often appear to be "battery hogs" because they stop functioning or indicate low battery even though there is plenty of life in the cells, albeit at reduced voltage. For instance, the flash pack on my 35 mm camera uses four AA cells. When they are fresh (1.6 V/cell), the flash recycles in a few seconds. But after shooting a roll or two of film, it seems to take forever, even though the batteries are only down to 1.35 volts per cell.

For shooting fast-paced nighttime foxhunting action, I used to throw away perfectly good

Low Power Operation

Michael Bryce WB8VGE
SunLight Energy Systems
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[prosolar@sssnet.com]

This time of the year at my house, we're usually up to our knees in snow. So, depending on where you are, you may be suffering from a case of cabin fever. I know of no better cure for cabin fever than building something for the shack. It's not a case of deciding what to build—it's just that the act of melting solder can often make you feel better.

However, if your supply of future projects has hit bottom,

how about working on designing your own PC boards? You know, nowadays, it's just not possible to really perfboard everything together. Usually, any circuit that requires more than one 14-pin IC is enough to make me stop thinking about building it, unless a PC board is available.

When I had just received my license, one of the local hams had built a two-meter HT from scratch! Sure, it was not very pretty, but it *did* work. Of

course, back then we had only one repeater in the county, and almost everyone was on 146.52 simplex. What really got my attention was that Joe made his own PC boards. Now, you have to remember that this was way, way back in 1975, and a computer in the shack was still the stuff of science fiction! No, what Joe did was to build his board out of double-sided PC board material using nail polish, hobby paint, and mailing labels!

Well, that was then; this is now. Today, we have several methods of putting circuits on PC boards. Let's look at some, from the easy ones to computer-generated Gerber files.

Since Joe's rig did not include any large-scale multi-pin ICs, he had a lot more room to put in his traces. Also, Joe was able to

build the HT large enough to suit the capacity of his drawing ability.

In making a PC board, the idea is quite basic. You apply some type of resistant coating to protect the copperclad board from the etching chemical. In Joe's case, he used nail polish. Joe applied the nail polish using a very fine camel hair brush—and a very, very steady hand! Where Joe wanted a copper trace, he put down the nail polish. When the board was etched, the only copper to remain was protected by the polish. A bath in acetone removed the polish. The holes were drilled as required, and the parts mounted on the board. An almost-instant PC board was made.

Almost-instant PC board? Well, that's right! You see, etching

batteries and put fresh ones in the flash unit, just to get fast recycle time. Putting NiCd cells in place of alkalines wouldn't solve the problem, because the terminal value of NiCds is only 1.35 volts each when freshly recharged, dropping to 1.2 V soon after. So now I just carry a couple of sets of rechargeable alkalines. After every session, I charge them back to 1.6 volts so they're ready to go.

Similarly, I use Renewals in the Sony portable shortwave receiver that I take on occasional overseas trips. I also carry them for backup use in my VHF handhelds. I don't have to worry about self-discharge in the camera bag, suitcase, and emergency box between times of need.

Some manufacturers recommend fully discharging your NiCd batteries regularly. Don't do that with your rechargeable alkalines. They last longest if they are not discharged below 0.9 to 1.1 volts per cell, depending on load. That's what makes them ideal for the camera flash, where they will not be used below 1.3 volts.

Renewal batteries are available

in sizes AAA through D. Because each cell must be charged individually, multi-cell batteries such as the popular NEDA 1604 9 V package are not available. For more information on Renewals, download the application notes and product data sheets from the Rayovac Web site [<http://www.rayovac.com/oem/>]. You can compare them with non-rechargeable alkalines by downloading Rayovac's primary battery application notes at the same site.

Ready to roll?

If a spurious signal appeared on your local repeater input frequency tomorrow, would you be ready to track it down? Members of the Hudson Valley Direction Finding Association were quick to respond when it happened to a repeater in Nyack, New York. "We did it by the textbook," wrote Tony Cioffi N2KI. When he and John Hirth W2KI got the call one morning, they went to the repeater site to get good bearings on the signal, which was quite unstable.

"We then headed out to another location that would give us

an intersecting bearing," N2KI went on. "With this info, we headed into New Jersey, where the bearing lines intersected. All the way, we had different signal strengths and at some points, nothing. What made it a lot harder was that the signal was drifting about 50 kHz. We had to keep scanning the band for it. As we got closer, we added more attenuation."

Before long, they were over 10 miles away at Beth El Cemetery in Paramus, New Jersey, where the signal was a solid S-9. "At 12 noon, it disappeared as if someone threw the switch," Tony continued. "Great, just as we finally get close, it goes away! So we went for lunch."

Luckily, the signal was back when they finished eating. "After walking around for a while and getting more readings, the work force was wondering what we were doing. When we explained, they were very considerate. We were able to check their business frequency to see if it had a connection to the spur. No such luck."

The intrepid pair kept tuning and taking bearings. Soon they were in a police parking lot,

with Bergen Pines County Hospital in view on the other side of the Garden State Parkway. "At this point, we had over 100 dB of attenuation. We couldn't get good directivity with the quads, or even with an antennaless handie-talkie. So John broke out his SuperDF, a Time-Difference-Of-Arrival set by BMG Engineering."

A few minutes later, they were certain that the spur source was within the hospital. They called the repeater trustee with the news. "After six hours, we had our culprit," Tony concluded. "Within 24 hours, the spur was fixed. We never did find out what equipment was causing it, but our repeater is now back to normal. It's really satisfying to be able to use RDF skills in a real situation and have positive results."

Unfortunately, grunge-busting isn't always that straightforward. It takes perseverance, logic, and luck to solve "tough dog" cases, even for experienced T-hunters. Next time, I'll tell the story of a hunt that didn't go as well. The lessons learned may help you if similar problems strike in your home town. 73

the copper from the board is the easy part. It's figuring out how to lay out the circuit that's the kicker! Circuit Layout 101. Here's how I do it, and believe me, for every ham you talk to about laying out PC boards, you'll get a different method. This is what works for me. By the way, we're talking hand-made right now—we'll look at computer-generated PC boards next time.

One of the first things you need is a pair of X-ray eyes. You need to have the ability to visualize looking through the PC board just like Superman would. By the way, this is exactly how the computer does PC display, by looking through the board.

I start by assembling all the major parts needed for the project. This includes the ICs and other larger parts like the electrolytic capacitors. If any oddball-shaped parts are used, I make sure I have them in the pile.

I like to put the parts on a PC board so that all the input and output lines are on the end. This way, I can use one of the multi-pin connectors I like. I then place the parts, such as ICs, on a sheet of paper. I may move them around so that the connections between one IC and another are as short and direct as possible.

Once I get a feeling on how the major parts should be placed, I use an ink pen and draw in the IC pins. I mark pin one with a red pen. Now, using your schematic, you start by drawing in the resistors, capacitors, and whatnots in pencil. Using your pencil, you connect the various parts together, while not allowing any of the pencil marks to touch or cross each other.

You may be wondering why I use an ink pen for the sockets and pencil for the traces. Of course, you can erase the pencil marks, but the ink is permanent. That way I can change the traces going to and from the IC pins without redrawing them each time I make a change. I put in

the resistor and capacitor leads the same way, provided I have decided to keep a part in its final position.

Believe me, you'll need to redraw the traces dozens of times before you're happy with the results. The general idea is to avoid the use of jumper wires. But, unless you're working on a double-sided board, you may not be able to avoid jumpers. The world won't come to an end if your circuit has some jumpers. In fact, I've seen some designs that used more jumpers than parts, but the circuits worked just fine!

I mark each component with its designator per the schematic. Resistors R1, R2, and so on, instead of 10 k, 1.2 k, and the like. That way, you know what part goes where. Things can get all screwed up if you have more than one 10 k resistor drawn on your sheet.

Normally, I run all the traces between all the pieces parts and then do the supply or VCC line. I run ground traces as I need them. Many parts require ground connections, so I try to daisy-chain these connections together.

After I get the paper version of the circuit down as well as I can, I make a photocopy of the layout. Now, I get some of the black foam they use for shipping static-sensitive components, and place my paper copy on top. Then I push the leads of the parts through the paper into the foam. This way, I have a real live full-scale model of the circuit board before I etch it. I do this step to be sure that all the parts fit! One of the problems I have is having a part that won't fit the finished PC board. This usually comes up as a heat sink or mounting screw. I forget the heat sink has fins, and the fins have a habit of getting in the way of another part. The nut used to hold the PC board to the chassis may touch a trace or a resistor lead in the final version of the PC board. These small things have a way of biting you in the butt!

Special design goals

When working with RF circuits, I try to keep all the trace lengths as short as possible. Lead inductance may cause your circuit to perform differently on a PC board than on a perfboard. The higher the frequency of the operating circuit, the greater the chances of troubles with a poor PC design.

Traces don't have to be straight or at right angles to each other. In some of my designs, I have made curved lines to get to the emitter of an RF amplifier. The use of large ground planes helps keep RF circuits happy. The more ground copper, the better the stability of the circuit.

Applying resist to the copper

For traces, a resist pen works fine. Radio Shack® sells these for a few bucks, but if you're into making your own PC boards, I suggest getting these pens from an office supply house. Office Max® and Staples® both carry the Sharpie® markers. Keep the caps on them when they are not in use. Exposure to the air will dry them out in a hurry! Putting in these large ground traces can prove messy. If you're using a resist pen, you'll run the pen dry before you get all the copper covered.

In a case like this, I have used several methods. One is to use nail polish. I really don't have the talent to apply this stuff in fine lines, but for large grounds, it works just fine. A trip to the local five and dime will yield dozens of nasty-colored cheap nail polishes. You'll need some acetone to clean up with and to clean your brushes.

If you don't want to mess with the nail polish, how about mailing labels? Yup! They work! Clean the copper you want to keep and then apply a mailing label. Burnish the label down using an old Bic® pen cap. Don't worry about the area you need to protect just yet. After you have the label burnished down, cut away any area you need with a sharp X-acto® knife. After you etch the board, you can rub off the

label. You can make an entire PC board using mailing labels! Just cut the label where you want the etchant to remove the copper!

Iron-on PC boards

If there is a board you wish to make, and the layout is in a magazine, there is an easy way to make your own boards. You'll need something called a toner transfer system. Basically, you copy the layout from the magazine onto this special TTS paper. Then, using an iron, you iron the image onto your copper board. By soaking the paper in warm water, you remove the paper backing, leaving a toner resist on the copper. You then etch the board as you normally do.

I have to admit, I've never had much luck with this system. There are hams who swear by it, but for me, it's way too much hassle.

Etching 101

Speaking of etching, I use the etching chemical (ferric chloride) available from Radio Shack. There are others available, but this stuff works the best, and is easy to obtain from the "Shack" on a Saturday evening.

You can speed up the etching process by heating the etching chemical, but don't get too carried away. If you get the fluid too hot, there is a good chance that you will undercut the copper being protected by the resist. If you're using mailing labels, it is possible to have them wash out if the fluid is too hot. Try not to heat the etchant higher than 100 degrees F.

By the way, in case you've never used ferric chloride, it will stain everything it touches. Ferric chloride is really nasty stuff, so be careful when handling it. Use only glass or plastic to store or etch your boards in. I use an old Pyrex baking dish.

How strong the etching chemical is, how hot it is, and the amount of copper you wish to remove all factor into how long it will take to make your board. I have found that with warm etchant, and with constant

THE DIGITAL PORT

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One of the hottest digital topics has turned out to be slow-scan television (SSTV). I think it is fascinating to send and receive a color image directly via HF ham radio over a distance ranging from a few hundred to several thousand miles *and* have it display with excellent clarity. Probably the reason I have observed so much interest is that it can be done for such a low cost.

I have written previous columns about getting on SSTV for less than \$50, and this was an accurate assessment, because I had done it (twice—two different approaches). There are programs available from Pasokon and Silicon Pixels that are either shareware or freeware and if you have a fairly up-to-date computer, the rest is a piece of cake (usually).

I receive more correspondence on SSTV than on any other mode, and that sparks my personal enthusiasm. Not long ago, a piece of E-mail arrived from Roger N8XP, who had just purchased a brand-spanking-new ultra-high-speed computer and a BayPac BP-2M multi-mode modem, and was experiencing problems with both the JVFX and the EZSSTV programs locking up the computer.

He explained that his computer came with Windows98™ and I formed an unmentionable notion based on something a few software people had told me a while back. I am still using

Windows95™, so I wasn't sure what to tell him, but I feared we were about to learn a new incompatibility problem.

Just to be sure I covered all the bases, I expressed the thoughts above along with the observation that these programs must run in DOS and not a DOS window. That is, Windows must not be running and I gave more detail than necessary. Then I told him, if he was following the rules up to that point, to call the BayPac people to see if they knew of any problem concerning JVFX being incompatible with Windows98, or to call John Langner WB2OSZ, the author of the Pasokon EZSSTV software.

A few days later, Roger replied with some very useful information to share. John Langner had informed him that some of the earlier versions of EZSSTV had problems and those earlier versions were still on many bulletin boards. However, the version on the official Pasokon site (see **Table 1**) is the latest update. Roger downloaded that one and it solved the problem.

That is the lesson I wish to pass on. The listing in **Table 1** is the correct site to download EZSSTV. This is a very informative site and John frequently updates the data, along with interesting images including, at this writing, some pictures transmitted by the *MIR* cosmonauts.

As a little side-thought, I recall

having trouble with the JVFX program a year or so ago and that is when I started nosing around and found so many great slow-scan programs and hardware ideas available. It just took off from there. Also, in fairness, it looks as though the author of JVFX now has a 32-bit version available. I haven't tried that one.

An SSTV organization

During one conversation with Bob W6EUZ, I was made aware of a fine non-profit SSTV group that puts out a newsletter and strives to advance the cause of slow-scan. The International Visual Communication Association, headquartered in Nashville, Tennessee, has a Web site. See **Table 1**.

I obtained some of their literature from Lew W6FVV. From that, I found the above Web site. It is really an education on the possibilities of SSTV—I mean possibilities that have already been attained. There are numerous images as received from *MIR* and a description of the equipment used on the orbiting spacecraft.

Included is a listing of those who have achieved various SSTV DX levels. One ham has confirmed 100 two-way image contacts and quite a few have recorded 50 countries. This gives an idea of the worldwide interest in slow-scan. There are also many related links that I didn't have the time to explore, but I would suggest there is a lot of education and motivation to get into this captivating mode.

The Internet—friend or foe?

Along the way, I had a touch of reality hit me again. One of my teenage grandsons passed through the shack and I was

showing him an image on the computer screen that was at that moment going out over the air. He looked at that for a few seconds, seemingly digested the thought, then asked, "Why don't you just send it over the Internet?"

At that moment, many unsettling thoughts flashed through my head. My answer didn't have much depth. I simply replied, "I don't want to. There is no challenge to that." Then I hoped I might reopen the question later when I could get my thoughts in order. But here lies a problem I have mentioned before.

This seeming "cookie-cutter technology" is so easy everyone is doing it. Those who are coming after us don't accept challenges very well. And I find the Internet, by whatever means it has, is capturing the vision of our bright young people and they are not finding fascination with ham radio. I am unsure how to change this situation. I see established hams abandoning the hobby because they find more to their interest on the Internet.

I grant that the Internet is a great medium for information gathering, as is evidenced in this column. It is educational for those who are so inclined. It will become a big-time player in commerce in a few years. But I grow weary (bleary) of looking at fancy Web sites and sure don't care to enter chat rooms with a bunch of people who don't have a life. I would rather spend 15 minutes calling "CQ" with no response. If I conjure up the correct attitude, those 15 minutes are more productive and, at the same time, relaxing. Maybe I am the strange one.

That antenna

Last time around, I told of a

agitation, it takes about 10 to 20 minutes to etch a small board (your mileage may vary). Check the progress by pulling the board up out of the

etching chemical, and allowing any excess to drain back into the etching tray. If you still see copper, then continue to etch. As you near the end of

the process, you will want to keep an eye out, as you don't want to undercut any traces. Or worse yet, etch away the traces you desire!

All you have to do now is wash the board off with water and drill out the holes. We'll pick up on how to do that next time. 73

home-brew mobile antenna I'd built for the side of our small RV. It started as a simple experiment and it works well, but there is something a bit too "magic" about it. I didn't give specific dimensions, and I am not going to, until I can master the theory of why it works so well.

In a nutshell, it resonates on 40, 20 and 15 meters (with no changes!) and, with the help of a good tuner, I can bring the SWR to or near 1:1 on all three bands. I am ecstatic about the success. I should "nail it," close the toolbox and go on to greater projects.

The strange part of this antenna came to light as I was attempting to tweak the resonant frequencies by changing the length of the whip. It was cut at an arbitrary 91 inches, so I lengthened it to an even 96 inches. The dip meter gave the same resonant frequency readings.

Well, I could accept that for a bit. The plan that day was to assemble a 72-inch whip to experiment with. With that installed, all

the resonant frequencies were the same. That is, 7.1 MHz., 14.2, 21.2, about 35 and about 45 MHz. It got eerier as I progressed.

I had left the temporary taps in place so I could change the coil dimensions and no repositioning of the taps made any noteworthy difference in the dip meter readout. I hooked up the radio and found that the SWR was much the same with one whip as it was with the other.

I attempted some coil tap adjustment to lower SWR, to no avail. Either whip radiates a signal. For proof, I worked a ham in Maine for a few minutes on 20 SSB with the six-foot whip. There is never time to get a real benchmark-type comparison, but I attempted breaking into a net on 40 with the short whip and they weren't copying.

After a few tries, I unscrewed the whip to make the change to the longer one and proved that the whip was doing something because the received audio disappeared with no whip in place. That was somewhat of a relief

because I was beginning to think I had built a loading system that used the metal body as a radiating element. With the longer whip in place, a 40-meter contact was easily established with a more local station and received a decent report.

This means several things

Number one: I have an operable mobile station that I can take down the road this next week and just plain enjoy. I have yet to mount the radio so it is accessible from the driver's seat, although I did take it for a spin with the radio in the passenger seat, and made a few mobile contacts. Not very sanitary, but fun. And I *do* have the material to make the mount.

Number two: I have quite a stack of antenna books here, but there are few theoretical articles on mobile antennas. I built the loading coil by modifying some dimensions given for a monoband mobile setup in one of these books. There were no formulas

available there. I hope all mobile home-brews are not designed and assembled by the seat-of-the-pants method as was mine.

Number three: Since arriving at this state of success, I have convinced the budget department (XYL) that it is a good idea to invest in an automatic tuner. I am truly convinced there is a safety factor concerning the driving hazards of the mobile operator as well as for the finals in the transceiver.

The main thrust of this endeavor is to work HF digital modes away from home. To this point, I have only been able to use VHF, which is limiting. Although I understand there is two-meter SSTV, I have never experienced it. This next week, I will be away from home and will experiment with "new-found horizons."

Speaking of automatic tuners, I am going to give LDG Electronics a buzz and get one of

Continued on page 50

Current Web Addresses

Source for:	Web address (URL)
HF serial modem plans + software	http://www.accessone.com/~tmayhan/index.htm
PCFlexnet communications free programs	http://d10td.afthd.th-darmstadt.de/~flexnet/index.html
Tom Sailer's info on PCFlexnet	http://www.ife.ee.ethz.ch/~sailer/pcf/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom - German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
Winpack shareware for Windows	http://www.duckles.demon.co.uk/ham/wp.htm
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software/baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
Tucson Amateur Packet Radio—where packet started—new modes on the way	http://www.tapr.org
TNC to radio wiring help	http://prairie.lakes.com/~medcalf/ztx/wire/
ChromaPIX & W95SSTV	http://www.siliconpixels.com/
Timewave DSP & former AEA prod	http://www.timewave.com
International Visual Communication Association—a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
Small computer boards/various kits, including VHF packet serial modem kit	http://www.ldgelectronics.com

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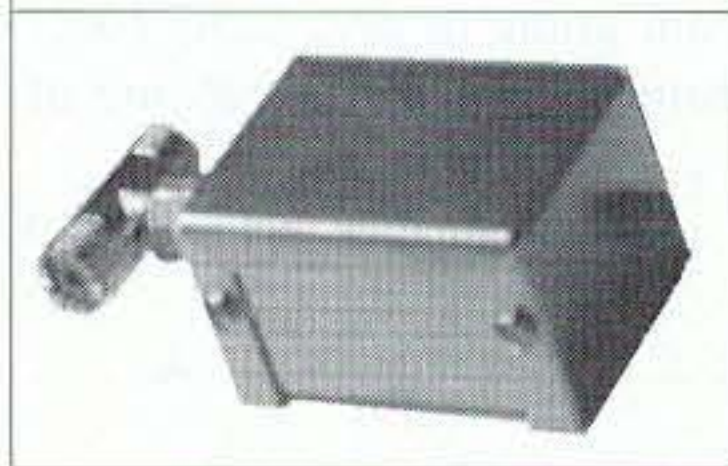
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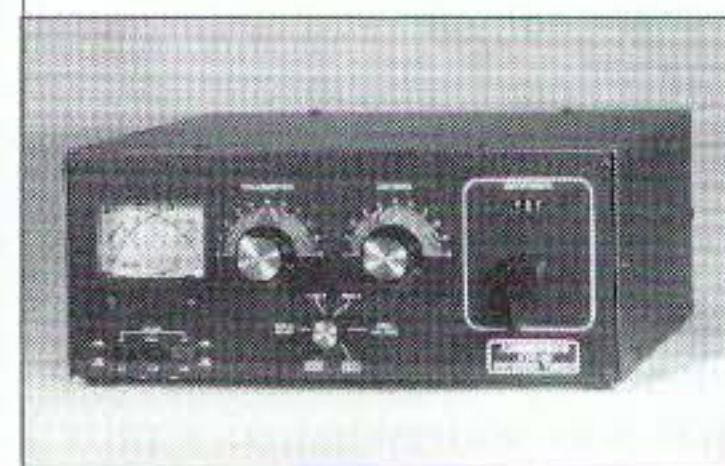
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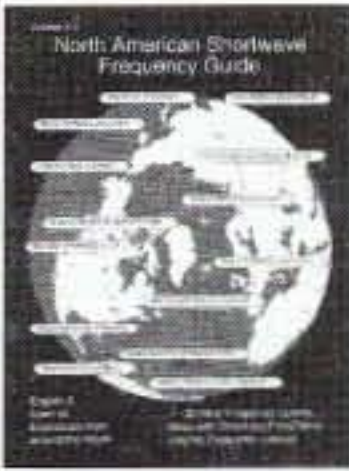
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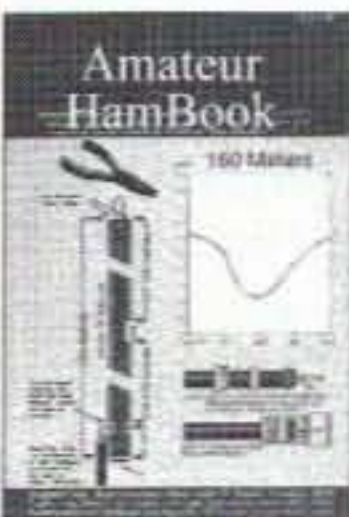
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10 GHz fun, 1999 update, part 2: the Gunn diode modulator power supply

Last time, we covered construction of the Ramsey FR-10 30 MHz FM IF system for our microwave transceivers for use on both 10 GHz and 24 GHz. This month, I want to complete the construction of the transceiver package, with discussion about the additional circuitry required in the transmitter portion of the system.

The power supply modulator in a wideband FM system is quite simple in that DC voltage is used to power a Gunn diode in a microwave cavity. The 24 GHz Gunn-varactor-controlled transceiver can be obtained from SHF Microwave Supply [arutz@shfmicro.com]; phone: (123) 456-789; FAX: (123) 456-789. The 30 MHz receiver was obtained from Ramsey Electronics,

793 Canning Parkway, Victor NY 14564; 1 (800) 446-2295 will get you the order desk for the FR-10 30 MHz receiver.

A little review is in order due to differences between 10 and 24 GHz Gunn oscillators. For 10 GHz, the Gunn voltage is in the 5 to 10 V range. Current requirements depend on the power output of the Gunn device. Ten milliwatt Gunn sources draw about 50 to 100 mA of current, while 100 mW devices can draw as much as 600 mA. 24 GHz Gunn diodes require lower voltages to function than the 10 GHz devices do. Nominal voltage for a 24 GHz Gunn device is in the 3 to 6 V range, with requirements similar to those of the 10 GHz devices with regard to power and current drawn.

The power supply/modulator for either circuit is quite the same. In each case, the power supply is constructed from a

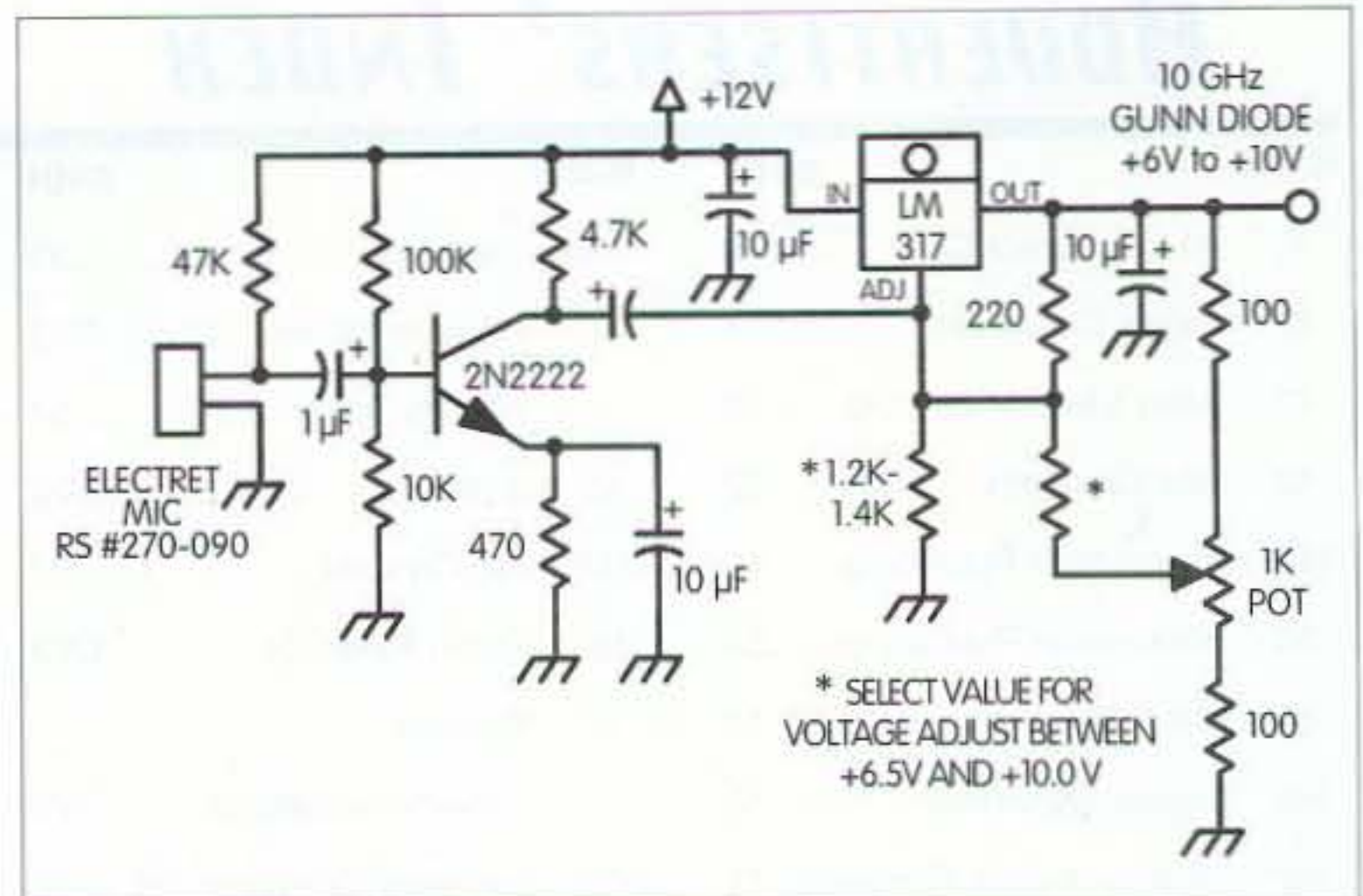


Fig. 1. Schematic for power supply modulator for 10 GHz Gunn diode source requiring +10 volts without varactor control. You must use an LM317 adjustable regulator for the circuit to function with modulation. A 7810 voltage regulator will not function as a regulator, having only in/out and ground, and no reference terminal.

single LM317 adjustable voltage regulator. For systems that use a varactor diode, the Gunn diode voltage is set at a fixed value near its maximum voltage of around +5 V, depending on diode specifications for that particular diode. Then, to adjust frequency, another variable resistor varies voltage on the varactor to adjust frequency of operation.

The modulator mike amplifier of the circuit can be a single transistor or an op amp. In the case of varactor cavities, the mike amp is connected to the

adjust terminal of the varactor regulator. Audio from the mike is a small-value AC component now riding on the regulator adjust terminal of the variable voltage regulator.

When the mike audio (a small-value AC voltage) is added to the fixed DC voltage on the regulator, it causes the output voltage to vary at the audio rate, producing a change in frequency varying at the audio rate. This produces FM (frequency modulation) on the transmit signal. The amount of

The Digital Port

continued from page 47

their kits. They were the ones who supplied the hard-to-get packet serial modem kit that I wrote about some months back and they have a reasonably priced tuner in kit form, or it can be purchased assembled. Their Web site is also listed in **Table 1**.

I see that the packet serial modem has been removed from their new Web site. It could be (though I doubt it seriously) that when I wrote about this wonderful packet modem that you folks simply cleaned them out and that was the last of the inventory. More likely, it was such a small item and was a bit

temperamental and possibly required more technical service replies than the profit could cover. The market has passed away on this item. There are a number of reasons as I discussed in a previous column.

Anyway, there are eight items listed and you might want to take a look. In addition to the regular tuner I intend to order there is a low-current-draw QRP tuner, two small computer boards for special control projects, relays to work with the computers, a repeater voting system, a balun kit and a nifty-looking headphone/speaker box to use between the output of your radio and your computer speakers.

One more item that looks like a winner comes from Timewave,

the folks who absorbed AEA. They already build a whale of a great DSP unit, the DSP-599zx (which is a must-install for the mobile installation here), that works very well when coupled with the old iron-horse AEA PK-232, and a great RTTY program to use directly with the modem in the DSP-599zx.

Now they have developed something unique just for the PK-232. They offer a DSP upgrade that works in all modes, including RTTY, PACTOR, CW and packet. This makes it possible to have excellent DSP performance for the PK-232 for 125 or 150 dollars depending on whether there is already a daughterboard in place. You can read about it on their Web site (see **Table 1**).

I had a recent E-mail asking where to purchase a PK-232. I replied that I had seen a number of used ones on the market in the \$100 range. I might also mention that if you look quickly, there may still be a closeout special from Timewave on the DSP-232 Multimode for \$100 listed on their Web site. I have had my PK-232MBX for so long that I wouldn't consider trading it, but that new \$100 multimode would sound good to someone who has none.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net] and/or CompuServe [72130,1352]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO. 73

audio when increased affects the deviation of the transmitter FM. The audio voltage (very small AC voltage) rides on top of the DC varactor control voltage that is used to set the RF frequency of operation.

Quite a simple scheme, mike audio to FM in a voltage regulator circuit. In the Gunn diode without varactor frequency control, the audio is connected to the Gunn diode voltage regulator adjust terminal to function much the same as in the varactor scenario. The non-varactor cavity setup is hampered with less frequency agility than varactor cavities allow. Frequency agility is quite good with varactor cavities, making them more expensive and desirable. In any event, both work—it's just that the varactor cavity is like a Lincoln in comparison with an economy car. See Fig. 1 for the power supply modulator circuit for a basic Gunn oscillator cavity without varactor control.

A simple circuit uses a single 2N2222 NPN transistor for the audio amplifier mike amp, as shown in Fig. 2. The LM317 circuit is similar for all applications, whether with 10 or 24 GHz Gunn sources. The only differing factor is the voltage required for the Gunn diode—

approximately 10 volts for a 10 GHz diode and a value of about five volts for a 24 GHz diode.

With most systems operating from +12 volts DC, a direct connection to the LM317 will be sufficient, with a modest heat sink to dissipate heat. For higher-current operation for high-current diodes, use a bootstrapping NPN pass transistor to increase the regulator's current handling ability. Almost any NPN transistor will work. I used a TO-220-case 2N3055, as it was in my junk box. Any modest current device will work, too. Use an insulating mount to secure the transistor to a chassis, as the back of the device is the collector and needs to be insulated on the heat sink. See Fig. 4 for circuit details.

Bypass the emitter of the NPN pass transistor with a 10 μ F or more cap (value not critical) to minimize noise on the DC line from the regulator. By looking on a scope, I found that at this emitter output point I had quite an AC oscillation when the regulator was combined. I eliminated the oscillation with a 40 μ F capacitor between the emitter of the 2N3055 and ground. I just grabbed the first tantalum out of the junk box—I suspect that a 10 μ F would work just as well.

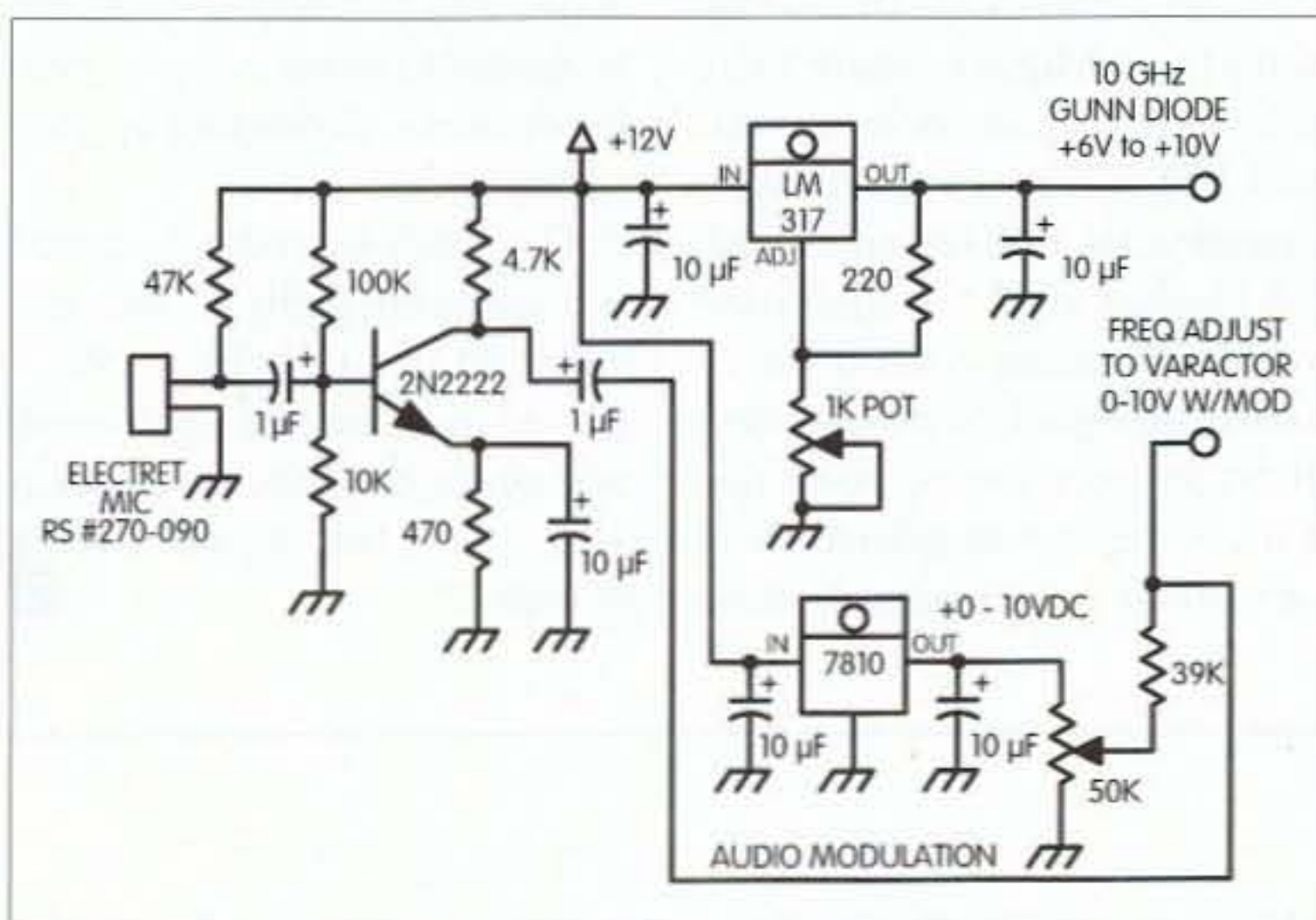


Fig. 2. 10 GHz schematic changes for varactor control mike audio applied to varactor for FM modulation. Audio voltage is superimposed on top of varactor DC control voltage that is used for frequency tuning. The LM317 could be replaced here by a fixed 7810 voltage regulator and used for both Gunn and varactor supply. Two regulators are used in this example for demonstration purposes.

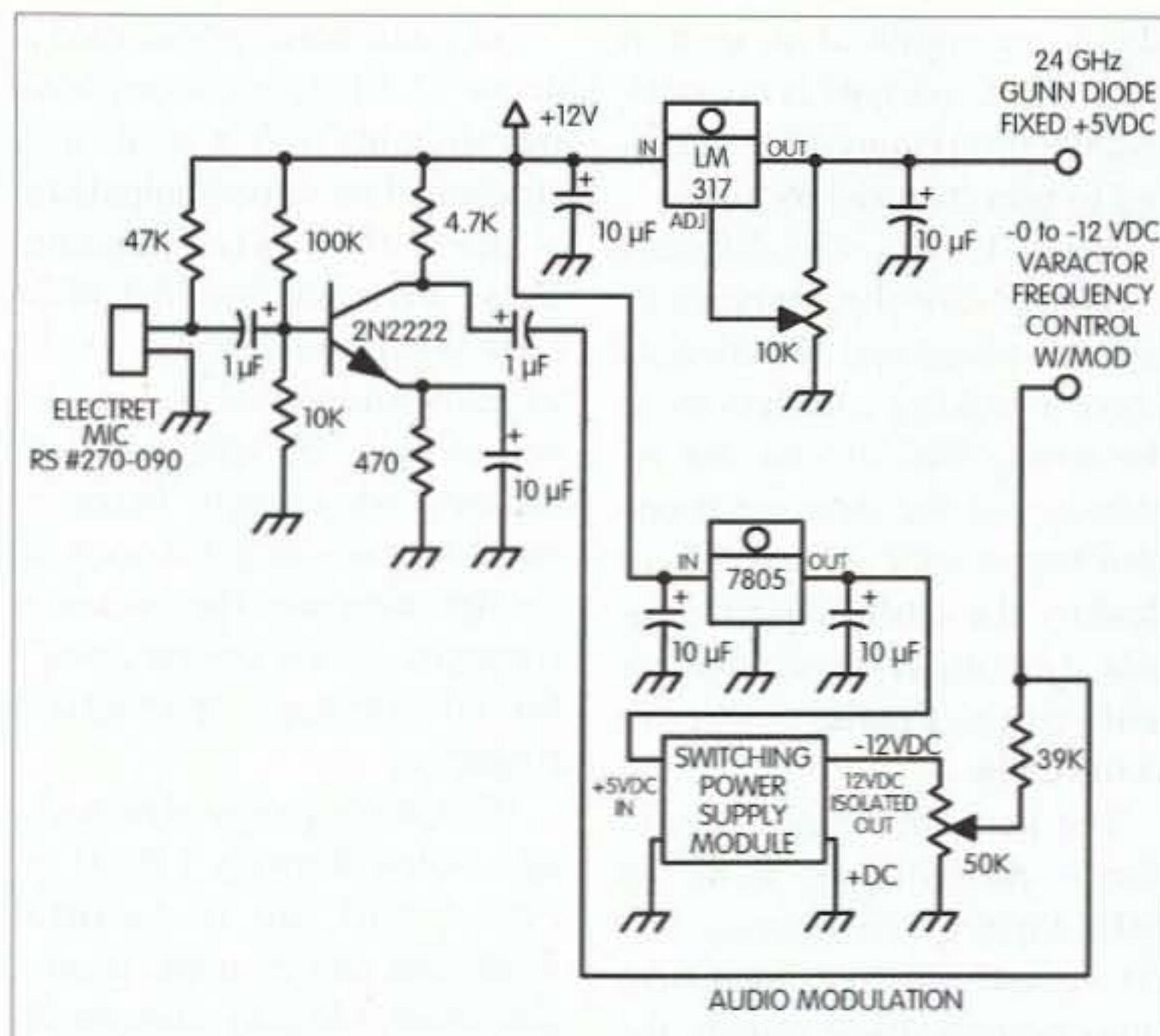


Fig. 3. Schematic changes when using 24 GHz Gunn diode source and varactor tuning arrangements. Note that on the 24 GHz cavity the varactor uses a negative voltage for control of frequency adjustment. Gunn diode voltage must be reduced to the required 5 to 6 V range. Verify your diode's maximum voltage before applying power. Note the addition of a small isolated switching PC-board-mount power supply added to obtain the inverted negative output for varactor tuning voltage. The power supply can be very small, as current required is less than 1 mA.

Check out the power supply modulator using a basic scope if you have one. Look at the DC voltage output and set the LM317 up for whatever voltage is required—in the case of our varactor-controlled 10 GHz system, this will be +10 volts nonvariable. The varactor is driven with a positive voltage and is DC-adjustable from zero to +12 volts. Verify voltage operation and then use the scope to verify modulation on the AC-coupled scope. A few millivolts is all that is required of AC modulation superimposed on the varactor DC voltage for proper FM modulation.

In operation with the completed system, check all your power supply connections and voltage requirements twice before you connect up the wrong polarity or wrong voltage to the precious Gunn diode and its associated detector diode. The diode can be bypassed with both a small- and large-value capacitor to lower frequency oscillations. You will find that 0.001

and 10 μ F capacitors will do just fine.

The detector diode needs a DC return to draw a little current to bias it slightly on. Most any value small RF choke near 30 μ H or so will suffice. Run shielded leads to both the Gunn and detector diodes. I used miniature coax (RG-174) that was

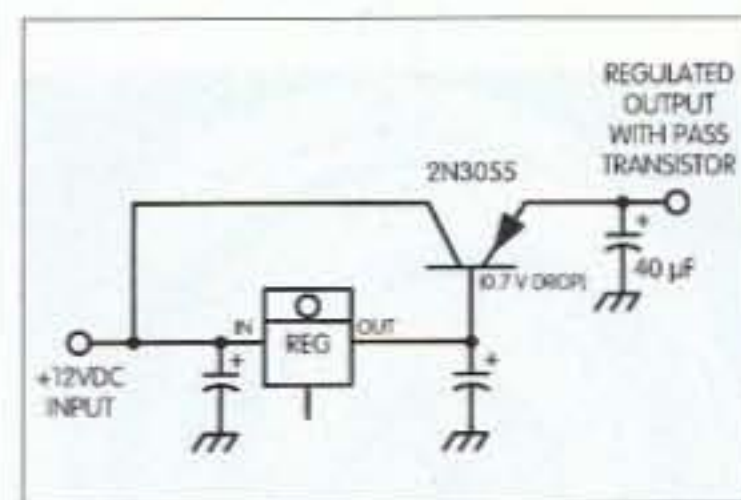


Fig. 4. Bootstrap 2N3055 or similar NPN pass transistor is added to voltage regulator circuit to increase current handling capabilities of voltage regulator. Note: There will be a 0.7 volt drop in regulated voltage out of the regulator due to voltage drop in the base emitter of the pass transistor. Set voltage regulator slightly higher to overcome voltage drop in use.

about one-eighth of an inch in diameter. Coax type is not critical; it's just required for shielding to prevent stray pickup.

Again, I stress: Use different connectors for the connections to feed voltage and detection, to prevent making connections to the wrong lead. If you, for instance, put the detector diode into the 10-volt source, it will destroy the costly detector diode. Use different connectors and you can't make an error in connections.

The detector diode connection is made directly to the 30 MHz input of the Ramsey FR-10 receiver. With the modifications described last month, the receiver should tune over a 400 kHz range of frequencies, making 30 MHz exactly the center of tuning. Normally, you will not have to make any receiver adjustment in frequency. For other stations that might be slightly off-frequency from 30 MHz, you may need to adjust slightly for received clarity.

Operation on microwave is full duplex, just like talking on a telephone. With simple horn antennas, you can communicate over many miles, depending on terrain and path conditions. By adding a small (12 inches in diameter) dish antenna, you can increase available gain by 28 dB

(vs. a small horn, whose gain is about 12 dB). Quite an increase in gain with such a small dish antenna. The same comparison is true for 24 GHz operation. However, a one-foot dish at 24 GHz would have about 35 dB of gain because of its smaller wavelength. As frequency increases, wavelength becomes smaller, and you get more gain for the same area than at lower frequencies. Of course, that's for a dish antenna optimized at frequency.

Well, there you go. The package of the Ramsey FR-10 receiver and the transmitter modulator power supply control circuits should get you on the air with simple wideband FM operation. I tested my circuits using the Ramsey receiver, which proved quite sensitive and of great quality. The frequency I used was 24 GHz, because I knew from past experience that if it worked here it will perform on 10 GHz just as well.

Why pick 24 GHz for a test?

We wanted to complete project testing in time for participation in the ARRL 10 GHz and up contest. I used my 10 GHz narrowband station at home and made several contacts, but I really wanted to try

24 GHz for pure fun and to see if both Kerry N6IZW and I could get operational. I constructed and modified the receivers and obtained some small medical receivers to use for a shielded housing after removing all junk from the cabinet except the fuse and on/off switch. A simple conversion of the cases sure beat the prices of new metal cabinets (hams are frugal at times).

Kerry N6IZW constructed the modulator power supplies, and one evening two days prior to the contest we sat down, bench-tested both units, and got them operational. Kerry fashioned his 10 GHz dish with a small C-clamp, to fix the 24 GHz diode assembly near focus, and that allowed him to obtain quite a bit of gain in his system, possibly as much as 45 dB. I did not have time to haul out the dish feed due to commitment to our grandson's soccer game that Saturday morning, so I used a simple miniature horn antenna less than an inch in area for my antenna. Still, I made contact with Kerry over a short test range of about two to three miles, from Mt. Helix to Kerry's front yard.

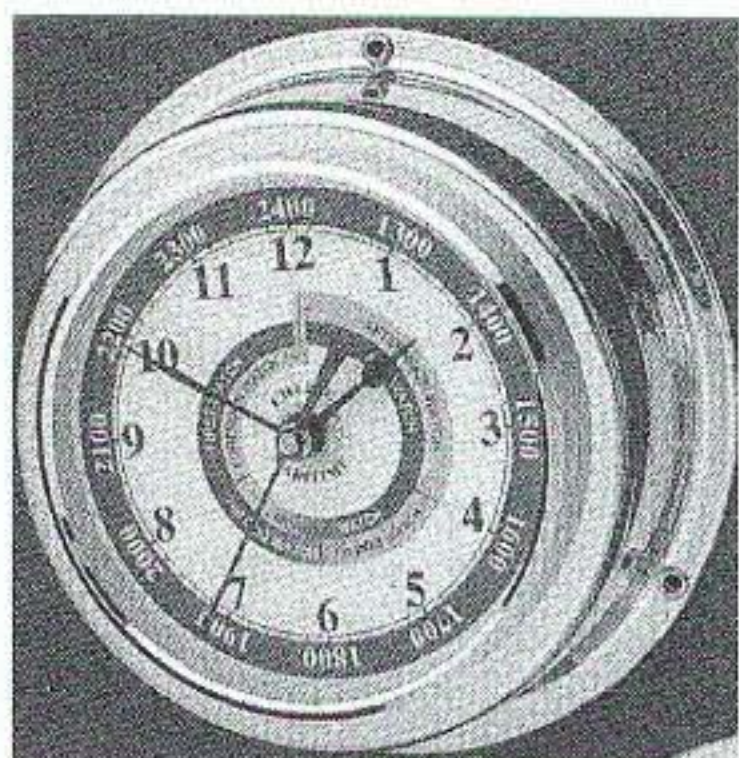
Then Kerry and I met on top of Mt. Helix and communicated with Ed W6OYJ again on 24 GHz wideband FM. He was on top of San Miguel, where there are several television stations and FM radio stations, besides commercial FM repeaters—all co-located near his operation point. We made contact on 24 GHz, but signals were so strong from an interference point that Ed's S-meter was pinned, with or without 24 GHz signals. Both

Kerry and I were able to hear sync buzz from the very powerful video UHF transmitter, even at some 12 miles distance. All in all, it made for a very interesting day and lots of enjoyment.

In retrospect, I can't give enough praise to the Ramsey FR-10 receiver. It delivered in many areas, including the most important one, cost. It is very inexpensive at \$35, and outperforms similar systems. It comes with all component parts, a quality PC board, and easy assembly instructions. In field tests that we ran, it proved to be a very important player, and worked far better than I had hoped. If you haven't picked one up yet, do so if you intend at all to get on wideband FM. You should not pass up this fine bargain.

Next time, I want to get into the test equipment that was constructed to allow our testing at 24 GHz. I will bet your work bench is in the same boat mine was, with nothing above 18 GHz in the testing arena. Well, my old 8551 20-year-old (or older) spectrum analyzer goes to blue light with external mixers, but in reality, it's not very good with regard to what it sees. Next time we'll describe what circuitry was assembled to do quality testing at 24 GHz. The approach is not limited to only this frequency but can be applied to others as well—even lower ones—depending on your testing needs.

The main ingredient needed is a spectrum analyzer that can cover up to a GHz or so. We'll let you in on the plot next month and describe what we came up with. 73 for now, Chuck WB6IGP. 73



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Amateur Radio Via Satellites

Andy MacAllister W5ACM
14714 Knights Way Drive
Houston TX 77083

On November 3, 1997, cosmonaut Pavel Vinogradov hand-launched *Sputnik 40*, during a spacewalk, from the *MIR* space station. This three-kg amateur-radio satellite was built by students at the Jules Reydellet College in St. Denis on Reunion Island and the Polytechnic Laboratory of Nalchik Kabardine in the Balkar Republic (Russian Federation). AMSAT-France, L'Aeroclub of France, and the Russian Astronomical Federation also participated. The satellite was built to commemorate the 40th anniversary of the launch of *Sputnik 1* on October 4, 1957. The *Sputnik 40* transmitter sent a beeping tone on 145.820 MHz that represented the satellite's internal temperature. The lithium batteries kept *Sputnik 40* (also known as *RS-17*) on the air for about a month. Check the February 1998 "Hamsats" column for details.

Sputnik 41

They've done it again. On October 25, 1998, a Progress rocket carrying *Sputnik 41* and

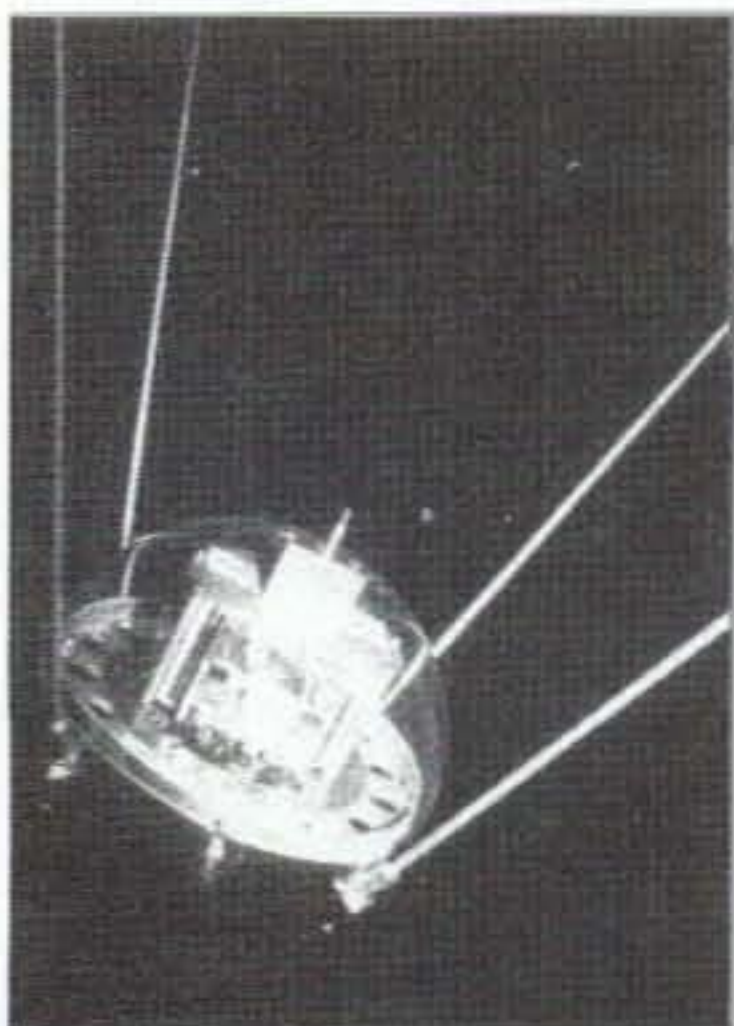


Photo A. *Sputnik 41* (RS-18) prior to launch (F6BVP photo).

supplies for *MIR* was sent into space. On October 27, *Sputnik 41* was delivered, along with the supplies. During a spacewalk on November 10, *Sputnik 41* was hand-launched by cosmonaut Sergei Avdeyev. Just before launch, Gennady Padalka told Avdeyev to "toss it gently toward the moon." This latest amateur-radio satellite was a joint project of L'Aeroclub of France, the Russian Astronomical Federation, and AMSAT-France.

Unlike *Sputnik 40*, which simply sent its series of beeps, *Sputnik 41* was designed to broadcast prerecorded messages in addition to minimal telemetry data. The project began in March 1998, when Victor Kourilov (commissar of the Russian Aeronautical Federation and project leader for *Sputnik 40*) invited the French participants in the *Sputnik 40* project to build a new satellite celebrating "1998—The International Year of Air and Space."

The *Sputnik 41/RS-18* project had a very short fuse, even for a simplistic satellite. Seven months after the invitation to create a new *Sputnik*, the completed flight-ready device was to be aboard *MIR* and ready for launch. Gerard Auvray F6FAO, AMSAT-France's vice president of engineering, had an engineering model completed within a few months. By September 5, he had personally delivered the finished satellite to Moscow. Project financing came from L'Aeroclub of France in celebration of their 100th anniversary.

Sputnik 41 weighs less than 10 pounds (about four kg) and is a one-third scale replica of *Sputnik 1*. The new satellite is

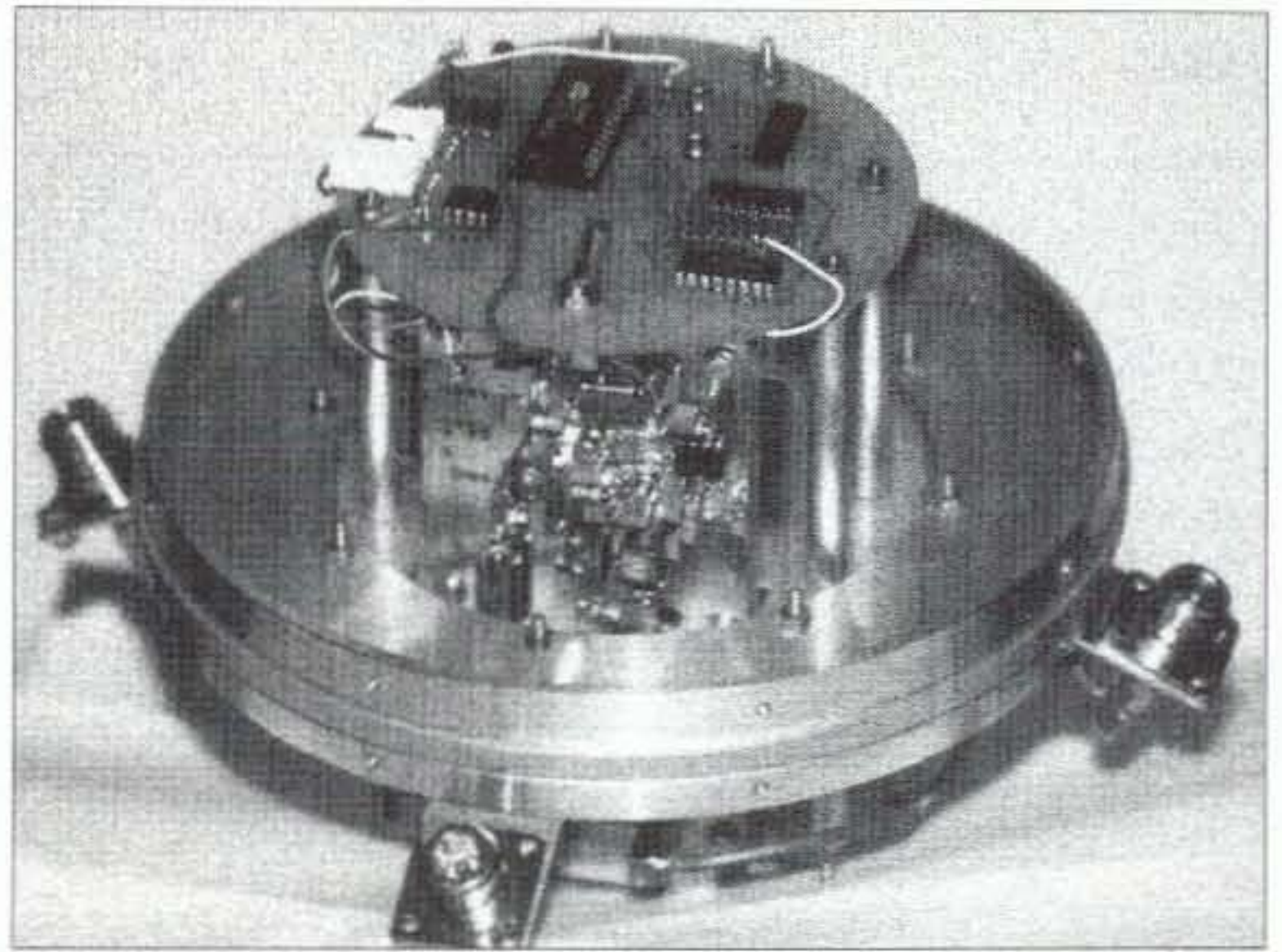


Photo B. RS-18 system with voice module above and two-meter transmitter below (F6BVP photo).

an eight-inch-diameter sphere with four swept-back antennas set for circular polarization. It transmitted 200 mW on 145.8125 MHz using FM while the internal batteries worked. The satellite was designed to function for one month. It did. The last signals from *Sputnik 41* were copied on December 11, 1998.

During its short life, the satellite sent two prerecorded voice messages in three languages, a recording of the beep signals from *Sputnik 1* in 1957, and its own audio tone sequence for satellite temperature determination. The onboard recorded message was stored in a 28-pin device from Information Storage Devices, Inc., capable of holding 90 seconds of good-quality (6.3 kHz sampling) monophonic audio. The transmitter was not keyed continuously, but only when a prerecorded, or telemetry, message was being sent. This helped conserve battery life, since there were no solar panels.

The first of the two messages sent by *Sputnik 41* was, "1998 was the International Year of Air and Space." It was read by Constantin Tsiolkovsky-Sambourov, the 14-year-old son of Sergej Sambourov RV3DR and great-grandson of Konstantin Tsiolkovsky, reputed inventor of manned rockets. The second message was, "International

space school *Sputnik* program." It was read by Victor Kourilov, the project leader. The French and Russian versions of the two messages were read by other students and members of the design team.

The frequency of the tone signal sent by *Sputnik 41* between transmissions of the 90-second prerecorded segment was proportional to the satellite's internal temperature. A tone of 440 Hz corresponded to a temperature of -20 degrees Celsius, while a 1200 Hz tone represented +20 degrees Celsius. Check out the plot of audio frequency vs. temperature in **Photo D**.

Did you hear the signals from *Sputnik 41* during its short life in orbit? AMSAT-France is offering a QSL card confirming reception reports. Send your report to:



Photo C. View of the voice module on RS-18 includes a 90-second memory chip and supporting circuitry.

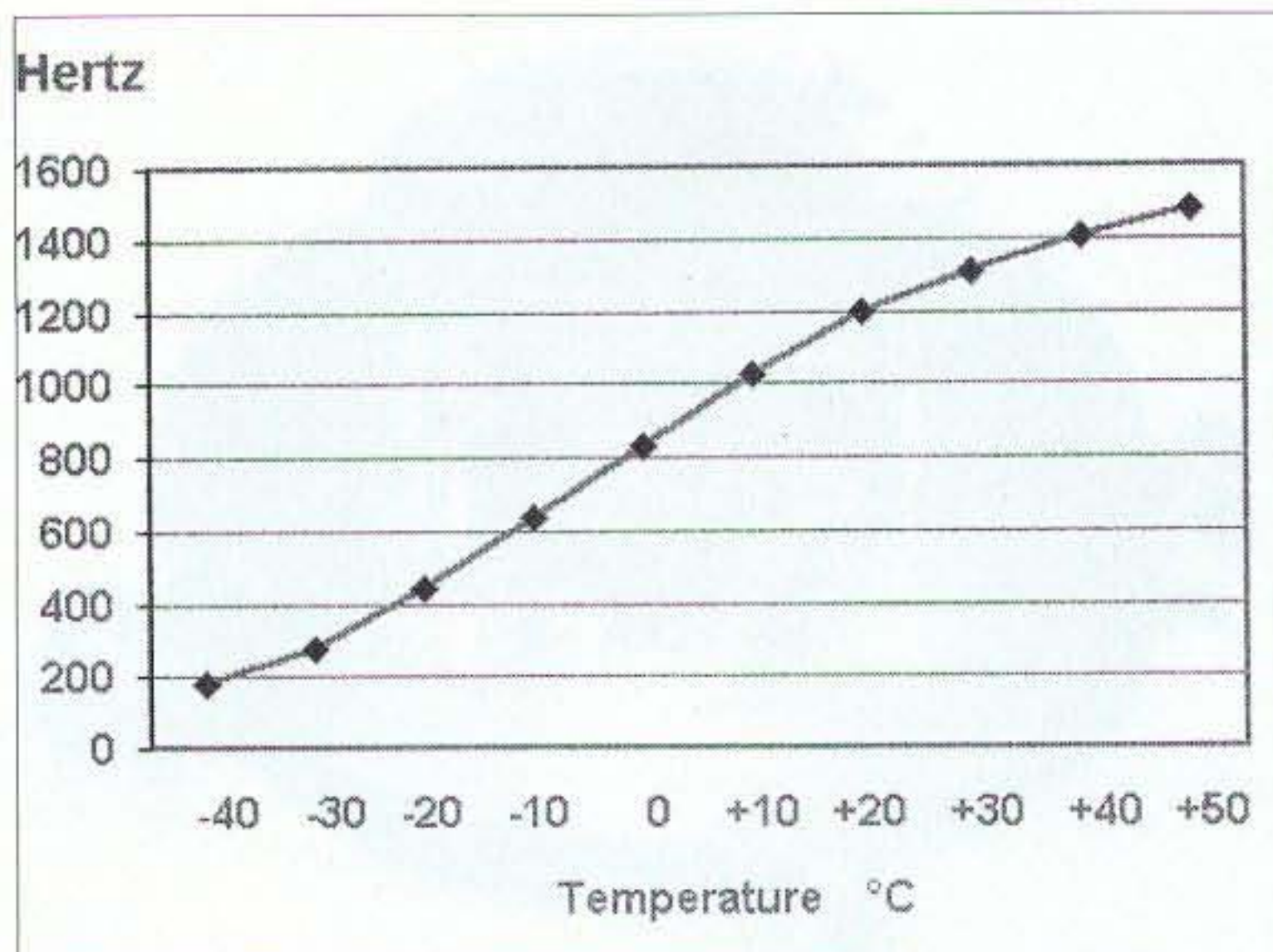


Photo D. Plot of the audio frequency vs. temperature chart for the audio beeps from RS-18 (F6BVP photo).



Photo F. Gerard Auvray F6FAO with the RS-17 satellite prior to launch (F6BVP photo).

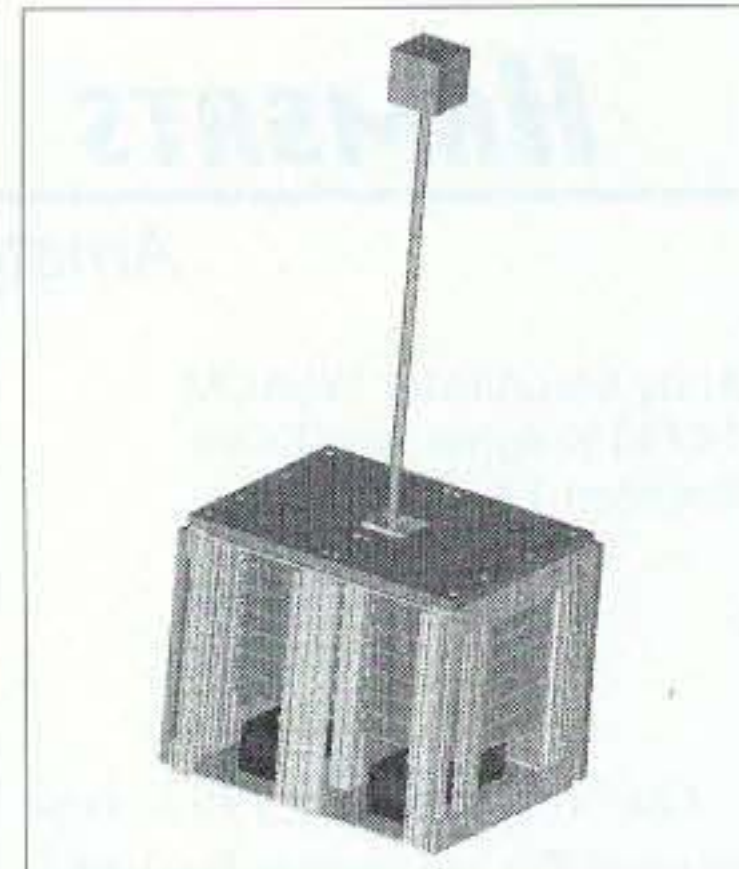


Photo H. Maelle is larger and more complex than SATEDU. It is set for launch in 2001.

AMSAT nets, and keep up with the news via AMSAT's Web site at: [<http://www.amsat.org>]. **73**

AMSAT-France,
QSL Spoutnik 41,
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F-92500 Rueil-Malmaison
FRANCE.

Send your QSL card or letter, along with two IRCs (International Reply Coupons) and a six-inch by nine-inch SAE (self-addressed envelope). Expect to pay \$1.00 postage (over one-half, but less than one ounce) to get all of these items to France in your airmail envelope.

To find out more about the *Sputnik 40* and *41* satellites, check out Web pages by AMSAT-France President Bernard Pidoux on the Internet at [<http://www.ccr.jussieu.fr/>

physio/sputnik41.html]. Useful links to AMSAT-France and other interesting sites are included in Bernard's pages.

But there's more ...

AMSAT-France and the other groups involved with *Sputnik 40* and *41* have more projects planned for 1999 and beyond. If you missed these two Phase-One-style (low orbit and short life) hamsats, there's another one coming this year. When *Sputnik 40* was sent to *MIR* in 1997, two electronics modules were sent. It is hoped that with a few more components, the backup system can be completed and released later this

year from *MIR*. It will likely be called *Sputnik 42* or *RS-19*. It is also hoped that the new sputnik can be launched by Jean-Pierre Haignere during his visit to *MIR*.

SATEDU is slated for launch in 2000. It is a small educational satellite that includes a simple computer and various radio experiments. It will broadcast data, images, and possibly HTML (Hypertext Markup Language) pages on two meters at 400 baud. A move to 1200-baud AFSK on FM may occur before the design is finalized.

Maelle is a more serious digital communications satellite set for completion and launch in the year 2001. It is to be a low-earth-orbit satellite, but will be available for serious two-way digital communications using VHF, UHF, and SHF frequencies.

Don't miss the next *Sputnik/RS* hamsat. Listen to the

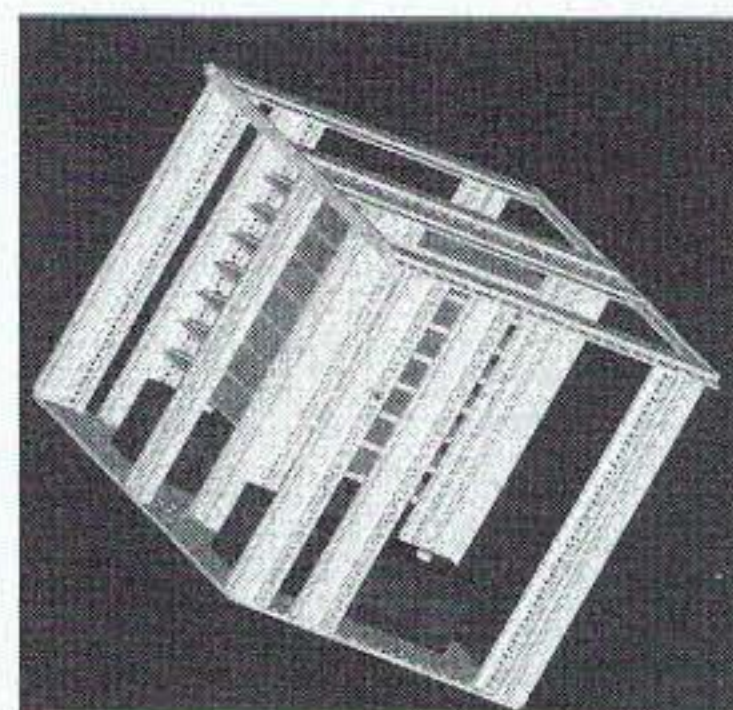


Photo G. SATEDU is scheduled for launch in 2000.



Photo E. The RS-17 and RS-18 crew. Left to right and back to front: Victor Kourilov, Gerard Auvray, Sergej Sambourov, Constantin Sambourov, and Michael Sambourov (F6BVP photo).

Number 54 on your Feedback card

UPDATES

Don't Fry Your Pot!

In "Mods for the OHR 100A," February 1999 issue, Fig. 3 on page 32 contains an important oversight. The 10k pot shown should be connected NOT to P100, which is the DC supply (!), but instead to P104.

Not VERVE, FFRF!

In Wayne's "Never Say Die" editorial in the January issue, he recommended a book called *In God We Trust*, a controversial examination of the Bible.

Somehow, in the last phases of putting the January issue together, the name of the company transmogrified from FFRF to VERVE. A number of interested people ordered the book, sending checks made out to VERVE, but the company's correct name is FFRF.

You can get a copy of the book from FFRF, Box 750, Madison WI 53701 for \$12 ppd. **73**

Enjoy CW Rag-Chewing

Some pointers for good — and fun — communicating.

Bob Shrader W6BNB
11911 Barnett Valley Road
Sebastopol CA 95472
[w6bnb@aol.com]

To have successful CW rag-chews, there are things you can do to make your transmissions more interesting for the operator at the other end and, most importantly, for yourself. Good SSB rag-chewing seems to come naturally; with CW and other modes it takes a little more finesse.

Start a good rag-chew by putting out information to the other operator which is interesting enough to produce an interesting reply. It may be something as simple as a few comments about the weather. If you can get other operators talking about themselves, you will usually get the ball rolling on an entertaining information exchange. A big help is to determine what the background or pastimes and hobbies are of the person at the other end of a QSO. You might start a QSO by briefly mentioning several things that you are in the process of doing, or have done, or expect to be doing in the near future. Always try to sign over with a question that requires an answer. This can help to start a QSO, or keep one going. If the other operator bites on any of your items or questions and comes up with a comment or answer, you may be on your way to an interesting gabfest.

Of major importance when rag-chewing on CW is to send neither too fast nor too slowly! Too fast and you lose the other operator—too slowly and you may bore him or her. The CQ you answer, or your CQ that is answered, plus the preliminary signal reports, QTH, and name information, will usually give you a good clue as to the speed at which you should send. Start your sending at the other operator's speed if it is not too fast for you. If you would rather be going faster, try increasing your speed a little each time it is turned over to you. When questions you ask are not being answered, you are probably sending too fast, so slow down a little. If the other operator is sending too fast for you or is making a lot of sending errors, don't be afraid to tell him or her to "QRS" (send more slowly) and you do the same. If you are sending faster than the other operator can read, he or she may try to increase the sending speed and make a mess out of their sending. Regardless of the speed at which the other operator is sending, never try to send at a speed which causes you to make errors. Poor sending results in short, ho-hum QSOs.

Be careful about using too many abbreviations on CW. If you know the other operator can handle abbreviations, go ahead and use them. Most newer amateurs today will not understand a lot of old-time landline abbreviations or others that are dreamed up by the other operator, which means that you may not be able to get your information across. The result will be a shortened and uninteresting QSO. There are quite a few abbreviations almost everyone will recognize and it does pay to use these. You will probably never get in trouble if you spell out most of your words. After all, you are not in a race—you only want to enjoy exchanging interesting topics of conversation with the other operator. A good rag-chew will normally require good operating skills, whether on CW, phone, or any other mode.

It is always best to use "break-in" or QSK when using CW, particularly with rag-chews—assuming your equipment can be operated that way. Some transceivers have a "VOX" switch which, if turned to "Fast" or "Full," will allow you to hear what is on your frequency in between your sending of CW dots and dashes, or if you take a breath on

SSB. ("Slow" or "semi" VOX is usually of no practical use on CW unless the code speed is extremely slow.) To reduce background receiver noises when using QSK, reducing your receiver RF gain may help. Different transceivers have different ways of allowing QSK to be used. If separate receivers and transmitters are used, it is usually necessary to use two relays, one to key the transmitter and another to change the antenna from receiver to transmitter. If you suddenly hear signals between dots and dashes while you are sending, stop and determine if it's the other operator breaking you to make a comment, or if it's another station moving in on you and who will be QRming your QSO. In the latter case, it might be wise to QSY a kilohertz or so to an uncongested frequency.

It is imperative that you and the CW station you are working to be on the same frequency. If not, you are just asking to be QRmed. Consider this: The station you are talking to is sending on a frequency a few hundred hertz away from yours. While you are transmitting, the other station's frequency will appear unused to other amateurs and one may start operating on it. You can't blame that amateur. You and the station you are working are the ones at fault. You must always operate on the same frequency as the station you are working—you must be "zero-beat" with the other station. Be sure to learn how to zero-beat your transmitter to another station's transmitting frequency. This is one of the most important procedures for amateurs to learn. If you call CQ on one frequency and the answering station is either up or down in frequency from you, you can ask that station to move to your frequency (which gives him or her practice with zero-beating), or you can zero-beat the other station's frequency after advising of your move. Practice zero-beating until you can do it correctly and quickly. Actually, if you're within 50 Hz of an exact zero-beat that's usually good enough. If your transmitter is crystal-controlled and you cannot change your frequency, ask any station you contact to zero-beat your frequency. If another station tells

you that his or her transmitter is crystal-controlled, you should zero-beat that frequency when you come back.

If your transceiver has an RIT (Receiver Incremental Tuning) control, make sure it is in the "off" position whenever tuning around! If RIT is detuned from its off position, it can cause a lot of difficulty on all modes of operation and usually results in your taking up more of the band than necessary. Also, when operating in a net, if your RIT is detuned a couple of hundred hertz it can require retuning of everybody else's receivers every time you start transmitting. On-frequency operations are particularly important for good rag-chews using any mode.

CW communications when QRN is high can be aided by using slower sending speeds. Unless keyer or bug dots can be adjusted to put out heavier than normal dots, it is often best to shift over to the old straight key whenever there is bad QRN or QRM. This may often result in extending an enjoyable rag-chew.

If the other amateur does not speak English well, be careful to use the simplest words you can that will convey your information. Don't abbreviate or use sophisticated or slang words when talking to foreign operators or they may not follow your meanings and will tend to sign off in short order. Information obtained from QSOs with foreign amateurs can be most interesting and informative.

When in communication with foreign amateurs, Q signals can be very useful, provided both parties are familiar with them. It might be smart to learn the meanings of the very few Q signals that might be applied to all types of communications on the ham bands and make a list of them to keep handy. Q signals have been in use on CW from the very early days.

It is rarely useful to do battle on the air over the use of a frequency. Sure, you may have been there first, but don't be a poor operator just because those who moved in on you showed that they were poor operators!

Proper use of the AGC control is important to make readability of signals add to a good rag-chew. Normally,

FAST AGC works well for both CW and SSB. However, if you are copying a strong signal and weaker ones appear in the background, set the AGC to SLOW and the weaker signals will become much weaker and less annoying. Any strong static crashes will drive the AGC circuit's biasing voltage high, which will desensitize the receiver until the capacitor in the AGC circuit discharges. To overcome this, with strong QRN, turn off the AGC and use the RF gain control to set the receiver's sensitivity. You will miss fewer letters the other operator is sending. If you have a good noise limiter or blanker it may take out some of the peaks of static crashes. These operations can greatly improve the enjoyment of a good rag-chew when undesirable operating conditions are present.

A poor RST signal report has a tendency to make an operator give up on a QSO. The best rag-chews usually are between stations who are having little or no difficulty in hearing each other. But don't depend on S-meter readings too much. In many cases they are not true indications of the readability of the other signal. Basically, with no signal, your S-meter needle should lie at the zero point, or there should be no illumination of LED indicators (only possible if there is no background noise at your location). Theoretically, the weakest signal that can be heard should move the meter to the "S-1" point. A signal that is 6 dB stronger than that should read "S-2". A 6-dB increase is twice the voltage (or four times the power) input to your receiver, or will produce a one S-unit higher indication. The difference between any two S-units should always be 6 dB (assuming the manufacturer uses 6-dB S-units). If an operator tells you that he or she has increased power from 25 W to 100 W, but your S-meter does not show a one S-unit increase, your meter is not calibrated correctly for that band. Make tests like this with stations during a rag-chew and see what your results are. It can be quite interesting. When QSB is bad you may have to use peak S-signal values, taken over 30 seconds or so, for your test readings. Try it on each of the different

bands you use. Most transceivers today have variable power output with meters that can make these transmitting changes easily (hopefully these power meters are calibrated correctly!).

When the S-meter of a receiver is calibrated at the factory, a signal generator is used to produce the signal. Using signal generators, S-units may be made exactly 6 dB removed from the adjacent ones. But when we attach an antenna to a receiver the received signals may be quite different. Suppose a dipole is only 10 feet above ground and a certain signal produces an S-5 reading. If the antenna could be raised to 65 feet the reading might be S-6 or S-7, depending on the shielding by nearby trees, buildings, etc., as well as ground reflectivity. What is the correct S-meter reading? A beam will probably add at least one S-unit over what a dipole would produce. An S-5 signal at right angles to the wire of a dipole should normally read S-6 or higher with a beam at the same height.

In many cases, it can be beneficial for operators to resort to the old method of giving S-meter readings by using a calibrated ear. In the first three decades of ham radio there were no such things as S-meters. Signal strengths were all determined by how loud the signals sounded with the RF gain control (if the receiver had such a thing) set to some predetermined level. Practice listening to signals and judging their RST strengths before looking at your S-meter reading. You can become surprisingly accurate with a little practice. If you turn off the AGC and control the signal loudness by using the RF gain control, you can become quite accurate. On some bands it will be the only way to give reasonable "S-meter" ("S-by-ear"?) reports.

An interesting question comes up: If an S-meter varies up and down, what report should be given—the peak, the minimum, the average of the two? The one that will make the operator at the other end of a rag-chew feel best is the peak indication, and it is as good as any other. As the band changes, the S-meter peak readings will change. This can be an interesting item on which both the other operator and you can

comment. Watch what your S-meter is doing and tell the other operator about it during the QSO. It should be an item of some interest.

After the RST, QTH, and name information is transmitted in a QSO, the usual items of interest to start with are the transceiver being used, its RF power output, and the antenna. If a transceiver is not used, describe the receiver and transmitter that are being used, the RF power output, and the type of antenna being used. Actually, your power output and antenna details are probably the most interesting things you can tell the other operator about your equipment. (In the old days the DC power input was usually given. If you only know your DC power input, about 60% of that will be an approximate RF power output. Most operators today can quote RF power output values because modern transmitters incorporate calibrated RF power output meters.)

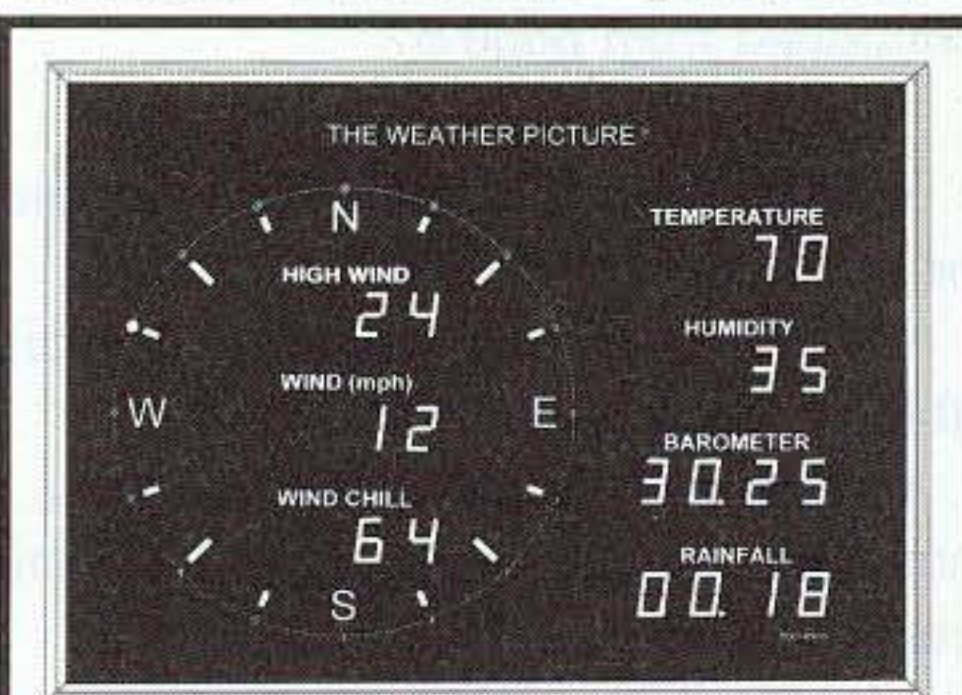
In the early days of ham radio, the kind of transmitter, receiver, and antenna you were using would take a long time to describe in a QSO. No two stations had the same. Everything inside and outside the ham shack might be home-brewed, and many times with an ingenious use of parts never meant to be in a radio station. Today most equipment reports boil down to the listing of manufacturer names, numbers, and letters to signify what equipment is being used. Not too many amateurs today know the make-up of either their receiving or transmitting circuits, or even details about their antennas! A good modern rag-chew will probably have to include topics other than what your equipment consists of, or what home-brew equipment you are using.

Some subjects that I use as bait to get a good rag-chew going are listed below. You can probably add a lot of your own. While many of the items are given as statements, if you ask questions based on these statements you will usually receive a lot of interesting information.

- Age (at least for men).

Continued on page 58

NEW for ham radio operators!



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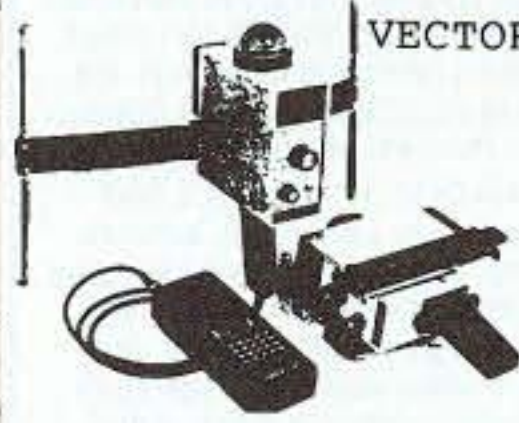
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CIRCLE 58 ON READER SERVICE CARD

Enjoy CW Rag-Chewing

continued from page 57

- Animals/birds you have, have had, or are seen in your area.
- Antenna being used, others available or being planned.
- Antenna difficulties, if living in a condo/restricted area (many sympathetic ears).
- Automobiles, RVs, boats, airplanes you have now, have had, problems with them, activities you have participated in or plan to be doing with them.
- Bands you like to use and why.
- Books/articles read lately, would like to write, or have written.
- Camera equipment, types of pictures you like to take.
- Computers you have and use in amateur operations.
- Difficulties with trees and other things around your property.
- Employment at present, previously, or expected in the future.
- Gardening you do, have done, or are going to do.
- Home repairing or building you have done, are doing, or will have to do.
- If you shipped out while in the service, interesting experiences, navy, merchant marine?

•Interesting experiences you have had on trips.

•Key being used: straight key, bug, sideswiper, electronic keyer, paddle, keyboard.

•Licenses other than radio: hunting, fishing, flying, handgun, etc.

•Marital status, number of kids, things spouse and kids do.

•Mobile radio equipment you use, have used, or plan to use.

•Modes you like to work: CW, SSB, FM, RTTY, AMTOR, packet, etc.

•Organizations: amateur, military, Masons, Odd Fellows, Elks, etc., that you belong to.

•Organized trips by boat, plane, or bus that you have taken or are planning to take.

•Other rigs and antennas you have and use.

•Radio equipment you are working on now or have recently built.

•Receiver details, superheterodyne, TRF, super-regenerative, bandwidth being used.

•Recent natural disasters in your area: fires, rain- or windstorms, cyclones, hurricanes, tornadoes, floods, earthquakes.

•Retired? From what? What you have done since retiring?

•Sports, such as archery, baseball, basketball, boating, bowling, fencing, fishing, flying model or real planes, football, golf, guns/pistols, hockey, horseshoes, hunting, ping pong, pool, skating, skiing, swimming, etc.

•Traffic handling systems in which you participate.

•Transmitter details, power output, power supply used.

•Try tests with the other amateur on antennas, transmitters, keying, modulation, etc.

•TV and VCR equipment you have and difficulties you have experienced with it.

•TV shows you enjoy watching, on standard channels, cable, or satellite.

•War duties, years, and experiences.

•Weather—always an excellent starting subject: temperatures, sunny, windy, foggy, rainy, snowing, sleeting, rainfall totals, snowfall totals, etc.

•What started you in the ham radio field.

•When licensed as an amateur/commercial operator.

If you can connect on only a couple of these subjects, you should be well along into an interesting rag-chew session. I can usually work a QSO into a rag-chew with someone who is not a DXer (and even some DXers at times), often a half-hour to an hour of some very interesting conversations. This is one of the things that ham radio should do for you: let you find out what the rest of the amateur world is doing and thinking. But don't be disappointed. There are some hams who are only interested in making short contacts, getting a signal report, maybe requesting a QSL card, and saying 73. With these people it may be useless to try to get much interesting information out of them. Once in a while, even with some of these CW operators, if you slow your sending sometimes you may get them to begin telling you something interesting if you happen to ask the right questions. Many CW hams who sound like they might be hotshots when sending (especially on KBs) but make a lot of mistakes may actually be very poor at copying hand-sent CW (as are their computers). It can be a challenge for you to see how much you can extract from such operators by slowing your sending. Sometimes a really interesting QSO results. Give it a try on the 30, 40, 80, or 160 meter bands. The other bands are usually used to work weaker, DX stations, which usually is not conducive to good rag-chewing. If you hook a rare one you hate to hold up other stations who are listening and want to contact that station. Any rag-chew you do make with almost any foreign station can be unusually interesting if you can manage to make it at off times.

One of the biggest but often most overlooked advantages of good CW rag-chews is the practice maintaining or improving operating skills, keeping the old fist in good operating condition, spelling out of your head, and using a card file to provide accurate recall of interesting items about other station operators. We should all try to improve our operating a little with each rag-chew. But by far, the best part of rag-chewing is that it can be a lot of fun—so give it a try!

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CIRCLE 56 ON READER SERVICE CARD

NEVER SAY DIE

continued from page 5

will teach you how to develop your psi abilities. It's *The Psychic Paradigm*, ISBN 0-425-16509-5, 200 pp., 1998, from Berkeley Books, a division of Penguin-Putnam. Bevy is an excellent teacher.

America, SRO?

What about our immigration policies? Should we continue to let our borders leak like a sieve? Or should we get serious about upholding our laws against illegal immigration? On the one side I read that, heck, America is a huge country, with vast areas either unoccupied or underused. Also, that we have a need for a continuous source of people for low wage unskilled jobs. Let's consider those arguments.

If you've done much traveling, or even watched anything on TV besides ball games, sitcoms and Geraldo, you know why the unused parts of our country are unused. They're remote and do not offer an acceptable quality of life. Most of 'em are really lousy places to live.

The fact is that immigrants, with very few exceptions, head for our cities and, almost all of them being poor, they increase the slum areas of our cities. They contribute substantially to the crime rates, and their kids often get involved with street gangs. Just what we need — a steady source of more unskilled poor, growing slums, and more street gangs. More drug problems. More crime. More law enforcement expenses, even more clogged courts, and a growing need for ever more prisons. Remember, every inmate costs us about \$30,000 a year to keep in prison, and that money comes out of your paycheck. And mine, dammit.

In my lifetime, the population of the country has about doubled. I've seen New York City gradually expand out to Long Island, where there used to be farms and now it's paved over with shopping malls and zillions of homes. The small towns of northern New Jersey have grown together, and the East Coast is basically one big city, reaching from New Hampshire to Washington DC. Megalopolis, we call it.

The immigrants are not moving to Idaho, Montana, or the Dakotas, they're going directly to where the money is, our cities. Hey, have you looked at a map of Southern California lately? Or Phoenix, Dallas, and Miami? How about Denver?

If we continue our almost open border policy, our city slums are going to continue to grow, pushing the more skilled people into what used to be the suburbs,

and our spacious plains are going to continue to be as spacious as they were a hundred years ago. And, unless we force our politicians to wise up on their drug policies, we'll soon have two million people in prison instead of 1.2 million. Instead of our pockets being picked by Congress for \$33 billion a year to keep these guys locked up, it'll be \$60 billion.

Okay, how about all those unskilled jobs? Without a continuing source (mainly illegal immigrants) of unskilled workers, the shortage of people to fill these jobs would force the wages for this work upward, so it's the large number of unskilled workers that keeps wages low.

The fast food restaurants, for instance, which are so automated that they require a minimum of skilled workers, would start having to pay more and, as has happened in some areas where there is a serious low-skilled worker supply, start hiring seniors and providing them with some additional revenues to make the lives of those trying to get along on their Social Security payments a little less miserable.

Without immigrants, our population would be fairly stable. As people make more money they tend to have smaller families, so our population could eventually shrink some.

We've seen the continual loss of low-wage jobs as companies move these jobs to lower-wage countries. We've also seen a large loss of middle-class jobs through downsizing, made possible by low cost computer systems and improved communications systems. We really don't have a need for more unskilled workers. Our need is more for higher skilled and better educated workers. Don't get me started on our school system.

Maybe it's time to start closing the borders.

Advertising Basics

Unless you're working for a large company, the government or teaching, none of which will ever make you much money or give you much freedom, an understanding of the basics of advertising is going to be of value to you, so you'd better either cut this out and save it, or make a copy. Well, I threatened to write about this — and was forced into it by a letter from Douglas Diss VK2TDD of Tamworth, New South Wales. How could I disappoint an Aussie?

The easy part of marketing a new product is designing the product. Since most of you are coming at this from the engineering end, you tend to think that it's the product that's the most important, not the marketing. Wrongo. I've seen many superbly designed products bite the dust through lousy advertising, promotion and marketing.

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CIRCLE 241 ON READER SERVICE CARD

These days, most ham products are being sold by mail order. In the old days, before the ARRL closed down 85% of the ham stores around the country, most ham products were sold through these stores — and they were just about everywhere. When I started *73* magazine in 1960, I soon had over 850 ham stores selling the magazine over their counters.

So, unless you are starting a really big company, you'll probably hire someone to do your advertising. Unfortunately, the odds are that this person isn't going to know squat about how to do it. They don't teach this in schools, you know. You have to learn by doing, but unless the person has had his own small business and learned the expensive, hard way, he isn't going to know what he's doing — a fact which I see clearly demonstrated as I flip through the ham magazine pages. Pathetic.

When I started my first company, the first thing I did was take a course in advertising. It was put on by the Advertising Club of New York and was superb. Since then, I've attended endless ad workshops and lectures, and I've been doing that for almost 50 years. Lately it's been more me lecturing.

Now, before I get into how to write

ads, let's go into how you should pick your ad medium. Advertising is going to be one of your major expenses, so you have to go about choosing your media carefully. Heck, you wouldn't buy supplies or parts from the first salesman that came along, would you? No, you'd ask for bids and look for suppliers who can provide the quality you need at the best price you can find.

If you start getting bids on your sales brochures or instruction manuals you'll be amazed at how wide a variation you'll find in bids. Some printers charge double or even triple what others do, and for the same quality of work.

Now, with advertising, you'll find yourself in a never-never land of unsubstantiated circulation and demographic claims. It's a jungle out there. Don't believe anyone. Period.

Here's my advice. I can put it in four words. Test, test, test, test.

If a magazine looks like it will reach your potential customers, rein in your ego and run a small ad. When you finally get around to reading books on advertising, and there are some good ones, you'll find that there is little correlation between ad size and sales response. Eventually you'll take whatever space you need to tell your sales story, but at first what you want to find out is which magazines are going to do the best job of selling your product. Make sense?

So, you run a small ad and keep track of the response. You want to know how many potential customers send for more information, how many order from the ad, and how many of those who get your sales literature eventually buy. As a simple rule of thumb, if an ad doesn't bring back at least 10 times the cost of the ad in sales, either your ad stinks or you're in the wrong magazine.

You may have a gangbusters product, but that doesn't mean that you're going to get much action from your first, or second, ad. Hardly anything is

going to happen at first. That's the way it is.

When I started my Radio Bookshop in 1958, I ran a half-page ad for several books. I got four crummy orders. I thought I must have made a big mistake getting into that business. But, magazine deadlines being what they are, I'd had to agree to run the ad again before I'd found out what a turkey I had. The second ad pulled about 40 orders. Hmmm. So I continued advertising the same books. By the end of a year that ad was selling about 400 books a month! If I'd gone by the four sales the first month I'd have screwed up big time. As it is, here I am 41 years later and Radio Bookshop is still perking along as a viable business.

I'm not going to turn this into a book, so when I think of it I'll explain more. The sorry fact is that somewhere around 90% of the ads I see in the ham rags are in desperate need of someone who understands how to advertise. These guys are throwing away sales by the ton.

If you'd like to get a head start on this you could do worse than read a couple of books by Joe Sugarman W9IQO, one of the most successful mail order advertisers in history. There's his *Marketing Secrets of a Mail Order Maverick*, and his *Advertising Secrets of the Written Word*. Both books are worth their weight in palladium to you — and they're heavy! Damned heavy. They're both \$40, and a steal. You can get them from Joe direct: JS&A, 3350 Palms Center Drive, Las Vegas NV 89103, or by phone at (800) 323-6400, FAX (702) 597-2002. And please say hello to Joe for me — he's been a good friend for many years.

LSD

An uptight reader (ALØFT) got all upset over my mentioning that I tried LSD back in 1960. A bad example for my kiddie readers (if there are any). Well, I didn't go into detail about it, not thinking anyone would be much interested. I was fortunate in

that my guide through the experience was a ham who had been a good friend for over 10 years, and who had worked for me a few years before. He'd gone on to work with Timothy Leary, so he really knew what he was doing. He's still a good friend and we visit through the phone and AOL instant messaging.

Having been through it, I'd hate to think how terrible the experience could be without a first-rate guide. Somehow the LSD amplified my senses. Enormously. My senses of taste, hearing, feeling and seeing were multiplied a thousand times. It was incredible! It showed me what my body is capable of. I just wish I didn't have to take a drug to experience it. If I'd had any negative thoughts I suspect they, too, would have been amplified and could easily have caused me harm.

The experience was worthwhile for me, but my approach was as a researcher and scientist rather than someone out for a joyride. I did it, I'm glad, but I don't recommend it for others, and I'm not going to do it again. Been there, done that.

The same goes for pot. I had a fabulous pot experience back in 1948, so I know what it's like. I did alcohol in 1945, when I was in the navy and on liberty in San Francisco with my shipmates. We got drunk and had a great time doing it. We still talk about those nights at the Shamrock Bar at reunions in Mobile, where our old boat is on display for the public.

For some reason I don't seem to have an addictive bent, except maybe when it comes to Haägen Dasz coffee ice cream and crossword puzzles. So I like to try things and learn about them, but I don't get hooked.

When I travel I much prefer going to new places and seeing new things and people. A trip to Moscow? Nah, been there, done that. Paris? Hum.

It's the same with ham radio. I've done repeaters, RTTY, slow-scan, packet, DXing, DXpeditions, 10 GHz, moon-

bounce, satellites, all of the contests, aurora bounce, building stuff, rag chewing, and so on. Been there, done that. So what's new for me to do? When personal computers were first developed, I got into that. In a very big way. Done that. When compact discs came along a little later, I did that. Big way again. Done that.

Flying? Done that. Sports car rallies? Done that. World travel? Done that.

So what's exciting for me now? My work with the New Hampshire Economic Development Commission a few years ago got me focused on investigating our school system, our government, the drug war, the war on poverty, the welfare mess, our health care system, and so on. Gradually the pieces began to fit together and I began to understand how all of us have been sold one hell of a crock of ... er ... baloney when it comes to our schools, our medical establishment, our jobs, our money, and our whole system of government and business.

Once I discovered how unbelievably dishonest everything really is, I wanted to help as many people as I could to stop being sucked in and free them to be able to make all the money they want, to regain their health and keep it, and then to help fix our major social problems. I guess I should apologize for being a Johnny One-Note on this subject, but that's the way I was when I got involved with building ham equipment, RTTY, then with repeaters, and again with personal computers, and then, still again, with compact discs. Now, I'm at it again, fighting your endless excuses and world class prize-winning procrastination. I've found a path through the jungle and I'm waving for you to follow. Well, I'm hoping you will.

We have what could be a really neat country. We have, mostly through our own carelessness, allowed politicians to take our money and use it to limit our freedoms. We've

allowed our states to confiscate our homes and property with what they call property taxes. That's rent, and if you don't pay the rent you'll find out that you don't actually own your home. We've allowed them to screw up our schools, the medical system, the courts, prisons, and so on. It's one hell of a mess and all unnecessary. And they've done it all with the money they've taken from you and me.

Foxhunting

The Garden City ARC newsletter mentioned that they are running foxhunts once a month. I wonder how many clubs are doing this? I sure don't see much of a sign of it in the club newsletters I'm getting. Yes, I read the newsletters.

How about some letters or articles for 73 on foxhunting? Maybe you've had some interesting adventures? Found some unusual places to hide the fox? Are your members doing all their hunting from cars or are you making them get out and walk? I think the US is the only country where much of the foxhunting is done in cars. Hams in most countries are out there on foot. It's good exercise for some of you pork-bellied hams.

What equipment are the winners using?

Have you considered doing some videos of your hunts? I'd love to see some. I'll never forget a Philmont film which showed them hiding the fox in the women's toilet of a police station, with the coax going out the window, under a lake, to the antenna mounted under a little bridge. The hunting cars drove over the bridge, with their antennas twirling to keep on target.

Ham clubs are desperate for entertainment, so if you can whup together some fun foxhunting material and make copies available, I think you'll get a lot of good PR for the club. You might even find other local clubs interested in seeing it too, like Lions, Elks, Chambers of Commerce, Rotary, etc. Heaven knows, amateur radio can use the publicity.

Lost Memories

My aunt is in her late 90s, and since my uncle died last year she hasn't been functioning well. I tried for several years to get her to sit down and start writing about how things were in our home town when she was young. It was a different world then, and to many of us, a fascinating one. So it's too late to get her to write now ... a lost treasure.

It wasn't until I started publishing my first magazine that I did much writing. Now I write every day and I enjoy it. Heck, I love it! There's so much to write about that I'll never run out. And no snide comments about my repeating myself. Sure, I do that, but mainly because when I wrote it the first (or 10th) time, I could see that it didn't stick. Secondly, because I write for several publications, sometimes I forget what I've written *what* for.

Okay, that's enough about me. The person you are most interested in is you. Now, how can I get you to start writing? It gets easier and more fun the more you do it. What can you write about? Hell's bells, there must be something by now that you know more about than most other people. Or some adventure you've had that others would be interested in reading about.

Or, how about writing about the more exciting times you've had in amateur radio. It might be something I'd find interesting enough to publish. And I guarantee that your club newsletter editor will be tickled to get some help. I get dozens of club newsletters every month. Yes, I read 'em. And most, sad to say, are deadly snores. I keep hoping to read some stories about interesting foxhunts, about adventures members have had, DXpeditions, and so on.

Oh, you haven't been on a DXpedition? Lordy, what does it take to blast you out of that rut? I went on my first DXpedition 40 years ago and I still remember every minute of it. Wow, that was an exciting

trip! We almost got killed ... twice! We went to Navassa Island, down between Haiti and Jamaica. It's a little desert island (about three square miles) with high cliffs all around, so even getting onto the island was a challenge. I was the licensee and got the call KC4AF. Some chap in Alabama has the call, now that they've changed the callsign system.

Then there was the all-ham African hunting safari in northern Kenya. That was another trip that none of us who were there will ever forget one minute of. Robby 5Z4ERR talked me into organizing it during our contacts on 20m.

Nowadays I write mostly about things I've researched. Have you bothered to get off your duff and make it your business to learn about something? What does it take to motivate you? It just isn't all that difficult to learn more about something than 99.9% of the public knows.

If you can't write from your experience or something you've learned about, how about trying poetry? We've about zero ham poets. I love poetry, so let's see what you can do. And please make it scan, okay? Golly, they taught us how to make poetry scan in the 3rd grade. Do they still teach that? And they taught us to read music about the same time, and how to tell good paintings from bad. I'll bet they don't teach that anymore. That education did well for me when I got interested in photography, and then really paid off when I became a TV cameraman. Soon I was made the chief cameraman at WPIX in New York and was doing one-hour variety shows all with my one camera.

Instead of using your computer to play games or wasting time rattling around the Internet, get into your word processor and let's see what emerges. Write for yourself. Write for me. Write for your club newsletter. Write to friends. If you're in business, then how about a newsletter for your customers to build their awareness of your products or services?

Just writing about this was fun for me. It brought back memories of the hunting safari, the time we almost got killed by the Somalian bandits ... and the ham European trip I organized on which we had an audience with the Pope. And making 10 GHz contacts from the top of Mt. Monadnock ... once in a dense fog while contacting New York, and several times freezing my fingers in the middle of the night while tuning for WA1KPS in Vermont or Connecticut. Or working all continents one morning in a half-hour when the skip was perfect. Working slow-scan TV from Jordan and from Navassa (on my second trip there as KC4DX). DXing from Swaziland, Nepal and other weird places. Well, these might not be worth reading about in 73, but such memories would be great for your club newsletter ... so how about writing about your ham adventures?

The Threat

I called David Jacobs to ask some questions about his book, *The Threat*, with the subtitle, "The Secret Agenda: What the Aliens Really Want ... and How They Plan to Get It," ISBN 0-684-81484-6, Simon & Schuster, 288 pages, 1998. He was too busy to answer many questions, and I had a bunch. He's a history professor at Temple University and had a stack of papers to grade before taking off for somewhere the next morning to give a talk. So I made a list of my questions and snailed 'em. Yeah, when I enjoy a book I often call or write the author — and that frequently leads to some fascinating conversations and new friends.

Dr. Jacobs has been teaching a regularly scheduled course on UFOs for 20 years and has hypnotically debriefed hundreds of abductees in an effort to find out what the aliens' program is all about. Yes, there are thousands of abductees, but very few of them remember anything about their abductions unless put under deep hypnosis. He found

Continued on page 64

PROPAGATION

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Normally, a disturbed ionosphere would seem to be all bad, but such is not always the case. When disappearing filaments, coronal holes, flares, and the like appear on the solar disc facing the Earth, we can expect propagation disturbances—sometimes so severe that the HF bands virtually “shut down” because signals are absorbed by the over-stimulated ionosphere.

However, once the effects begin to subside in a day or two, the ionosphere could be excellent for radio propagation on all HF bands. So, when you see a P (poor) or VP (very poor) on the calendar, be sure to check radio propagation on the higher HF bands a day or two after, even if the chart shows P-F (poor to fair) or (F) fair, because that is when the ionosphere recovers and is likely to be at its best.

This month's chart shows that the best days are likely to be March 6th, 7th, and 13th-15th, while the worst days are likely to be the 1st, 3rd, 18th, 25th, 26th, and 31st.

Band-by-band forecast

10-12 meters

Expect morning F2 path openings to Europe and Africa; on (G) days, midday path openings to South and Central America, and F2 path openings to Japan, Australasia and the Pacific during the afternoon at your location. DX moves west as the day progresses.

15-17 meters

Expect good DX paths to most areas of the world, with excellent openings from the northern hemisphere to Africa, South America, and the Pacific during hours of daylight and peaking during local afternoon. Good short-skip communication over 1000 miles will occur on (G) days.

20 meters

Very good DX openings to all areas of the world from sunrise through the early darkness hours. The signals will peak an hour or two after sunrise at your location, and again during the afternoon. Short skip beyond about 700 miles will occur during daytime hours.

30-40 meters

Good worldwide DX openings from sunset to sunrise should occur on (G) days. Noise levels (static) will be higher as Spring thunderstorms occur, and can depress audibility. Short skip between 100 and 1000 miles will occur during daylight hours, and at distances beyond 1000 miles at night.

80-160 meters

On 80, DX to the southern hemisphere and to Europe should occur after dark and during sunrise hours—limited, of course, by static noise levels. Daytime short skip to about 350 miles, and beyond 500 miles

March 1999

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

after dark, will prevail on (G) days. On 160, no daytime propagation will occur due to ionospheric absorption of signals, but after dark, peaking around midnight and again during the predawn hours, you should be able to work many areas of the world. Short skip from 1000-2000 miles or so will prevail during the nighttime hours ... but, as always, it will be limited by high static levels from thunderstorm activity.

Don't forget to work the *darkness path* (± 30 minutes around local sunset).

Check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch. Good hunting! W1XU/7. **73**

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15/17											15/17
ARGENTINA	20	20	30/40							10/12	10/12	15/17
AUSTRALIA	15/17				30/40	30/40	20	20			20	15/17
CANAL ZONE	20	30/40	30/40				20	20		10/12	10/12	20
ENGLAND	20		30/40	30/40				10/12	15/17	15/17	20	20
HAWAII	15/17			80	30/40	30/40	30/40				10/12	15/17
INDIA												
JAPAN	20						20	20	15/17	15/17	15/17	20
MEXICO	20/30	30/40	30/40				20	20		15/17	15/17	30/40
PHILIPPINES							17/20	17/20				
PUERTO RICO	30/40	40/20	40/80	40/80	40/80	40/20		17/20	10/12	10/12	15/17	15/17
RUSSIA (C.I.S.)	30/40						20/30	17/20	17/40			
SOUTH AFRICA			20/30					10/12	10/12	17/20	17/20	30/40
WEST COAST												

CENTRAL UNITED STATES TO:

ALASKA	14/20	17/20	17/20		30/40	30/40				17/20	15/17	15/17
ARGENTINA	17/20	30/40									10/12	15/17
AUSTRALIA					30/40	10/12	17/20	17/20				15/17
CANAL ZONE	20	30		30/40	30/40			17/20	10/12	10/12	15/17	17/20
ENGLAND			40/80		30/40	30/40			15/17	17/20	20	
HAWAII	15/17	20/30			40/80	40/80	40/80	20/30			10/12	12/15
INDIA								20/30	17/20			
JAPAN	15/17	17/20				20/40	40/80	17/20				15/17
MEXICO	20	30		30/40	30/40			17/20	10/12	17/20	20	
PHILIPPINES	17/20	30/40					17/20	20/30				15/17
PUERTO RICO	20	30		30/40	30/40			17/20	10/12	15/17	20	
RUSSIA (C.I.S.)			30/40						15/17	17/20	20	
SOUTH AFRICA	17/20								10/12	17/20		17/20

WESTERN UNITED STATES TO:

ALASKA	15/17	15/17	17/20			30/40	30/40					
ARGENTINA	10/12	15/17	20	30				30			15/17	10/12
AUSTRALIA	15/17	17/20						20/40				10/12
CANAL ZONE	17/20	20/30	20/30	30/40	30/40	80			15/17	10/12	10/12	17/20
ENGLAND				30/40	40/80				15/17	15/17	17/20	20
HAWAII	15/17	20/30						20/30	20/30		10/12	10/12
INDIA	17/20	20							17/20			
JAPAN	15/17	15/17	17/20			30/40	30/40					
MEXICO	17/20	20/30	20/30	30/40	30/40	30			15/17	10/12	10/12	17/20
PHILIPPINES	15/17	17/20	20	20		30/40			17/20	17/20		
PUERTO RICO	17/20	20/30	20/30	30/40	30/40	80			15/17	10/12	10/12	17/20
RUSSIA (C.I.S.)				30/40					20	15/17	20	17/20
SOUTH AFRICA	20								17/20	15/17	17/20	20
EAST COAST												

Say You Saw It In 73!

Here are some of the books Wayne has written. Some can change your life, if you'll let them. If the idea of being healthy, wealthy and wise is of interest to you, start reading. Yes, you can be all that, but only when you know the secrets which Wayne has spent a lifetime uncovering.

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some very difficult changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. \$5 (H)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (M)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (B)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (C)

The Bioelectrifier Handbook: This explains how to build or buy a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, patented, and then hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (A)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronauts' biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. \$5 (D)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-

come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before March 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, or even Y2K? I'm getting ready, how about you? \$5 (E)

Wayne's Submarine Adventures in WWII: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? There are some very funny stories. If you're near Mobile, please visit the Drum. \$5 (S)

Improving State Government: Here are 24 ways that almost any state government can cut expenses enormously, while providing far better services. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (L)

Travel Diaries: You can travel amazingly inexpensively — once you know the ropes. Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under \$1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. \$5 (T)

Wayne's Caribbean Adventures: More budget travel stories — where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me so busy with parties I didn't have time to dive. \$5 (U)

Radio Bookshop

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. \$15 (Y)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngsters' IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (Z)

Reprints of My Editorials from 73.

Grist I: 50 of my best non-ham oriented editorials from before 1997. \$5 (F)

Grist II: 50 more choice non-ham editorials from before 1997. \$5 (G)

1997 Editorials: 240 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. In three \$5 volumes. \$15 (O)

1999 Jan-Aug Editorials: 188 pages in two \$5 volumes. Bringing you up to date. \$10 (P)

Ham-to-Ham: 45 of my ham-oriented editorials. These will help you bone up on ham history. Great stuff for ham club newsletter filler. Yes, of course these are controversial. \$5 (Q)

\$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. \$43 (V)

One Hour CW: Using this sneaky method even you can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. \$5. (CW)

Code Tape (T5): This tape will teach you the letters, numbers and punctua-

tion you need to know if you are going on to learn the code at 13 wpm or 20 wpm. \$5 (T5)

Code Tape (T13): Once you know the code for the letters (T5) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. \$5 (T13)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. \$5 (T20)

Code Tape (T25): Same deal. It doesn't take any longer to handle 25 wpm as it does 13. Or use the ARRL system & take six months. \$5 (T25)

Wayne Talks at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. \$5 (W1)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. \$5 (W2)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (R1)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs — such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. \$25 (R2)

Elemental Energy Subscription: I predict this is going to be the largest industry in the world in about 20-30 years. They laughed at me when I predicted the personal computer growth in 1975. PCs are now the third largest industry in the world. The elemental energy ground floor is still wide open, but then that might mean giving up watching ball games and talk shows on the boob tube. \$30 for six issues. (EE). A sample issue is \$10.

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. \$5 (K)

.....Wayne

Radio Bookshop

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Name _____ Call _____ Phone _____

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City-State-Zip _____

Items ordered - use letters or copy page and mark books wanted. Order total plus \$3 s/h in US,\$6Can. US\$ _____

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Yes! Put me down for a year of 73 for only \$25 (a steal). Canada US\$32.

Foreign US\$44 by sea, US\$67 by air. Whew!

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger! The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

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

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

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

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the June 1999 classified ad section is April 10, 1999.

Great New Reference Manual with over 100 pgs of P/S, transistor, radio, op-amp, antenna designs, coil winding tables, etc. See details at [www.ohio.net/~rtormet/index.htm] or send check or M.O. for \$19.95 + \$2.00 P&H to RMT Engineering, 6863 Buffham Rd., Seville OH 44273. **BNB202**

Electricity, Magnetism, Gravity, The Big Bang. New explanation of basic forces of nature in this 91-page book covering early scientific theories and exploring latest controversial conclusions on their relationship to a unified field theory. To order, send check or money order for \$16.95 to: American Science Innovations, PO Box 155, Clarington OH 43915. Web site for other products [http://www.asi_2000.com]. **BNB100**

ALL HAM RV TOUR of the British Isles now forming for mid-September to mid-October, 2000. \$5150 per person double occupancy. For info, E-mail [hjzebra@aol.com]— or send SASE to Richard K. Glover W4AOP, PO Box 407, Solebury, PA 18963. See last October 73 Magazine for feature article on the fun we had last year in VK- and ZL-lands! **BNB250**

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

MANUALS for Hallicrafters, Hammarlund, National, Gonset, WRL, Knight, Lafayette, Johnson, EICO, Ameco, Drake, Harvey-Wells, Morrow and most 1930 to 1970. Alvin J Bernard, PO Box 690098, Orlando, FL 32869-0098. Tel 407-351-5536. **BNB275**

TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. \$12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wlt.com]. **BNB113**

ASTRON power supply, brand-new w/warranty, RS20M \$99, RS35M \$145, RS50M \$209, RS70M \$249. **AVT.** Call for other models. **(626) 286-0118.** **BNB411**

WANTED: Radio Shack HTX 404 HT, charger, 6 AA battery holder. M. Zeiders, 7348 Carnival Ln., New Port Richey, FL 34653. **BNB224**

NEVER SAY DIE continued from page 61

that most of them started being abducted when children.

So what did Dr. Jacobs find out? You don't want to know.

Well, I'll give you a hint. The abductions have entirely to do with creating a breed of alien-human hybrids with which they plan to repopulate our world. They've been going to lengths to keep this program secret — which obviously they have to do in order not to have the rest of us in a panic.

How can we combat aliens who can both read our minds and control us so thoroughly that we don't even know anything has happened? That's enough to scare anyone.

Anyway, Jacobs has pieced together hints that the aliens have given here and there to abductees, but the memories of which hadn't been wiped out beyond the ability of deep hypnosis to retrieve.

So when are the aliens going to replace most of us with hybrids? The target seems to be 1999! Of course there's always the chance that some of the other aliens may not let the greys get away with this scheme. One thing is for sure — we'll soon see. How reliable is Jacobs' information? A Roper survey showed that about 2% of Americans have been abducted, so a breeding program with five million donors for breeding hybrids could, after a few years, provide them with one heck of an army. Jacobs gave the most credibility to the stories of abductees who were with other abductees (whom they didn't know) during their experiences and both reported the same events.

As a known troublemaker and iconoclast, I'll probably be one of the first to be eliminated. This could make the 175 million people that we and our governments have killed so far in this century amount to nothing! **73**

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. check it out at [www.ohio.net/~rtormet/index.htm]—over 100 pages of circuits, tables, RF design information, sources, etc. **BNB530**

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