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JULY 2003
ISSUE #512
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Specifications subject to change without notice or obligation. *Digital communications require at least two similarly equipped transceivers. Digital mode may not be legal in some countries. See FAQ on digital at www.alinco.com. Products intended for use by properly licensed operators. Permits required for MARS use. Specifictions subject to change without notice or obligation.

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FEATURES

REVIEW

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QRX . . .

Smart Guy, Eh?

Could you pass a 1940 test? Here are a few questions and answers from one.

Ques: Why is full-wave rectification generally preferable to half-wave in a power supply?

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SS-18	15	18	1⅜ x 6 x 9	3.6
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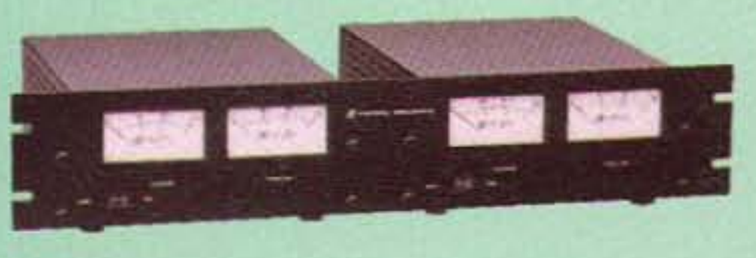
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅝	6.5
SRM-30M	25	30	3½ x 19 x 9⅝	7.0



MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30-2	25	30	3½ x 19 x 9⅝	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅝	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅝	11.0

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MODEL SS-10EFJ-98

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GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
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UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
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300 Channels • 10 banks • Built-in CTCSS • S Meter

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Frequency Coverage: 29.000-54.000 MHz., 108.000-174 MHz., 216.000-512.000 MHz., 806.000-823.995 MHz., 849.0125-868.995 MHz., 894.0125-956.000 MHz.

The Bearcat 895XLT is superb for intercepting trunked analog communications transmissions with features like TurboScan™ to search VHF channels at 100 steps per second. This base and mobile scanner is also ideal for intelligence professionals because it has a Signal Strength Meter, RS232C Port to allow computer-control of your scanner via optional hardware and 30 trunking channel indicator annunciators to show you real-time trunking activity for an entire trunking system. Other features include Auto Store - Automatically stores all active frequencies within the specified bank(s). Auto Recording - Lets you record channel activity from the scanner onto a tape recorder. CTCSS Tone Board (Continuous Tone Control Squelch System) allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning pleasure, order the following optional accessories: **PS001** Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter $14.95; **PS002** DC power cord - enables permanent operation from your vehicle fuse box $14.95; **MB001** Mobile mounting bracket $14.95; **EX711** External speaker with mounting bracket & 10 feet of cable with plug attached $19.95. **CAT895** Computer serial cable $29.95. The BC895XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, EDACS, ESAS or LTR systems.

Bearcat® 245XLT Trunk Tracker II

Mfg. suggested list price $429.95/**CEI price $189.95**

300 Channels • 10 banks • Trunk Scan and Scan Lists
Trunk Lockout • Trunk Delay • Cloning Capability
10 Priority Channels • Programmed Service Search
Size: 2 1/2" Wide x 1 3/4" Deep x 6" High

Frequency Coverage:
29.000-54,000 MHz., 108-174 MHz., 406-512 MHz., 806-823.995 MHz., 849.0125-868.995 MHz., 894.0125-956.000 MHz.

Our Bearcat TrunkTracker BC245XLT is the world's first scanner designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS and EDACS® analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. Our scanner offers many new benefits such as Multi-Track - Track more than one trunking system at a time and scan conventional and trunked systems at the same time. 300 Channels - Program one frequency into each channel. 12 Bands, 10 Banks - Includes 12 bands, with aircraft and 800 MHz. 10 banks with 30 channels each are useful for storing similar frequencies to maintain faster scanning cycles or for storing all the frequencies of a trunked system. Smart Scanner - Automatically program your BC245XLT with all the frequencies and trunking talk groups for your local area by accessing the Bearcat national database with your PC. If you do not have a PC simply use an external modem. Turbo Search - Increases the search speed to 300 steps per second when monitoring frequency bands with 5 KHz. steps. 10 Priority Channels - You can assign one priority channel in each bank. Assigning a priority channel allows you to keep track of activity on your most important channels while monitoring other channels for transmissions. Preprogrammed Service (SVC) Search - Allows you to toggle through preprogrammed police, fire/emergency, railroad, aircraft, marine, and weather frequencies. Unique Data Skip - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. Memory Backup - If the battery completely discharges or if power is disconnected, the frequencies programmed in your scanner are retained in memory. Manual Channel Access - Go directly to any channel. LCD Back Light - An LCD light remains on for 15 seconds when the back light key is pressed. Autolight - Automatically turns the backlight on when your scanner stops on a transmission. Battery Save - In manual mode, the BC245XLT automatically reduces its power requirements to extend the battery's charge. Attenuator - Reduces the signal strength to help prevent signal overload. The BC245XLT also works as a conventional scanner. Now it's easy to continuously monitor many radio conversations even though the message is switching frequencies. The BC245XLT comes with AC adapter, one rechargeable long life ni-cad battery pack, belt clip, flexible rubber antenna, earphone, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, ESAS or LTR systems. Hear more action on your radio scanner today. Order on-line at www.usascan.com for quick delivery. For maximum scanning satisfaction, control your Bearcat 245XLT from your computer running Windows. Order Scancat Gold for Windows, part number **SGFW** for $99.95 or the surveillance enhanced version with audio recording part number **SGFWSE** for $159.95.

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Bearcat 278CLT 100 ch. AM/FM/SAME WX alert scanner	$139.95
Bearcat 250D 1,000 ch. Trunktracker III handheld scanner	$339.95
Bearcat 245XLT 300 ch. Trunktracker II handheld scanner	$189.95
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1,000 Channels • 20 banks • 50 Select Scan Channels
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Frequency Coverage:
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The AOR AR8200 Mark IIB is the ideal handheld radio scanner for communications professionals. It features all mode receive: WFM, NFM, SFM (Super Narrow FM), WAM, AM, NAM (wide, standard, narrow AM), USB, LSB & CW. Super narrow FM plus Wide and Narrow AM in addition to the standard modes. The AR8200 also has a versatile multifunctional band scope with save trace facility, twin frequency readout with bar signal meter, battery save feature with battery low legend, separate controls for volume and squelch, arrow four way side rocker with separate main tuning dial, user selectable keypad beep/illumination and LCD contrast, write protect and keypad lock, programmable scan and search including LINK, FREE, DELAY, AUDIO, LEVEL, MODE, computer socket fitted for control, clone and record, Flash-ROM no battery required memory, true carrier reinsertion in SSB modes, RF preselection of mid VHF bands, Detachable MW bar aerial. Tuning steps are programmable in multiples of 50 Hz in all modes, 8.33 KHz airband step correctly supported, Step-adjust, frequency offset, AFC, Noise limited & attenuator, Wide and Narrow AM in addition to the standard modes. For maximum scanning pleasure, you can add one of the following optional slot cards to this scanner: **CT8200** CTCSS squelch & search decoder $89.95; **EM8200** External 4,000 channel backup memory, 160 search banks. $69.95; **RU8200** about 20 seconds chip based recording and playback $69.95; **TE8200** 256 step tone eliminator $59.95. In addition, two leads are available for use with the option socket. **CC8200A** personal computer control lead $109.95; **CR8200** tape recording lead $59.95. Includes 4 1,000 mAh AA ni-cad batteries, charger, cigarette lighter adapter, whip aerial, MW bar antenna, belt hook, strap and one year limited AOR warranty. For fastest delivery, enter your order on-line at http://www.usascan.com.

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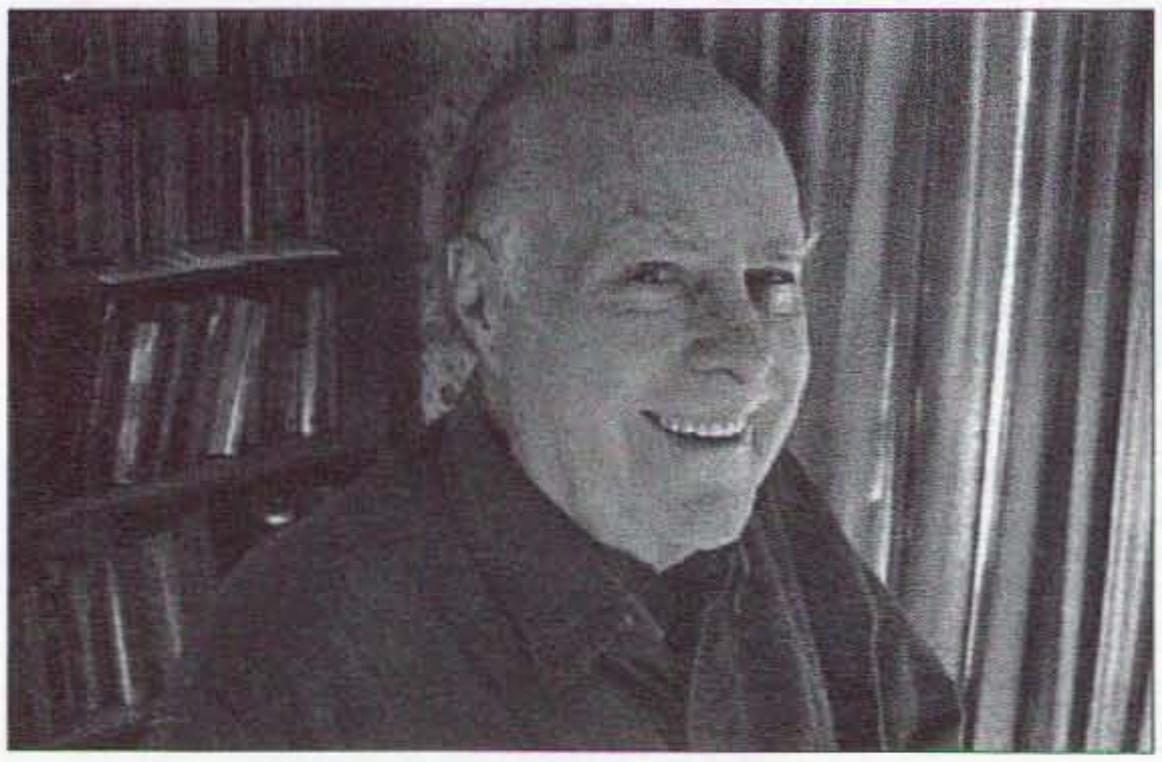

Wise Up & Beat the Odds

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New Blood

Here we are with our hobby gradually fading away … with the Silent Key list longer than the new licenses list. We need to get our act together and get some youngsters interested. (a) What have we got to offer that's more fun than the Internet? (b) If we do come up with a message, how can we get it to the youngsters? Please advise.

We'd better hurry because the Internet is offering more and more action … and we aren't.

The Feynman Syndrome

If you haven't yet read *Surely You're Joking, Mr. Feynman — Adventures of a Curious Character,* then you've got a wonderful surprise in store for you. Nova did a great program on Nobel prize–winning physicist Feynman. There's even a CD out of Feynman telling about his "safecracking" days at Los Alamos. Spring the $10 for the book.

What he did at Los Alamos is discover how easily the file cabinets locking the top-secret atom bomb research files could be broken into. He tried to get the bureaucrats running the place to get better locks by showing them how easy it was for him to get into the file cabinets. The bureaucratic response was not to improve the locks, but to prohibit Feynman from getting near the files.

Alas, that syndrome came to mind when I was thinking about the problems facing RPI (Rensselaer Polytechnic Institute). I was such an itch about the need to improve their School of Management and make its MBA program more competitive with other schools that Bob Hawkins, the dean, finally threw me off the School of Management Board of Overseers. And since I'm a similar pest when it comes to the rest of RPI, I wouldn't have been surprised if my RPI Council membership had been terminated … instead, the RPI Council was terminated.

The problem is mostly me, I admit it. But I don't have a clue as to what I can do about it. Most people see things going wrong and are either pliant or politick enough to keep quiet and let things be. Through either some defective DNA inherited from a smoking and drinking father, which was guaranteed to cause genetic mischief anyway, or through some dreadful failure in my education, I've turned out to be one of those bothersome people who not only call a spade a spade, but are dumb enough to speak up and say so out loud. The king has no damned clothes.

For instance, a few years ago New Hampshire Governor Judd Gregg asked me to serve on an Economic Development Commission. The problem was that our state had been hit the worst of all 50 states by the recession and the governor and the legislature were looking for some guidance on both short- and long-range plans for solving the problem.

There were 32 of us appointed to the commission … about half businesspeople. By nine months later over half had dropped out, and the commission faded away without ever even submitting a report. It did not fade silently away because I was raising hell with the commission members every inch of the way.

Early on, I saw that the meetings weren't getting anywhere. There was no way for 32 people to discuss the problems facing New Hampshire and come up with proposed solutions. The meetings were a shambles, so I decided to get as much information from the meetings as I could, then do my homework by reading the recommended books and interviewing experts. I put all the information I discovered together and started sending the commission members reports on what I'd found, along with ideas for solving the problems.

I pointed out exactly why New Hampshire had been hit so hard by the recession and why, unless some major changes were made by the legislature, we weren't apt to be able to recover quickly. I looked into the rising unemployment and came up with some proposals for creating thousands of new jobs. After hearing testimony from the presidents of our major colleges and other key educators, I pointed out that if New Hampshire was going to produce the technically educated workforce the 21st century would demand, we'd have to make some big changes in our school system.

A few books and several file drawers of reports from educators later, I had a good grasp of what needed to be changed to improve our school system and proposed this in my reports.

I researched crime, drugs, our prison system, welfare, health care, and so on, and came up with creative solutions to our problems in my reports. The response from the commission members? Many of them didn't "have time" to read my reports. Others were supportive, but not enough to actually get anything changed.

Does any of this resonate with your business, or what you see going on with our government? If so, do your homework, propose changes and stick to your guns.

As George Bernard Shaw said, "The reasonable man adapts himself to the world, the unreasonable one insists on trying to adapt the world to himself. Therefore, all progress depends on the unreasonable man."

Remote Viewing

Whazzit, remote viewing? It's being able to see something in your mind that's somewhere else or even sometime else. If you've been listening to the Coast to Coast AM (C2C) show you've frequently heard Ed Dames (a.k.a. Ed Dooms for his endless predictions of coming disasters), who sells courses in remote viewing.

As I mentioned last month, during his most recent appearance on the show he predicted

that Kim Song Il would set off a nuke in the DMZ in order to blow a few thousand American troops to smithereens. Oh, and he confirmed that we'll be having a pole shift soon, which will wipe out much of humanity. Well, heck, maybe it's time for a fresh start. Things are getting onto hand when we have two-way radio wrist watches à la Dick Tracy, global positioning watches, and so on. My new watch has a picture of Krusty the Clown and says, "Hey kids, it's story time!" when I push a button. Well, I got tired of my calculator watch that corrected itself every morning via a signal from Colorado. And the two-way radio watches are still a bit bulky for other than shopping trips. They're the only way I can find Sherry once we get into a store. Well, you know how huge some supermarkets, BJs, and Borders have gotten.

Oh, remote viewing. Yes. Sherry woke up one night when Ed Dames was explaining about remote viewing. When he mentioned that it could be used to predict lottery numbers it was only a matter of hours before Sherry had signed us up for a weekend remote viewing class in Las Vegas, complete with airline, hotel, and rental car arrangements. I'm pretty good at this psychic stuff, so why not? Besides, it would give me an opportunity to visit Art Bell again and see how he's doing since he retired from the C2C show last December.

We got to Vegas Friday evening, drove an hour to Pahrump, had dinner with Art, and visited his FM station (KNYE), which is totally automated. That's right, no staff. None. He can even program it from home, a few miles away across town. Then, back to his house and on 75m until 1 a.m.

One of the first to call in was W6BMG, Walt Zuckerman. I used to visit him when he was W2LBF, three blocks from me in Brooklyn. We used to have a ball on 160m working full duplex with five or six other locals. That was 65 years ago, shortly before I got my ticket.

At the conference the next morning Ed and "FM" explained about the remote viewing protocols and started the group … about 30 of us … trying to figure out what the picture they had in a sealed envelope might be. I got an impression of some towers, water and rocks. It turned out to be a picture of the Golden Gate Bridge, with two big towers, rocks in the foreground, and water under the bridge. Hmm. Not a big win, but not a total loss.

I got some fairly close impressions on a couple of other tries, and total losses on some. I need more practice.

On the downside, if remote viewing really does work, how come they're offering $25 million to find Osama and no one is stepping forward? Maybe if they offered it tax-free?

And all that mystery about Saddam's being alive or not? I guess the government stopped using RVers to find stuff like that.

Since Sherry and I were going to be taking a class in PhotoReading the next weekend in Boston, I thought it would be nice to get good at RVing and PhotoReading so I could sit back at home and browse through the books I wanted to read in the Library of Congress … without having to go to Washington to do it. When I was living in Washington seventy years ago, I spent a lot of time reading books in the Library of Congress. In those days a taxi ride anywhere in town was a quarter, so it was easy to get there … even for a kid.

I was disappointed in the PhotoReading course. I'll tell you more about that after I've cooled off.

Adam Osborne

On our flight to Las Vegas for the remote viewing course put on by Ed Dames, Sherry and I got to talking about the old days and Adam Osborne. Neither of us had thought about Adam in years. A few minutes later I pulled out my copy of *Time* and started reading … and there was an obit for Adam, aged 64, dead after a series of strokes. A coincidence … of course.

Adam got started in the business with a series of microcomputer books. He organized a computer conference in Paris, where I addressed the group on the current state of the art. In 1981 he brought out the first portable computer. At 24 lbs., it was an arm-stretcher.

The microcomputer revolutionaries are disappearing. Les Soloman died last year, now Adam Osborne. And I haven't had any answers to letters to old friends George Morrow or Bill Godbout.

Education?

Okay, I give up … what are they teaching in our schools? We know that colleges are having to spend millions on remedial reading, writing, and math courses. 29% of the freshmen at four-year colleges have to have this. It's 41% at two-year collegettes. That's right, almost half the high school graduates have gotten a really bum start in life.

A recent international test of Americans 18–24 found that 30% could not find the Pacific Ocean on a world map. 56% were unable to find India. Heck, 11% couldn't find the US on a map. 58% couldn't find Japan, 65% France, 69% the United Kingdom. Sigh. Less than 15% could locate Israel or Iraq. One third put the US population between one and two billion.

It's taking students five and six years to graduate from four-year colleges. Only 31% make it in four years at state institutions! When Pennsylvania last year promised $6 million bonuses to state colleges that graduated at least 40% of their in-state students within four years, not one college made it.

So, our school system has been getting worse and worse while it's been getting more and more expensive. So? You have a choice of the "what can I do about all this?" route … the "how can you fight city hall?" syndrome … or to decide that heck, someone really ought to DO something about this government-run mess we've let get messier.

Well, there's this geezer in New Hampshire who says he knows how we can fix all this and give our kids a better chance to compete with the rest of the world by growing a new technology (distance learning via DVDs) into a big industry. And that takes a magazine, just like personal computers, cell phones, and compact discs did.

Or you can shrug and reach for the remote control while our kids are running up an average of $19,400 in student loan debt, plus losing the wages they'd have made if they were working, making each of those two added years cost either them or their parents about $50,000.

I haven't made any secret that I consider the whole concept of high school, college, and then getting a job to be a giant con job. I wrote my first book on that subject 40 years ago. Well, I didn't know any better, and neither did my dad. WWI came along when he was college-age, so he went to New York Military Academy and graduated into the Army Air Corps … and afterwards a career in aviation.

The alternative (for any newcomers to my stuff) is to go the medieval apprentice route and learn a trade. No, I don't mean plumbing or carpentry. The career road to freedom and money, I preach, is to pick some field that is so much fun that you feel like you are cheating, get a job with some small company in that field, and then spend the next year or two learning everything about it. Get someone else to pay you to learn everything you need to know to run a small business. Oh, and keep your imagination peeled for any need of new products or services in that field. The gory details are in my $5 *Secret Guide to Wealth* book.

But we still need to provide an alternative for our public schools and colleges … provide the education kids need

Continued on page 8

QRX . . .

continued from page 1

Ans: A full-wave rectifier supplies twice as many pulses per second to the filter for a given supply frequency, and therefore is easier to filter and provides better voltage regulation.

Ques: What undesirable effects result from frequency modulation of an amplitude-modulated carrier wave?

Ans: Spurious signals that occupy a wide band of frequencies and cause unnecessary interference may be transmitted.

Ques: Draw a schematic diagram of a filter for reducing amateur interference to a broadcast reception consisting of a series-tuned circuit connected in shunt with the BC receiver.

Ans: See **Fig. 1.**

Taken from The Modulator, *the news and views of the Fort Myers Amateur Radio Club, Inc., March 2003, which gives credit to a sample test found in the 1940 (seventh) edition of the* Radio Handbook.

Mil Freqs

Want to listen in on military frequencies? Here are the top 49, courtesy of Ron KOØZ.

1. Air Force GHFS primary days — 11.175 USB
2. Air Force GHFS primary nights — 6.739 USB
3. Air force GHFS — 4.725 USB
4. Air Force GHFS — 8.993 USB
5. Air Combat Command (ACC) ops. — 9.014 USB
6. STRATCOM primary days — 11.243 USB
7. STRATCOM primary nights — 6.761 USB
8. MYSTIC STAR primary AF-1/AF-2 SAMs — 6.812 USB
9. Air Force GHFS McClellan/MacDill AFB — 11.246 USB
10. Air Force GHFS (old SAC S-394) — 13.201 USB
11. Air Force GHFS Andrews/MacDill AFB — 13.215 USB
12. Air Force GHFS — 13.244 USB
13. Search & Rescue, all military — 5.680 USB
14. Primary USCG aviation (nights) — 5.696 USB
15. USCG (primary days) secondary nights — 8.984 USB
16. U.S. Navy HICOM — 6.697 USB
17. U.S. Navy HICOM — 11.267 USB
18. NORAD primary nights — 9.023 USB
19. STRATCOM (old SAC) — 13.241 USB
20. STRATCOM Sierra 302 — 3.113 USB
21. STRATCOM — 13.205 USB
22. STRATCOM X-Ray 906 — 13.217 USB
23. Mystic Star/Andrews AFB/STRATCOM — 13.247 USB
24. ACC (2nd) tactical ops. — 15.091 USB
25. STRATCOM Alpha Sierra — 3.369 USB
26. STRATCOM Sierra 304 — 4.495 USB
27. Mystic Star / Andrews AFB — 4.721 USB
28. Air Force GHFS (discrete) — 18.002 USB
29. Air Force GHFS — 18.046 USB
30. STRATCOM Foxtrot — 5.020 USB
31. STRATCOM (discrete) — 17.972 USB
32. Air Force GHFS — 17.975 USB
33. STRATCOM (old SAC Whiskey) — 20.631 USB
34. ACC tactical (old SAC Charlie Alpha) — 20.846 USB
35. Navy anti submarine warfare ops. — 8.872 USB
36. Air Mobility Command (AMC) ops. — 5.197 USB
37. AMC ops. — 18.027 USB
38. NORAD — 11.214 USB
39. NORAD — 5.297 USB
40. NORAD — 9.793 USB
41. NORAD — 10.194 USB
42. NORAD — 10.452 USB
43. STRATCOM — 5.328 USB
44. NORAD — 11.441 USB
45. NORAD — 14.364 USB
46. NORAD — 20.855 USB
47. STRATCOM Papa 382 — 5.826 USB
48. STRATCOM Golf — 6.826 USB
49. STRATCOM X-ray-Yankee — 7.330 USB

From GARBLE, *the monthly publication of the St. Charles Amateur Radio Club, Inc., April 2003.*

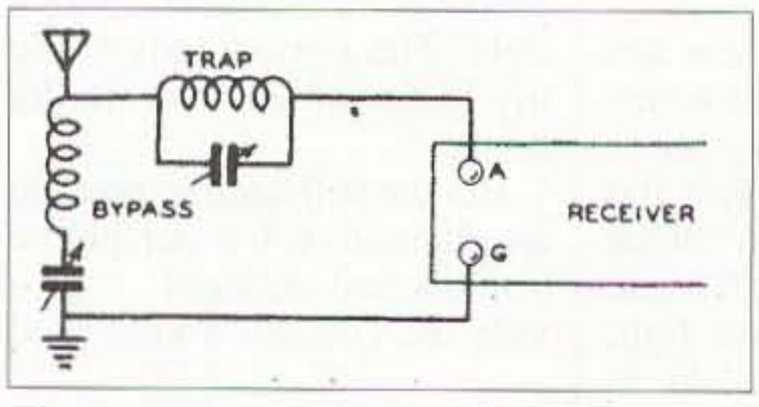

Fig. 1. Answer to 1940 test question.

Are You an Old-timer?

How many of these items do you remember or have you used?

Do you remember the SKY BUDDY or maybe the SKY-RIDER SX-28? How about RCA's AR-77 receiver?

Have you ever called CQ using a Johnson RANGER, or perhaps even the little ADVENTURER?

Have you ever built a HEATH-KIT? Or even further back, a STANCOR KIT?

Did you ever order anything from the ALLIED CATALOG, or maybe LAFAYETTE RADIO? Did you ever buy any gear from HENRY RADIO in Missouri?

Did you ever call your antenna an "AERIAL"?

Ever build a crystal set? How about a regenerative receiver?

Let's go way back. How about an AUDION PANEL, or perhaps a VARIOMETER? Or perhaps a detector tube.

Remember TUBES? Did you ever enjoy an 807?

Ever use Q-signals? National Radios? Remember when you would have killed for an HRO? Or an RME?

Many hams had an HQ-129X. I did. Of course, everyone wanted a COLLINS. Any one. It didn't make any difference.

Remember plug-in xtals? How about ASTATIC mikes?

Bugs? All kinds of them. Remember when you had to keep a log?

Remember when *CQ* was 35 cents and gas was 20 cents a gallon?

Remember when *73 Magazine* first came out? It cost 37 cents.

Remember when most people didn't know what a "HAM" was? They either thought we were nuts or held us in utter awe.

Nice, wasn't it? Take you back???

Thanks to the March 2003 issue of The Modulator.

Harvey Honors Hams

Radio commentator Paul Harvey chose Wednesday, March 19, to honor ham radio. In his broadcast, Harvey described radio amateurs as America's quiet warriors. He said that there are 700,000 of them who are unpaid, uncelebrated, civilian radio operators, who are there during and after floods, fires, and tornadoes.

And, said Harvey, after the 9/11 attack hams were indispensable in reuniting families.

This was a very unexpected salute to the nation's ham radio community. You can find it on the Web at [www.paulharvey.com]. Look for the show dated March 19th.

Thanks to W6RCL, via Newsline, *Bill Pasternak WA6ITF, editor.*

Tube-Type PCs

It seems that a venerable old friend simply refuses to die the death of technical obsolescence. The vacuum tube continues its reemergence into the audio marketplace, this time — believe it or not — in personal computers.

The first tube motherboard appeared last year in response to PC gamers who craved the allegedly "more natural" sound produced by vacuum tube technology. Those who have seen the boards call it a strange sight to behold.

More on this May-December marriage of filament and silicon can be found at [www.neoseeker.com/Articles/Hardware/Reviews/aopenax4btube].

Thanks to CGC Communicator, *Clayton Creekmore, and [www.neoseeker.com], via* Newsline, *Bill Pasternak WA6ITF, editor.* 73

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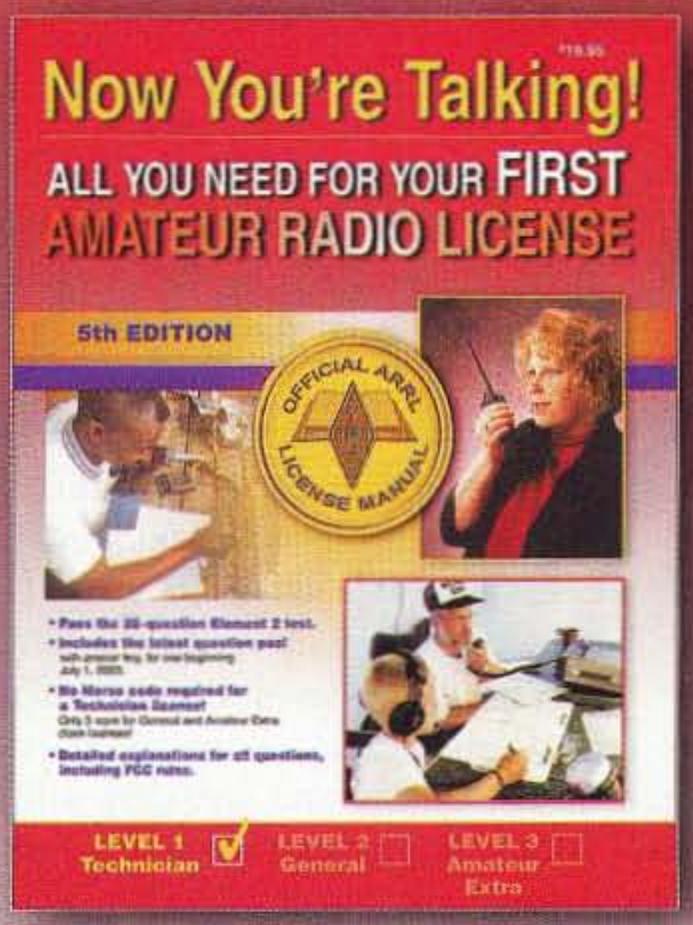

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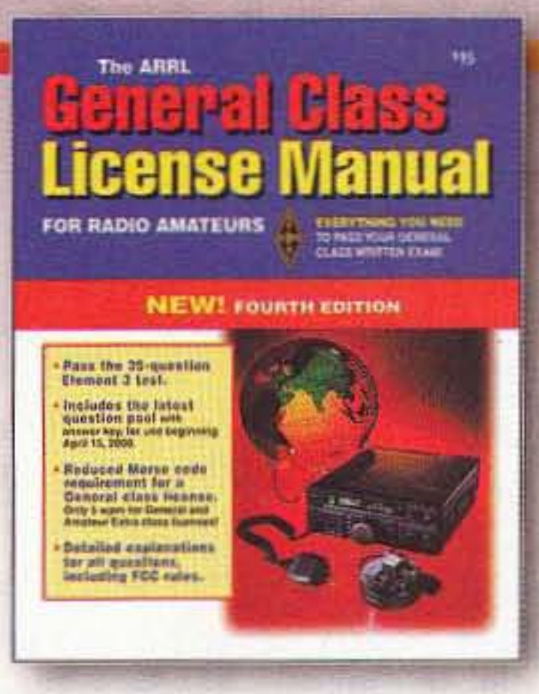

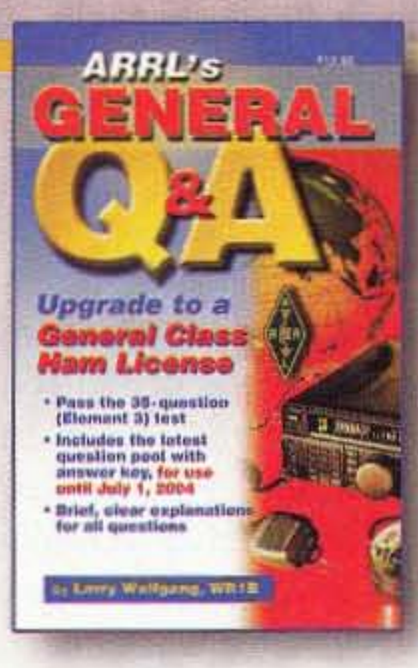

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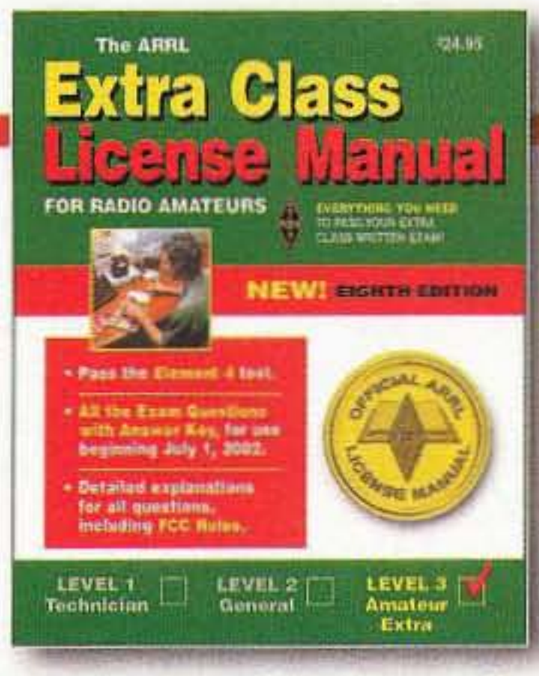

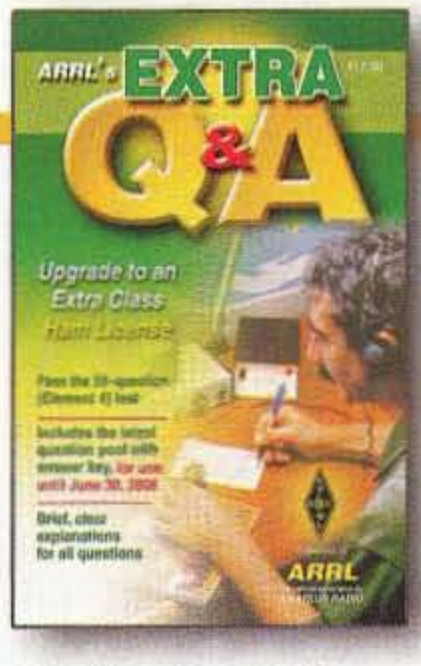

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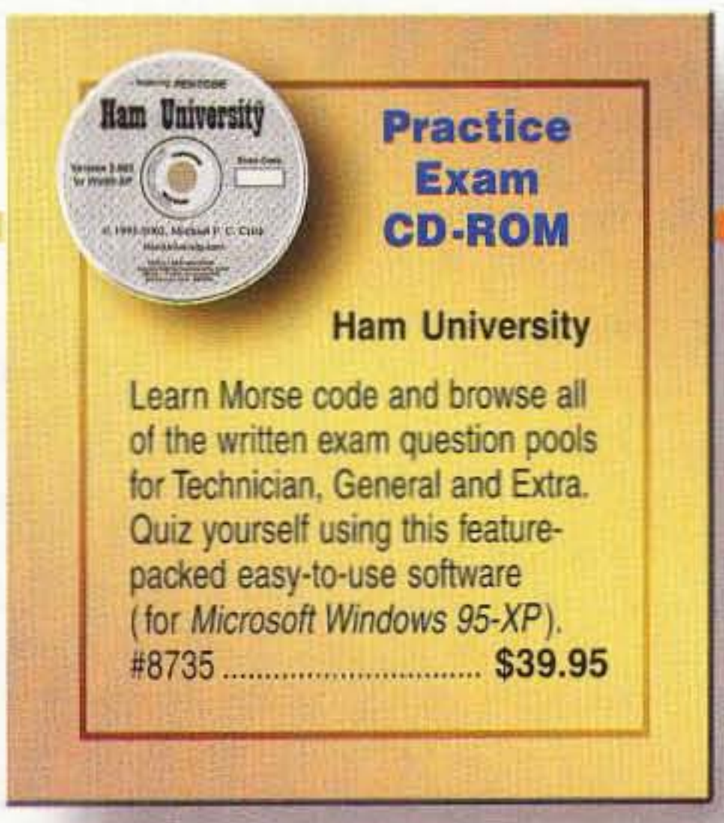

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LETTERS

From the Ham Shack

Marcel Lemay VE7TSF. I read with interest your ideas about prison reform through self-sufficiency (January 03). Many years ago, through my employment, I was privileged to have a conducted tour of all the federal prison facilities in and around Kingston, Ontario, Canada. As a civilian employee of the RCMP, I was responsible for all their radio communications facilities in most of the province of Ontario. As a result of a threat of strike by prison guards, my section was directed to do a communications survey of all seven federal penitentiaries in the area so that as required, the RCMP could move in and guard the prisoners complete with their own communications system. Unionized workers have been known to sabotage their equipment under such circumstances. It was during this survey that I observed the activities taking place in all the penitentiaries, be they minimum, medium, or maximum security. Each of the prisons had a specialty operation. One was dairy, another beef, another hydroponics, another general farming, another garden produce, or some combination. The system was such that for this area the prisons system could have been self-sufficient as far as food production was concerned except ... we were informed that through restrictions from various government marketing boards, local unions, and merchants, the local economy (merchants) might have suffered because of it. For this reason, the full potential of the farming activities could not be realized. This would also have helped reduce the cost to the taxpayer and provide the inmates a sense of accomplishment. It seems that the unions won out again. Keep up the fight, Wayne — we are with you.

Richard Appleyard VE3YAG/VEØRCN. Wayne, I have read your editorials over the years, and I'd just like to inform you that my daughter (13 years young) has attempted to build a regenerative receiver from 1924. With the schematic being 80 years old and tube technology, we required assistance from several hams to get the radio operational. The radio is for a school project. She did two speeches on her subject in her school and now goes to the next level of public speaking. The radio will be on display for another part, the competition. Will keep you informed on her status. After the competition she will be studying for a ham ticket to be able to work dear old Dad when he is away from home. My daughter is one person who does not back down from a challenge! She is involved in choirs, sports, sailing and studying diligently to achieve her dream of being a physician. Even our family physician, who is her role model, says she has every confidence in her achieving her goal. So now, when some kids are taking the easy way out, she is working at her goal.

Wayne, I got so tired of my physician browbeating me about my weight that I have lost 20 pounds by cutting in-between snacks and walking up to three miles a day three times a week, and you are right, there are many hams — myself included — who are overweight. If a person cannot walk too far then do a couple of blocks and forgo transportation if possible, and walk. It lets you see what a person missed behind the wheel of a vehicle. And take the HT for company — distance goes quicker when chatting and walking at a brisk pace of 2 mph.

Ray J. Howes G4OWY. At the last count, I had at least a dozen QRP rigs — all sizes, all descriptions, some of 'em home-brew, too! Clever, eh?

Anyway, in the light of Wayne's (editorial on the Planet X scenario, March 2003) exhortations to get our QRP rigs in good shape, perhaps I should pass on some of my surplus QRP transceivers (well, to be honest, they're not that surplus, but I'd like to do my bit, if only for the sake of amateur radio) to those not so fortunate as myself — just in case. Any takers?

Enjoyed reading the "Autobiography of Everyham," part 1 — roll on, part 2!

Stew Tannahill KB2VVB. Read your article in *73* concerning making your own QSL cards. I had similar interests to Steve KE8YN. My technique is a little different, so I thought I'd drop you a line and explain them. I used Avery Label-Pro software to design the whole card. Then printed the QSL cards on my old dot matrix printer with Avery postcard stock #4167. This card stock, believe it or not, is still available thru Office Max for about $18 a box. This gives exactly the correct-size postcard.

While they are in b/w only, they are quite acceptable to hams in general. Got my DXCC, WAC, WAS with them.

I thought I would be changing my call early on, so I didn't want a batch of cards with the wrong call on them. That eventually changed. This prompted my ingenuity in designing the cards. Some of my friends liked them, so I did some for them.

NEVER SAY DIE

continued from page 5

and want, not what they're being force-fed today. And therein lies the beginnings of a new trillion-dollar industry.

All it will take, I believe, is a magazine to get this whole new industry launched. And that's going to take about a million dollars to get up and running. My business plan shows the publication breaking even in about three years, and by six, earning over $3 million a month in profits. And double that a year later.

If you or someone you know has the money and an interest in totally changing the world (for the better), a copy of my business plan can be had for $100 plus a nondisclosure agreement (NDA).

Trivia

Walter Schiva KB6BKN sent me a couple copies of a free local publication packed with trivia stuff. Like? Like the annual defense budget for Andorra in the 1970s was $4.90 — for blanks to fire on national holidays. And Mrs. Dorothy Edgers, an employee at the Office of Naval Intelligence who, on December 6, 1941, decoded a Japanese message that said Honolulu was to be attacked. Her superior officer said the message needed more work and could wait until Monday. Or that the Germans during WWII painted their munitions factories with camouflage paint. Allied bombers then bombed only the camouflaged buildings.

Smallpox

They're telling us that smallpox is highly contagious and could spread rapidly, killing millions ... that smallpox can be spread by casual contact with an infected person ... that the death rate is thought to be 30% ... that there is no treatment for smallpox ... and that the

smallpox vaccine will protect us from getting the disease.

And we suckers are buying this hokum hook, line, and sinker. Well, those who haven't done any homework are. Those who have read Walene James's book (see the review on page 7 of my *Secret Guide to Wisdom*) know what a bunch of baloney we're being fed.

So why the massive disinformation barrage? Would you believe it has something to do with money, not public health or protection against a possible terrorist attack?

Smallpox is not highly contagious. It's spread mainly by bedbug bites. When's the last time you had a problem with bedbugs? In all my travels I've only encountered 'em once, at the Australia Hotel in Sydney. Oh, what a night that was! I moved to another room the next day.

The only people who have gotten really sick in the past were those who were already sick or badly malnourished, people with severely depressed immune systems. The death rate during some of the worst epidemics ran 4.2%, not 30%. The fact is that smallpox is one of the least virulent diseases.

So here we are, faced with our government about to force us to be vaccinated with a vaccine that does not prevent people from getting the disease, just makes them less sick if they do, and has a history of killing a small percentage inoculated, and making a substantial number sick.

Homework: [www.healingcelebrations.com]; [www.vaclib.com]; [www.allaboutsmallpox.com].

Now you know why Indians were given blankets in order to give them smallpox so their land could be grabbed.

Today it's all about Wyeth Laboratories making billions selling their stores of smallpox vaccine.

The government has stockpiled 300 million doses. I wonder how much that cost us all?

80% of those vaccinated develop pustules which are extremely contagious for three weeks if not kept covered with a bandage. Rubbing the itching vaccination area and getting the pus into the eyes, ears, or nose can cause blindness, deafness, disfigured tissue, and even death.

Radar Jamming

Another million-dollar fraud! No, those passive radar jammers don't work. Even those costing over $300 do not work. Check it out at radarbusters.com — radartest.com — troubleshooter.com — laseradar. com — radarone.com.

Alzheimer's

According to Dr. Fudenberg, the world's leading immunologist, all it takes is five flu shots to increase your chances of getting Alzheimer's disease ten times higher than if you'd had no shots. It's the mercury (thimerasol) in every flu shot (and in many childhood shots) that goes to the brain and does the dirty work. Oh, plus mercury from amalgam fillings.

D.C. Schools

Maybe you read … or heard on *60 Minutes* about the Washington public schools. They're spending $10,500 a year per student, the second highest in the nation, with a student-teacher ratio of 15.8, so they should be some of the finest in the world.

At nine of the 19 high schools only 5% or less of the students are proficient in reading. In 11 of the high schools 5% or less of the students are proficient in math. Even worse, each year up to 96% are promoted to the next grade. This is a total fraud on the students and the public.

Yes, most of the students are black, but we have schools that are just as black in other cities which are honestly educating their students, and at a fraction of the cost.

Then we have New York City, where 60%–70% of the black and Hispanic kids are illiterate … aimed at a life on welfare or in prison. And this despite the city spending $11,128 per pupil! Despite flat enrollment the school system has added 13,000 more employees in the last seven years … and still the kids are not learning to read.

Researchers claim that 90% could become literate if phonics were taught. In California reading scores have dramatically improved when phonics is taught. So why failure when success is so easy? Because failure means more government money.

Seed Licenses

The USDA is at it again … with a plan to make it a federal law that farmers and gardeners who save seeds will have to have a license ($100 minimum in California). The penalties are from $1,000 for home gardeners to $250,000 for nurseries. Also, gardeners must be able to prove that their cultivated plants are USDA-approved. This is going to make it more and more difficult to get non-genetic modified seeds.

The Salem Oregon City Council passed an ordinance limiting gardens to no more than a few hundred square feet.

And to think … they're doing this "for our own good"! Oh, yeah? They're doing this for the good of the five largest seed companies. Money talks loud and clear.

Suckers

While reading an article by Dr. Tunsky it occurred to me (for the nth time) what suckers virtually 100% of Americans are. We are suckered into illiteracy and ignorance by our school system, which is terrible and getting worse. We're suckered into going to college for four to six years. Then we're suckered into finding a job, so we can support ourselves and our family … instead of starting our own business.

We're suckered into believing that we can eat and drink anything legal. The great American diet makes us sick so we suckers go to a doctor instead of changing our diet. Never mind that two million Americans go to the hospital each year with adverse reactions to drug side effects, with ten percent of them dying. We get fat. We get heart disease … 1.2 million die every year from this self-inflicted problem. We get cancer … a half million die every year from this self-inflicted problem which has a 93% fatality rate. A quarter million die from diabetes … also self-inflicted.

So we sit watching TV with a beer and chips. We wake up to a cup of coffee and Danish. We have a burger and fries for lunch, with a diet cola to watch those calories. We have a well-done steak and potatoes for dinner. We commute an hour to and from work. Oh, I forgot the morning and afternoon coffee breaks. There's some reason Starbucks is on every corner. And a Dunkin' Doughnuts in between.

Is it any wonder we have more doctors per capita … one for every six citizens … than any other country? Thar's big money in them golden medical hills. Or why our pharmaceutical industry is one of the most profitable in the world? It even beats out Microsoft!

Sugar

Dr. Perricone *(The Wrinkle Cure, The Perricone Prescription)* says, "Sugar causes inflammation, inflammation causes aging. Fifty percent of skin aging is the result of sugar. It's as bad for you as excessive sun exposure." He goes on to say that stuff like pasta, breads and potatoes rapidly raise blood sugar levels, leading to inflammation, wrinkles, and accelerating other disease processes.

Stress, too, is a bummer in that it kills brain cells, increases blood sugar levels and depresses the immune system.

My prescription for stress is a daily dose of classical music. Hey, it sure works for me.

The *Bob Livingston Letter* has a piece about hyperactivity … pointing out that

Continued on page 17

John J. Phillips K2QAI
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Winsted CT 06098

Inside the ARRL — the REAL Story

Show this to your ARRL Director if you want ham radio to survive.

Ever since the first issue of 73 Magazine *in October of 1960, it certainly has appeared that Wayne has a problem with the ARRL, even though in his very first editorial in 73, he published a few "Policies" about the direction in which he wanted the magazine to go.*

The first of these policies was the statement "We are not mad at anybody." Well, while he may not have been angry, his frustration with the lack of direction within amateur radio was obvious, and most of his ire seemed to be directed toward the ARRL.

What's right with the League

Being one who tries to keep an open mind on most things, I chalked up his attitude to mostly "sour grapes," since he wasn't running an organization nearly as large and powerful as the League, or publishing a magazine like *QST*. So, for many years, I read his editorials with interest, but didn't really react. However, this all changed when in early 2001 I accepted a position with the ARRL as an electronics engineer, in charge of working on interference problems reported by hams.

One of the things that immediately struck me when I started there was how wrong Wayne was when he made statements about how the League's leaders should spend less time on the golf courses of Newington, and more on preserving, protecting, and advancing the hobby.

I now believe that Wayne was just using poetic license to make his point, because I found an organization being run on a shoestring, and not located in a high-class location. As far as I know, there's not even a miniature golf course in Newington, much less a real one.

I have no way of knowing if all the excesses on the part of League officials at the WARC some 40-odd years ago that Wayne says he observed actually happened, but I have seen no evidence during my stay there of such behavior. All I can say for sure is that the employees at the League are hard working and dedicated, and work for very low pay. In my case, I accepted the job only because I thought it would be fun to work in ham radio, and didn't want to move to Texas or California, where the jobs in my specialty were located at the time. The salary I accepted was about one-third of what was being offered in the real world, but it seemed to be the easy path to take at the time.

Once I got there, I was amazed at how diligently the League works for the good of amateur radio as they define it. For instance, people can send in questions about technical, legal, or operating matters, and great efforts will be made to ensure that those inquiries are answered promptly. Back in the days when there was a lot of building going on, it never even crossed my mind that I could go to the League for help, which I have to assume was available back then as well.

Beyond that, the ARRL VEC processes most of the testing for amateur licensing — far more than all the other VECs combined — and any DXer who isn't a member is missing out on the services of the outgoing QSL bureau, where you can send in a pound of cards along with eight dollars and they take care of distributing the cards to other bureaus all over the world — saving you far more than the membership fee. Then there are the educational programs that give many people access to information that would be difficult to find on their own. I could go on and on, but I'm sure you get the idea.

Regardless of whether you like the ARRL, you SHOULD be a member if you have any real interest in seeing the hobby continue, simply because they are trying to do so much with very few resources. Again, like it or not, the League is the only organization we

have that may be able to keep ham radio alive and well over anything more than the next 20 years or so.

Even if you hate their guts, you can do yourself and ham radio in general a great service by joining, and — far more important — you can be a participant in letting the League leadership hear from you about what you would like to see happen in the hobby. I say this because I have observed that the people in charge really jump when a member contacts them on any matter.

What's wrong with the League

This is the part of the article I am writing because it needs to be said, not because I am going to enjoy it. When I said above that you should join and participate, I meant that the funding you provide will enable the League to provide more and better services, but in order for the process to work, it is imperative that you keep in contact with your Directors, Vice Directors, Section Managers, et al., on a regular basis and let them know what you think and what you want done.

This does not mean that you have to haunt them or bury them in mail and E-mail messages, but at the very least let them know your opinion about what you want and what the League is doing or not doing, at least twice a year. There are two Directors' meetings every year, and if anything is going to get accomplished, it will usually happen there. My impression has always been that the League sails majestically on its way, without much interest in receiving input from the "little people" who pay the bills. Even worse, they seem to enjoy promoting the idea that they are somehow above the rest of us and they will read the truth to us from the stone tablets they were given by Hiram Percy Maxim some 75 years ago.

Another thing I observed is that the Directors enjoy the prestige of being Directors, but they are all busy people who have their own lives to lead, and consequently they cannot spend a lot of time on League matters. It appears that the agenda of the Board is pretty much set by the so-called "Executive Committee," which predominantly consists of League employees. This is not necessarily a bad thing, but it sure does seem to suppress alternative points of view. My feeling is that the Executive Committee decides beforehand what will be done, and the Directors eventually go along, after some discussion on minor points — but nothing that will change the essence of the pre-made decision.

It is for this reason that the members must stay on top of the Directors to ensure that the things they want done are attended to. The impression among the Amateur community in general is that their opinions don't count. I can assure you that any communication from a member is taken seriously, so it's up to you to decide if you have the desire and interest to work to advance ham radio by taking the time to let your elected officials know how you feel about things.

While we pride ourselves on being members of a cutting-edge hobby, the leadership of the League is anything but cutting-edge. While I was certainly not privy to what went on in Newington during the Incentive Licensing fiasco, my guess is that there was no evil plot on the part of the League, but rather a lack of comprehension and foresight on the part of a few ARRL leaders who were probably too lazy, incompetent, and self-serving to really think it through.

There was a *QST* editorial written back in the early 1960s that simply said, "There is something wrong with Amateur Radio," but it never said exactly what the problem was and never suggested a solution. Probably out of this came a proposal from the ARRL to the FCC recommending that the Commission begin to tighten up on licensing requirements, without any clear reason given as to why this was necessary or what the benefits might be. The result was the "Incentive Licensing" disaster. Even then, at a relatively young age, I had the feeling that it should have been called "DIS-Incentive Licensing."

This poor judgment on the part of the League was devastating to all of amateur radio in America. When all this was happening, many of you were not yet into the hobby, but it is important for us all to really grasp how profoundly

this shoddy decision-making on the part of the leadership has affected the entire hobby, right up until now. Not surprisingly, given the past track record and attitudes, there are still leaders at ARRL who will not admit it was a disaster that had permanent negative consequences for the hobby. They are oblivious!

The primary philosophy at the League seems to come down to this: Circle the wagons, do whatever you can to prevent new ideas and concepts from being considered, and, above all, protect your own turf.

A few months ago, I had a chance conversation with a number of people who just happened to meet in the halls at Newington, and the subject of Incentive Licensing came up.

I said that I thought that it had been unfair to the hams of the time, and if it had been really necessary at all, it would have been better to just make it a little more difficult for newcomers — taking away existing privileges seemed to me to be reason enough for anyone to be upset.

Dave Sumner, the CEO, spoke up and said something to the effect that "you're just unhappy because you lost some frequencies," which was completely untrue in my case since I had passed my Extra Class license test at the FCC Field Office several years before the Incentive Licensing tidal wave struck, and the direct cost to me was nil. As a matter of fact, I was really into DXing on 40-meter CW, and from a selfish point of view, I could say that it was great!

I still recall having a ball on that first night in November 1967, when the new rules took effect, and the vast majority of operators were no longer allowed to use frequencies that had been perfectly legal for them 24 hours earlier. I experienced much less QRM than usual, but I also realized that it just wasn't right.

To this day, I have been unable to understand what the point of that move had been, or just who thought they would benefit. It certainly didn't give anyone any incentive that I could see. All it did was generate a lot of ill will among those who didn't have the ability to obtain their Extra Class license. Once the magnitude of the disaster became obvious, the League just pointed to the FCC as the culprit, without ever acknowledging their part in initiating the whole mess.

Did you ever wonder why ALL the American ham radio manufacturers and dealers simply faded away within a year or two? The enraged or discouraged hams sold their equipment at tremendous discounts, prices plummeted, and nobody was buying new products. No sales, no companies — it was as simple as that.

It's pretty obvious that the ARRL leadership really didn't "get it," and I feel that a similar attitude still holds there today.

For instance, we have all heard the grumbling from both sides of the issue about the Morse code requirements for a ticket. I know for a fact that many among us are absolutely sure that the ARRL is trying to eliminate all code requirements for amateur licenses, but there is also another large group of hams who are just as sure that the ARRL is trying to force Morse code on anyone wanting to get a ticket, no matter what it may cost the hobby.

Obviously, both sides cannot be correct. I have come to the conclusion that the League is being pulled both ways by a few vocal individuals, and that it will not address the issue for fear of political repercussions.

From what I saw from the inside, there is great concern over how to best proceed. Personally, I use CW for well over 95 percent of my contacts, just because I enjoy it. However, the plain fact is that other than enjoying the sound and the skills that go along with CW, there is very little practical reason to make it a requirement for anything at all — since most of the world no longer uses it.

What is missing here is a vision of how to recreate the kind of mystique and attraction of ham radio that existed from the very beginning of radio. The first time I heard a shortwave receiver, I was hooked! Today, nobody is looking into how to make the experience just as vibrant for succeeding generations. If we don't get new blood into the hobby, and very soon, it is my opinion that it will all fade away in the next couple of decades. Yet no one at the ARRL seems to be grasping that fact.

While they have a program to promote the hobby in selected schools, nobody (outside of Wayne, and who listens to him?) is promoting the idea that each one of us should be doing all he can to introduce newcomers, especially youngsters, into the hobby. It is certainly a technical hobby, but most people at the top don't seem to understand that it is primarily an intensely personal and emotional experience for most who become deeply involved.

The fascination is not primarily the love of electronic components and equipment — it is in the way it grips a person's heart. However, what specific issue needs to be addressed is not important — rather, the problem is with the narrow-minded people at ARRL who need to open themselves up to some new ideas. Despite all the great things that have been done by Amateurs in the past, the hobby is undeniably stagnant. Unless there is some new dynamic leadership at the League, the hobby is doomed.

To show clearly the ossified attitudes permeating the ARRL, I will bring up my own case, where I ran into the closed minds that "knew" that telecommuting could not work, despite the fact that many large and successful companies like IBM and Microsoft have been doing it for years.

It did not seem to matter to the League that I had a broadband Internet connection, several telephone lines, a fax, a copier, a laser printer, remote access to my E-mail and voice messages at my desk in Newington, etc. — in short, everything that would allow me to work from home more efficiently than from Newington. (As an aside, *73 Magazine* is published almost totally through the use of telecommuting.)

When I accepted the job at the ARRL, I did indeed understand that it required my presence in Newington, but when I later developed some serious vision problems and the commute was becoming both dangerous and stressful, I hoped that Mark Wilson, the League's chief operating officer,

and Ed Hare, the supervisor of the laboratory, would recognize the outstanding results I had been producing, especially in handling the ever-expanding list of power-line noise complaints. I even asked that they give it a trial before making their decision one way or the other.

Their response to my proposal was a letter stating my termination date. To make matters worse, while the person they replaced me with is reputed to have great technical skills, I have been told by a number of people who have known him in his earlier tour of duty at ARRL that he is almost completely lacking people skills. It makes me uncomfortable to even mention this because I don't even know him, and he is probably a very nice person like most of the other League employees, but I am even more concerned with the future of amateur radio and with how the effort to control interference will dwindle without the proper focus and direction.

While I am a graduate electrical engineer, it is not necessary to be Albert Einstein to understand the technical part of the problem. However, it IS critically important to have outstanding communication skills and empathy for all the people you must be in contact with, including the affected amateur, the power company, and the FCC, among others.

This situation has the potential to become another disaster for amateur radio because we were making great progress in this area for the very first time, but now I fear that it will fall back to the old approach wherein the League just gives everyone lip service, but doesn't accomplish much. If the power-line problems weren't so common, it might not be all that important to anyone other than the affected ham, but as things get worse and worse, we will all have less inclination to subject ourselves to this aggravating phenomenon and just find another hobby.

More important, the whole problem revolves around the way the League handles any matter that might be even slightly controversial. I mentioned to my boss many times that it was my opinion that the corporate culture at ARRL could best be described as "wimp-ism," but he strongly disagreed.

However, I have observed in many cases that they will go to any lengths to avoid facing simple truth. This might be in telling someone that they are wrong, or even worse, in admitting that there really isn't much more we can do in a lot of these cases. This would never be allowed, because it might make someone appear to be less than omnipotent.

There are currently a large number of open power-line interference complaints that have been in the hands of ARRL, some for more than two years, and the League and the FCC have repeatedly been in contact with the offending companies with no significant results. When I tried to push this issue either in-house or with the FCC, I was given the clear message to just let things alone, don't rock the boat, and so forth. There have been many cases that have been ignored by the power companies, but no one seems willing to stand up for the affected amateurs, something that is clearly not in the best interest of amateur radio.

In a meeting held in Newington in July of last year, some of these really bad cases were discussed with Riley Hollingsworth of the FCC, but I was told by ARRL management to let the matter slide. The only result of all these discussions was that the FCC agreed to send yet another letter to the worst offenders, saying in effect, "We really meant all that stuff we said before, and you had better do something this time."

If you believe that approach is going to accomplish anything, you probably also believe in the Easter Bunny and the Tooth Fairy. I have heard from a number of hams who have been told by their power company that they didn't care what the FCC had to say, they were going to continue to do as they pleased, and they were sure that the FCC would do nothing. As discouraging as this may be for amateur radio, I am coming to the conclusion that they might be correct. It is very easy to send official-sounding letters, but much more difficult to actually do anything useful. It is pretty obvious that the League cares far more about maintaining their cozy relationship with the FCC than they care about working for the welfare of the members.

For all these reasons and many more, the only hope for improvement of the situation is if the League membership decides to take a short pause from rag-chewing or contesting and take a careful look at just what is going on inside their national organization. If you really care about our hobby, I beg you to become involved. I promise that you will have a much greater effect than you probably think.

K2QAI is a former ARRL RFI Engineer. — ed. 73

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World Radiosport Team Championships — 2002

A photoreport.

This is an event which could be compared with the Olympic Games. The tradition of the Olympics is thousands of years old — the Radio Olympic Games were initiated in 1990 in Seattle, WA.

The principles are simple: Teams consisting of two operators from the same area, and having approximately the same antennas, participate in the IARU HF Championship the second weekend of July. In July of 2002, this event took place in Finland, and all the antennas were exactly the same, made locally. Previously, in 1996, the WRTC had been hosted by San Francisco, CA hams; in 2000, by the Slovenia Contest Club.

In case you don't know where Slovenia lies — it's a country smaller than New Jersey that for decades had been a part of Yugoslavia, and is tucked between Italy, Austria, Hungary, and Croatia, with narrow access to the Adriatic Sea.

Finland is probably better known. Placed in northern Europe, between Sweden and Russia, the country has undergone a transformation from a timber- and farming-dominated economy to a modern, diversified industrial community during the last 20 to 30 years. One of the side effects of their advanced cell phone industry (Nokia is Finnish!) is a large number of cell phone base stations with high antenna towers. A few more antenna towers with amateur radio antennas do no harm, according to local lawmakers, I presume. An average contester in Finland has a 100-ft. rotary tower with stacked arrays. On the other hand, most of them are hidden in forests, and finding them was not easy for me.

The "games" took place in the southern part of the country near the capital city Helsinki. There were 52 teams from several countries. Going there and meeting the competitors, referees, judges, and other visitors was actually equivalent to making an around-the-world trip. Anyone interested in details of the competition and the results can find these in printed magazines as well as on the Web. The official site is at [www.wrtc2002.org].

Most of my pictures were taken at the annual Finnish ham radio camp in a small place called Himos. The WRTC crowd, including foreign visitors like me, was hosted there for a few days and could socialize as well as adapt to the Midnight Sun. How many bottles of beer were emptied there? Don't know — it is not mentioned in the final scores.

Except for the hosting Finns, the Americans were most numerous at WRTC 2002. It has a natural explanation — there are many, both ambitious and proficient, amateur radio operators in the USA. Sometimes I have a feeling that as many U.S. contest logs are submitted in major competitions as from the rest of the world.

The Olympics of amateur radio take place during the IARU HF Championship. This contest has only advantages. It is short, lasting for only 24 hours. The 48-hour events have the disadvantage of starting on a Friday for everyone west of Greenwich and ending on a Monday for everybody else. It covers both modes — phone and telegraphy. Points are related to ITU zones and also given for contacts within a country. Contest results are announced and certificates are mailed promptly. Even the most zealous contest foes have really little to complain about. During the WRTC 2002 in Finland, the teams were given short callsigns (with OJ1 to OJ8 prefixes) only 5 minutes before the contest commenced. Each team was closely watched by a referee, and hosted by a local ham.

The organization was terrific. I don't think any other group in the world will be able to come up to snuff with the

Photo A. *Country banners on the ground outside the tent, just before the official opening ceremony.*

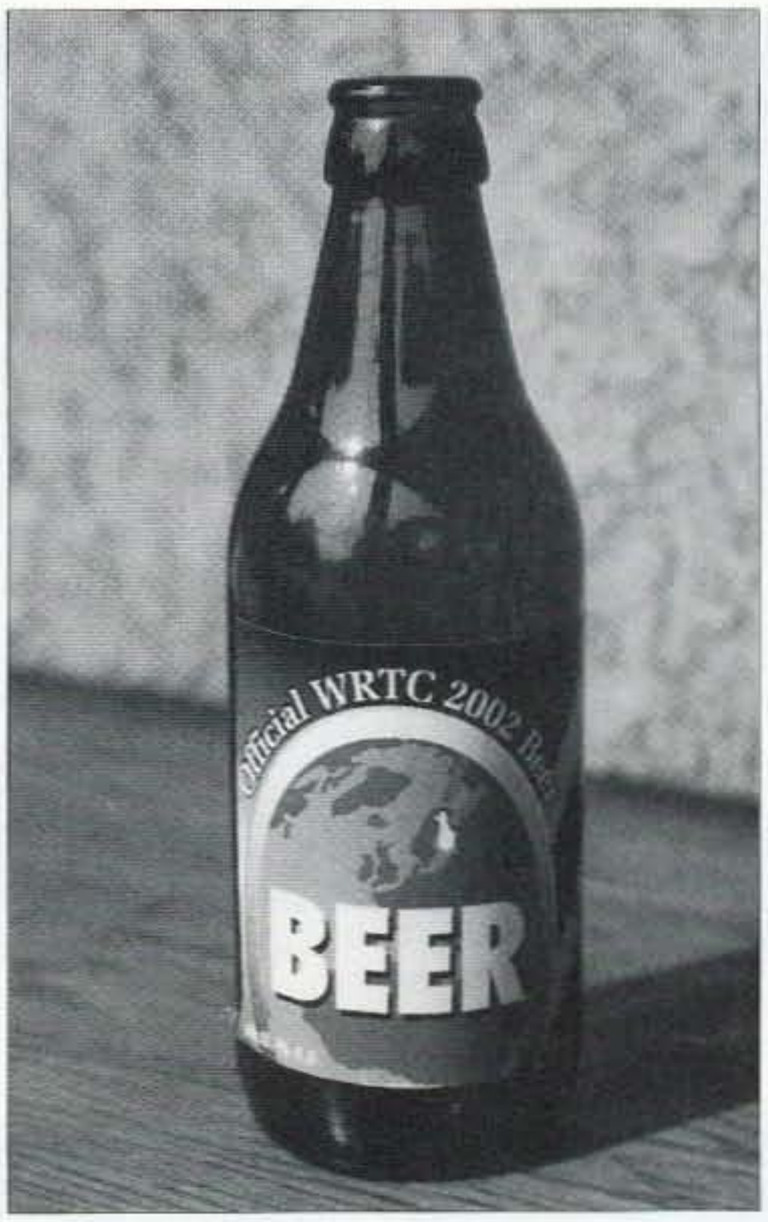

Photo B. *The official WRTC 2002 beer.*

Photo C. *Part of the Canadian representation: (left) John VE3EJ, Jim VE7ZO.*

Photo D. *Some folks from the Estonian group really camped on the summer camp of Himos.*

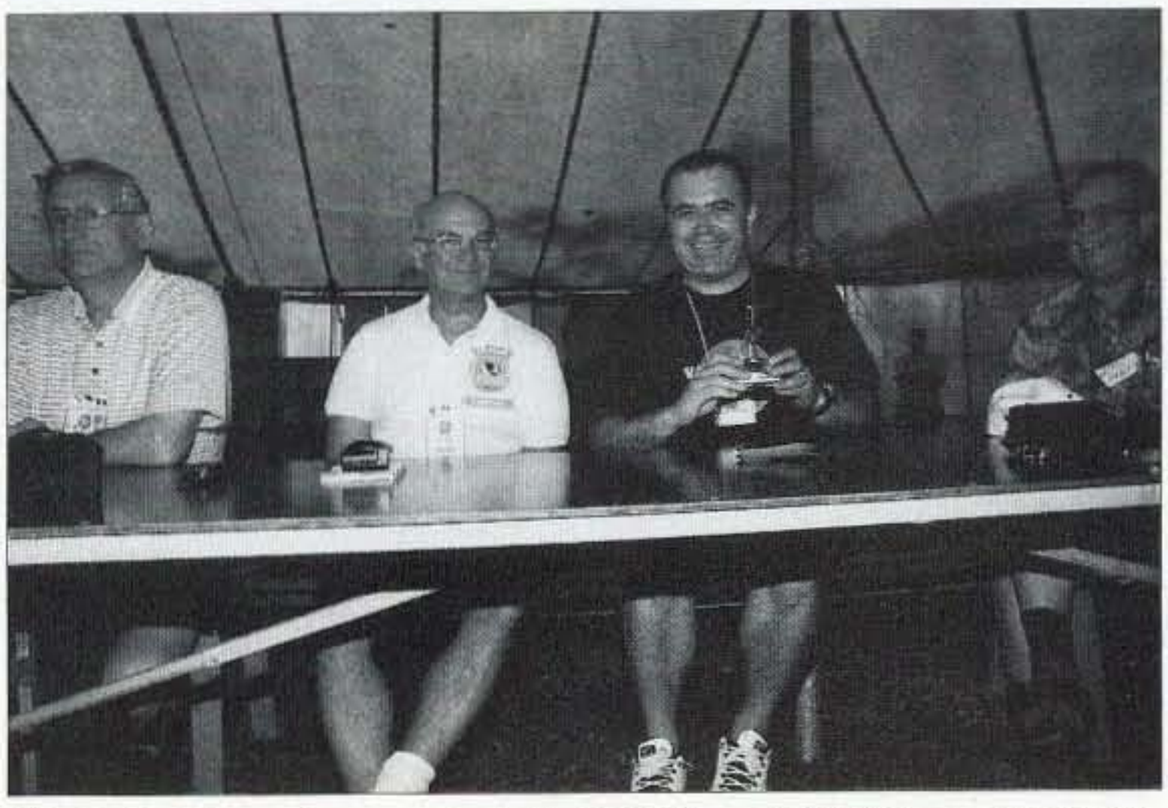

Photo E. *Canadians on the left, VE3EJ and VE7SV; Ivo 5B4ADA, living in Cyprus now, and OH6XY, far right.*

Photo F. *Stewart KC1F, a referee of the games, talking to UA9s from Asiatic Russia.*

Photo G. *The Russian group, Igor RA3AUU up front.*

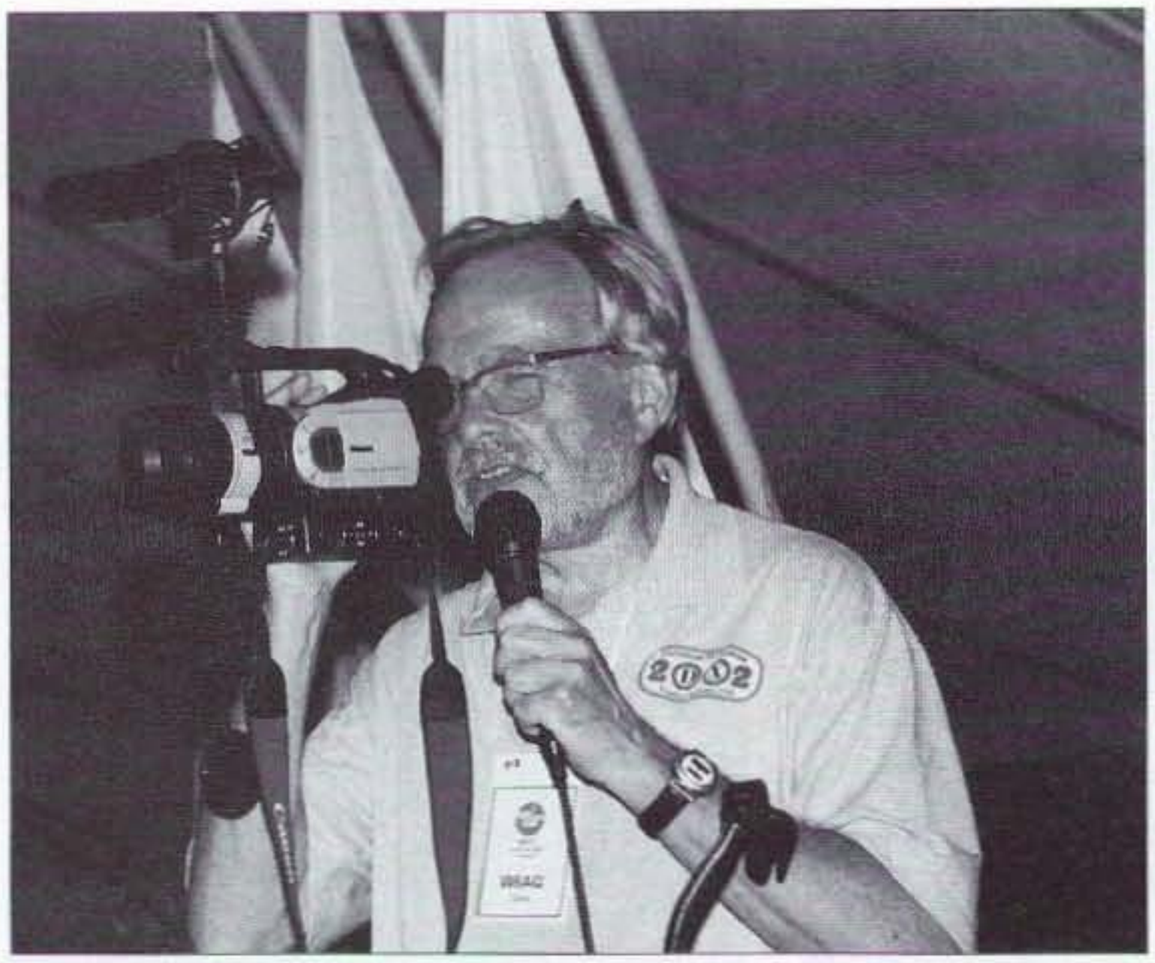

Photo H. *Dave W6AQ of Hollywood, CA, shot the event on video.*

Photo I. *From left to right: John K1AR, Bob K3EST, Doug K1DG, Trey N5KO.*

Photo J. *Left to right: Claudio LU7DW, Lucas LU1FAM, Dave G4BUO, Emily P43E (from Aruba).*

Photo K. *Swedish referees, right to left: Janne SM3CER, Thomas SM3DMP, Tord SM3EVR.*

Photo L. *From left: Rich K1CC, Thomas OZ1AA, Jim N3BB, Trey N5KO.*

Contest Club Finland, which, in cooperation with the national radio league (SRAL), staged a rich and flawless program. Kudos to the Finns!

When the on-the-air activity was over at 3 p.m. local (summer) time on Sunday July 14, 2002, everybody went to Helsinki to submit the computer log files and have some rest. Several hundred logs from all over the world were E-mailed to Finland, and the intensive checking process began. Next day, Monday, the official results were announced and the team of Jeff N5TJ and Dan K1TO made it to the very top again. But the Russian and German teams were very, very close. Basically, all the

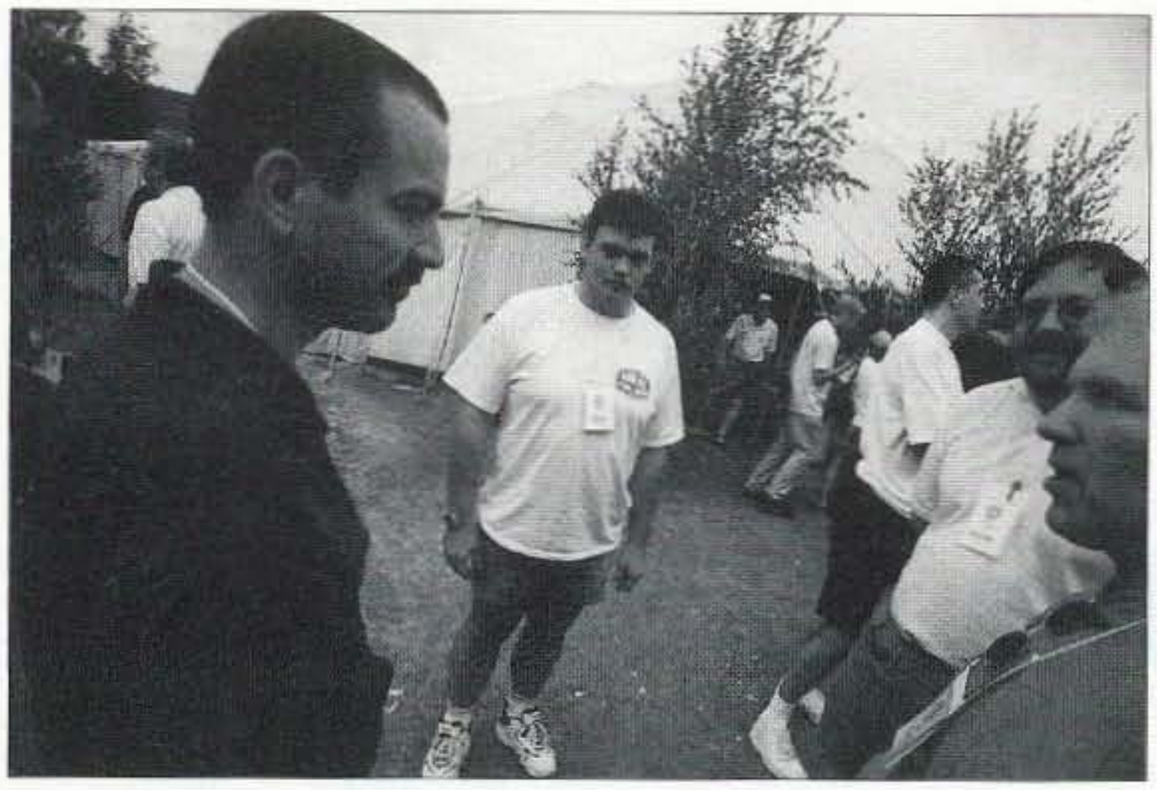

Photo M. *South Africans: Chris ZS6EZ and Bernie ZS4TX.*

Photo N. *Ward NØAX, who, apart from writing about the event, also collaborated in the Unofficial WRTC2002 Song Book and served as referee.*

Photo O. *Modest winners of WRTC2002: Jeff N5TJ (right) and Dan K1TO (Center). The gentleman on the left is Ken K1EA, who influenced contesting by creating a logging computer program called CT.*

Photo P. *A side effect of staying almost a week in Finland — Peter ON6TT tries to order lunch in Finnish.*

participants of WRTC are excellent operators and really represent the state-of-the-art level of human interface with HF radios. An event like this needs more support from all member societies of the IARU, and, of course, all amateur radio operators of the world. It strengthens the global position of our hobby — united, we are strong. The WRTC 2002 event was officially addressed by the president of Finland. 73

NEVER SAY DIE

continued from page 9

hyperactive children almost always have abnormal blood sugar. So we give them Ritalin. Check [www.ritalindeath.com] for info. These drugs have known side effects of heart damage, seizures, behavioral changes (mania), loss of consciousness and death.

The sugar from one soft drink (now being sold in almost every school ... which get a commission) results in inattention, depression, sleep disturbance and cravings. Sugar is addictive.

Van Allen

He's the guy they named the radiation belt that surrounds Earth after. Never mind that Nicola Tesla predicted it about 70 years earlier.

Anyway, *Time* had an article about Van Allen, now 88, and is still hard at work. He says that the charged particles emitted by the Sun reach out more than 7.5 billion miles. That explains why the radiation field is so strong only 93 million miles away, where the Earth and Moon are. It also explains why any astronauts venturing beyond Earth's protective Van Allen Belt are going to need a lot of heavy duty shielding from this intense radiation if they're going to live more than a few minutes.

No, those Apollo missions did not have heavy duty shielding.

Continued on page 59

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Getting Back a Gertsch

Adventures in refurbishing a Singer-Gertsch FM-9 frequency/deviation meter.

For most hams, the name Gertsch requires no introduction. Gertsch test equipment had quite an impact on two-way radio equipment starting in the early '60s. During this period, commercial two-way radio gear was being recycled from commercial applications into ham radio usage.

Most of the early gear was used for the VHF band, with some also opening up the way for the generation of ham repeater systems in the UHF band.

As a result of the influx of commercial gear into the realm of ham radio, modulated oscillator-type transmitters and superregen receivers gave way to commercially built crystal-controlled equipment. Because it was crystal-controlled, hams then desired to "net" their equipment so they could operate on channelized frequencies. Many techniques were developed by hams to align their equipment to a given frequency channel. In commercial usage at that time was the Gertsch line of frequency meters and Motorola test sets. Both pieces of equipment were very accurate frequency transfer standards that allowed the setting of both frequency of operation as well as the deviation of the FM signal.

It was during this period of time that those hams working in the commercial radio field teased those who didn't have access to commercial equipment with their use of a "Gertsch" for setting up their radio equipment. Most hams had only heard of a Gertsch and actually knew very little about them — and that included me.

The Gertsch frequency meters remained out of the reach of most hams for a long time, until later on when some of the older models reached the swap meet tables. During this period of time, Singer took over the Gertsch line of equipment and made a number of technical improvements — but that's straying a bit from the point that I'm making, which is that test equipment is a "ham's best friend."

I have a Gertsch FM-9 signal generator/test set that was given to me as a gift. It was not functioning and was in need of repair. **Photo A** shows a front panel view of the FM-9 and **Table 1** shows the specifications for it. The capability of the equipment is excellent for most ham applications and really "fit the bill" for the time period that it was built. Except for its massive size, the capability of the Gertsch FM-9 makes it a valuable piece of equipment for most any ham experimenter's test bench.

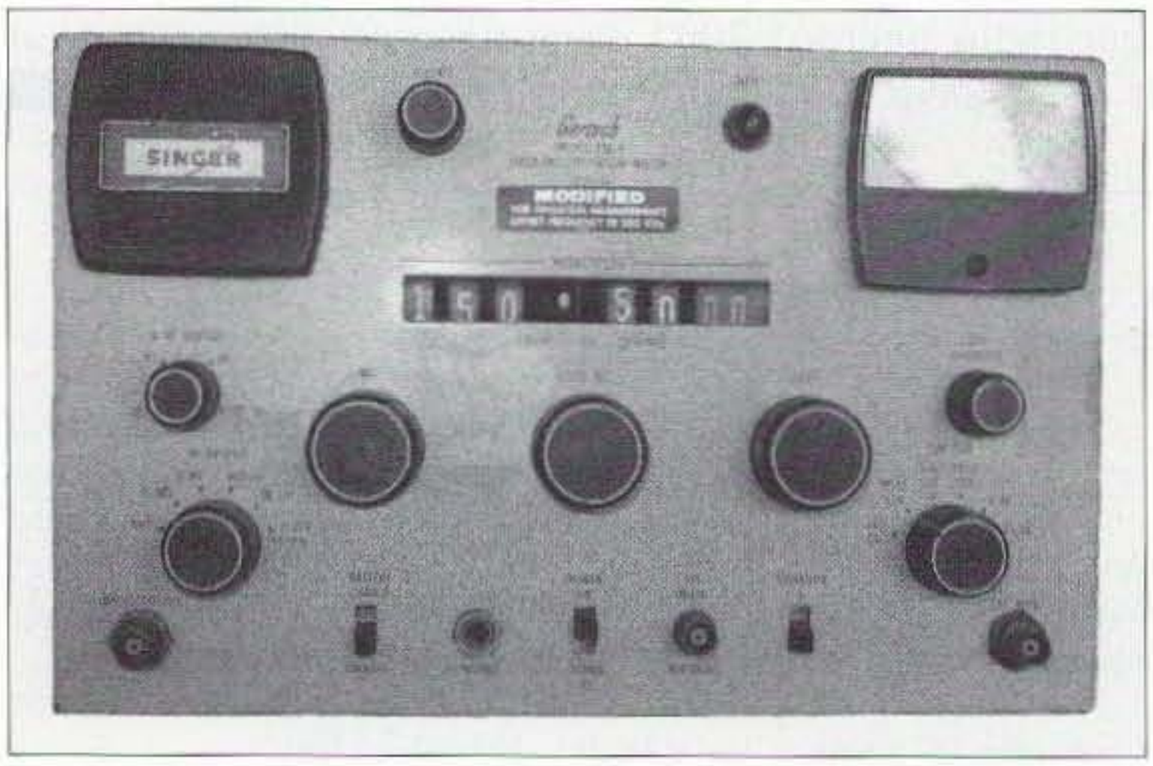

***Photo A.** A front panel view of the Singer-Gertsch FM-9 frequency/deviation meter.*

Inside the FM-9

The story that I'd like to lead you through involves getting the FM-9 to operate after being out of service for apparently a very long period of time. Servicing the Gertsch isn't for the weak of heart, since the circuitry is

reasonably complex and the alignment of the internal circuits is quite critical. True, I didn't know anything about it either, but was willing to study and learn from the device. You must be familiar with phase-locked-loops and how to deal with them when they tend to drop out of lock. **Fig. 1** shows a simplified block diagram of the FM-9 showing the three VCOs and the LFO that are used to make up the signal generation/selection portion of the device. In addition to the generation of a signal, the FM-9 has a built-in low sensitivity receiver. The receiver portion utilizes the FM-9's generated output signal as a local oscillator that mixes with an incoming signal to create an intermediate frequency (IF). As I determined from working with my FM-9, the original factory setting for the IF was 450 kHz and later on the factory shifted the IF to 300 kHz. A sticker was placed on the face of the test set to indicate the modification. The receiver's IF path consists of an amplifier-limiter driving a frequency discriminator. A meter is mounted on the front panel providing a visual indication of tuning, signal strength, and two levels of deviation. In addition, an audio amplifier is included for monitoring the FM sounds being received.

The heart of the FM-9 is a 1 MHz crystal that's mounted in a temperature-controlled oven. When at temperature, the crystal's frequency stability is fantastic to say the least. In addition, the frequency of the crystal in my FM-9 was so close to WWV that I had some difficulty determining how close. Yes, a counter indicated it was on frequency, but I was interested in knowing how the crystal's frequency compared to WWV. Because the frequency was so close to WWV, I refrained from touching the frequency adjuster because I could have only made a good thing worse.

To provide a frequency reference for the FM-9, the crystal's frequency is both multiplied as well as divided as shown in **Fig. 1**. A multiplier is used to increase the crystal's frequency to 130 MHz, allowing it to become the VHF frequency reference for the high frequency VCO. The divided output from the crystal is used for setting up the reference frequencies for the low

FREQUENCY	
RANGE	
Fundamental	150 - 162 mc
Harmonics	450 - 486 mc
ACCURACY	± 0.0002% (± 2 ppm) (After 30 minutes warmup)
DEVIATION MEASUREMENTS	
RANGE	
Low	0 to 5 kc
High	0 to 15 kc
ACCURACY	± 5% of full scale
SENSITIVITY, FREQUENCY, AND DEVIATION MEASUREMENTS	
150 to 162 mc	1 mv
450 - 486 mc	5 mv
RF OUTPUT	
RANGE	
150 - 162 mc	50 mv to 0.5 uv
ACCURACY (Calibrated into 50 ohm load)	
0.5 uv	± 2 db (With RFA-20)
All other points	± 4 db
ZERO BEAT INDICATORS	
Aural	Built-in audio amplifier and speaker
Visual	Meter
EXTERNAL FREQUENCY MODULATION	
150 - 162 mc	
300 to 3,000 cps	5 kc deviation
100 cps	2 kc minimum
450 - 486 mc	
300 to 3,000 cps	15 kc deviation
100 cps	6 kc minimum
Required Audio Input	1 vrms (approximate)
AUXILIARY OUTPUTS	
IF ALIGNMENT SIGNAL	
Frequency	400 - 500 kc, with high harmonic content
Amplitude	3 v peak to peak
Source Impedance	1 k
CRYSTAL CALIBRATION SIGNAL	1 mc pulse
POWER REQUIREMENTS	
AC	115/230V, 50 to 400 cps, 7 va
DC	11.5 to 15 v, approximate 0.3 amp average current, NEGATIVE ground
OPERATING TEMPERATURE RANGE	32° to 120°F (0° to 50°C)
FURNISHED ACCESSORY EQUIPMENT	Built-in battery charger and voltmeter Six foot coax cable .50 ohms BNC to UHF connectors DC power cable, cigarette lighter connector RFA-20 attenuator

Table 1. Singer-Gertsch FM-9 specifications.

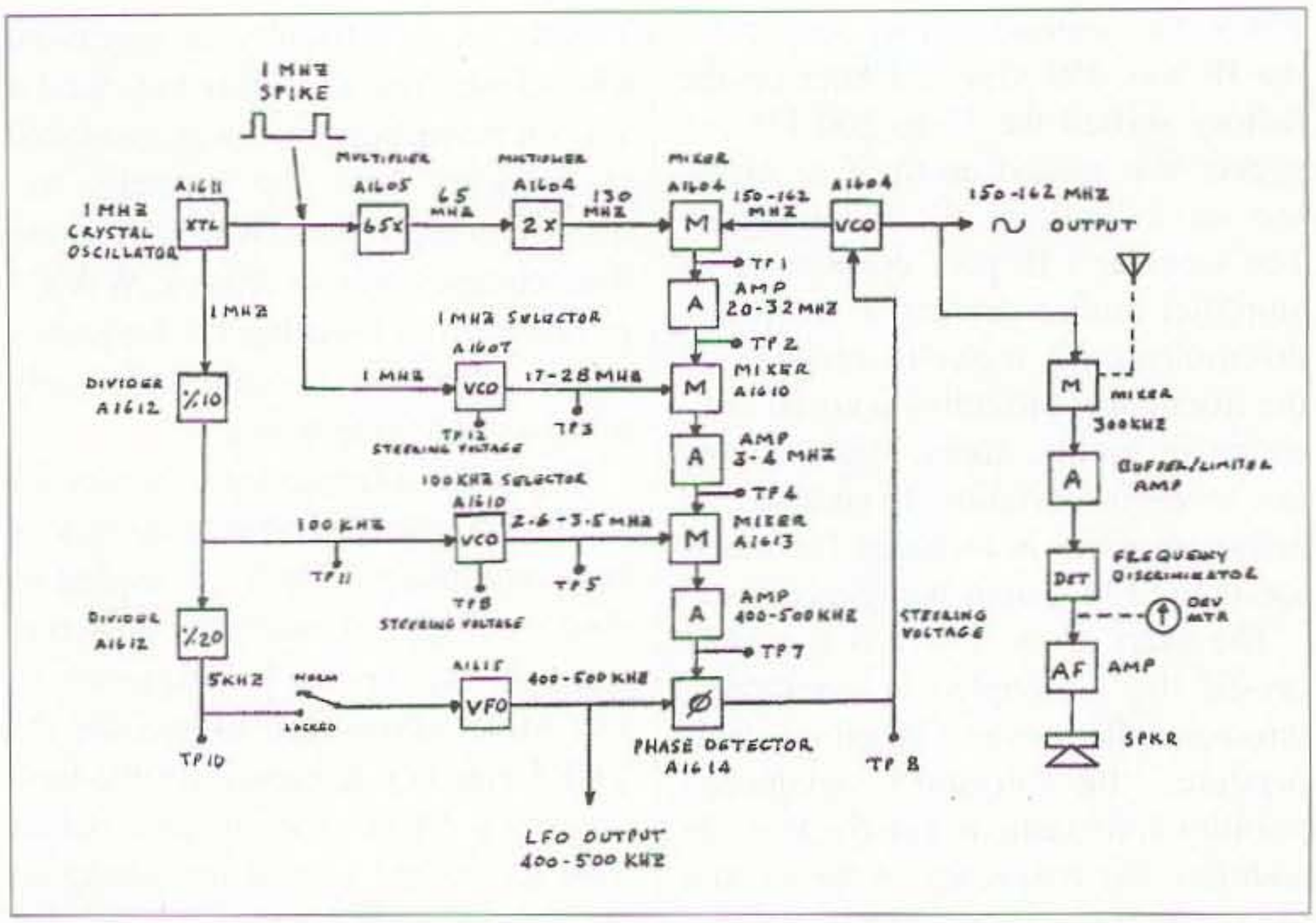

Fig. 1. This is a functional block diagram of the FM-9. Module designation numbers, test points, and frequencies are shown.

frequency VCOs and for "locking" the LFO (unlocked is the normal position).

While on the subject of the LFO, it is locked only for special situations where it can be "locked" at 5 kHz increments. Because the LFO does not have a closed loop, it doesn't phase lock as such, but you can hear the beat note in the speaker when the LFO and 5 kHz signal begin to match (zero beat).

To create a multiple number of discrete frequencies, the FM-9 utilizes the output from each of the three VCOs by creating frequency mixes. The mixer chain creates a signal channel that's equivalent to the intermediate frequency path of a superheterodyne receiver. As each frequency is mixed along the path, the combined/resultant frequency is mixed with the LFO and routed to a phase detector whose output is the tuning voltage for the HF VCO. The above explanation is a simple summary of what actually takes place within the system.

Troubleshooting

I'd like to lead you through the steps that I followed to both examine and troubleshoot my FM-9. First off, it's my philosophy that if the equipment operated once, it should be repairable in order to operate again. By that I mean that it's necessary to find the fault and repair the circuit, not redesign the circuit. Unfortunately, during my examination of my FM-9 I found two areas that failed to work "as designed" and I had to make minor changes to compensate for the problems.

During an overall examination of the FM-9, I found all of the components to be functional and operating pretty much as designed — no "bad" parts were found. The majority of transistors were germanium, and substituting them with silicon devices only degraded the performance; that meant that I had to stay with the transistors mounted on the boards. It appeared to me that the circuits were all operating on a narrow margin and that any slight shift in a circuit parameter stopped the circuit from performing as needed to keep the system functioning. Being an all-discrete device design,

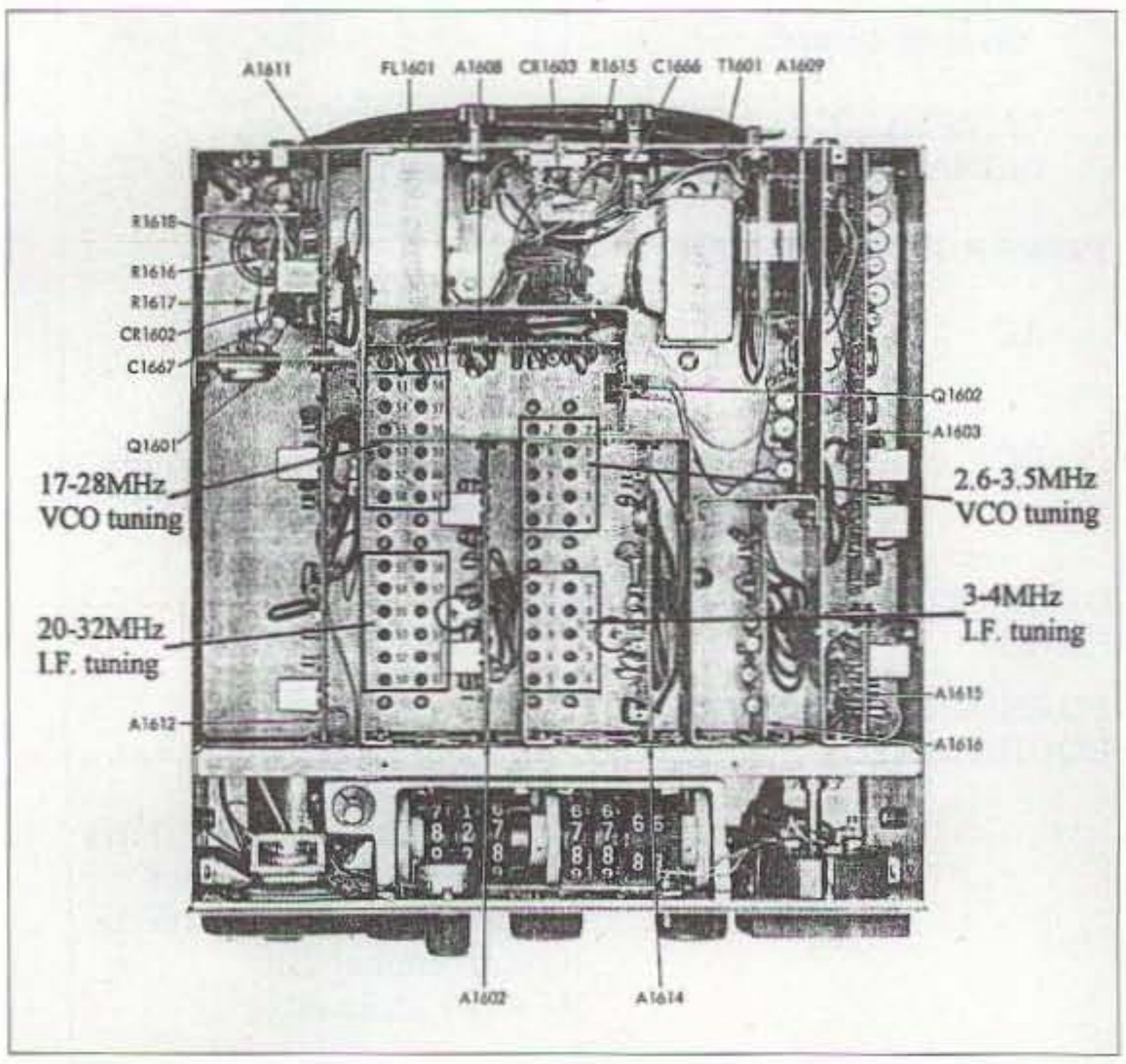

***Photo B.** Topside view on the chassis showing all of the alignment adjustments for the two low frequency VCOs.*

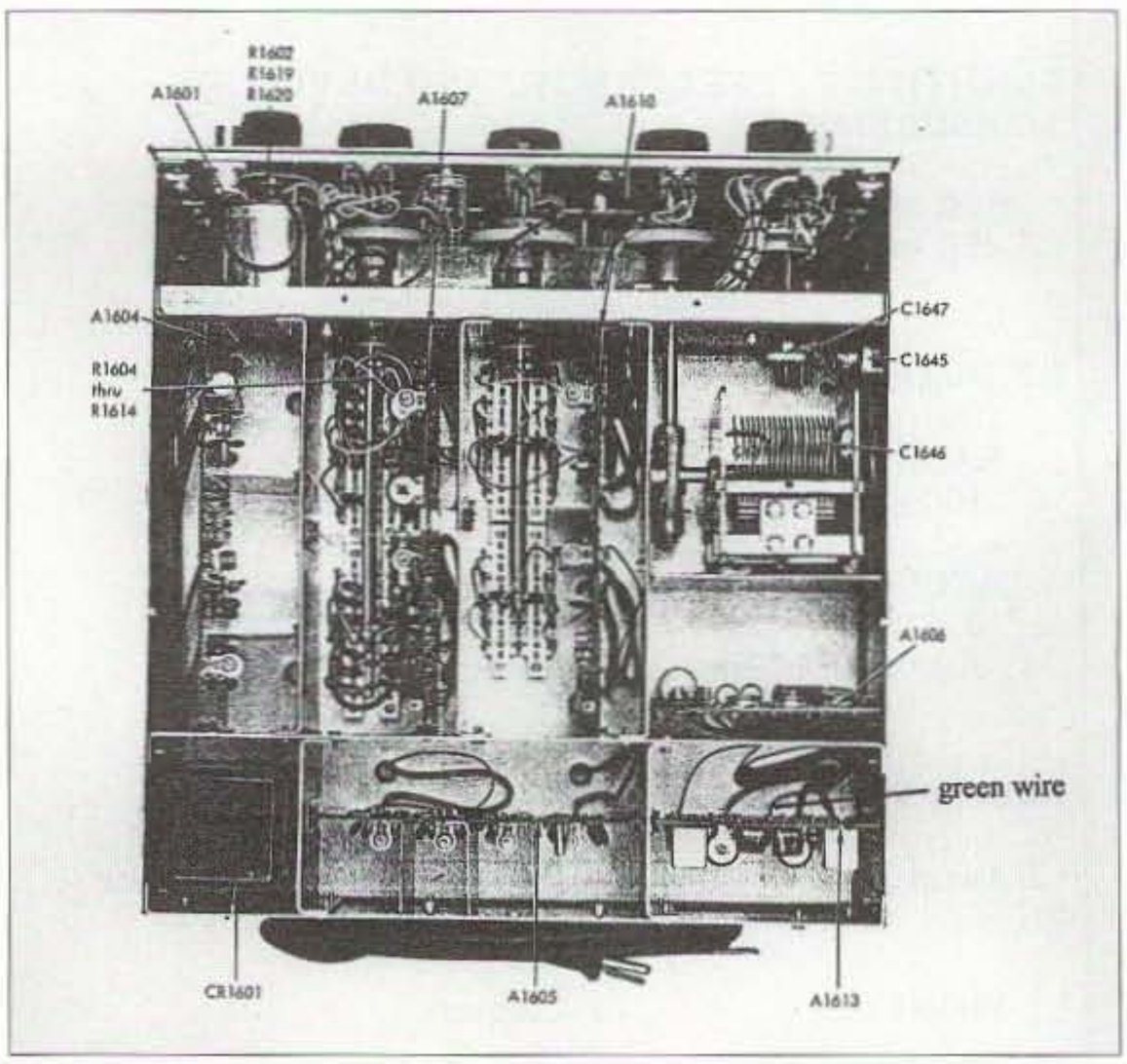

***Photo C.** Bottom side of the FM-9 chassis. Module numbers and the "green wire" are shown.*

every component can be examined individually for problem-solving, if necessary.

The process that I used for examining the FM-9 was to study each module to both gain an understanding of it as well as determine how well it was functioning. After making the rounds through the modules several times, I ended up each time at the 20-32 MHz mixer as being the failing module. My question each time was, "Why isn't the mixer outputting a signal?"

The signals entering from both the multiplier and the VCO appeared to be sufficiently high, although I still question the signal output amplitude from the 130 MHz multiplier. Using an oscilloscope I measured a signal level of 70 mVpp applied to the mixer when I would have liked to have seen a signal amplitude closer to 200–300 mVpp. But the signal level wasn't to be any higher! That forced me to re-examine the mixer to see if it was capable of mixing at the input levels received from the 130 MHz multiplier and the HF VCO. I built up an external mixer identical to the internal one and applied variable-level signals into it. From that experiment I quickly determined that the mixer required a higher signal injection level than it was getting from the 130 MHz multiplier. Everything in the multiplier appeared to be working well and I wasn't able to increase the signal output level with alignment nor with a component change. That left me with the mixer as the design change option. After studying the FM-9 schematic I concluded that the emitter resistor in the mixer circuit could be increased in value to raise the injection level sensitivity — and that worked well. I changed the emitter resistor from 150 ohms to 1k. The output signal from the mixer was now strong enough to provide a signal into the 3-4 MHz amplifier and mixer circuits.

With the mixer resistor change, the overall system began to lock on some frequencies which indicated that I was on the correct path, but as yet, had not reached the final goal. The next step was to do a complete alignment of the test set. I really made a mess of the thing after reading through

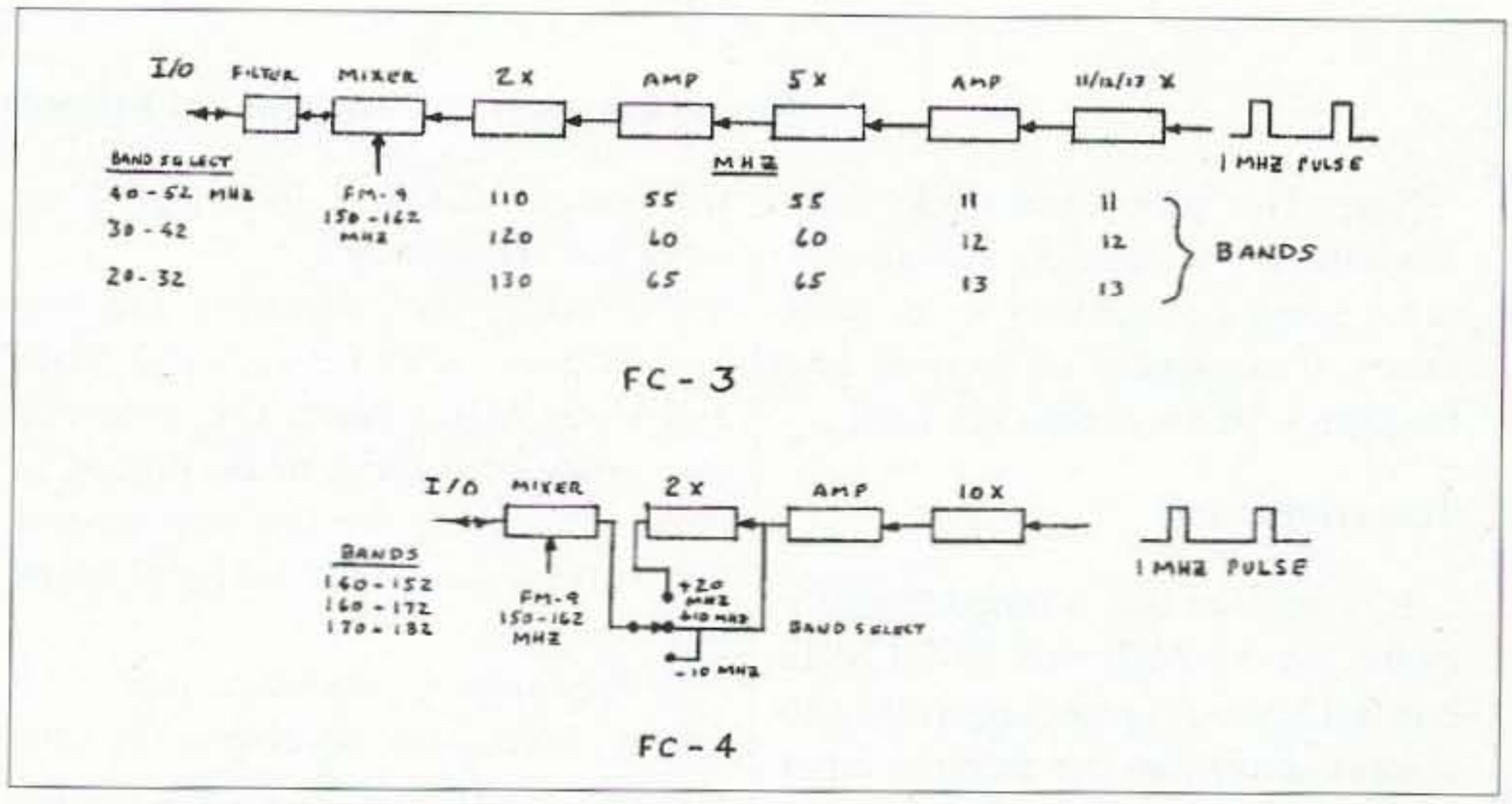

Fig. 2. *Singer-Gertsch frequency converters used to extend the frequency coverage of the FM-9 frequency/deviation meter. The FC-3 covers the frequency range of 20–52 MHz. In addition, the FC-3 may be used to convert signals in the 260-292 MHz band. The FC-4 covers the frequency range of 140–182 MHz.*

the alignment procedure provided in the book and attempting to follow it — not sure why!

As a result, I developed an alternate alignment procedure that worked for me as shown in the sidebar. The basic steps involve getting the 17–28 MHz and 2.6–3.5 MHz VCOs onto the correct frequencies with each FM-9 dial setting. Once those VCOs lock correctly, then the rest of the system begins to work as designed. **Photo B** shows the adjustment locations for the VCOs and their respective amplifiers. There should be *no need* to adjust the amplifiers unless components are changed.

I used two techniques to verify the correct frequency for each of the two VCOs. The first step was to temporarily block the sweep signal and to "look" at the output signal using a receiver tuned to the VCO frequency. With the sweep blocked, the VCO frequency was adjusted at each dial setting. As each adjustment was made, the block was lifted to see if the VCO remained on frequency or jumped away.

Once both VCOs appeared to be locking correctly, the FM-9 operated over most of its operating range. An unlock failure occurred when slewing the LFO from "zero" frequency to 100 kHz. To sort out this problem, I connected my oscilloscope to the detected/rectified IF output signal (green wire) on module A1613 (see **Photo C**) and watched the voltage value while slewing the LFO dial. It appeared the voltage level was dropping off as the LFO was slewed toward the higher end of the tuning range. So the question arose as to how one might obtain a little more signal amplitude in order to retain "lock."

Since an alignment had been done a couple of times in hopes of raising the signal level, and changing transistors failed to help, the only opportunity remaining was to try a minor design change. Upon examining the 400–500 kHz buffer amplifier (module A1613) that follows the mixer, I noted that an un-bypassed emitter resistor was used in the design. An un-bypassed emitter resistor creates some signal degeneration within the stage. What would happen if a bypass capacitor was added across the resistor? Upon adding a 0.001 µF capacitor, the signal level into the phase detector rose significantly — but system phase locking ceased. Apparently, the addition of the bypass capacitor raised the signal level too much, causing the frequency sweep circuit to be inhibited (without a sweep, the VCOs fail to tune to a "lock" frequency). When phase lock occurs, the sweep circuit normally stops except for a "tickle" indicating that it's ready to sweep when a dial setting is changed. Anyway, to "fix" the gain issue, I tried

Singer-Gertsch FM-9 Alignment Procedure

Note: This procedure works only when the test set unlocks periodically or on some dial settings — in other words, if alignment of the two low frequency VCOs is the only fault.

Test equipment

1. A receiver that is tuned digitally in the 2.6–3.5 MHz and 17–28 MHz bands. Connect a probe, equivalent to a scope probe, to the antenna input connector. The probe tip must be insulated to prevent electrical contact.

2. A frequency counter that responds to a signal in the 150–162 MHz band.

Test steps

1. Remove the top cover from the FM-9 to expose the alignment adjustments as shown in **Photo B**.

2. Turn on the FM-9 and allow it to warm up for at least 30 minutes.

3. Rotate the dial settings at random until a "lock" is achieved.

(a) Compare the counter's frequency indication to the dial setting.

(b) If the two compare, the two low frequency VCOs are set correctly for the indicated dial setting.

(c) If the two indications do *not* compare, then one of the two low frequency VCOs is locking on an adjacent frequency.

4. Finding and adjusting the two low frequency VCOs (2.6–3.5 MHz and 17–28 MHz). Note: The receiver's test probe will have to be placed in close proximity to the appropriate adjustment screw for a signal to be detected.

5. Adjustment procedure notes: (a) Using both the receiver and the counter, verify that frequency indications compare to the FM-9 dial setting after each adjustment. (b) To achieve an equal +/- lock on the "MC" range, the "100KC" dial is set to XXX.5000 when adjusting the 17–28 MHz VCO through all settings. (c) Refer to **Photo B** for the appropriate adjustment screws. The screw number matches the dial setting number. When turning an adjustment screw, less than 1/4 turn is required to pass through the adjustable lock range. (d) Adjust only the VCO frequency adjustments. Do not adjust the IF amplifier tuning screws.

6. Adjustment.

A. Select each dial setting to ensure that a "lock" occurs. With each dial setting, compare the counter's indication to the dial setting. Should the dial and counter not agree, do the following:

(1) Take note of the "MC" and "100KC" dial settings.

(2) Using the tables from Step #4 above, determine the expected frequencies for the two low frequency VCOs. As an example, when a loss of lock occurs at 155.5XXX, the 17–28 MHz VCO should be operating at 22 MHz and the 3–4 MHz VCO should be operating at 3.1 MHz.

(3) Probe adjustment screw "55" for a frequency of 22 MHz, and probe the adjustment screw "5" for a frequency of 3.1 MHz.

(4) Adjust (1/4 turn or less) the appropriate screw to achieve lock at the correct frequency.

(5) Compare the counter's indication to the dial setting.

(6) Continue the dial selection/comparison routine while making the appropriate adjustments until all settings show an indication of "lock" at the correct frequency.

B. Loss of lock while adjusting the "LFO" dial.

Note: Check the 2.6–3.5 MHz VCO when a loss of lock occurs while rotating the LFO dial.

(1) At each "KC" setting, rotate the "LFO" dial from end to end.

(2) When an unlock occurs, as an example, at XXX.2XXX, use the receiver to check the frequency of the 2.6–3.5 MHz VCO — it should be operating at 2.8 MHz. Slightly adjust the "2" adjustment screw to achieve lock at 2.8 MHz. Compare the dial setting and the counter's indication.

(3) Rotate the "LFO" dial from end to end to test for "lock." Repeat the "KC" dial setting to the next setting and repeat the "LFO" adjustment until all "KC" dial settings retain "lock."

XXX.0000	2.6 MHz
XXX.1000	2.7 MHz
XXX.2000	2.8 MHz
XXX.3000	2.9 MHz
XXX.4000	3.0 MHz
XXX.5000	3.1 MHz
XXX.6000	3.2 MHz
XXX.7000	3.3 MHz
XXX.8000	3.4 MHz
XXX.9000	3.5 MHz

Table S1. *Dial setting table for the 2.6–3.5 MHz VCO.*

150.0000	17 MHz
151.0000	18 MHz
152.0000	19 MHz
153.0000	20 MHz
154.0000	21 MHz
155.0000	22 MHz
156.0000	23 MHz
157.0000	24 MHz
158.0000	25 MHz
159.0000	26 MHz
160.0000	27 MHz
161.0000	28 MHz

Table S2. *Dial setting table for the 17–28 MHz VCO.*

several small value capacitors and settled with a 39 pF capacitor. It raised the gain above the marginal threshold value just enough to allow the LFO dial to be slewed from end to end without affecting the phase lock.

As an afterthought, perhaps the addition of a 10–100 pF trimmer capacitor connected across the resistor would have been a better choice. Adjusting the trimmer to a "critical" value would likely have provided the desired stage

gain setting needed to improve the VCO lock range.

Second alignment procedure

Once the FM-9 began to operate over most of its dialing range, a few lock failures continued to occur. This resulted in a different approach to the alignment with a counter connected to the output BNC connector. Even though the device was apparently locking OK on most all dial settings, some of the HF VCO output frequencies were off by at least 20 kHz. Upon chasing that problem, I found the 17–28 and 2.6–3.5 VCOs were independently locking on an inappropriate frequency. When a nonselected frequency appeared at the output, the receiver was tuned to the frequency of the two VCOs to see where they were operating. If not per the listing as shown in **Fig. 3**, Test Step 4, the appropriate adjustment was made to correct the frequency. Every dial switch setting had to be checked to ensure that a correct lock occurred. After getting the VCOs to lock correctly, the entire RF generation system appeared to be very stable.

As a final comment before leaving alignment: I found an interesting situation regarding the power supply voltage. According to the book, the power supply output voltage was to be set to 9.0 V. After getting into the gain issue with several of the circuits, I found that varying the power supply voltage affected the gain sufficiently to be of concern. After doing a +/- margin test of the system lock versus the power supply voltage, I determined that setting the supply voltage to a value between 9.0 V and 9.5 V appeared to be best. I settled on 9.3 V and now my FM-9 appears to be stable at that supply voltage value.

Receiver portion

The receiver portion of the test set is comprised of an IF amplifier-limiter and a frequency discriminator followed by an amplifier. When I first started to examine the receiver section I was under the impression, as indicated in the service manual, that the IF was set up to operate at 450 kHz. But a sticker on the face of the test set indicated that it had been modified to 300 kHz. Using an external signal generator I was able to determine that the IF amplifier had a pass band wide enough to cover both the 300 kHz and 450 kHz frequencies — therefore, it did not require alignment.

For whatever reason, the discriminator failed, at first, to respond to a signal from the external signal generator. After grounding two points within the discriminator's output circuit, I was able to electrically separate the two tuned circuits. Without the grounding, the two circuits were interacting, creating some confusing indications (the grounds were not required when the panel meter was used as an indicator). Once separated, the tuning of two tuned circuits responded as expected and their frequency was measured. The discriminator is made up of two independent diode detectors whose output is summed to create a differential voltage. One circuit is tuned to 270 kHz and the other is tuned to 330 kHz. The offset creates a very linear "S" curve that is centered at 300 kHz. Following the alignment check, I used a standard 5 kHz deviated signal to check the metering circuit on both the 5 kHz and 15 kHz settings. Both appeared to be within +/- 0.5 kHz.

Frequency converters

The basic tuning range of the FM-9 is 150–162 MHz. To be useful at other frequencies, the direct output can be multiplied up to frequencies including 1 GHz. But to go lower in frequency, Singer-Gertsch provided two converters, an FC-3 (20–52 MHz) and an FC-4 (140–182 MHz). Each converter has three bands, with each covering a 12 MHz frequency segment.

I opened up the converters attached to my FM-9 to determine how they were set up. I worked up a block diagram for each of the converters as shown in **Fig. 2**. Basically, each converter utilizes a balanced diode mixer with combined inputs from a frequency multiplier chain and the output from the FM-9 to create an output signal within the selected band.

Inside of the FM-9, the 1 MHz oscillator drives a blocking oscillator that creates a 1 MHz pulse waveform that is ideal for driving multiplier circuits. That pulse is injected into the converter where it drives a series of multiplier circuits. An amplifier follows each multiplier circuit, except for the last multiplier in the chain. The amplifier shapes the waveform to a sine wave by reducing the harmonic content at the selected frequency.

Of the two converters, the FC-3 is the more complex because of the multiplication factor changes that take place with each band selection. As an example, the first multiplier produces an 11, 12, or 13 MHz output depending upon the band selection. The output of the first multiplier is then multiplied again by a factor of 10 in two multiplier stages to achieve an output at 110, 120, or 130 MHz. The output signal frequency is derived by subtracting the multiplier's frequency from the FM-9's dial indication. In a like manner as the FM-9 (direct input), the converter allows for a transmitted signal to enter into the I/O connector and be transferred to the FM-9 as a received signal. The deviation measurement remains direct regardless of the converter band selection.

I did try an experiment to see if the FC-3's multiplier's output signal would add with the FM-9 to obtain a higher frequency. Even with the filter in the output circuit of the converter, I was able to obtain a usable signal in the bands of 260–272, 270–282, and 280–292 MHz. The FC-4 converter already takes advantage of the sum and difference to achieve the output band of frequencies.

Conclusion

Hams are the fortunate recipients of commercial test equipment that is being dropped from commercial service. Much of the gear, including the Singer-Gertsch FM-9 test set, provides hams with valuable tools for their personal test bench.

Although the FM-9 test set is a complex piece of equipment to repair, I hope that this discussion will assist in keeping this fabled piece of equipment operating for many years to come. 73

By G.E. Smith W4AEO

Yes, I Built Sixteen Log Periodic Antennas!

Part 2: Assembly.

After determining if there is sufficient area for the LP when aimed in the desired direction, it is suggested that a scale drawing be made showing the proposed mast locations for the LP as it will be when suspended from the masts. By drawing this to scale, it is quite easy to determine any needed or unknown dimensions.

Next, procure the necessary material for the LP selected. **Fig. 9** illustrates the construction or assembly of a typical DLP, and **Fig. 10**, the monopole LP configuration.

Note that for the long rear element (#1) and the short forward element of a horizontal DLP, small ceramic egg–type compression insulators are used as these two end elements carry most of the load or strain of the center 2-wire open feed line and its center insulators or spacers. The latter are home-made from .64m (1/4")-thick Lucite or Plexiglas. This can usually be purchased at hardware, building supply, or radio stores.

The Lucite is cut into strips 1.59cm wide x 15.24cm long (5/8" x 6"). These are then drilled to make three types of insulators for the LPs, which are:

(1) End insulators for all elements (except the front and rear as mentioned above). Two holes are drilled in this type.

(2) Center insulators for the DLP center feeder which serves as the center insulator for all elements (except front and rear), also supporting and spacing 10.16cm (4") the 2-wire center feeder. Four holes drilled.

(3) Center insulator for the monopole LP. Same as the DLP type except these have an extra center hole for securing to the 1/4λ vertical elements. For this type, the two outside holes are for securing the 1/4λ ground radials or counterpoise.

The hole spacings for above are illustrated in **Fig. 11**. These are all the same size to simplify production.

Lucite is used for these as it is difficult to locate a ceramic insulator of this type. The Lucite is light in weight, easy to cut and drill, low loss, and less expensive than commercial insulators. They average 10 to 20 cents each. Hundreds of these have been used on the LPs here. Only one has broken after four years of use.

The importance of transposing between elements cannot be stressed enough. This is accomplished either by criss-crossing the feeder as illustrated in **Fig. 1a** or by transposing the feed to the elements as illustrated in **Fig. 1b**. Both work equally well in providing phase reversal to alternate elements. The latter method is better suited for wire beams from a construction standpoint as shown in **Figs. 6** and **10**. This method has been used here for all but one LP. It is the method generally used for the large commercial LPs.

An LP is in effect a multi-element endfire array and *must have a phase reversal between adjacent elements* as with any endfire array (example, the "ZL Special" or the "W8JK"). If there is no phase reversal between elements, you do not have an LP.

Briefly, an LP is similar to a yagi except that all elements are driven. The "active" section of an LP consists of a rear-driven reflector, a driven or "active" 1/2λ radiator, and a number of driven forward directors. It must, therefore, function as an endfire array. If the adjacent elements are not approximately 180° out of phase, there will be no forward lobe or gain.

Several OMs have written that their LPs were nondirectional and gave no gain. After checking, it was found they failed to transpose.

Antenna wire

Because the forward and rear elements and the 2-wire center feedline are the only portions requiring a strain-type wire, these should be #7/22, #7/24, or #14 copper or copperclad.

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All of the other elements can be #16 soft-drawn bare copper, enameled or tinned (hookup) wire. This can be purchased economically in 304.88m (1000') spools. Even #18 has been used here, which seems entirely satisfactory — at least to 500W. This saves weight and cost.*

Since an LP has a lower Q than a yagi, there is not the high RF current in the elements. The yagi generally requires tubing, whereas wire is entirely satisfactory for an LP. Wire is used for the large commercial or military fixed LP antennas (references 1, 2, and 3). Further, since there are several "active" elements per band, the RF current is no doubt distributed over several elements. Therefore, wire is entirely satisfactory.

Soft-drawn wire is suggested for all elements except #1 and the short forward element, since there is practically no pull on the remaining elements. Being soft-drawn, the wire will not tend to coil up or kink as does hard-drawn or some of the copperclad. There is enough tension on the forward and rear elements to prevent this problem.

After all material has been collected, and the Lucite insulators fabricated, proceed as follows:

(1) First, assemble the two-wire center feeder.

Select two sturdy posts, trees, or other supports with about 1.53m (5') greater separation than the required length of the center feeder for the LP selected. Secure one end of the pair to or around the post at a height of approximately 1.83m (6') above ground level. Now thread the center Lucite insulators on the 20-wire feeder at the free end. This end may now be secured to the second post or tree. Stretch the two wires so they will be parallel and separated about 20.32cm (8") at the support ends. They will tighten to

*A number of the LPs here have been constructed entirely of aluminum wire (#15 electric fence wire, Sears Cat. No. 13K22065). This is quite inexpensive compared with copper; you can get a 402.44cm (1320') roll for $8.70. The aluminum is also used here to reduce weight, since trees are used as the "masts."

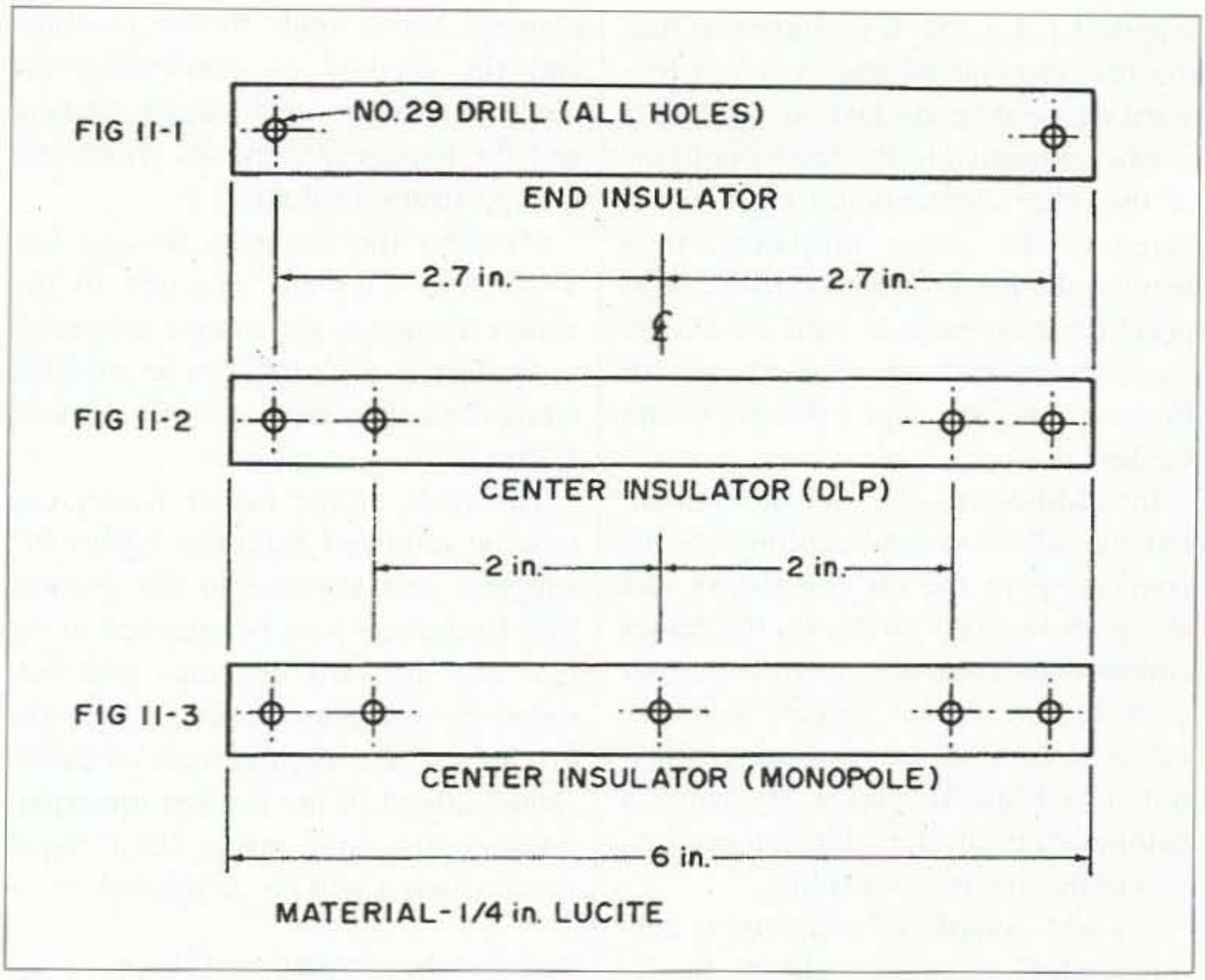

Fig. 11. *Hole spacings for the insulators.*

10.16cm (4") separation after the center insulators/separators are spaced. They should be about shoulder height to make for easy assembly. If necessary, two turnbuckles can be used temporarily at one end to tighten the two parallel wires and to adjust them for equal tension.

Now slide the center insulators (spacers) and distribute along the feeder in their approximate locations as given in **Table 2**. Starting at one end, mark or indicate the location where the 2-wire open feeder will be attached to the center of the long rear element #1. A piece of 2cm (3/4") masking tape can be used on each of the two wires to indicate this starting point, which should be about 30.48cm (12") from one of the end supports. The #1 element will be located at this starting point.

Now measure from this point with a steel tape the first spacing distance, S1, which will separate elements #1 and #2. The first Lucite center insulator will be located at this point (location of the second element, #E2). This insulator is held in place between the 2-wire feeder by means of a few turns of 2cm (3/4") masking tape served on either side of the Lucite insulator on both wires. Allow a slight distance of "play" on each side of the insulator so the tape will not be snug against the insulator. The wires should be able to turn free in the insulator holes. This helps keep the 2-wire line from twisting after the antenna is completed. The masking tape hardens after a few days in the weather and prevents the center insulators from sliding on the wires, which would alter the correct spacing of the elements.

Next, measure the spacing distance, S2, and secure the next center insulator. Continue measuring and securing the insulators until all are in position, then measure the last spacing distance and mark with tape as was done for the starting, #1, element. This last marking will be the location of the shortest end element (egg insulator) and will also be the feedpoint to the LP.

The distance from the back side marking to the last forward marking will be the overall length (boom length) of the LP and will total the spacing distances, S1 + S2 +S3 … etc. It is suggested that this total length of the center feeder be measured to make certain no errors have been made in any of the spacing distances. This total length is given in **Table 2**.

(2) The next step will be cutting the various elements (or doublets) to

length: L1, L2, etc. It is suggested that the rear element #1 and the short forward element be cut last, as these will not be connected to the feeder until all of the other elements are cut and secured to the center insulators; thus leaving the feeder attached to the supports for convenience until all except the forward and aft elements are in place, connected, and soldered to the feeder.

In addition to the actual element lengths, allow several centimeters for connecting to the end insulators and about 25.4cm (10") extra for the center connections from the element center ends to the 2-wire feeder, as *every other element is transposed* as illustrated in **Figs. 1b** and **9**. By using a continuation of the element centers, you eliminate an extra splice.

An odd number of elements is recommended, since this allows the 2-wire feeder to be connected directly (nontransposed) across the center (egg) insulators of the end elements (reference 18).

Also note that the rear of the center feeder is "fanned" or separated at the rear element (reference 18). This helps in keeping the two feeder wires separated on the longest rear (S1) span, especially important for lower frequency LPs. This precaution helps prevent the two feeder wires from becoming twisted or from touching during a high wind. Additional Lucite spacers between S1+S2 and possibly S2+S3 may be necessary for 40m, or even 20m, LPs. This can usually be determined after the LP is finally assembled at the 1.83m (6') level.

(3) After the elements are cut to the various lengths, they can be attached to the center Lucite insulators, starting with element 2. The connections from the elements to the feeders can be made after all elements (except the rear and forward elements) are secured to the center insulators. *Note that every other element is transposed,* i.e., element 1, nontransposed; #2 transposed; #3, nontransposed … etc.; or *all even number elements transposed* and *all uneven numbers nontransposed.*

Fig. 11 illustrates the Lucite center insulator, the transposed and nontransposed method of connecting the element center ends to the feedline, and the method of connecting the feeder to the short forward element and the long rear elements which use the egg strain insulators.

(4) After the elements (except forward and rear) are attached to the center insulators and in turn connected to the feeder, all joints can be soldered while the center feeder is still elevated 1.83m (6').

The ends of the center feeder can now be removed from the 1.83m (6') supports and lowered to the ground. The feeder can now be attached to the rear and forward elements and soldered. Spread the complete LP on the ground at its approximate location (when aimed in the desired direction) between the four masts (DLP type) from which it will be suspended.**

Nylon catenary support lines

The DLPs used here are supported by two catenary side lines shown in **Figs. 4** and **6**.

These are stretched between masts A-C and B-D and the LP suspended between these. Nylon line, 0.32cm (1/8"), is used. Next, 0.48cm (3/16") nylon is used for supporting the long rear element, #1, and the short forward element as shown in **Figs. 4, 6,** and **9**. Nylon does not shrink when wet or stretch when dry as does most rope. Further, nylon will not rot and should last several years. After four years in constant use here [in 1975 — ed.], none of the nylon line has broken.

The next step is to suspend the LP between the two catenary side lines.

At this point the LP has been assembled and is spread out on the ground between the four masts or other supports, aimed in the beam direction. It should now be raised 1.83–3.05m (6–10') above ground level and suspended at this height between the masts to be used in its final full height position. By using these masts, all angles and distances will be the same as when the LP is hoisted to its maximum height.

The long rear element, #1, and the short forward element are attached to the 0.48cm (3/16") nylon line which supports the rear element between supports A & B. The short element is stretched between C & D.

The 0.32cm (1/8") side catenary lines or bridles are now stretched between A & C and B & D. Actually, these are supported A–B and C–D. However, these splices will be near the masts; the 0.48cm (3/16") lines carry all the load and will be tied to the mast halyards.

Next, add the Lucite end-insulators to all elements except #1 and the short forward element. These use the egg strain insulators.

Now, starting with element #2, tie short lengths of #18 (165-lb. test) nylon cord to the end insulators. These will in turn be tied to the side catenary lines. A–C and B–D. Element #2 will then be suspended between the side bridles.

When first tying these element support cords to the catenaries, make a knot which can be easily untied. It may be necessary to adjust the tension on the various elements several times before they are correct and the catenary lines start taking their proper "suspension bridge" shape as shown by **Fig. 4, 6,** or **9**.

Elements #1 and #2 should be parallel, by making certain that their end spacings are equal to the center spacing, S1. After element #2 has been attached and adjusted parallel with #1, proceed to suspending and adjust element #3 and the following elements, #4, #5, etc., until all are suspended between the side bridles. As these are attached, the catenaries will start taking on the shape of a commercial LP.

Adjusting the tension of the elements between the side lines is the only "cut-and-try" procedure required for the LP assembly. When constructing your first LP it may require several tries but it will soon assume the correct shape illustrated by **Figs. 4, 6,** or **9**.

Note: All elements other than the rear #1 and the short forward element will have some sag. This does not

**For some of the LPs, I have used monofilament fish line (40 or 50 lb. test) in place of the Lucite end-insulators to reduce weight, cost, and fabrication time. The line used was Sears Cat. No. 6KV32232 (40 lb. test).

seem to affect the operation. If the elements are pulled too tight between the side support lines (to try to level the elements), too much strain will be placed on the side lines, possibly requiring larger line and even sturdier masts.

There will also be some sag of the center feedline sagging toward the center. This shows no ill effect in the LP's operation. Some sag or "give" in all elements (except the long #1 and the short forward element) is desirable. If all lines are too tight, they might break during heavy icing conditions.

None of the LPs here has come down over the past four years. During this time there have been three heavy icestorms. The LPs sagged almost to the ground from the ice build-up. As soon as it melted, they returned to their normal height. They have also withstood several high winds without damage.

After all element support cords (#18 nylon) have been adjusted (and readjusted) several times so the sag of these is approximately the same, all elements parallel, and the side lines appear identical and have a similar catenary "curve" as in **Fig. 4**, the cords can be secured permanently to the side lines.

I suggest that a few turns of 2cm (3/4") masking tape be served on the 0.32cm (1/8") side lines on either side of the #18 nylon support cords. This will prevent the latter from sliding out of place along the side lines after the antenna has been raised.

Before raising the LP to normal height on the masts, an SWR should be run while the antenna is still 6 to 10 ft. above ground. Proceed as follows.

Feeding the log periodic

The simplest method of feeding the LP is to connect the high impedance balance winding of a 4:1 broadband balun at the feedpoint (short element end). The coax is then connected to the balun. Two other feed methods will be presented later, but the 4:1 balun method is the easiest for running the initial SWR before raising the LP to full height.

A low-powered transmitter or transceiver should be placed on a box or table directly under or a short distance in front of the short element feed end. Connect a short length of coax from the 4:1 balun to the SWR meter and another short length to the transmitter or transceiver.

An SWR run should be made over each of the bands for which the LP has been designed to cover. Readings should be taken at least every 100 kHz over each band. Record these for comparison with a second SWR run to be made after the LP has been hoisted to full height and the final length coax used between the antenna and the shack is positioned.

While the LP is still at a workable height, it is interesting to check the element ends for RF voltage on each of the bands. Either a small 1/4 watt neon or a "sniffer" can be used. This test will give one a better idea as to the operation of the LP.

If the SWR readings are 2:1 or better, the LP should be OK after it is raised to full height. Generally the SWR readings will improve after being raised higher above ground. They should then be similar to the SWR examples given by **Table 1** (and reference 18).

Other feed methods

The feed method mentioned above using a 4:1 balun directly to coax is the simplest and is recommended. However, two other feed systems can be used:

(1) Tuned open line from the shack directly to the LP feedpoint. This, of course, requires a tuner at the shack which must be returned when changing bands. The tuner with open line is OK for a monoband LP but is a nuisance when more than one band is used.

(2) 300Ω TV flat line can be used from the LP feedpoint to the shack, then the 4:1 balun and coax to the set. This is the method used here. Since trees are used as "masts," RG-8/GU or RG-11/U coax is too heavy, causing the LPs to sag. The 300Ω TV line seems entirely satisfactory for low power "bare foot" operation. Further, the TV line has extremely low loss if properly terminated and is quite inexpensive for

long runs. Some of my LPs use over 107m (350') of TV line between the LP feedpoint and the 4:1 balun.

After the final method of feed is selected, it can be connected permanently to the LP feedpoint.

The beam is now ready to be hauled up to maximum height by the mast halyards. After the LP is in place, another SWR should be run over each band and compared with those run at the lower level. They should not exceed 1.5:1 over any band (or any frequency within its bandwidth, if necessary test equipment is available to make measurements outside the ham bands).

A doublet at the same height and broadside to the LP's beam should be used as a "standard" or test antenna for comparing gain in the forward direction.

Monopole log periodic assembly

The assembly and erection of the monopole LP configuration is similar to the DLP. **Fig. 8** illustrates the general construction for either a 7.0–7.3 or 3.5–4.0 MHz monoband monopole LP. **Fig. 10** gives element lengths and spacing distances for 40m and 80m.

A single catenary line is run from the high rear mast to the shorter forward mast; 0.64cm (1/4") nylon line is suggested. The 5 vertical elements are suspended from the support line. Note the "suspension bridge" shape of the catenary illustrated by **Figs. 2** and **8**.

The short forward mast should be a wood pole or any other nonmetallic support since it is directly in the line of fire of the vertical beam.

Note that the ground radials decrease in length from the rear end (below the longest rear vertical reflector, element #1) to the #5 forward element, the radials being the same length or slightly longer than their 1/4λ vertical elements.

The radials should be about 3.05m (10') above ground to allow access under them. Although the radials can slant down from the center feeder, the ends should be high enough to prevent contact as some are quite "hot" with RF.

The 2-wire feedline is identical to the DLP type; however, the elements connected to and supported by the Lucite center insulators (**Fig. 11**) are arranged differently in that the two outside holes are for the two 1/4λ side radials and the center hole is for the 1/4λ vertical element. Actually the center insulator and the 2-wire feeder are suspended by the 5 vertical radiating elements and they in turn by the single catenary line. **Fig. 10** illustrates these elements, showing the jumper connection between the two side radials. Transposition or the "criss-cross" feed is accomplished as illustrated in **Fig. 10**.

The suggested method of feed is by the 4:1 balun, then to coax. Be sure the coax shield is grounded to an earth ground as near the balun as possible.

For these monoband monopole LPs, the #2 or 1/4λ "active" radiator is approximately 1/4λ from the balun feedpoint. This 1/4λ line provides a matching stub between the low impedance feedpoint of the #2 element and high impedance at the feedpoint which is probably in the order of 200–300Ω, making a good match to the input of the 4:1 balun.

Summary

I believe anyone having observed the gain of the LPs used here will agree as to their effectiveness. When using the 17-element 20-15-10m West beam (LP #11) on 20m, W6s often report "strongest W4 on the band at this time." Considering that many of the other W4s are using the legal limit with rotary beams, a report of this type is encouraging.

I wish to thank the many hams who have assisted by reporting the readings taken on the various LPs tested here over the past four years and hope these tests will be beneficial to others. I especially wish to thank YV5DLT for his many reports on the 20m and 15m LPs; also, W4QS and K4FBU for their observations during the 40m tests for the past year.

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Continued on page 57

73 Review

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Inside the Wristlinx X2X FRS/GMRS Wristwatch Communicator

... where our ace reviewer has the time of his life.

Bet you think your snazzy new HT is small. Heck, the keypad's barely big enough for your fingers, right? Well, wake up and greet the 21st century, because now you can have a real, useful UHF 2-way radio on your wrist.

Yes, it's sci-fi come to life! The Wristlinx X2X Family Radio Service (FRS) Communicator from Xact Communication is an amazing little product. And, despite its low price, this radio is no toy.

Why should a ham care about FRS? From what I see at hamfests, it looks like we care a great deal. These days, I see more FRS HTs than ham ones at many 'fests. FRS is perfect for keeping in touch with the spouse and kids who aren't yet licensed as you wander the aisles, looking for that bargain of the century. If you've ever tried to juggle two HTs, though, you know how hard it can be to stay on the ham bands and FRS at the same time — especially when you're trying to keep at least one hand free for cherrypicking or hauling your latest find. This little gem neatly solves that problem.

Basic features

As wristwatches go, this one is somewhat bulky — as you might expect. It looks geeky, mostly due to the cartoonish speaker grille. You probably won't want to wear this thing to business meetings, but it sure beats carrying an FRS HT when you need comms with the family.

This incredibly small FRS/GMRS transceiver offers all 14 FRS plus 8 GMRS channels. It has automatic receiver power saving, just like a ham HT. It scans and it even has VOX, which can be used without an external headset. If you want one, though, there's a jack for it, and the company offers a headset at low cost.

The radio has all the usual FRS features, including the ubiquitous and annoying call tone. At least it's not tagged on the end of every transmission, as it is with many FRS radios. To use it, you press the PTT twice in rapid succession. On the left side of the case are the power and scan buttons. The power button doubles as a menu selector, but don't worry — there are only two menus, each just one level deep,

***Photo A.** Wristlinx X2X FRS/GMRS Wristwatch Communicator.*

making this a very easy radio to operate. On the right side are the up and down buttons used to change channels and volume level, and the combination charge/headset jack. Yup, the charger plugs into the headset jack! It seems like a strange idea, but it works fine. After all, you're never going to want both of those things plugged in at the same time anyway, and they had to save space somehow.

The mic, speaker, and PTT are on the front, below the display. Channel and operating status (TX, RX, call, volume level, and low-battery indicator) are in the upper section of the LCD, with time at the bottom. Pressing any button lights the display nicely for about 5 seconds.

The antenna is a one-inch rubber duck (yes, one inch!) which flips up for operation and folds down neatly when you're at close range or not using the radio. Despite its diminutive size, it works amazingly well, and flipping it up makes a huge difference in the radio's performance.

Squelch is automatic, with no adjustment possible. There are no "quiet code" subtones.

The case and band are plastic. With the battery installed, the whole shebang weighs about four ounces, but the feel is solid and not toylike at all. The band has an especially clever locking mechanism for a secure fit. The package includes the watch, battery, charger, and instructions.

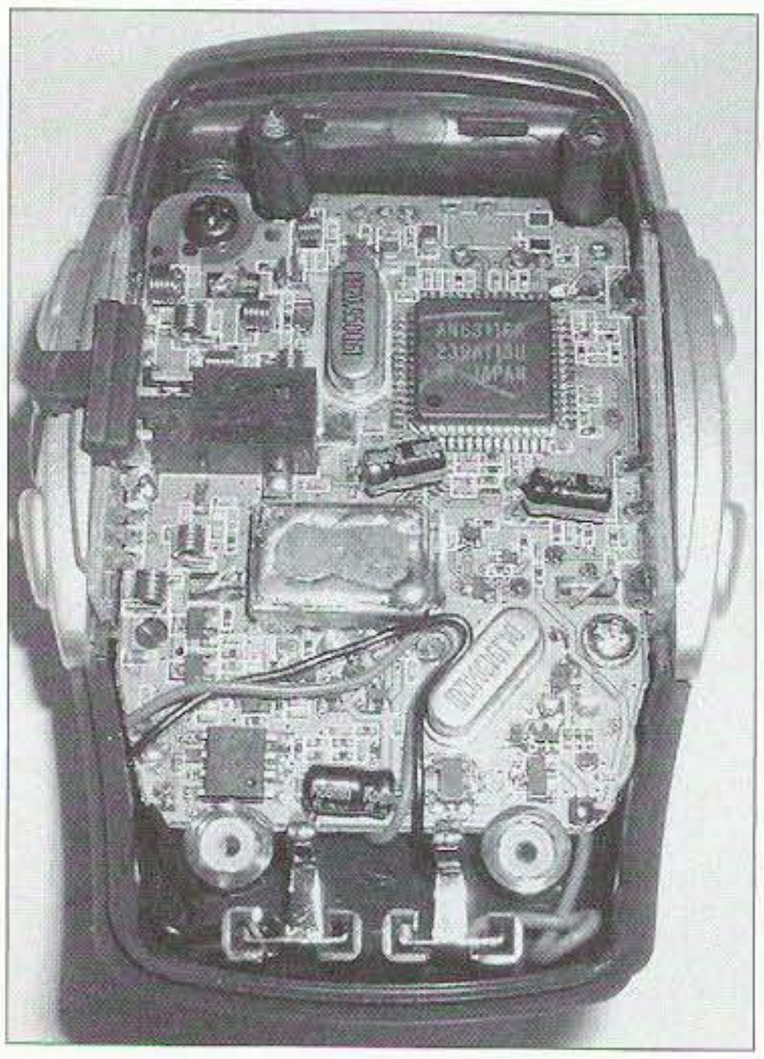

***Photo B.** Inside view.*

Power to go

When I first saw this radio, I assumed it was a low-power kiddie gadget that might make it across the front yard if the wind were blowing the right way. How wrong I was! This baby puts out the full 500 mW allowed on FRS, just like a full-size FRS HT, and has a stated range of 1.5 miles!

How in the heck do you power a transmitter like that on a wristwatch? As with most of today's tiny gadgets, from cell phones to camcorders, the answer lies in lithium ion technology. The X2X uses a 3.7-volt, flat lithium battery which fits in the back and can easily be replaced by the user. Here's the kicker: This tiny battery is rated at 540 milliamp-hours, for a total of nearly 2 watt-hours. That's a lot of juice!

Getting started

After installing the battery, the time shows up on the display, and you press the power/menu button a few times to set it. It's easier than on many watches. To turn the radio on, you hold the same button for a few seconds. The radio status indicators pop up, a few tones sound from the speaker, and you're ready to go.

The right-side buttons normally control the volume, the level of which is shown on a little graphic on the LCD, but you also use them to change channels by first hitting the menu button. The channel numbers blink, indicating that they will change instead of the volume.

Performance

Receiver sensitivity is nothing short of astounding. There's no spec given for it, but this thing hears signals with its one-inch antenna that my full-size FRS HT can't. In fact, it's almost as sensitive as my Yaesu VX-5R is with that rig's full-size duck. I suspect that the tremendous RX sensitivity accounts for the good range, making up for what must be a very lossy transmitting antenna.

The transmitter does get out, though. I've talked to people a mile away, and the reports were good. The TX audio is excellent and indistinguishable from the sound of a bigger radio.

Alas, the same cannot be said for the receive audio quality. There's just no nice way to put this: it's atrocious. The tiny speaker is very tinny, and there's a lot of distortion even at low volume levels. Above moderate levels, clipping is so bad that you might not be able to understand what someone is saying, especially if the transmitting radio has very hot modulation. (The watches keep their own TX modulation low, probably for this reason, and they don't sound as bad when used with each other.) Keeping the RX volume down does help a bit, though.

While much of the receive audio problem is undoubtedly due to the speaker, not all of it is. I listened through a headset, and there was still plenty of fuzziness. Still, it was a lot better than with the speaker.

The squelch does a good job of keeping out noise but opening for weak signals. It pops horribly, though, making headset use uncomfortable. There doesn't appear to be any hysteresis, either, so very weak signals and sometimes auto ignition noise make it pop rapidly.

The VOX is weird but somewhat useful. What's weird is that, contrary to what's stated in the manual, speaking normally won't turn it on. In fact, shouting at the watch usually won't either! At first I thought my radio must be broken, but they're all like that. What does work well is to blow a short puff of air into the mic hole. That turns the VOX on reliably, and it stays on if you talk normally after the puff. I suspect Xact did it this way on purpose, so that typical arm movements, and perhaps a sleeve rubbing on the rig, wouldn't put it into transmit, killing the battery and annoying other FRS users. It does take some getting used to, but it's great when your hands are full and you can't reach the PTT button. In fact, it makes sense to leave the VOX on all the time, since the PTT still works in that mode. You sure don't have to worry about accidental transmissions!

The rig will scan all 22 channels, stopping for five seconds when the squelch opens and then resuming regardless of whether there's still a signal on the frequency. As with most FRS radios, you can't lock channels out or do any of the other fancy scanning tricks we're used to with our ham rigs. Scan speed is not overly fast, but I've seen slower.

Unfortunately, when you stop the scan, it returns the rig to the original channel you were on before scanning, not the one you're on at the time it stops! That makes it annoying when you hear something and want to join in; you have to hit the menu button and then advance the channel to get where you wanted to be. There is an undocumented feature, however, which helps in this situation: If you press the PTT, the scan wait becomes much longer, staying on the frequency for about 10 seconds after the squelch closes before resuming scan, and resetting that timer each time you transmit. So, you can carry on a short conversation while in scan mode, but I still wish canceling the scan would leave the radio on the last channel scanned.

The battery lasts a long time. I measured transmit current at 300 milliamps, so, even key-down, the rig should transmit for a good hour and a half or more on a full charge. Not many ham HTs can do that. (Of course, I don't recommend you try it, as you will probably overheat the final transistor, just as you would in your other HTs. FM handhelds aren't built for continuous-duty-cycle use.) In normal, active use, the battery seems to do fine. I've played with my rig (can you really call a wristwatch a "rig"?) all day and still haven't seen the low-battery indicator. With lithiums, there's no memory effect, so you can charge the battery up when you're done for the day, regardless of how much power is still in it. And, if you want an extra battery, the company offers them for $13, which is very reasonable for a flat lithium cell.

GMRS

GMRS, the General Mobile Radio Service, is intended for business and family use, and requires an FCC license which costs more than a pair of these radios. Yet, many new FRS sets are including GMRS channels, and some even put out a few watts on those frequencies while dropping back to 500 mW on FRS. Given the widespread inclusion of GMRS on so many consumer radios, some people probably use the licensed frequencies illegally, since the low-power transmissions are unlikely to bother anyone or even be heard. I can't recommend you do that, of course. The Wristlinx includes a reference to the FCC Web site, so you can see about getting a license if you want to use the GMRS channels. Since there's no way to disable those channels on the Wristlinx, their presence raises a problem with giving the radios to children, who would otherwise be prime customers for them. Who's legally responsible if your kid gets in trouble for unlicensed GMRS operation? I'm guessing you, the parent.

Those little nitpicks

The front of the package states that the radio puts out 500 mW. The specs in the instruction booklet, however, state that it's 0.3 W ERP. Actually, both may be true; the tiny antenna may be lossy enough to reduce the 500 mW output to 300 mW effective radiated power. Still, the transmitter has plenty of power and gets heard.

There's no monitor button to open the squelch. Especially given the lack of squelch hysteresis, it'd be nice to be able to force it open for weak-signal reception. I'd have preferred if the scan function, which typically isn't used that much, had been moved to the menu and the button had been used for a monitor. Or, perhaps, a quick press of the button could start the scan, while holding it down opened the squelch.

During scan, the up and down buttons change the scan direction instead of the volume. To adjust the volume, you have to stop the scan first.

The battery indicator only comes on when the battery is nearly dead. It's not a multisegment meter, even though it looks like one. A real meter would have been very welcome. The same indicator comes on while charging and then disappears when charge is complete, which is nice.

This is clearly a radio that also tells time, not a watch that also communicates. The timekeeping function is extremely limited, with no date, day, stopwatch or any other fancy watch functions. And, if you carry an extra battery and change it during long periods of use, the time is lost and must be reset. You can't even back light the watch when the radio is off.

That battery is really small, flat and cool, but it's hard to remove from the radio! It won't come out with your fingers; using a corner of the removable battery cover to pry it out works, but it's still not easy.

Conclusion

Complaining about these mostly minor details is like saying, "My monkey plays the piano pretty well, but he hits a few wrong notes!" Even with the substandard receive audio, this is an absolutely amazing sci-fi dream of a gadget, and it's cheap, too! A 2-way radio that can go more than a mile and fits on your wrist — we live in interesting times, don't we? Now if only someone can convert one of these to the 70cm ham band ... any takers?

Specs

Manufacturer: Xact Communication, LLC, 105 Madison Avenue, New York NY 10016; [www.xactcommunication.com].

List price: $49.99.

Street price: $29.00 at Wal-Mart. 73

Isidor Buchmann
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Batteries to the Max!

An expert tells us how to get the most out of 'em.

A common difficulty with portable equipment is the gradual decline in battery performance after the first year of service. Although fully charged, the battery eventually regresses to a point where the available energy is less than half of its original capacity.

Rechargeable batteries are known to cause more concern, grief and frustration than any other component of a portable device. Given its relatively short life span, the battery is also one of the most expensive and least reliable parts. In many ways, a battery exhibits humanlike characteristics: It needs good nutrition, prefers moderate room temperature, and, with the nickel-based system, requires regular exercise to prevent the phenomenon called "memory."

How to restore and prolong nickel-based batteries

When nickel-based batteries are mentioned, the word "memory" comes to mind. Memory was originally derived from "cyclic memory," meaning that a nickel-cadmium (NiCd) battery could remember how much energy was required and would provide similar amounts on subsequent discharges. Improvements in battery technology have virtually eliminated this phenomenon. The modern term of "memory" refers to a crystalline formation that robs the battery of its capacity. Applying one or several full discharge cycles can commonly reverse this effect.

The active cadmium material of a NiCd battery is present in finely divided crystals. In a good cell, these crystals remain small, obtaining maximum surface area. Memory causes the crystals to grow, reducing the surface area. In advanced stages, the sharp edges of the crystals may penetrate the separator, initiating high self-discharge or an electrical short.

The effect of crystalline formation is most visible if a NiCd battery is left in the charger for days, or is repeatedly recharged without a periodic full discharge. Since most applications do not use up all energy before recharge, a periodic discharge to 1.0 V/cell (known as exercise) is essential to prevent memory.

All NiCd batteries in regular use and on standby mode (sitting in a charger for operational readiness) should be exercised once per month. Between these monthly exercise cycles, no further service is needed and the battery can be used with any desired user pattern without memory concern.

If no exercise is applied to a NiCd for three months or more, the crystals ingrain themselves, making them more difficult to break up. In such a case, exercise may no longer be effective in restoring a battery, and reconditioning is required. Recondition is a secondary discharge that slowly removes the remaining battery energy by draining the cells to virtually zero volts. NiCd batteries can tolerate a small amount of cell reversal. During deep discharge, caution must be applied to stay within the allowable current limit to minimize cell reversal.

When Nickel-Metal Hydride (NiMH) was introduced in the early 1990s, there was much publicity about its memory-free status. Today we know that NiMH also suffers from memory, but to a lesser extent than NiCd. No scientific research is available that specifies optimal maintenance. Applying a full discharge once every three months appears right. Because of the shorter service life, over-exercising of NiMH is not recommended.

Simple guidelines for nickel-base batteries

- Do not leave a nickel-based battery in a charger for more than a day with the "ready" light on. It is better to remove the battery from the charger and apply a charge before use.

• Apply periodic discharge cycles. Running the battery down in the equipment may do this also — as long as the pack is not discharged below 1.1 V/cell.

• It is not necessary to discharge the battery before each charge. This would put undue stress on the battery.

• Avoid elevated temperature. The battery should cool off and remain at ambient temperature after full-charge.

• Use high-quality chargers.

The effect of zapping

Remote control (RC) racing enthusiasts have experimented with all imaginable methods to maximize battery performance. One technique that seems to work is zapping the cells with a very high pulse current. Zapping is said to increase the cell voltage by 20 to 40 mV under a 30 A load. According to experts, the voltage gain is stable; only a small drop is observed with usage and age.

During the race, the motor draws 30 A from a 7.2 V battery. This calculates to over 200 W or close to a quarter HP of power. The race lasts about four minutes.

According to experts, zapping works best with NiCd cells. NiMH cells have been tried, but the results are inconclusive. Zapping is done with a 47,000 µF capacitor charged to 90 V. Best results are achieved if the battery is cycled twice after treatment, and then zapped again. Once in service, zapping no longer improves the cell's performance. Neither does zapping regenerate a cell that has become weak.

Companies specializing in zapping batteries use top-quality Japanese-made NiCd cells. The cells are normally sub-C and are handpicked at the factory. Specially labeled, the cells arrive in discharged state with open cell voltages of 1.11 V to 1.12 V. If below 1.06 V, the cell is suspect, and zapping does not work well.

There are no apparent side effects to zapping, but the battery manufacturers remain noncommittal. No scientific explanation is available, and only little is known on the longevity of the cells after treatment.

How to prolong lithium-based batteries

Battery research is focusing heavily on lithium chemistry — so much so that you might presume that all future batteries will be lithium systems. In many ways, the Lithium-ion (Li-ion) is superior to nickel- and lead-based chemistries.

A Li-ion battery provides 300 to 500 discharge/charge cycles or two to three years of service from the time of manufacturing. The loss of battery capacity occurs gradually, and often without the knowledge of the user. There are no remedies to restore Li-ion batteries when worn out.

Li-ion prefers a partial rather than a full discharge. Avoid depleting the battery fully. Instead, charge more often or use a larger battery. There is no memory to worry about.

The aspect of aging is an issue that is often ignored. A time clock starts ticking as soon as the battery leaves the factory. The electrolyte slowly "eats up" the positive plate, causing the internal resistance to increase. Eventually, the cell resistance reaches a point where the battery can no longer deliver energy, although it may still retain a charge.

The speed by which Li-ion ages is governed by temperature and state-of-charge. The most harmful combination is full charge and high temperature. If possible, store the battery in a cool place at a 40% charge level. **Table 1** illustrates the capacity loss as a function of temperature and charge level.

Simple guidelines for Li-ions

• Avoid full discharges; recharge Li-ion more often. There is no memory to worry about.

• Although memory-free, apply a deliberate full discharge once every 30 days on batteries with fuel gauge to calibrate the battery. If not done, the fuel guage will become increasingly less accurate.

• Keep the Li-ion battery cool. Never freeze the battery. Avoid a hot car.

• For prolonged storage, keep the battery at 40% charge level.

• Avoid purchasing spare Li-ion batteries for later use. Observe manufacturing date. Do not buy old stock, even if sold at clearance prices.

How to restore and prolong lead-acid batteries

The sealed lead-acid battery, known as valve-regulated lead acid (VRLA), is designed with a low overvoltage potential. This is done to prevent water depletion. Consequently, these systems never get fully charged, and some sulfation will develop over time.

Finding the ideal charge voltage limit is critical. Any voltage level is a compromise. A high voltage limit produces good battery performance but shortens the service life due to grid corrosion on the positive plate. The corrosion is permanent. A low voltage protects the battery and allows charging under a higher temperature but is subject to sulfation on the negative plate.

Restoring a sulfated battery is difficult and time-consuming. One method that provides reasonably good results is applying a charge on top of a charge. This is done by fully charging a battery, then removing it for a 24 to 48 hour rest period and applying a charge again. This process is repeated several times and the capacity is checked again with a full discharge. The lead-acid battery is able to accept some overcharge, but too much causes corrosion and loss of electrolyte.

Applying an overvoltage charge of up to 2.50 V/cell for one to two hours can also reverse sulfation. During treatment, the battery must be kept cool, and careful observation is needed. Prevent venting. Most plastic

Temperature (degrees C.)	40% charge level after one year (recommended storage charge level)	100% charge level (typical user charge level)
0	98%	94% after 1 yr.
25	96%	80% after 1 yr.
40	85%	65% after 1 yr.
60	75%	60% after 3 mos.

Table 1. *Permanent capacity loss of Li-ion as a function of temperature and charge level. High charge levels and elevated temperatures hasten the capacity loss. Improvements in chemistry have increased the storage performance of some Li-ion batteries.*

VRLA batteries vent at 34 kPa (5 psi). Not only do escaping gases deplete the electrolyte, but they also are highly flammable (hydrogen gas).

Sealed lead-acid batteries are also available in cylindrical form. The Cyclon by Hawker resembles an oversized D-size cell. If sulfated, applying an elevated charge voltage commonly reactivates the cell. Initially, the cell voltage may rise to 5 V, absorbing only a small amount of current. In about two hours, the small charging current converts the large sulfate crystals back into active material. The internal cell resistance decreases and the charge voltage normalizes. When within 2.10 V to 2.40 V, the cell starts to accept normal charge. If the sulfation is advanced, this remedy does not work and the cell needs to be replaced.

When applying overvoltage, current-limiting must be utilized. Always set the limit to the lowest practical setting on the power supply and observe the battery voltage and temperature during charge.

Improving the capacity of an older lead-acid battery by cycling is mostly in vain. Such a battery may simply be worn out, and cycling wears it down further. The lead acid battery is not affected by memory.

VRLA batteries are commonly rated at a 20-hour discharge. Even at such a slow rate, a capacity of 100 percent is difficult to obtain. For practical reasons, most battery analyzers use a 5-hour discharge when servicing these batteries. This typically produces 80% to 90% of the rated capacity. VRLA cells are normally overrated and manufacturers are aware of this practice.

Photo A. *The Cadex 7400 programmable four-station battery analyzer has a range of 1.2 V to 16 V and 100 mA to 4 A. Each station operates independently. Custom battery adapters simplify battery interface; universal adapters accommodate less-common batteries. Nickel-based batteries are automatically reconditioned if the capacity falls below the user-defined target capacity.*

Simple guidelines for lead-acid batteries

- Always store lead-acid charged. Never let the open cell voltage drop below 2.10 V. Apply a topping charge every six months or when recommended.
- Avoid repeated deep discharges. Charge more often or use a larger battery.
- Prevent sulfation and grid corrosion by choosing the correct charge and float voltages.

Battery recovery rate

Restoring batteries by applying controlled discharge/charge cycles varies with chemistry type, cycle count, maintenance practices, and age of the battery. The best results are achieved with NiCd. Typically, 50 to 70 percent of discarded NiCd batteries can be restored when using the exercise and recondition methods of a Cadex battery analyzer or equivalent.

Not all batteries respond well to exercise and reconditioning. An older battery may show low and inconsistent capacity readings. Another battery may get worse with each advancing cycle. An analogy can be made to a frail old man for whom exercise is harmful. Such a condition suggests battery replacement.

Some older NiCd batteries recover to near-original capacity when serviced. Caution should be applied when rehiring these old-timers because of possible high self-discharge. If in doubt, measure the self-discharge. A 10 percent self-discharge in the first 24 hours after charging is normal. Discard the battery if the self-discharge approaches 30 percent.

The recovery rate of NiMH is about 40 percent. The lower yield is in part due to the reduced cycle life. Some batteries may exhibit irreversible heat damage suffered by incorrect charging. Elevated operating and storage temperatures also contribute to permanent capacity loss.

Lithium-based batteries have a defined age limit. Once the anticipated cycles have been delivered, no method exists to restore them. The main reason for failure is high internal resistance caused by oxidation. Operating the battery at elevated temperatures will momentarily improve the performance. However, the high internal resistance will revert to its former state when the temperature normalizes.

Many Li-ion batteries for cell phones are being discarded under the warranty return policy. Dealers have confirmed that 80 to 90 percent of these batteries can be repaired with a battery analyzer. Because no equipment is on hand, the batteries are often sent back to the manufacturers or are discarded without any attempt to restore them.

Some Li-ion batteries fall asleep if discharged below 2.5 V/cell. The internal safety circuit opens and the charger can no longer service the battery. Advanced battery analyzers feature a boost function to activate the protection circuit enabling a recharge. If the cell voltage has fallen below 1.5 V/cell and has remained in that state for a few days, a recharge should be avoided because of safety concerns.

The recovery rate for lead-acid batteries is a low 15 percent. The reasons for the low yield may be due to incorrect charging methods, high cycle count, operating at elevated temperatures, and old age.

The question is often asked about whether a restored battery will work as well as a new one. The breakdown of the crystalline formation on NiCd can be considered a full restoration. However, the battery will revert to its former state if the required maintenance is denied. If the separator is damaged by excess heat or marred by uncontrolled crystalline formation, that part of the battery will not improve.

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A Sorry Solder Tale

If you're a masochist, figuring out how to bulk-solder will be great fun.

I've always enjoyed building electronic circuits. Point-to-point wiring, wire-wrap, or using a PC board, it's always fun. But what happens when the fun becomes work? That's what happens when a small project grows out of control. Like it or not, when a published project becomes popular, it's no longer fun.

A little background: I own a small three-person company called Sunlight Energy Systems. We sell solar electric modules and do system design work. We also design and sell several models of charge controllers. One of our circuits appeared in the October 2001 Issue of *QST* magazine. The article is called the "Micro M Plus."

The Micro M Plus is not a new product for us. It's been around a while and we manage to sell a few hundred each year. Each one is hand-assembled and then calibrated. On a rainy Saturday afternoon, I can easily assemble a dozen or so with enough time left over for some 30-meter CW work, too.

As a company we don't advertise much. Most of our sales are through word of mouth. With that said, we started picking up sales from several customers who were putting the Micro M Plus into solar-powered wellhead monitors. We slowly started to see an increase in Micro M Plus sales. Now, I had to spend sunny Saturday afternoons stuffing PC boards and soldering in parts. After a very short while, it was no longer fun anymore!

Increasing production

Instead of using my old circuit board holder that held about three boards at a time, I needed something a bit bigger. I located a PC board rack. A rack is nothing more than an aluminum frame with aluminum rails that hold the PC boards. This particular PC rack will hold 38 of the Micro M Plus PC boards at a time.

Stuffing all those parts into the PC boards is hard work. It's also very tedious work. I can do one rack in about four hours, with dozens of breaks to keep me from going batty. I have my wife do most of the part stuffing. She can do that for hours on end without trouble.

After the boards are stuffed, a cover is mounted over the top of the boards. The top cover is lined with foam rubber and that holds the parts in place. You flip the rack over and solder the parts in.

Sounds simple. But guess what, it's not. When you flip the rack over, you're looking into the bottom of 38 PC boards stuffed with parts. What you see is all those resistor leads looking up at you. It does not take too long to figure out you can't get the soldering iron tip down into that mess to get to the board to do the soldering. So, what you end up doing is clipping off the leads to a length of about 3/8 of an inch long. Now you can solder the leads. Of course you must now go back and trim the leads flush to the PC board. That's one more step added to the process.

Just imagine doing this over and over again. After a while, it's no longer fun; it's becoming work. Then out of the blue I get a call from a company wanting a quote on 258 Micro M Plus controllers. I had to find a better way of putting these together.

Assembly of electronic printed circuit boards

I decided that 258 are way too many for us to do by hand all at one time. So, a quick search on the Internet for "electronic assembly" turned up pages of companies that put things together. Trouble is, they don't do it for nothing.

And, to top things off, they won't talk to you unless you want zillions done every month. OK, maybe not zillions, but I did hear figures of at

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A Sorry Solder Tale

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least 1,000 per month minimum runs. Most were looking at 5,000 pcs per month. Don't I wish!

There are several ways to assemble printed circuit boards. The first one is of course by hand. In fact, some of the companies I talked to that would do small runs did exactly what I have been doing. The printed circuit board is stuffed and assembled by hand. The boards were then soldered one at a time by hand.

The second method is also done by hand. It's called stuff and push. Here's how it works. Imagine a railroad track that holds a single PC board or a single panel of PC boards. (A panel consists of many single PC boards held together as one. Breaking off the tabs holding them in place separates the boards from each other.) The track runs from one operator to the next. The first operator stuffs in, say, four resistors. She then pushed the board down the track to the next operator, who then stuffs in her parts. This operator pushes the board off to the next operator and so on. When the board reaches the end, it's fully populated and ready to be soldered.

The third method is called auto insertion. Here a machine takes taped components and bends/cuts them before stuffing the part into the PC board. The whole operation is untouched by human hands and is very, very fast. There are many guidelines that must be followed such as hole spacing and part location before the machine can be used. It's also not a simple matter of programming the machine to your job. This all equals a lot of money, and thus these auto insertion machines are only used for large jobs that require thousands of boards.

The last method is known as pick and place. Normally you don't see this type of equipment used in through-hole board assembly. Pick and place machines live in the world of surface mount components. And like the auto insertion machines, they need to be programmed so they know what part goes where.

On a side note, I have learned that some of the very high-end printed circuit layout CAD programs can generate the required data so either type of these machines can be quickly set up.

It's not the parts; it's the soldering

I really don't have a hard time stuffing parts into the circuit boards. In fact, my wife seems to enjoy it. What takes the time is the soldering.

Aside from hand soldering, there's wave soldering, wave pot soldering, dip soldering, ultrasonic soldering, thermal soldering, and solder pot soldering.

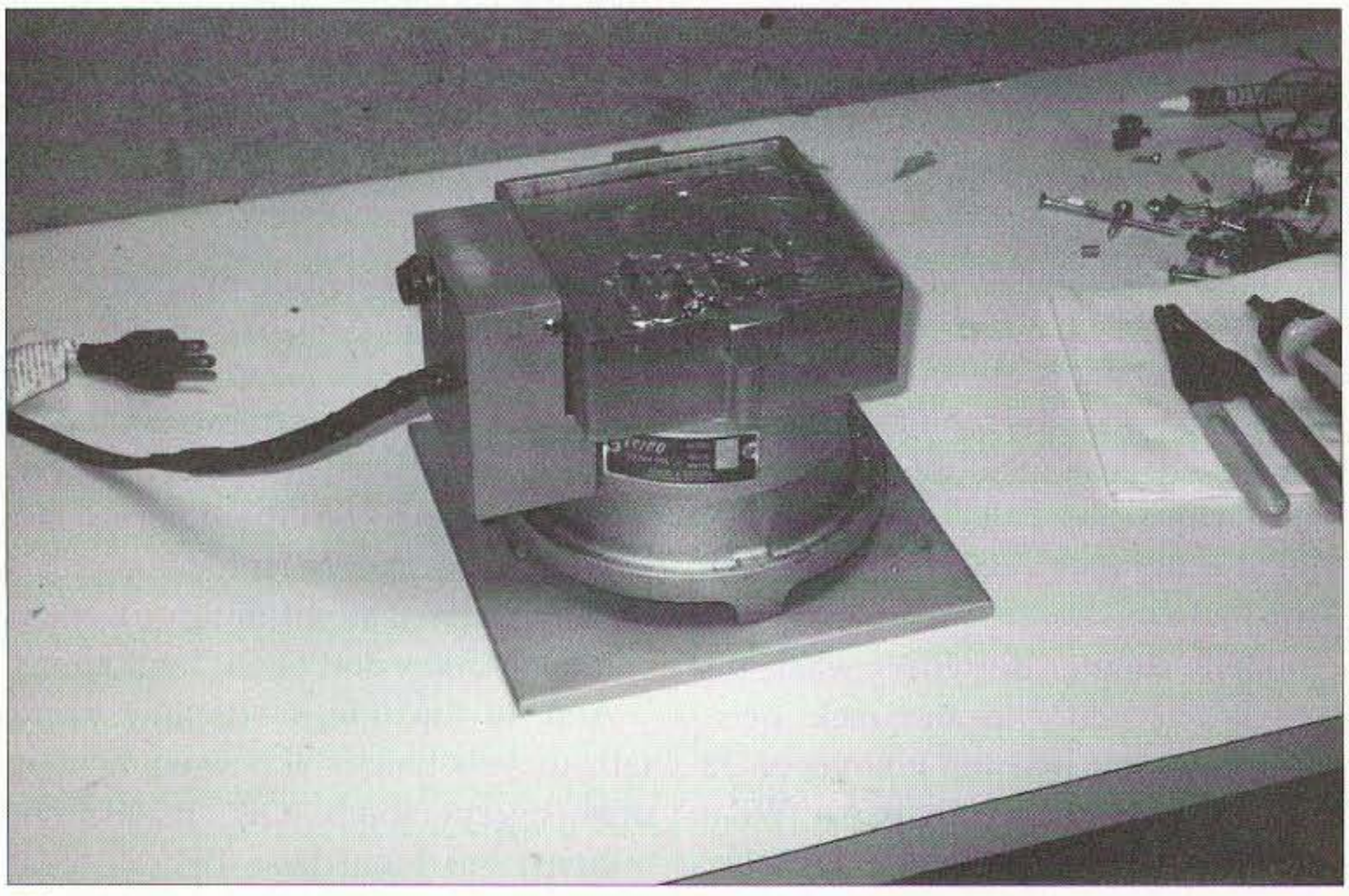

Photo A. *Here's the solder pot getting ready for another job. Notice the ceramic tile on the table. This keeps the hot solder pot from burning the tabletop.*

Wave soldering

Wave soldering involves moving the printed circuit board across a wave of molten solder. As the board moves past the wave, the molten solder touches the bottom of the board and solders the parts as the board passes through.

In a wave soldering machine, the PC boards enter on one end and travel down an incline toward the solder wave. Before the solder wave, the boards are usually cleaned and then dried. After the boards have dried, liquid solder flux is applied. The flux can be sprayed on or the board dipped into the flux. However, most of the newer machines have a flux foamer.

A flux foamer is really rather simple. Air bubbles are piped into the flux, creating bubbles of flux to be formed. The bubbles travel up a tube or channel and are allowed to flow up and over the pipe. The boards then are passed through the flux bubbles!

The board is then preheated using either quartz or infrared heaters. The now-preheated boards are then passed over the liquid solder wave, soldering the parts in. The board is then usually cleaned or defluxed and cooled. The board then goes to a final inspection station, where any solder bridges or missed connections are fixed.

This is more or less how a wave soldering machine works. Some machines do more, some do less. Some machines preheat the board before applying the flux; some apply the flux before preheating.

The amazing part of a wave soldering machine is the solder wave. Here's how it's done. To imagine the solder wave, take a garden hose and attach a fan-watering head. Turn on the water. Now tilt the head to one side, the water will fan out of the head rise up, and then fall down toward the ground. At the knee of the water, or the top part as it just starts to fall over is the wave.

That, in a nutshell, is how a wave of solder is generated. Molten solder is pumped though an opening that creates the wave. The slick thing is that the opening can be fan-shaped to cover all the board or round to only solder certain places on the board. This selective soldering is used when

boards have mixed technologies such as surface mount and through-hole components.

As slick as a wave soldering machine is, it's not something you find at your local Wal-Mart. A wave soldering machine consumes huge amounts of electricity. Most require three-phase electrical power. You just don't fire one up to make three dozen boards!

Then, of course, there are the environmental problems of having all that solder — which of course contains lead. Some of these wave machines contain up to 500 pounds of solder. The flux is an acid that must be monitored. Let's not forget about all the fumes generated that must be vented to the outside.

And then there's the cost. A "used, repairable" wave soldering machine is about $30k. There are cheaper tabletop units that start around eight grand.

The next step is a machine called a wave pot. A wave pot is a soldering pot with an internal pump that moves the liquid solder much like a wave soldering machine. Only in a wave pot, it's on a much smaller scale. Usually a wave pot is used for selective soldering on smaller boards.

But what is a soldering pot in the first place? Well a soldering pot is just what the name implies. It's a pot of liquid solder. Most of us have seen a solder pot in the catalogs from electronic supply houses. I've always thought the only thing you could do with a solder pot is pretin wire, by dipping the wire first in flux and then into the solder pot. While that is a big part of what a solder pot is used for, I also found out that there is something called dip soldering.

In dip soldering you dip your prestuffed printed circuit board into a pot of molten solder. It's almost like wave soldering, but without the wave. This is the process that I ended up using. Dip soldering is much more manual than wave soldering. All the labor must be done by hand. And, it's a much slower process as well.

Here's how I dip soldered my circuit boards

The first step is locating a solder pot that could handle the size of boards I will be soldering. Most solder pots are round. The one I purchased is 4.5 inches square. It will hold about 12 pounds of solder. The model is the 75T, made by Eisco industries.

The next step is obtaining the necessary solder and solder flux. I use Kester Ultrapure 63/37 bar solder. Bar solder is rather expensive stuff and runs about six bucks a pound. It's also a traded commodity and thus the price changes daily.

I use Kester 945 no-clean solder flux. A one gallon container is about $30. I applied the flux using a standard spray head from a used spray cleaner bottle. I purchased both the solder and solder flux from Techni-Tool.

One of the problems with both wave soldering and dip soldering is getting the boards ready for the molten solder. Places that you don't want soldered must be masked off. You can't use good old masking tape either. You need to use a peelable solder mask. This is a liquid material that goes on wet and dries semi-hard. It will resist the heat from the molten solder yet is easy to peel off of the circuit board.

The solder mask takes about 24 hours to cure. After the mask has cured, the boards are sprayed with flux. This stuff is nasty and spraying is not the best method to use, but so far for me it's been the easiest to do.

After the flux is applied, I preheat the board by holding it above the molten solder for a few minutes. Then the entire circuit board is pushed into the

vat of molten solder. I keep the board in the solder for about one or two seconds. I have found that by watching the plated-through holes, as soon as I see solder filling into the top holes, the board is done. At no time is the board in the solder more than two seconds.

The next step is to remove the board from the solder and check the results. In one second in the solder pot all connections are soldered. They are bright, shiny, and tight. I've found solder bridges between two pads on the board to be very rare.

The leads are clipped off and the board checked for errors. Usually a touch or two of the soldering iron will take care of any bridge that might have been made.

Lessons learned

Dipping the boards in by hand does not produce perfect results every time. I need to come up with some sort of jig to hold the boards as they go into the solder. If you tilt the board too much one way, there may be some spots that don't touch the solder and thus are not soldered.

Preheating the boards by holding them above the solder pot takes too long. Right now, I can only do one board at a time. Some sort of preheater to heat up several at one time is in order. Perhaps some infrared lamps may do the job.

I have to come up with a better idea for applying the flux. I have been thinking of using a large tray and dipping the board into the flux. This would not be as messy as the spray I use now.

Other concerns

When you place a printed circuit board coated with liquid solder flux into a bath of molten solder, it gives off a lot of fumes. I really have to come up with some ventilation to keep fumes down.

When you have almost twelve pounds of molten solder; you have to really be careful. Other than the fact that it can cause really nasty burns, if spilled it will destroy anything it touches. And of course solder is mostly composed of lead, and lead is toxic.

The entire solder pot gets really hot! From the knob on the thermostat to the base itself, the whole shebang gets hot. So hot, in fact, that the first time I used the solder pot, it burnt four marks into the table it was sitting on. I think the fix may be as simple as a ceramic tile placed between the pot and the desk.

End results

All in all, I've been pleased with how the dip soldering has been working. Every time I use it, I get a bit better. Right now some sort of jig to hold the PC boards is on the drawing board.

Even without the jig, and just by hand dipping, I am able to do 60 boards in less than an hour. By hand, that many boards would have taken me a week of nonstop hand soldering.

Update!

Since I last put this together, I have put some of my own ideas to work. Using a large plastic food container solved the flux problem. Now the boards are dipped into the flux, allowed to drain, and then warmed over the hot solder.

The solder pot now sits on top of a ceramic tile. That works just great and keeps the tabletop from getting too hot from the heat of the solder pot.

I found an old circuit board holder. Its spring loaded jaws hold the PC boards in place, and because it's made of aluminum the solder won't stick to it. It's much faster than what I had originally used. The only trouble is that it gets hot after a while and you have to keep it cooled off or your finger starts to burn.

And like anything else, practice makes perfect. I can now solder all the boards in the board holder, 38 pcs, in about 15 minutes. In fact, it takes longer for the solder pot to get up to temperature than it does to get the job done!

So, now that I have a solder pot, I can solder! 73

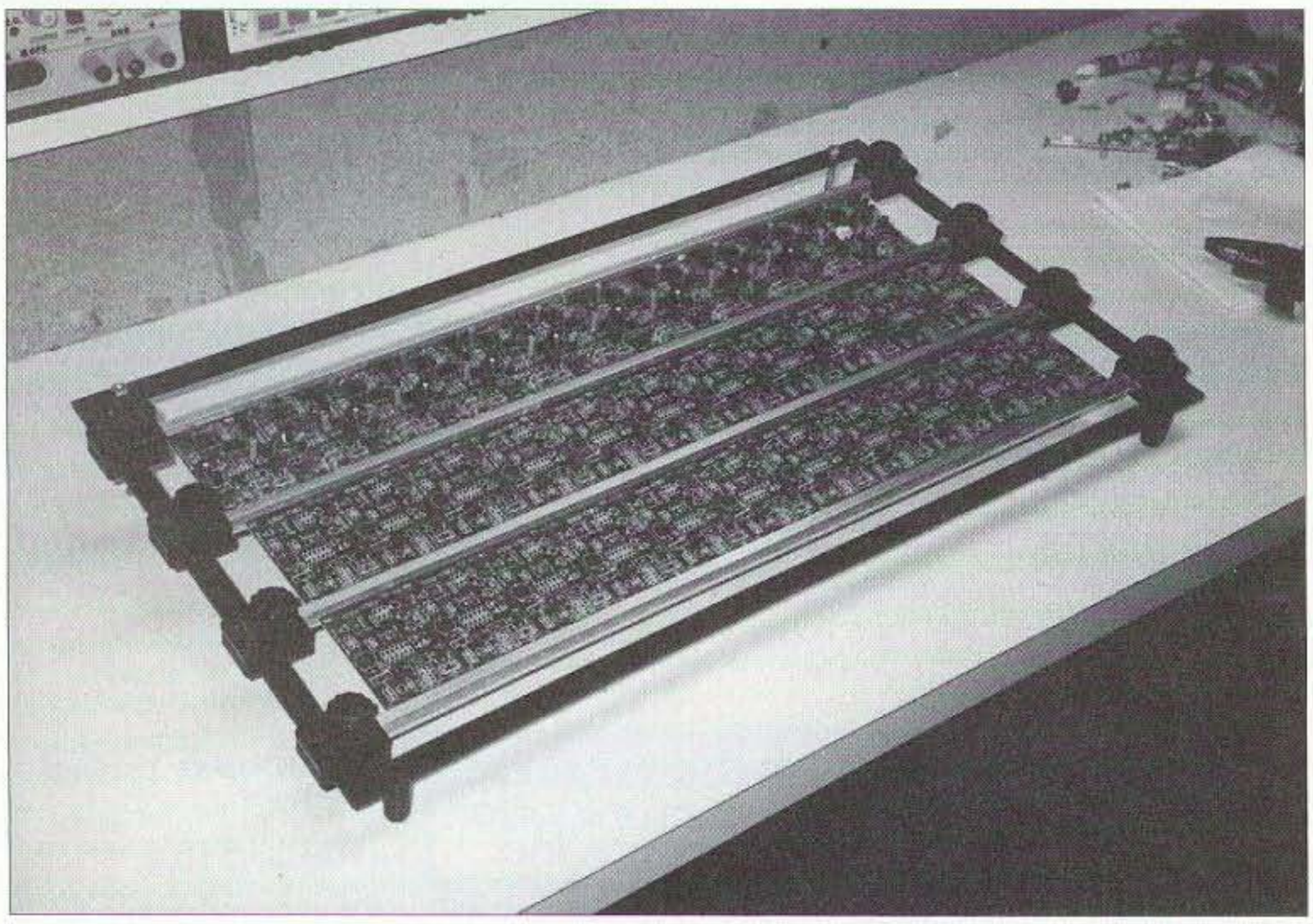

***Photo B.** Here's a rack of Micro M+ controllers being assembled. The rack will hold 33 PC boards. The top row of boards is already stuffed.*

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Morse-by-Mouth

A unique way to master the Code?

Even with the de-emphasis on Morse code in amateur radio license testing, The Code remains a popular, much-used mode on the amateur bands.

Learning the code, or enhancing your existing ability doesn't have to be a gut-wrenching, migraine-producing, hair-pulling experience. In fact, when approached from the following radical angle, it can be fun and entertaining, as well as rewarding.

M-B-M … A beginning

Morse-by-Mouth was developed back in the dark ages of amateur radio by a group of hams trying to have fun with a difficult proposition — how to increase their Morse code copying ability. After much unscientific (but heartfelt) study, some empirical experiences, plus the support of fellow loonies, it was agreed that you *can,* through the use of M-B-M, learn the code, increase your speed, get the job you've always wanted, marry the girl of your dreams, and live happily ever after. It's all in your "talkability."

Talking your way to success

If you got a lot of reprimands for talking in class, if your friends had to smack you upside the head with a slice of pepperoni pizza to get a word in, or if your daddy told you "Kid, you got a big mouth!" — you're gonna love code talking!

With apologies to the valiant Navajo Code Talkers of WWII, *code talking* here refers to verbalizing Morse code — literally sounding out each Morse character — just as if your mouth was a CW transmitter. Okay? or **dah-dah-dah, dah-di-dah, di-di-dah-dah-di-dit.** Notice that we don't pronounce it as "dash-dash-dot-dash." This more literal translation is not only confusing, but it hampers your talk speed as well.

Sound like a goofy premise? Just bear with me for a bit and I promise you'll at least find this an interesting process.

The good old days — the way it was

I was a Novice back when things were a lot tougher — when to get your General class license you had to send and receive 13 wpm in addition to passing a written exam, under the watchful eye of a real FCC field engineer, who was armed. Tests were only administered at an FCC field office. Since none of our gang was old enough to drive, we had to get there the best way we could, which meant bicycling or walking — several miles, usually uphill, through several feet of snow. Asking your parents to drive you was not an option.

During those formative years, I struggled along with my fellow high school radio club members to reach the 13 wpm level, while others were just trying to do the 5 wpm for their Novice tickets. It was slow going.

"Man, I'm never gonna bust that ten-words-per-minute hurdle," I complained to my buddy Walter after a code practice session.

"Hey, don't bitch," Walter says. "I'm still stuck at eight!"

Walking to class later that day with James, Walter asked him how *his* code speed was doing.

"Di-di-dah-dit, dah-di-di-dit" ("FB"), he responded.

We both chuckled over that. And James mouthed something else. **"Di-dah-dah-dah-dah, di-di-di-di-dit, di-dah-dah, di-dah-dah-dit, dah-dah"** ("15 wpm").

"No kiddin'," I said. "That's great!"

"Yeah, we're stuck at eight and ten," Walter said.

Walter and I looked at each other at the same instant, realizing that we'd just copied James' verbally produced

If you're a No-Code Tech, and you're having fun operating, tell us about it! Other No-Code Techs will enjoy reading about your adventures in ham radio—and we'll pay you for your articles. Yes, lots of nice clear photos, please. Call Joyce Sawtelle at 800-274-7373 to get a copy of "How to Write for *73* Magazine."

CW in our heads! At a speed that sounded considerably faster than what we'd been copying from the machine. Who would've thunk it? And why did it happen?

The great "immersion" theory

"It's called "*immersion*" because that's what you do," said a doctor friend of mine. "You literally immerse yourself in your study, project or whatever." He told me that's how he'd had to learn anatomy. "Total immersion," he said. "You read it, think it, talk it, and dream it until it becomes a natural part of your persona."

Training experts tell us that immersing oneself in any subject or pursuit will enhance your ability to learn and to excel in almost anything. But there is one caveat — you must commit to an appropriate amount of time required to master the subject. I'm not sure that I'd agree with the concept of a 24/7 effort with regard to something that's supposed to be a pastime.

In the case of Morse code, you might want to try thinking of it as a second language — in reality that's what it is — a digital language. And try giving it the same time and attention you'd give to learning any new language.

Let's take a closer look at just how you can use this immersion stuff.

Once you get "code on the brain," you'll find yourself *mentally* sounding out words and sentences at every opportunity. During your morning cup of coffee you may find yourself humming some "**di-dahs**." That corned beef sandwich you got for lunch — did it come with **dah-dah, di-di-dah, di-di-dit, dah, di-dah, di-dah-dit, dah-di-dit**? The city bus blowing by on route **di-di-di-dah-dah, dah-di-di-di-dit**. All of these mental exercises are fodder for your code practice. (And believe me, the code you create this way is a lot easier to hear or feel than it is to read in print!).

You might want to try talking to yourself, too. Yeah I know, this is really sounding goofy now. But just consider how many times a day you talk to yourself, albeit silently — asking questions, making obscene remarks about a coworker, telling yourself to avoid that cheesecake for dessert, weighing options of doing a job your way instead of theirs. So what's wrong with putting those thoughts in a language other than the one you speak normally — in this case, *Morse?*

Brevity means clarity

I'll admit that all those dits and dahs can be a mouthful. So cutting back on the full-size words and cumbersome phrases would be helpful. We can do this by memorizing and using every accepted CW abbreviation (like GG for "going," HW for "how," and FB for "fine business," "fine," or "great"), prosign (BK, AR, SK, AS, BT, K), and Q signal. All of these can be found in various amateur radio handbooks and selected amateur radio publications.

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A Tale of the Tape

(You think.)

I was experiencing a pleasurable morning, wandering the rows of fellow amateurs at one of last summer's hamfests. Ancient technology was stacked beside objects of not-so-ancient vintage equipment, all for the browsing of future buyers. Or so was the hope of the vendors plying their wares.

Not having the need for new equipment, nor wanting to rebuild the nostalgia items, I was happy to wander row after row of tables, while looking for "nothing in particular." I sometimes attend the local hamfests to "donate" the entry fee to the sponsoring club, and to "eyeball QSO" should the opportunity arise. I was thinking of times long ago when I operated some of those choice pieces and thought then that it couldn't get much better. Boy, was I asleep as technology paraded past!

Farther down one row was a small gathering of individuals grouped around a card table. They appeared to be listening to the vendor whom I can only assume was "hawking" his wares to the crowd.

Well, not being one to miss out on what is happening, I scurried along to join the group, to see (and hear) what all the interest was. I'm happy to report that joining that group was one of the highlights of the day.

Andrew Kabasakalian WB2WZC (PO Box 454, Glenwood, NJ 07418) stood there, chatting with members of the group, and expounding the benefits of QRP and the gear he was willing to part with. Each piece on his table was carefully created by himself and was now available to whoever wished to purchase an item. He didn't seem enthused about parting with any of it, but if the purchaser was adamant, he would sell. His interest was definitely more toward generating interest in the group in operating and building QRP gear!

Continued on page 58

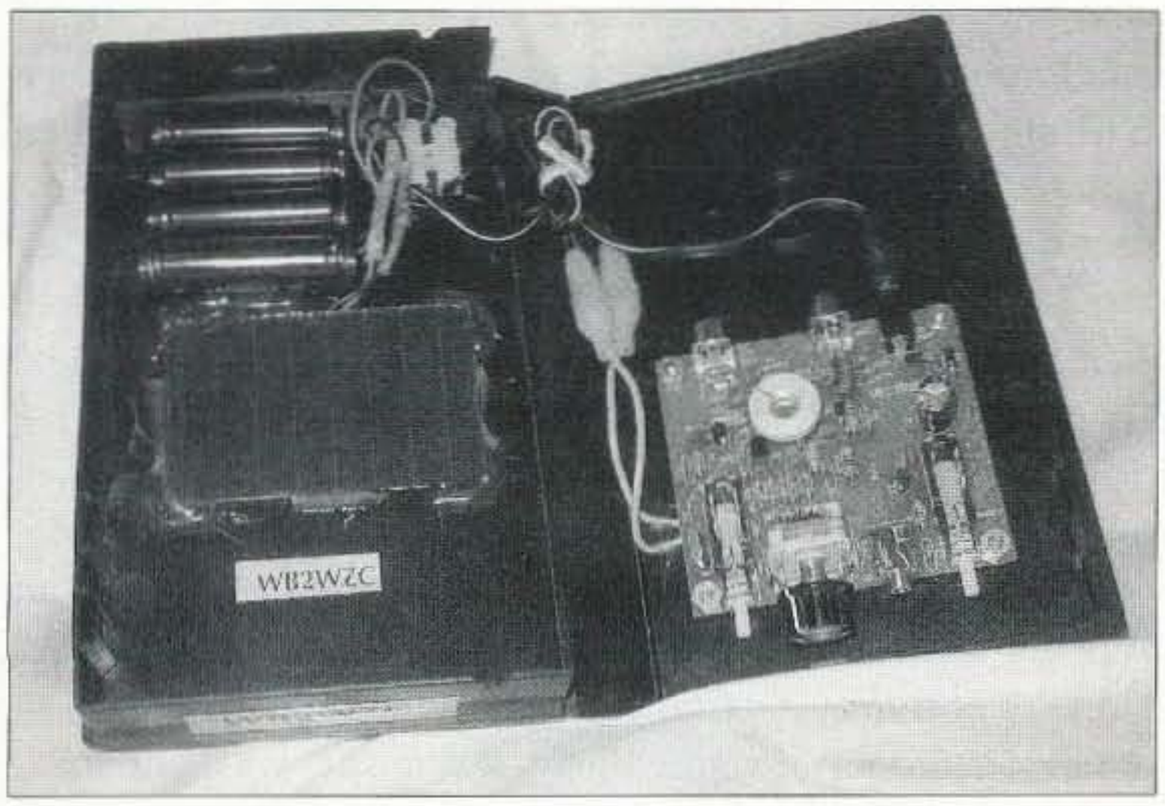

***Photo A.** Inside workings of the QRP rig installed in a VHS tape enclosure. This rig can be easily stored on the shelf until ready for use. And it looks good too!*

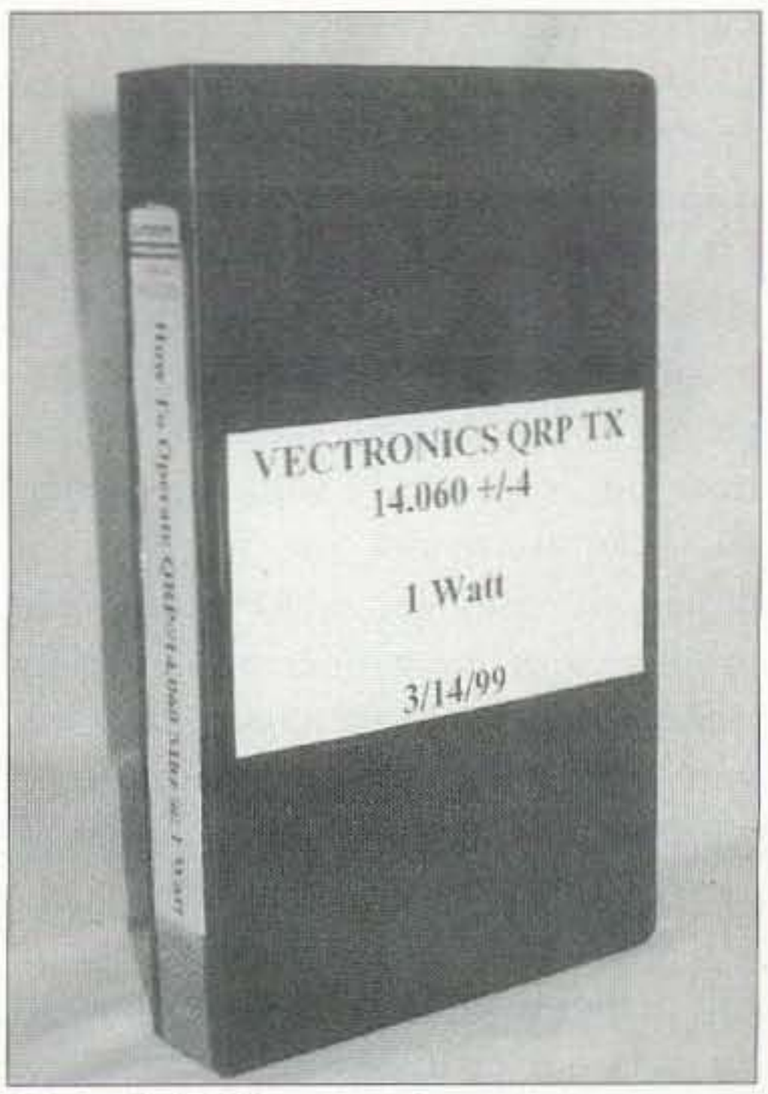

***Photo B.** VHS tape enclosure.*

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Daddy's Girl

How a ham license became a ticket … to grow up.

I knew I had a problem when he first showed up: a tall, red-headed, gangly boy, with a driver's license!

This impressed my daughter, but it scared a few choice words out of me. "What does he want?" I quipped to my wife.

"What do you think he wants?" she replied. "He just wants to visit with Angie."

"She's too young for boys, and probably will be for the next 20 years," I declared. My wife, however, thought that it was kind of cute how they just sat there talking.

"How can they talk so much, they don't even know each other?!" I moaned.

I realized the position I was in from the start. Here I was, the guardian and protector of my household. I was expected to invite this intruder in and treat him respectfully while he figured out how to render me helpless, or rather my daughter, before him. The problem was, the women in my family were all a party to the conspiracy. My wife and I had established rules by which dating would occur, and one by one, exceptions were being made.

It was clear that I was going to lose this battle, so one day when my daughter was not distracted, she asked me how hard it would be to get an amateur operator's license. Knowing opportunity when I see it, I came home that very night with a license manual for the Technician class license.

Angie is a bright girl, the first of my children. I did not want my kids growing up being afraid to experience life to the fullest, so I taught her important life skills such as learning to ride a bike, and how to swim. The secret to teaching kids any of these skills is to first teach them to love the activity before you teach them how to do it. For example, I took my kids swimming for many days and just had a good time playing in the water before I taught them the elements of swimming. After they became totally at home in the water swimming just seemed to come naturally.

Becoming a ham operator happened the same way. Seeing her dad enjoying and talking about radio contacts peaked her interest enough to one day want to get involved herself.

Not being as dumb as my kids perceived me to be, I saw the opportunity that was embedded within her question. I told her the truth — that it is not hard at all to become licensed. I also seasoned my speech with some additional sales pitches … er, words of wisdom … that I had seen about how scholarships were available to graduating students who were also amateur operators.

My primary motive, however, was that since my daughter, a country girl, was soon to be getting her driver's license, and since this was going to make her infinitely more mobile, I wanted her to be able to call home if the car should break down or the boys started following her everywhere.

I gave her the license manual and I bought one for myself, thinking that I might as well upgrade when it came time to go for the exam. She studied and so did I, and off we went to a test session that is offered every other month by a local radio club. We both passed that night; I made 13 wpm and successfully completed the written exam for the General ticket, and Angie got a no-code Tech license. Of course, on the way home she inquired about getting an HT, and I assured her that a radio would be available for her use — particularly when she was out on a date.

Continued on page 58

CALENDAR EVENTS

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

JULY 12

OAK CREEK, WI The South Milwaukee ARC Inc. will hold its 36th annual Swapfest on Saturday, July 12th, at the American Legion Post #434 grounds, 9327 S. Shepard Ave., starting at 6:30 a.m. and running until at least 2 p.m. CDT. Free parking, a picnic area, and limited free overnight camping are available. Hot and cold beverages, donuts and sandwiches will also be available starting at 6 a.m. Admission is $5 per person. Prizes will be awarded during the day and you need not be present to win. A free flyer and map may be had by writing to *The South Milwaukee ARC Inc., P.O. Box 102, South Milwaukee WI 53172-0102.* Talk-in will be on 146.52 (WA9TXE) simplex as well as on many of the local repeaters.

JULY 13

KIMBERTON, PA The Mid-Atlantic ARC will present their annual Valley Forge Hamfest and Computer Fair, Sunday, July 13th, at the Kimberton PA Fire Company Fairgrounds, Route 113, south of the intersection with Route 23. This ARRL sanctioned Hamfest will be held rain or shine. Sellers admitted at 7 a.m. and buyers admitted at 8 a.m. Admission is $6. Unlicensed spouse and children of licensed amateur radio operator will be admitted free of charge. Lots of great door prizes will be available. Many dealers will be there selling amateur radio and computer gear. Demonstrations will also be featured. For inside tables w/elec., E-mail *Rick Miskinis N3AGS* at *[reservations@marc-radio.org],* or call him at *610-825-9590.* Indoor tables are $10 each for 1 to 4 tables, $8 each for 5 or more, in addition to admission. Outdoor tailgate space $6 per space in addition to admission (not available in advance). Food and beverage sales are to be done by authorized vendors only. For more info please E-mail MARC at *[Hamfest-info@marc-radio.org],* or write to *MARC, P.O. Box 2154, Southeastern PA 19399-2154.* Info is also available on the club Web site at *[http://www.marc-radio.org].* Talk-in on 146.835(-) MHz and 443.800(+) MHz PL 131.8. Watch for signs directing you to the site.

JULY 18, 19

OKLAHOMA CITY, OK The Central Oklahoma Radio Amateurs will sponsor its 30th annual "Ham Holiday 2003" at the Oklahoma State Fair Park, northeast of the I-40 and I-44 intersection, in the Made In Oklahoma building. Doors open 5 p.m. to 8 p.m. Friday, July 18th; 8 a.m. to 5 p.m. Saturday, July 19th. Features: Technical and non technical programs, WAS card check, VE exams, flea market. Pre-registration is $7, $10 at the door. Advance flea market tables are $15, $20 per table at the door (if available). Electrical hookup $10. People under 16 years of age are admitted free if accompanied by an adult. Talk-in on 146.82. Additional info and registration forms are available on the CORA Web site at *[www.qsl.net/coranews].* Vendors, E-mail *[kc5qcv@cox.net]* for details. Send pre-registration to *CORA Ham Holiday 2003, P.O. 265, Ft. Supply OK 73841-0265.*

JULY 19

CARY, NC An ARRL-sanctioned "Mid-Summer Swapfest" will be held by the Cary ARC, July 19th, 8 a.m. to 2+ p.m. at the Herbert Young Community Center, Academy St. and Chapel Hill Rd. Talk-in on 145.39-.6. The event is indoors and air-conditioned. Tickets $4 in advance and $5 at the door. VE exams registration at 10 a.m. Testing starts at 11 a.m. Walk-ins OK. E-mail to *[n4nc@arrl.net],* or see the Web site at *[www.qsl.net/n4nc/]* for more info.

LOVELAND, CO The Northern Colorado ARC will host their annual Superfest from 8 a.m. to 2 p.m. at the Larimer County Fairgrounds, 700 Railroad Ave., Loveland CO. Features include commercial exhibits, computer and radio goodies, and more. Free parking. Table reservations and general info is available from *Willis Whatley WA5VRL* at *970-407-6599.* Talk-in on 145.115(-100 Hz).

JULY 20

SUGAR GROVE, IL The Fox River Radio League of Batavia IL, will hold their Annual Hamfest at Waubonsee Community College, Rte. 47 at Waubonsee Dr. in Sugar Grove (5 miles NW of Aurora). Talk-in on 147.210(+) PL 103.5/107.2. Doors open Sunday at 8 a.m. Setup is 7 p.m. on Saturday and 6 a.m. to 8 a.m. on Sunday. VE exams start at 10 a.m., bring original license, copy of license and photo ID. Contact *Maurice L. Schietecatte W9CEO, c/o FRRL, P.O. Box 673, Batavia IL 60510.* Phone *815-786-2860,* or E-mail to *[scat42@ msn.com].* The Web site is at *[http://www. frrl.org].*

WASHINGTON, MO The 41st Annual Zero Beaters ARC Hamfest will be held July 20th, 6 a.m. to 2 p.m. at Bernie E. Hillerman Park in Washington MO. Free parking and free admission. Sandwiches, brauts, refreshments and desserts will be available. Features: Commercial vendors, bingo, ham radio and computer flea market, technical sessions and ham radio demonstrations. Additional info and talk-in on 147.24(+) rptr. Watch for green on white hamfest signs. Registration for VE exams starts at 9 a.m. Walk-ins welcome: limit 30. Bring original license and a photocopy. For exam info SASE to *ZBARC VE Exam, P.O. Box 1305, Washington MO 63090.* For hamfest info, contact *Zero Beaters ARC, P.O. Box 1305, Washington MO 63090;* or *Keith Wilson KØZH* days at *636-629-7368; fax 636-629-0103.*

JULY 26

CINCINNATI, OH West Side - Saturday, July 26, 2002, Flea market 6 a.m. - 1 p.m. Air-conditioned inside vendor area 8 a.m. - 1 p.m. Sponsor: OH KY IN Amateur Radio Society. Location: Diamond Oaks Career Development Campus, 6375 Harrison Avenue, Cincinnati, OH (handicapped accessible). This large facility is located just east of I-275 and I-74. Take I-74 to the Rybolt Road/Harrison Avenue Exit (Exit #11). Go east on Harrison Avenue. Diamond Oaks is located on the right (south side) of Harrison Avenue, less that one mile from the I-74 exit. Special seminars, transmitter hunts, indoor vendors, large outdoor flea market, door prizes, VE exams (8 a.m., walk-ins accepted), refreshments, free parking, handicapped parking available. ARRL-approved! Talk-in: 146.670(-) repeater. Admission: Adv. $5, gate $6., age 12 and under free. Indoor vendor tables (6 ft. with free electricity) $10 ea. Outdoor flea market, $1 per space. *Contact Lynn Ernst WD8JAW, 10650 Aspen Place, Union KY 41091-7665; 859-657-6161, E-mail [wd8jaw@arrl.net]. Web: [www.ohkyin.org].*

SWANSEA, MA The Fall River MA Amateur Radio Club will hold its annual Geek-fest, clam-boil, and flea market, Saturday, July 26th, at American Legion Post 303, Ocean Grove Ave., Swansea MA. For more info contact *George KB1CNA* at *[kb1cna@msn.com]; Skip*

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CALENDAR EVENTS

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KB1CNB at *[kb1cnb@arrl.net;* or *Roland N1JOY* at *[n1joy@arrl.net].*

JULY 27

TIMONIUM, MD The Baltimore Radio Amateur Television Society will hold its BRATS Maryland Hamfest and Computer Fest on Sunday, July 27th, at the Timonium Fairgrounds, York Rd. off I-695, I-83. Directions: Take I-695 (the Baltimore Beltway) to Exit 24 (I-83 North). From I-83, take Exit 17 (Padonia Rd. East), then turn right at the 3rd traffic light onto York Rd. Continue south on York Rd. to the Fairgrounds entrance. You can also take the MTA Light Rail to the Timonium Park & Ride stop, or park in the Timonium Park & Ride lot on Deereco Rd. Talk-in on the 147.03(+), 145.13(+), 224.96 and 448.325 MHz rptrs. Grounds open for tailgating at 6 a.m. Building opens at 8 a.m. Accessible to the handicapped. Vendors can setup beginning at 2 p.m. on Saturday. Admission is $6 per adult, children under 12 free. Tailgating spaces are $10 each, first come, first served. No advance reservations for tailgating spaces. VE exams will be given at 9 a.m. only; check-in is at 8:30. Pre-registration is required. To pre-register call *John Creel WB3GXW* at *301-572-5124,* after 6 p.m. For further info see the Web page at *[http://www.bratsatv.org];* E-mail *[hamfest@bratsatv.org];* call or fax *410-461-0086;* or write *BRATS Hamfest, P.O. Box 5915, Baltimore MD 21282-5915.*

AUG 2

ALFARATA, PA Juniata Valley ARC Hamfest, 6:30 a.m. General admission, 8:00 a.m. Morning and noon food items available. Admission $2.00 donation, XYL and children free. Tailgating $5.00 donation, includes admission. Indoor tables, $10.00 donation per table. Space is limited. Vendors responsible to collect PA sales tax. Electricity, $2.00 additional. Please bring your own power cords. Directions: The Decatur Fire Co. is located along US Route 522 North, 8 miles east of Lewistown, PA in the town of Alfarata, PA. Look for signs. Talk-in on 146.910 MHz. *For more info, contact JVARC, PO Box 73 Yeagertown PA 17099, or contact Cliff Bell WB3IVX, 717 248 2616.*

AUG 10

PEOTONE, IL The Hamfesters Radio Club is proud to announce that they will hold their 69th Annual Hamfest Sunday, August 10th, at the Will County Fairgrounds (I-57 Exit 327 East) in Peotone. The air-conditioned, fully enclosed pavilion ensures you a good spot, rain or shine, hot or not. This hamfest is vendor friendly. Saturday setup from 3 to 11 p.m. (August 9th). Convenient unloading and parking areas. Free overnight parking. A secured building. The fairground offers plenty of free parking and there are ample food and rest room facilities. Tables are $15 each, electric $10. One ticket free per vender. All others $5 in advance, $6 at the gate. Your gate pass will be issued at arrival, your ticket will be needed. Gate opens at 6 a.m. Sunday. Main Exhibition Hall opens at 8 a.m. sharp. Send reservations and donations to *Robert Nelson WB9WFR, 1720 Vollmer Rd., Flossmoor IL 60422.* VE exams will be available. Visit the Web site at *[www.hamfesters.org]* for more info.

AUG 16

OAKLAND, NJ The Ramapo Mountain ARC will hold its 27th Annual Ham Radio and Computer Flea Market on Saturday, August 16th at the American Legion Hall, 65 Oak St., Oakland NJ. This event is ARRL sanctioned. Vendors setup at 6 a.m., buyers admitted 8 a.m. until Noon. The kitchen opens at 7 a.m. Talk-in on 147.49/146.49 and 146.52 simplex. Donations $5 with XYL and harmonics admitted free. Inside tables $12 each. Tailgate spaces $10 each. For more info please contact *Bob Anderson K2BJG, 69 Page Dr., Oakland NJ 07436.* Phone *201-337-6945;* fax *973-962-6210.* Club E-mail *[rmarc@qsl.net.* Club Web site *[www.qsl.net/rmarc].*

SEP 25–28

SEATTLE WA Microwave Update 2003 organizers and the Pacific Northwest VHF Society are joining forces to host a joint conference in the Seattle WA area on September 25–28, 2003. Registrations for the joint conference will be accepted beginning April 1st. Cost of the registration will be $40 prior to September 12th, and covers all three days. Single day or single event registrations are not available. Late registrations, including at the door, will be $50. Registration forms can be downloaded at *[www.microwaveupdate.org]* or send an SASE to *John Price N7MWV, 12026 81st Ave. NE, Kirkland WA 98034,* and a form will be mailed to you. Completed registration forms and payment should be sent to the same address. Make checks payable to *Microwave Update 2003.* Joint conference sessions and the Saturday evening banquet will be held at the Everett Holiday Inn and Conference Center, a short drive north of downtown Seattle. Special rates have been arranged with the hotel for conference participants. Rooms are $69 per night plus tax, a real bargain for the Seattle area! It is suggested that early reservations be made directly with the hotel at *425-337-2900.* Be sure to mention "Microwave Update" to get this rate. Reservations must be made by August 21st for this rate.

"White papers" are currently being solicited from potential authors and speakers for publication in the 2003 conference proceedings. Topics specifically of interest to Microwave Update attendees, as well as those on VHF and UHF subjects usually associated with the annual Pacific Northwest VHF Conference are being solicited. Papers will be accepted until July 1st, 2003, to allow enough time for printing. White papers should be sent directly to *Jim Christiansen K7ND,* via E-mail at *[k7nd@att.net].* MS Word format is preferred. Microwave Update 2003 and the Pacific Northwest VHF Society respectively, will be the sole judges of whether presentation requests and white papers are accepted.

If you are interested in making a session presentation at one of the Microwave Update 2003 sessions, please respond to *NU7Z [nu7z@aol.com].* For presentations at the Pacific Northwest VHF Conference sessions, contact *N7CFO* at *[n7cfo@ix.netcom.com].* LCD projection equipment will be available for those using PowerPoint presentations. Slides and video presentations can be accommodated with advance notice.

SPECIAL EVENTS, ETC.

AUG 16, 17, 18

NEW JERSEY QSO PARTY The Englewood Amateur Radio Assn., Inc. invites all amateurs the world over to take part in the 44th Annual New Jersey QSO Party. (1) The time of the contest is from 2000 UTC Saturday, August 16th to 0700 UTC Sunday, August 17th and from 1300 UTC Sunday, August 17th to 0200 UTC Monday August 18th. (2) Phone and CW are considered the same contest. A station may be contacted once on each band — phone and CW are considered separate bands. CW contacts may not be made in phone band segments. NJ stations may work other NJ stations. (3) General call is "CQ New Jersey" or "CQ NJ". New Jersey stations are requested to identify themselves by signing "De NJ" on CW and "New Jersey calling" on phone. Suggested frequencies are 1810, 3535, 3950, 7035, 7235, 14035, 14285, 21100, 21355, 28100, 287400, 50–50.5, and 144–146. Suggest phone activity on the even hours with 15/10 meters on the odd hours (1500 to 2100 UTC); 160 meters at 0500 UTC. (4) Exchange consists of QSO number and QTH (state/province or country). NJ stations will send county for their QTH. (5) Scoring: Out-of-state stations multiply number of complete contacts with NJ stations times 3 points per QSO times the number of NJ counties worked (maximum of 21). NJ stations multiply number of complete contacts times 3 points per QSO times the multiplier. The multiplier is the sum of the number of states (other than NJ), Canadian provinces, and NJ counties worked. Maximum is 49 + 13 + 21 = 83. (6) Certificates will be awarded to the first place station in each NJ county, state, province, and country. In addition, a second place certificate will be

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Crickets, Gunshots, and Antenna Placement

My wife hates crickets! Their noise keeps her awake and annoyed. If there's one chirping anywhere in the house at bedtime, I'll have to find and dispatch it before anyone will get any sleep.

What does chasing crickets have to do with direction finding? Well, have you ever tried to locate one in a small area with hard walls such as a bathroom? The sound bounces from all the tile, porcelain, and glass. If the little noisemaker is down in a corner behind the wastebasket, the sound waves can reinforce and cancel such that it appears to come from the shower stall. Sometimes the source appears to change location as I move around the room. And of course as soon as I begin to close in, the little guy detects the heat from my body and stops chirping, only to start again as soon as I leave the room.

The same phenomenon of bouncing signals giving confusing directional indications (which engineers call multipath) causes bearing errors in radio direction finding (RDF) at VHF and UHF frequencies. But before moving to that topic, let's look at another example of acoustic direction finding.

Wheres the gunfight?

A news item in *Wireless System Design* magazine just caught my eye. Proxity Digital Networks of New Orleans and Synchros Technologies of Tulsa are developing a product that is intended to enable law enforcement agencies to determine the precise source of gunshots. When I first saw the item, I was skeptical. After all, it was in the April issue. But a visit to the company's Web site[1] revealed a sales pitch for a system of clamp-on sensors that can be hung from streetlights and other high locations.

The sensors detect impulse sounds such as gunshots and transmit data on their waveform and precise time of arrival via a wireless network. A central computer uses the arrival time and Global Positioning System (GPS) coordinates of the sensors to calculate and map the precise location of the source of the gunshot.[2] It also analyzes the waveform to determine — or so claims the manufacturer — the type and caliber of weapon.

The On Alert™ Gunshot Detection System is still in the early stages, but it's scheduled for beta testing by the Tulsa, Oklahoma, County Sheriff's Department in coming months. How well will it work? I certainly have lots of technical questions. Just like the cricket chirp in the bathroom, outdoor gunshot sounds reflect from walls, moving vehicles, trashcans, and just about every other hard object in the environment, including the pavement.

How well can a few overhead sensors determine precise arrival time of the direct acoustic signal? Will the acoustic signature of the weapon be mangled by multipath enough that the precise type can't be determined? What about indoor gunshots — will a shot inside a convenience store be located and analyzed as easily as one in the alley behind it? How will the sensors react to other percussive sounds such as nearby thunder and backfiring trucks?

Like all good marketers, the folks at Proxity have tried to figure out every possible use of their technology and to adopt the technology to it. Proxity proudly claims to be working on systems to detect and report screams in parking garages, tornadoes, earthquakes, and even the sound of footsteps. If you're involved in testing this system from either the selling or buying standpoint, I'd like to hear from you.

Impulse time-of-arrival location techniques are used for radio multilateration, too. GPS geolocation[3] and the Teletrac Vehicle Tracking System[4] are two examples. For precise locations, the target signal must

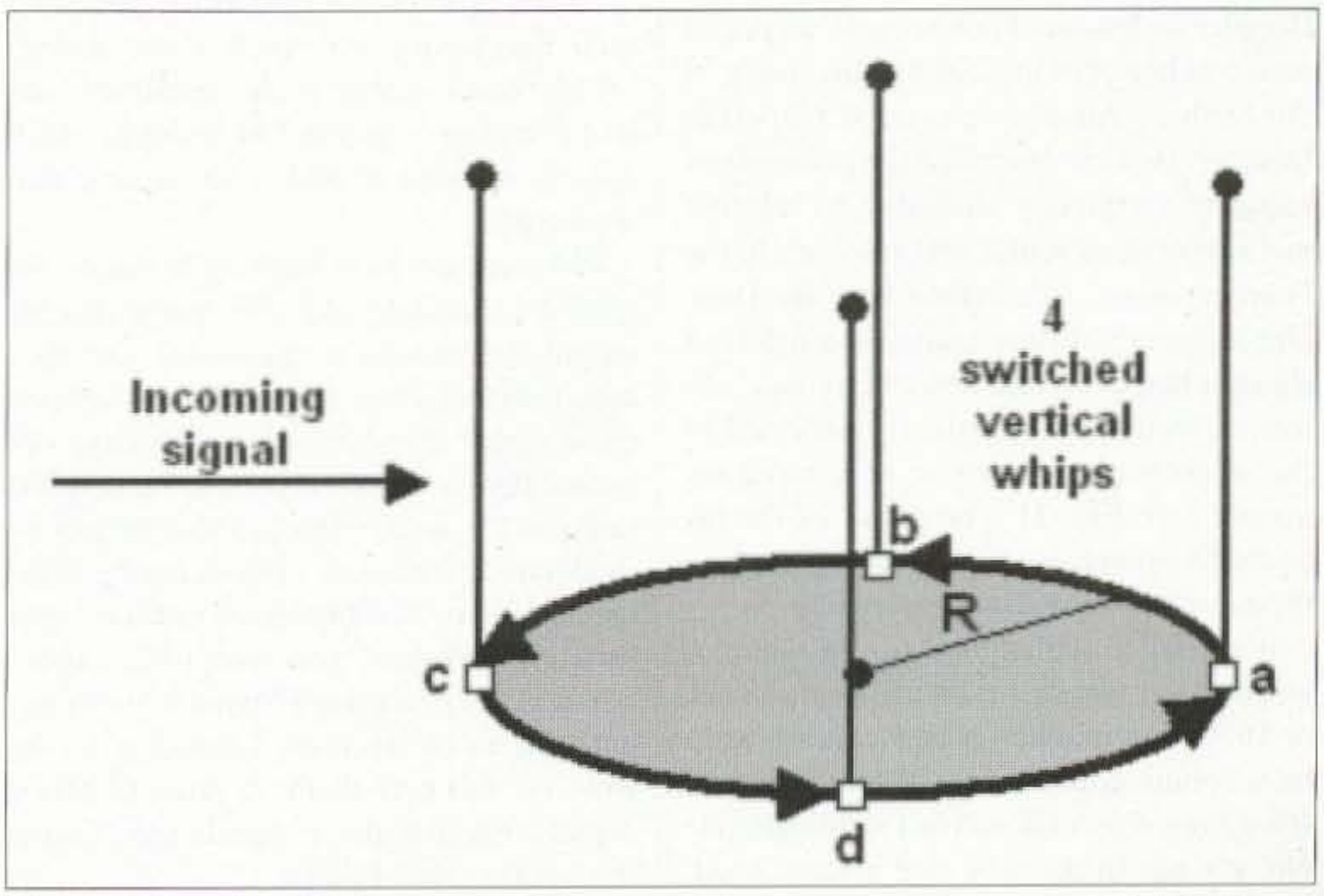

***Fig. 1.** A Doppler RDF antenna set has vertical elements that are connected to the receiver one at a time, for equal periods, using PIN diodes or other electronic switches. The individual elements should be nondirectional in amplitude and phase.*

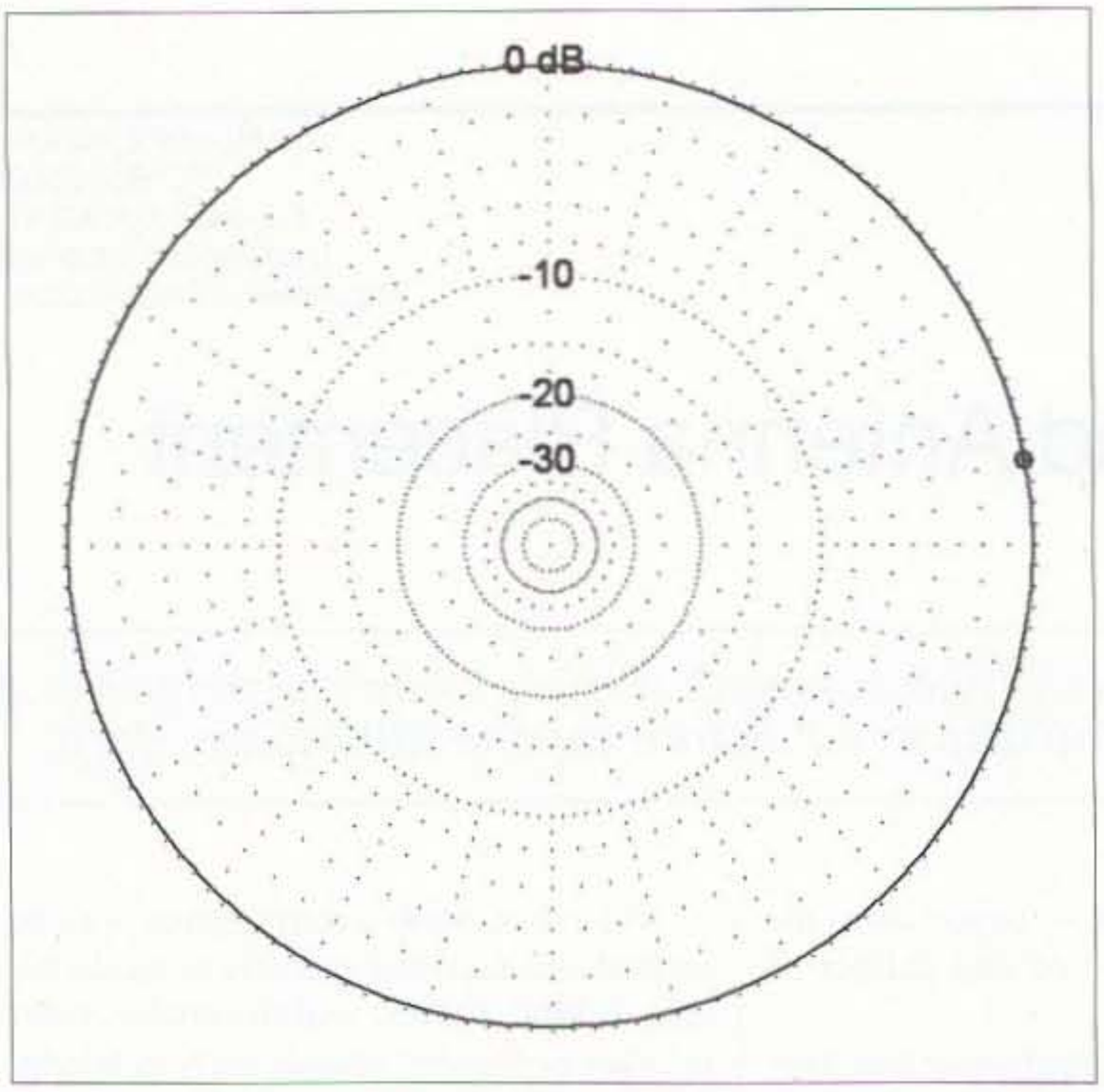

Fig. 2. A quarter-wavelength whip centered on a large conductive surface is almost perfectly omnidirectional in azimuth, as this EZNEC polar plot shows.

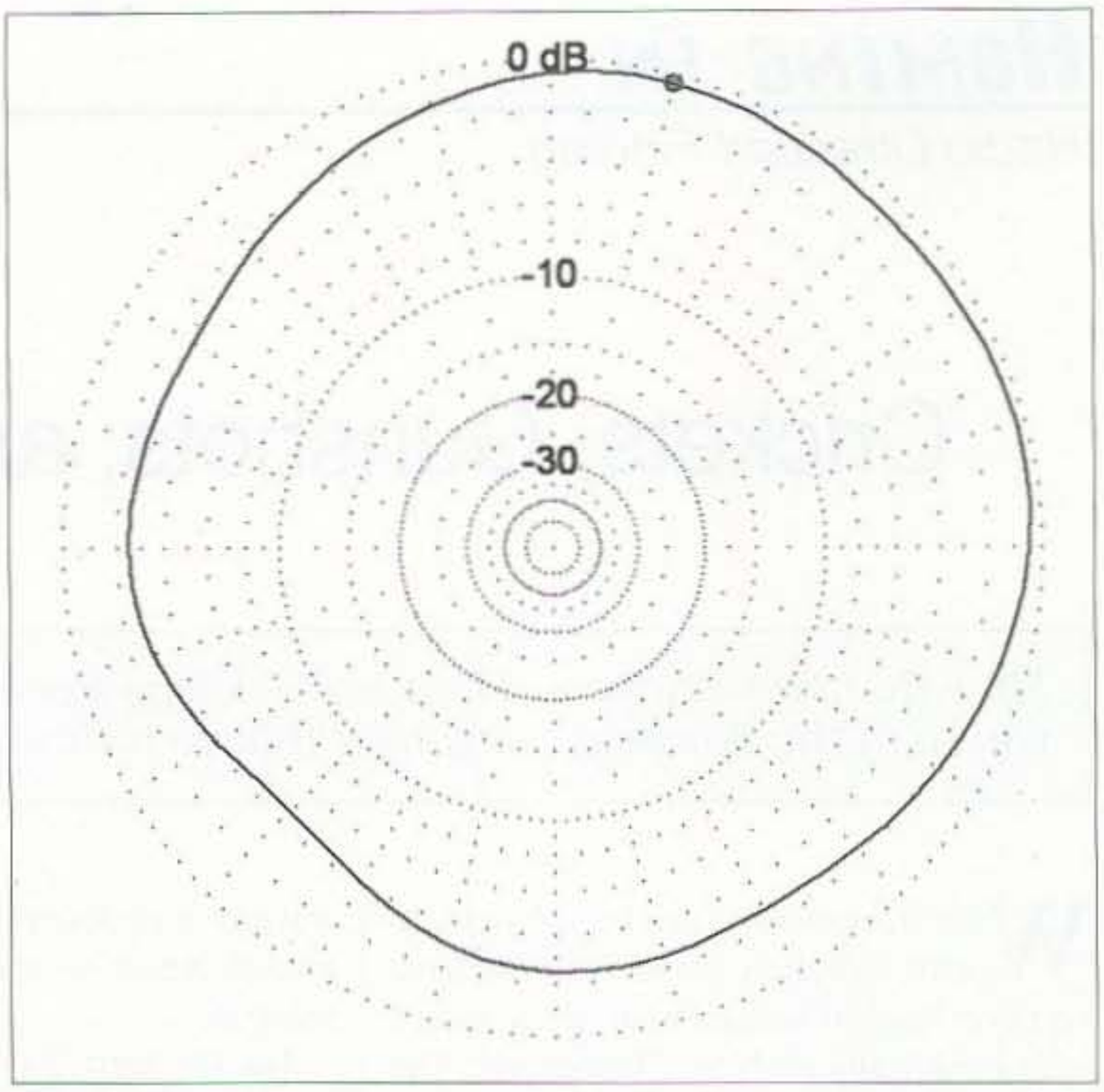

Fig. 3. Mounting a quarter-wavelength whip near a corner of the big ground plane skews the directivity toward the larger plane area. Such directivity is undesirable for elements of a Doppler array.

either be a very short pulse or use coded modulation that can be correlated precisely in time. Hams can't use this method to set up a multiple-site jammer-tracking system because jammers' signals don't have such waveforms.

Nondirectional antenna = better bearings?

For rapid automatic bearing-taking from fixed sites, hams usually choose Doppler RDF sets. "Homing In" is featuring the Doppler technique this year with a special series, in honor of the 200th anniversary of the birth of Austrian physicist Christian Doppler. He first described the principle of apparent frequency shift due to relative motion between source and receiver. In the February issue, I described how the Doppler frequency shift is created in a received signal when a circular array of vertical antennas, whips or verticals, is connected to the receiver one by one in very rapid sequence (see **Fig. 1**). The phase of the induced Doppler frequency modulation gives the azimuth of the incoming signal.

It's vital to understand that a Doppler antenna set, whether it has three elements, or 16, or any number in between, needs to be a nondirectional array. What, you say? It's giving direction, so isn't it directional? No, it's not in the way that a yagi, quad, rhombic, Sterba curtain, or parabolic dish is directional. A Doppler works on phase, but it's not the same as an array of phased verticals that an AM broadcast station or a 160-meter DXer might use.

Simply put, a good Doppler array is completely nondirectional in terms of amplitude. No matter what the azimuth of the incoming signal, the amplitude of the RF signal going into the receiver must be the same, and it must remain constant as the Doppler's switch selects the elements of the array in sequence. The signal phase and apparent frequency will (and must) change with the pseudorotation, but amplitude should not.

At this point, some readers are pounding their magazines with their fists, saying, "Why does it matter if the amplitude varies? The receiver has an FM detector, which doesn't respond to AM!" Ah, if only that were true.

FM receivers have limiting IF stages, intended to saturate and effectively clip off amplitude changes in the signal. But they aren't perfect. First, they only limit above a fixed signal threshold. You may have observed this yourself on your broadcast FM radio or TV audio (which is also frequency modulated). If there is a thunderstorm in the area and your AM broadcast radio is beset by static crashes, you won't hear these crashes on very strong FM or TV audio signals due to the receiver's limiting action. But you will hear them on distant FM/TV signals, because those signals aren't up to the limiting threshold.

Second, the amplitude variations aren't just neatly clipped off in a limiter. They still cause slight changes in the phase of the limited signal presented to the discriminator or ratio detector. This effect is called "AM-to-PM conversion" and it's familiar to radar designers who work with linear-beam tube amplifiers such as klystrons. In saturation (limiting), changes in amplitude at the input cause phase delay changes in the output of up to six degrees per dB of input amplitude change, depending on the gain of the tube. That has an adverse effect on target velocity measurement in a pulse-Doppler aircraft-tracking radar. Similarly, a limiter stage in a receiver will have some AM-to-PM conversion depending on the sharpness of limiting, bandpass versus signal deviation, and so forth.

If a Doppler array is unintentionally directional in amplitude, the AM induced on the signal by pseudorotation will be partially converted to FM/PM in the limiter, causing bearing errors. The more directional the array, the greater the error will be. You may not notice the bearing error when your vehicle is standing still because the error is a fixed amount under these circumstances. You might "calibrate it out" and never realize it. But think what happens when you start moving down a city street, taking bearings on a fixed signal source as you go along.

Like the cricket in the bathroom, the signal you're tracking comes primarily from one direction, but your Doppler also receives momentary reflections from stationary and moving objects between you and the source, especially the close ones. The

more amplitude directivity in your Doppler antenna array, the more this multipath will cause deep signal cancellations that will be turned into significant phase changes in the receiver's IF. The result can be wild fluctuations in the LED display on the front panel.

Symmetry and the sweet spot

If you make your Doppler antenna less directional in amplitude, you will see less fluctuation in the display as you drive through multipath. You probably already know that a quarter-wavelength vertical antenna requires a horizontal conductive ground plane underneath, and that it works best on a vehicle when it's mounted right in the center of the vehicle's metal rooftop. In that position, a two-meter whip gets more than a quarter wavelength of ground plane in all azimuth directions. And just as importantly, the ground plane is nearly equal in all directions.

Just how important is center-of-rooftop mounting to a Doppler? Antenna analysis software can help provide the answer. Using EZNEC,[5] I simulated a quarter-wavelength vertical monopole (representing one switched element of the Doppler array) on a 4x4-foot SUV roof. **Fig. 1** shows the azimuthal pattern of the antenna and radials in free space. It's about as nondirectional as you could hope for, with less than 0.1 dB variation in gain. That would be perfect for Doppler performance.

Next I simulated putting this monopole four inches from a corner of the same roof, an unlikely location but one that makes the point. **Fig. 2** shows the results. There is more than 4.3 dB variation in gain around the azimuth circle, enough to degrade Doppler performance in multipath situations due to AM-PM conversion. What's more, antenna elements that are directional in amplitude are also directional in phase.

Unfortunately, EZNEC doesn't compute relative phase versus azimuth or elevation. When I started analyzing Doppler arrays ten years ago with ELNEC for DOS, I asked creator Roy Lewallen W7EL why it doesn't. He told me that until I called him, no one had asked for this feature. Apparently nobody has asked since, because it's not in EZNEC for Windows. However, I know from analysis of vertical AM directional broadcast arrays that 3 dB of gain difference can represent about 45 degrees of relative phase difference.

It's true that most hams are not likely to mount a Doppler array in one corner of the roof, but you might be tempted to put it on the hood or trunk lid. Don't. It will become even more directional because signals are partially blocked from some angles. Signals from opposite angles will be scattered back into the array with unpredictable gain and phase changes. Don't put it on top of a roof rack either, as that would provide an incomplete and nonsymmetrical ground plane.

Other antennas on your vehicle might have a surprisingly deleterious effect on your Doppler's performance. **Fig. 3** shows the directivity of a two-meter quarter-wavelength whip on a perfect ground plane when a 5/8-wavelength communications antenna for the same band (with 50-ohm simulated load) is two feet to the right, as it would be if mounted on the edge of the roof. Doppler signal pickup toward the side with the 5/8-wave whip is reduced by 3.4 dB, with corresponding phase corruption of the incoming wavefront.

Higher gain antennas can affect the wavefront even more. Occasionally I have gone two-meter transmitter hunting with the Doppler antenna centered in the rear half of my 4x8-foot van roof and my RDF quad in front of it. As I rotate the quad to peak up a steady signal, the bearing displayed by the Doppler swings around the LED display, sometimes by up to 90 degrees. The effect is worst for signals coming from the front "through the quad," as you might suspect.

So to recap, the individual elements in switched VHF/UHF Doppler antenna sets must be as nondirectional as possible to achieve the best Doppler performance in multipath environments. Whip antenna sets need a good symmetrical ground plane with minimum obstructions and an absence of other antennas, especially those resonant in the band of interest.

What about interaction among the whips in the array? Interwhip coupling can cause amplitude directivity effects that are even more severe than those described above. Poor connections to the ground plane can increase this undesirable interwhip coupling. Some Doppler antenna designers don't consider these issues and then believe it's normal that their displays always go crazy when moving. It doesn't have to be that bad. I'll let you in on the secrets of minimum-directivity antenna arrays in the next installment of this series.

Meanwhile, keep training and planning for the USA ARDF Championships, July 30th to August 3rd in Cincinnati, Ohio. It's going to be a great weekend of challenging on-foot foxhunting on two meters and 80 meters. Learn more about it at the "Homing In" Web site.

Notes

1. [www.proxity.com].
2. This article says the technique was triangulation, but that's a common media mistake. Since the sensors work on time-of-arrival, not directivity, the proper term is multilateration.
3. "Homing In: Navigation and Networking via Packet," *73 Magazine,* October 1994.
4. "Homing In: Three-second T-hunts," *73 Magazine,* July 1991.
5. [www.eznec.com].

73

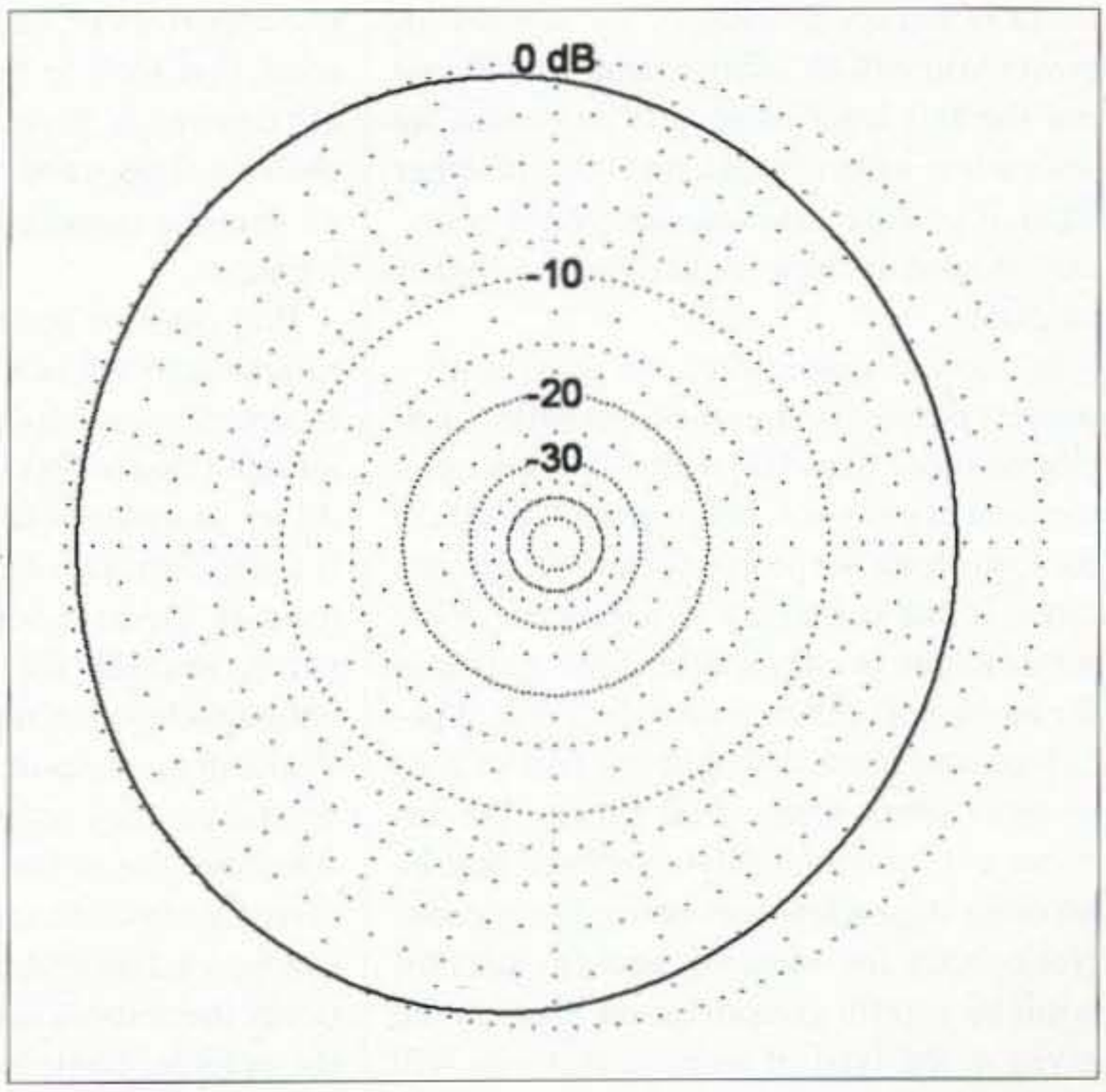

Fig. 4. *A communications antenna to the right of the Doppler whip makes that whip's pickup quite directional.*

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HF Mobile Antenna Selection

After you get your mobile HF rig in your car, what is the next step? The antenna, of course — or is it the antenna mount? Like the chicken and the egg, it's hard to decide which comes first.

I try to approach most issues logically, so I like to start with the basics. Any antenna is a device designed to convert an electrical signal from a transmitter to one that can travel through space. The ideal antenna — called an isotropic antenna — is often used for calculations, but does not actually exist in the real world. (Isn't that the way that it always is?)

Among most real-world antennas there are distinct advantages to making the antenna as large as possible and to locate it as high as possible. A good antenna most commonly works in conjunction with a good earth ground. In addition, a horizontally polarized antenna is generally accepted as being preferable to a vertically polarized one since most man-made radio frequency noise tends to be vertically polarized.

Of course, the need for an effective antenna is largely a result of the amount of power you will be using to transmit. If you run the full legal limit, you can make do with a less effective antenna. On the other hand, if you use lower power, you'll generally benefit from a bigger, better, higher antenna.

In mobile operations, we start with a modest power level to the transmitter, usually no more than 100 watts. A connection to an earth ground is not practical. While in the ham shack we probably have an antenna tuner, in the car trying to adjust one more set of knobs is impractical. Most antennas for mobile operation tend to be vertical polarized and located within ten feet of four or more spark plugs. And finally, the antenna will be physically shortened and be no more than a few feet above the ground. Not exactly the ideal situation to start off with, so careful consideration needs to be given to the type of antenna that you will be using.

There are some very impressive mobile antennas. Next hamfest you attend, take some time to stroll through the parking lot and look at the variety that exists. If you have only operated VHF and above from your car in the past, you are used to seeing a relatively small and light antenna. A quarter wave antenna for two meters, for example, is just under 20 inches in height. Because of the small size, the antenna can be mounted to the car in a variety of ways. It can be attached to the trunk lip, a magnetic mount, or even capacitively coupled through the windshield or rear window itself. One of the factors that you will need to evaluate in your antenna decision is the load on your vehicle.

Among the largest antennas are single band "bug catchers" and tunable "screwdriver" antennas. One of the best reasons to drive a large SUV or stretch cab pickup is to support these large antennas. I've seen some that look to be at least 20 feet high. Of course, in Wyoming, with its general absence of trees and other obstructions, such an antenna is more practical than in other locales.

Bug catchers tend to include a large coil to tune it to the band on which you intend to operate, and it is the brute size of the antenna that makes it effective. The screwdriver antennas also use a large coil, but it is tunable by use of a small motor such as is used in electric screwdrivers (hence its name). Recently these have begun to shrink, although they do tend to be somewhat bulky. While these types of antennas do work well on trucks, they may be a little difficult to adequately secure on an automobile. Screwdriver antennas have the advantage that they can be used on multiple bands, and you can tweak the antenna for best SWR from within the vehicle. Some even have automatic or memory tuning. Their utility is good, but with the complexity of their construction they will be higher priced than other antenna types.

The next group of antennas is also multiband and usually consists of an aluminum mast with several radiators, each tuned for a different band. You can choose to mount a single resonator or as many as five — one vertical at the top of the antenna and four horizontally spaced at 90 degrees from one another. Some of these can be mounted to a trunk lid mount, but you may need to limit yourself to three or fewer resonators due to the weight. Although multiple resonators may present no problem while sitting still, at highway speeds the wind and motion might provide enough torque to damage the antenna and mount.

Other versions of this type of antenna use a 3/8" 24 mount and can be attached to a ball mount or a mount below the bumper. This tends to be somewhat more rugged than the trunk lip mount, but it still pays to be aware of the amount of torque that can exist. I have had a multiband antenna twist loose and get dragged behind the car still attached to the mount — not a pleasant surprise. Some hams attach a guy wire from one or both of the rear windows to the antenna to help it remain in the vertical position.

I have used multiple resonator antennas with a great deal of success, but there are certain things you need to avoid. These include low-hanging tree limbs and low-clearance garages. I currently park on the fourth floor of a parking garage, so a multiple resonator antenna would not be my first choice at this time. If I still parked out in an open lot, my decision might be different.

There is another type of multiband antenna, such as the Outbacker, which consists of a single mast with a jumper that can be changed to determine which band can be

Continued on page 59

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Andrew C. MacAllister W5ACM
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Happy Birthday, OSCAR 7!

On June 21, 2002, Pat Gowen G3IOR posted a message to the AMSAT Internet bulletin board reporting on the reception of what appeared to be satellite telemetry.

His message began with, "I have just come across something most remarkable this Friday 21st June evening. Checking out interlopers in our 145.800–146.000 MHz space band with a new vertical now atop my 60' tower and working like magic, at 1728 UTC I came across a beacon at S.7 sending slow 8–10 wpm CW in 145.973.8 MHz. It slowly Dopplered down to 145.970 MHz before going out at 1739 UTC."

Pat was the first to report the rebirth of AMSAT-OSCAR-7. The rechargeable batteries on AO-7 have long since failed, but whenever the satellite is in sunlight, it is active, and working amazingly well. No one could even guess how long AO-7 would work, but it has been extremely reliable for a year since Pat's report, almost like having a new satellite.

Some AO-7 history

AO-7's launch anniversary won't come until later this year. The satellite went to space on November 15, 1974, on board a Delta 2310 launcher from Vandenberg Air Force Base near Lompac, California. The main payload was an ITOS-G (NOAA-4) weather satellite. A second small satellite launched with AO-7 was the Spanish INTASAT. AO-7 is the second Phase 2 (low-orbit, long-life) satellite from AMSAT (The Radio Amateur Satellite Corporation). AO-7 weighs in at 28.6 kg, and looks like a rather large eight-sided cylinder covered in solar cells. The orbit is circular at 1450 km with an inclination to the equator of 101.7 degrees. This is a tall orbit compared to other LEO (low-earth orbit) hamsats. The potential for quality conversations and DX contacts is excellent via AO-7. In its first life, AO-7 lasted about six and a half years. Then, after 20 years of silence, it came back.

The two-meter and 70-cm antennas are canted turnstiles, while the 10-meter antenna is a dipole extending from the ends of the cylindrical shape. The 2.4 GHz helix is mounted on one end of the space frame. Due to legal issues, the 2.4 GHz transmitter cannot be activated. It's outside the ham band, as defined in this century.

AO-7 now

Shortly after G3IOR's reception report was positively identified as transmissions from AO-7, Jan King W3GEY, AMSAT-OSCAR-7 Project Manager, stated that AO-7 "has a good set of arrays and the first BCR (Battery Charge Regulator) we ever flew. It's the first spacecraft we ever had that was capable of overcharging the battery. When the battery failed, the cells began to fail short. One cell after another failed and the voltage measured on telemetry began to drop. So, the cells were clearly failing SHORT.

"Now, after all these years, what happens if any one of the cells loses the short and becomes open? Then, the entire power bus becomes unclamped from ground and the spacecraft loads begin to again be powered, but this time only from the arrays. Now you have a daytime-only satellite but, each time

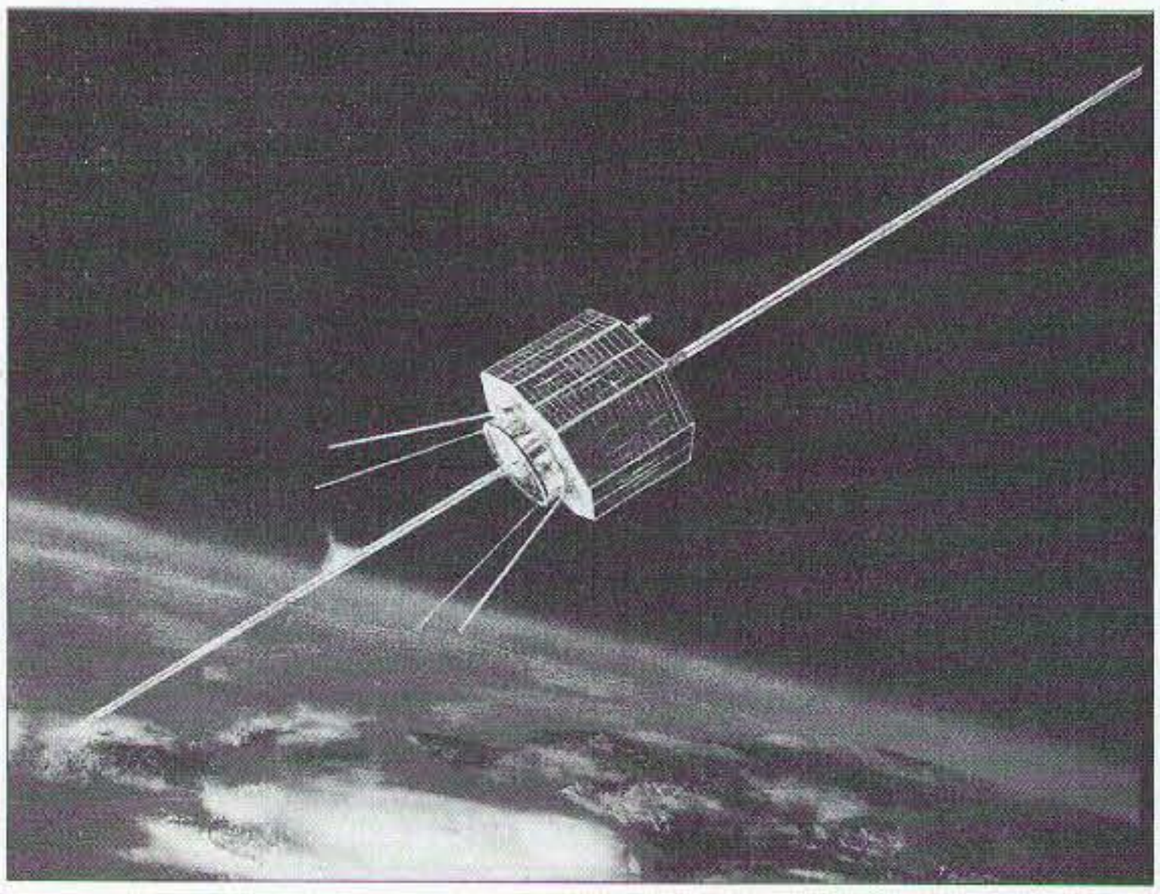

Photo A. *Artist's conception of AO-7 in orbit. (W4PUJ)*

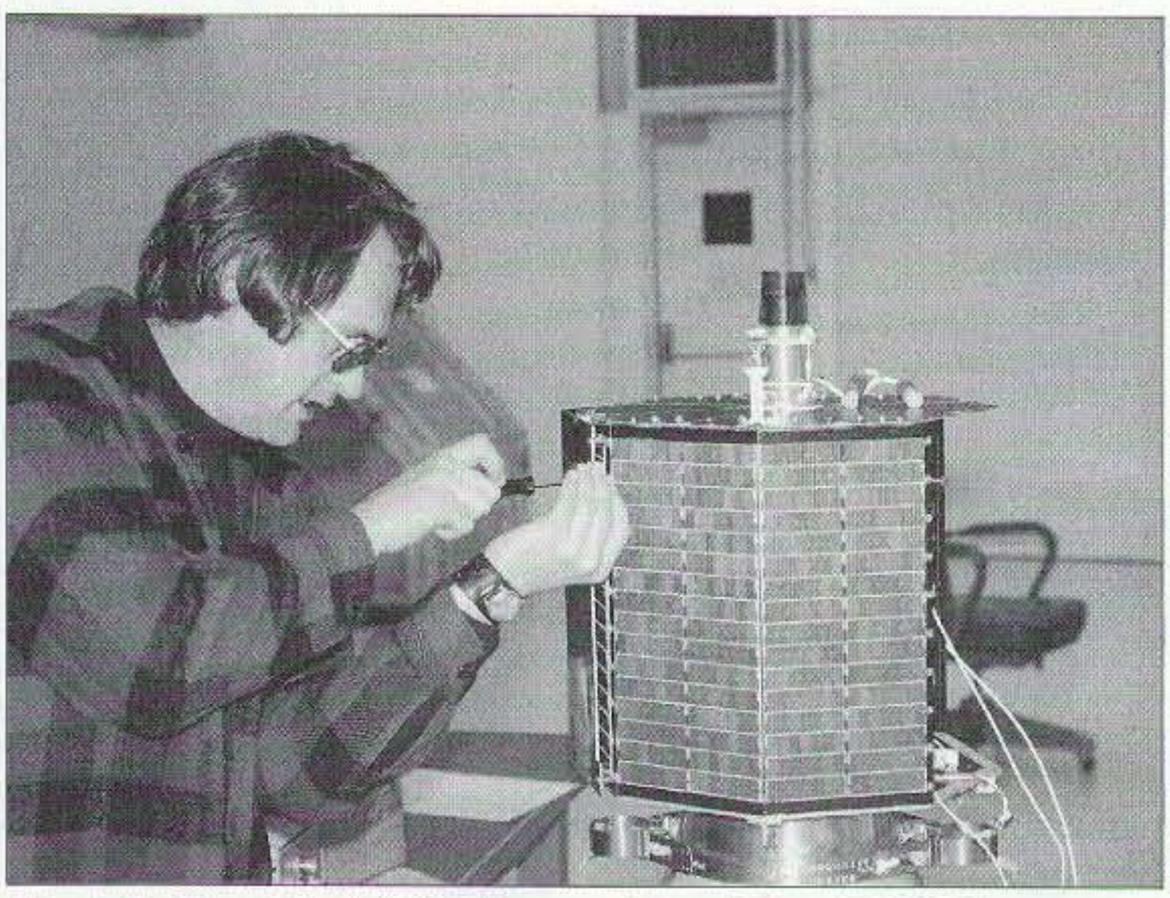

Photo B. *Tom Clark W3IWI at work on AO-7. (W4PUJ)*

Photo C. *Perry Klein W3PK leads the way with AO-7 on its flight to California for the 1974 launch. (W4PUJ)*

Photo D. *Dick Daniels W4PUJ and Jan King W3GEY work on the AO-7 adapter ring just prior to launch. (W4PUJ)*

the sun rises at the spacecraft you have a random generator that either turns on Mode A or Mode B or whatever it wants. So occasionally that 70/2m transponder transmitter and beacon must at least work. From what you have told me (and without going back and decoding the old telemetry equations), I can tell you that the following things work in the spacecraft; the arrays, the BCR, the ISR (Instrumentation Switching Regulator), the Mode B transmitter and the beacon injection circuitry, the Morse Code telemetry encoder, and the voltage reference circuitry. The latter I know is working because the last telemetry value is 651. The "6" is just the row number of the telemetry value, but the 51 means that the voltage reference is measuring 0.51 volts. I know that telemetry equation by heart since it was used as the calibration value for the rest of the telemetry system. So the telemetry has a fair chance of being decoded and making some sense!"

A look at the AMSAT Web site [http://www.amsat.org] provides all of the data you need to decode AO-7 telemetry. There are three telemetry downlink modes: slow CW, fast CW, and RTTY. There have been no reports of RTTY reception since AO-7 came back to life, but both CW modes have been heard. K3TZ has a simple and free Windows-based program on the AMSAT site that will take text files with raw telemetry (you type in the received CW) and provide a populated display of the results by using the equations associated with each channel. A second method is to use an Excel spreadsheet by W3GEY and WDØE. The received numbers are hand-entered into one column, and the results are calculated and presented in another. Even when the last telemetry value is 651 as in Jan King's explanation, the resultant values shown for some channels can still be wrong due to sensors that may have failed or drifted in the last 29 years.

The modes of AO-7

Just when you think that AO-7 is locked in a particular mode, it comes up doing something different. AO-7 was the first hamsat to have an elaborate array of transmitters, receivers, and telemetry beacons. The letter designators derived from the logic output signals of the control circuitry, A, B, C, and D, define the satellite's modes of operation. Mode A activated the two-meter receiver in conjunction with the 10-meter transmitter. The 70-cm telemetry beacon can be active during Mode A. Mode B turns on the 70-cm receiver and two-meter transmitter. Mode C is simply a low-power version of Mode B. Mode D activates the 70-cm telemetry beacon. The 2.4 GHz beacon does not have a letter-designated mode. Due to safeguards in the system design, it is doubtful if the satellite could accidentally come up with this microwave beacon active. Several stations have listened for it over the last year, but there have been no reports of anything heard.

Due to the nature of AO-7's orbit, it spends most of its time in sunlight, but whenever it passes into darkness, everything shuts down. When the satellite's solar arrays once again generate enough power to bring AO-7 back to life, the mode of operation should be a random choice of one of the four options. This has not quite been the case. The length of the eclipses seems to have some influence on the "random" selection of A, B, C, or D. It may take a few years to adequately form some theory about the modes of AO-7, but for now it seems that the satellite is somewhat seasonal with Mode A dominant in the spring and Mode B (or C) more likely in the summer and fall. The best rule is to simply be ready for anything, and make contacts while the sun shines. Some hams have multiple receivers all listening to the beacon frequencies on 10 meters, 2 meters, and 70 cm. Others have programmed the satellite's modes into their radio's memory system, and then switch between them when AO-7 comes over the horizon.

Strange sounds

Not a pass goes by that something strange isn't heard in the downlink passbands of AO-7. The odd carriers seem to be more prevalent in the two-meter transmitter, but curious signals have also been noted in the 10-meter signal. Fortunately none are near the beacon frequencies, and quiet spots can

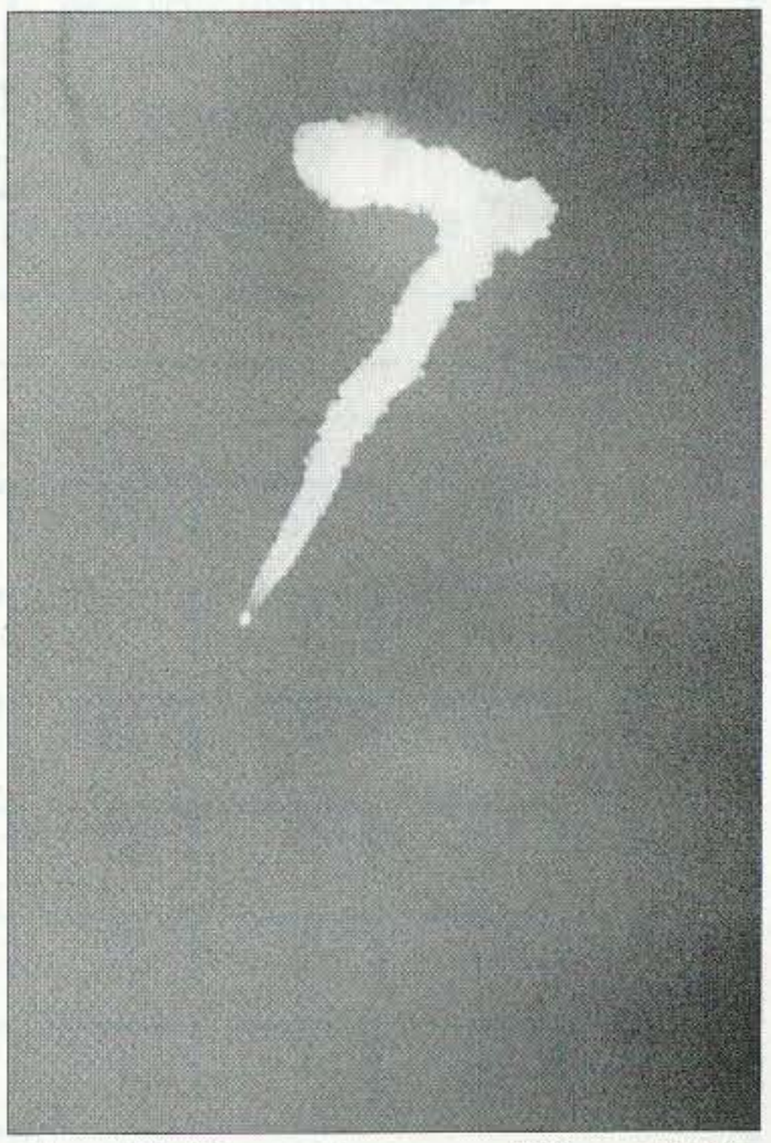

Photo E. *The rocket contrail from AO-7's launch in 1974. (AMSAT)*

be found near the passband centers where most enthusiasts congregate. The most difficult anomalies are when the whole passband is affected by FMing caused by high-power uplink signals and also a general raspy sound that sometimes occurs. A good policy for any satellite earthstation is to focus on the receive system and only run enough uplink power to make a contact.

When AO-7 is operating well, only a few watts of uplink signal (CW or SSB) are

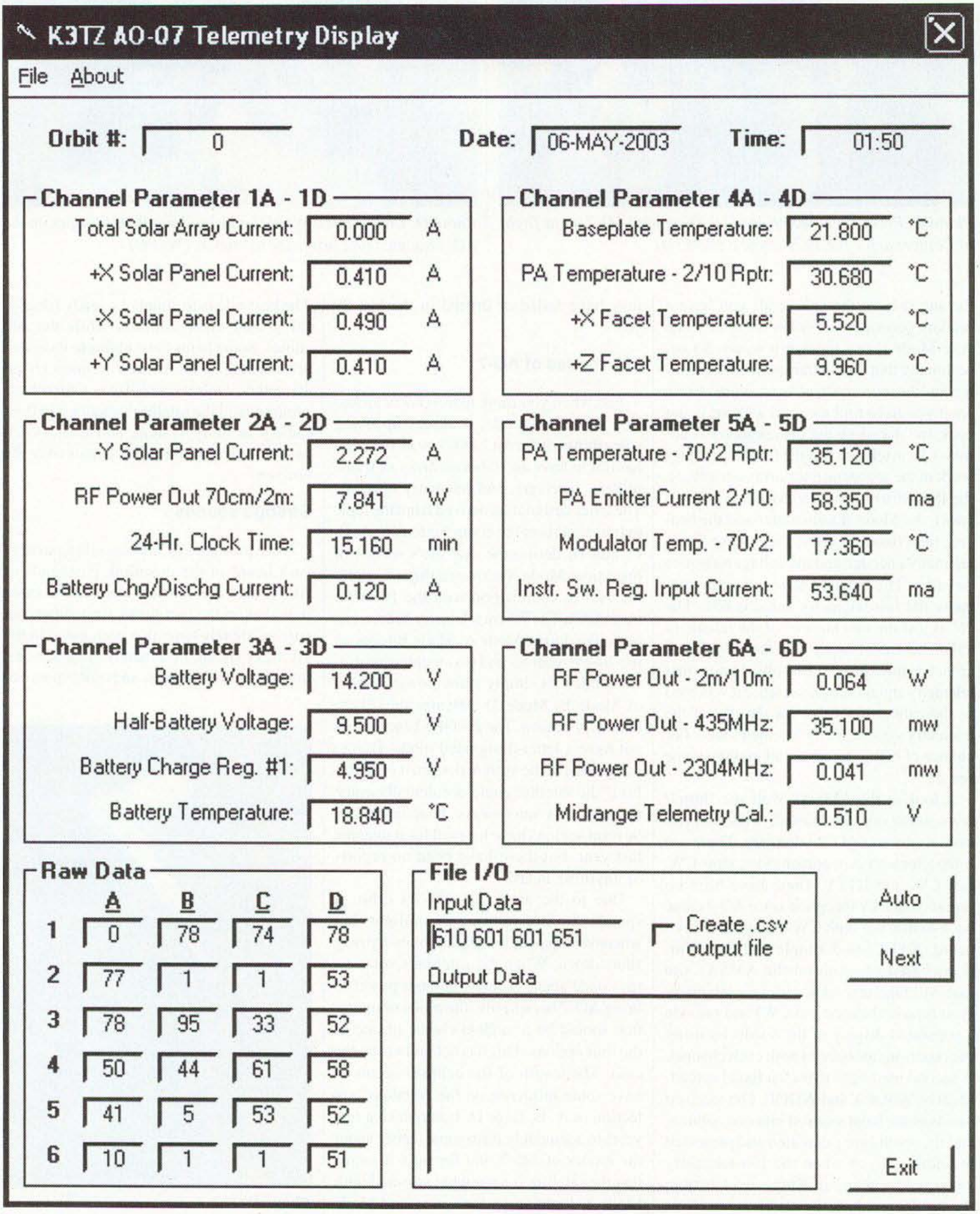

Fig. 1. Results display of the telemetry frame using K3TZ's AO-7 Telemetry Decoder software.

needed to get through. For the 70-cm uplink, best results are obtained with a circularly polarized directional antenna with right- or left-hand switching available. On the 2-meter uplink, the ability to switch polarization isn't required, but power levels up to 50 watts are sometimes needed. The best antenna for 10-meter reception is a small beam with azimuth and elevation control, but very few stations have one. Most use a dipole antenna. Experiment.

When conditions are poor, either because of the satellite or just band conditions, serious VHF and UHF satellite arrays are required. There have been times when the beacon for a particular mode has not been active, but the transponder has been on. There have been very few passes when nothing has been heard, but there have been many passes with no operators to make contacts.

Where is everyone?

During the course of the last year I have made several hundred contacts with just over 100 different stations via AO-7. During too many passes than I would like to count, I have been the only station active in North America. While dozens of stations vie for a few seconds on UoSAT-OSCAR-14, the downlink passband of AO-7 has been silent, with the exception of the strange sounds that never seem to go away. A few of the regulars on UO-14 have discovered the satisfaction of easy roundtables on AO-7. Rather than simply attempt to exchange grid squares, they have time to carry on real conversations, exchange notes about the other satellites, and actually get to know each other. I keep a sorted list of callsigns and names of AO-7 enthusiasts, just because I've had so many repeat contacts.

OSCAR 7 frequency guide

Transponder I: Mode A
Type: linear, noninverting
Uplink: 145.80–145.950 MHz
Downlink: 29.400–29.500 MHz
Translation equation: Downlink (MHz) = Uplink (MHz) – 116.450 MHz ± Doppler
Output power: 1.3 watts PEP (start of life)
Beacon: 29.502

Transponder II: Mode B and Mode C (low power)
Type: linear, inverting
Uplink: 432.125–432.175 MHz
Downlink: 145.975–145.925 MHz
Translation equation: Downlink (MHz) = 578.100 – Uplink (MHz) ± Doppler

Morse Code Telemetry Frame Decoder for AMSAT-OSCAR-7

23-Jun-02

W3GEY/WDØE

MC TLM Channel:	Function:	TLM Count:	Analog Value:	Original G3IOR Analog Value:	Units:	Comments:
1A	Total Array Current	0	0	0	ma	May have always been broken. Not sure.
1B	+X Quad. Array I	78	410	450	ma	Some biases in this data
1C	-X Quad. Array I	74	490	690	ma	Some biases in this data
1D	+Y Quad. Array I	78	410	410	ma	Some biases in this data
2A	-Y Quad. Array I	77	430	370	ma	Some biases in this data
2B	70/2 Rptr RF Power Output	1	7.84	1.16	watts	Looks on low side of normal. Not very active on 432 MHz!
2C	24 Timer Value	1	15	0	hours	just reset or channel is broken
2D	Battery Charge/Discharge I	53	130	160	ma	
3A	Battery Voltage	73	14.2	13.9	V	May be measuring BCR output voltage with no battery load but, with spacecraft load
3B	1/2 Battery Voltage	95	9.5	5.8	V	
3C	Battery Ch. Regulator #1 Voltage	33	4.95	4.65	V	Normal for in-sun with Regulator #2 Selected
3D	Battery Temperature	62	18.8	15.9	C	
4A	Baseplate Temp	50	21.8	14.4	C	
4B	2/10 Rptr PA Temp	44	30.7	16.9	C	
4C	+X Quad. Array Temp	91	5.5	5.5	C	
4D	+Z (S/C Top Plate) Temp	88	10.0	8.5	C	
5A	70/2 Rptr PA Temp	41	35.1	35.1	C	PA is working, this looks right, given other S/C temps.
5B	2/10 PA Emitter Current	5	58.4	11.6	ma	Probably means "zero" with a 1 count bias error
5C	70/2 Modulator Temp	62	17.4	13.8	C	This looks right.
5D	Inst. Swithing Regulator Input I	62	54	35	ma	This looks right.
6A	2/10 Rptr RF Power Output	10	64	0	ma	Repeater is OFF. Normal
6B	435MHz Beacon RF Power Out	1	35	0	ma	Beacon is OFF. Normal
6C	2304 MHz Beacon RF Pwr Out	1	0	0	ma	Beacon is OFF. Normal - Glad for this as it would be illegal!
6D	Midrange TLM Calibration Value	51	0.51	0.51	V	Spec. = 0.50V +/- 0.1 V

The results are given in this column.

INSTRUCTIONS:

Insert the "xx" value into this column for the correct "channel" row.
Enter data into the blue cells only.

Write your telemetry down in rows and columns as shown to the right. From the telemetry matrix formated as shown here, find the appropriate row (1A thru 6D).

1A - 1xx	1B - 1xx	1C - 1xx	1D - 1xx
2A - 1xx	2B - 2xx	2C - 2xx	2D - 2xx
3A - 3xx	3B - 3xx	3C - 3xx	3D - 3xx
4A - 4xx	4B - 4xx	4C - 4xx	4D - 4xx
5A - 5xx	5B - 5xx	5C - 5xx	5D - 5xx
6A - 6xx	6B - 6xx	6C - 6xx	6D - 6xx

Fig. 2. Telemetry values using the W3GEY/WDØE Excel Telemetry Frame Decoder spreadsheet.

Output power: 8 watts PEP Mode B, 2.5 watts PEP Mode C
Beacon: 145.972

70-cm beacon: 435.1 (rarely heard)
13-cm beacon: 2304.1 (not heard)

Telemetry frame

Here is a complete frame of telemetry from a Mode A pass on May 6, 2003, at 0150 UTC:

HI HI
100 178 174 178
277 201 201 253
378 395 333 352
450 444 461 458
541 505 553 552
610 601 601 651
HI HI

The randomness of AO-7's operation is a challenge to some, but it must be a sticking point for others. It's just not predictable. When the satellite was new, the modes had a schedule. Certain days were for Mode A, some for Mode B, and Wednesday was recharge day or experiment day. AMSAT nets in North America are on Tuesday nights (Wednesday UTC) because that's when the satellites got a rest. Accept the fact that AO-7 is now a random-mode satellite, and make some contacts. Parts of Europe can be worked from Houston, TX via AO-7 on the right passes. Hawaii, Alaska and South America are easy. Some of the first satellite DXCC (ARRL DX Century Club) awards went to stations on the east coast using AO-7. It can happen again. More satellite operators simply need to recognize the possibilities of AO-7 and its tall orbit.

How long will AO-7 last this time? It's been on for over a year now. It may be with us for many more, or it may go silent tomorrow. Don't miss out! In the meantime, Happy Birthday, OSCAR 7! 73

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Logger32: Powerhouse Freeware

Many of you have been aware of the "old" Logger16 logging program, and most of us have used that faithful standard log system to some extent. I know I did. I used it as somewhat of a benchmark for ease of use and as a good backup for QSO data.

Now the latest version, Logger32, has arrived. It had been promised for a long time, and some of the devotees to the Zakanaka/Logger format were getting extra anxious long before its official release.

But — Wow! And a simple "Wow!" hardly does the result justice. This is really an amazing piece of work. I downloaded it as soon as I heard of it. It is sizable. My dial-up connection took about a half hour to get it into the computer. Actually, that half hour wasn't nearly as frustrating as the time it took to gain a connection to the very busy server that day. Demand resulted in a terrific overload for a few days.

The install went flawlessly. Then I opened it and was truly awed by what I saw. There were all those little windows on my monitor waiting to do things I was simply not ready to ask for.

Discoveries galore

I expected a great log program with a few amenities to help identify previous contacts, along with a window resembling the old Zakanaka communications module. That latter window did not even appear until I found where to click to bring up that part of the display. To tell the truth, it probably took me a good fifteen minutes to even care about whether this software had a way to work PSK31 and RTTY. There was just too much else to explore. By the way, the icon to activate the "Sound Card Data" window to work PSK31 and RTTY is found as the eighth in the row of icons at the top of your monitor and resembles a speaker.

The more I look at this program, the more I realize there is not room enough in a single column to tell all about it. So I will tell you what I see thus far, and you will simply have to go download it and get the rest for yourself.

My thought, going into this review, was to tell what a great log program this is now. It is. There are a lot of log programs available, free as well as commercial. This one is an extremely powerful piece of software and it is FREE.

After working with Logger32 for a few days, it becomes apparent this is an educational feast. And to that, I must add the words, "thoroughly enjoyable." Few single packages come with so many integrated, useful features right out of the box.

I launched into the use of the log portion immediately after recovering from the first exposure to all the other features. The log handles the most extensive array of information about contacts I have ever worked with. I saw so many columns that I made a quick cursory count totaling 47. About the only info not having designated spots are the other operator's Social Security and VISA numbers.

Import the log

The next exercise was to see if I could get log entries that, once in place, would not require extensive editing. I admit to an imperfect log, but I wished not to compound the problem any more by adding to the existing blemishes.

So, I referred to the Help file. This Help File is a work of art. You will believe it when you see it. A few stabs at the Look-up sequence and I found what was needed under the heading of Transferring existing files from Logger16 and other sources. (Title to that effect.)

This is a step-by-step approach for those of us prone to making mistakes and skipping through the process too quickly. I say this because there is even a portion that refers to those who would rush into the import process and get ahead of the game and need to rectify the errors. And, yes, there are specific instructions for those of us referred to. You can correct those errors and start again. Very nice.

Even though this was fairly straightforward, I printed that five-page portion of the Help File and took my sweet time. It worked out as near perfect as possible in the end. I did not detect any errors after the transfer that did not already exist.

I did a slight extra step I should tell you about. Since I had most of my files already in the old Logger16 program, I updated and corrected that information so the files imported into Logger32 would be from "familiar territory." However, it appears the instructions apply quite well to import data from other sources. There is even a conversion routine that allows for editing such things as BPSK31 or PSK to PSK31 as well as allocating the contents of Comment fields. I ran that and it appeared to have been a real help in the process.

Once you have your log data imported into Logger32 you can begin to experiment with a few of the features. Clicking on Awards brings a submenu that gives you some immediate statistics on states and countries worked including obvious areas you need to work or get confirmation from. Very easy, just click and read.

Simple and intuitive

One quickly obvious seem-to-be problem is the narrow columns that do not allow you to read all the data in a cell. There is a quick remedy. Simply place your cursor at the top of the divider between columns until a two-pointed cursor displays, click and adjust the width to suit. How else do we get all those columns in such a narrow space?

As you move around in your new log, you will discover when you click on an old QSO

that the info automatically appears in the Previous QSO window along with other QSOs you have logged with the same station. Of course, when you type in a callsign to the Entry window or double-click on a callsign in the PSK31 or RTTY receive pane, similar action occurs.

An idea so clever that took me a moment to realize its existence is alternate tool bars at the top of the screen. That is, if you click on Setup you will get a replacement set of buttons used as you setup the program, then at the right end of this group is a button marked "Main Menu" that gets you back to "normal" view.

There is a surprise when you click the CW button. You will discover what is termed the "CW Machine." This is a sophisticated CW keyer with all the documentation to get it set up and running. The only hardware you will need will be a small circuit similar to a PTT circuit, which is fully documented in the Help file.

As I looked over this program, I naturally had quite a few questions. One concerned the out-of-the-box RTTY capability. That is, did I have to load the MMTTY package into the program folder? Nope — it already comes with it, ready to run. And of course, as usual, the MMTTY engine does a superb job.

The more you look, the more features you find already plugged in and ready to play. One first experiment was to put a known callsign in the receive pane so I could watch the action. I had just barely got the cursor to the callsign when I heard the QRZ disk whirring in the CD drive and that info was displayed, plus the previous QSO was in the appropriate window. Happened so quickly, I had to go back and do another to see what came first. So much action all at once kind of blurs the consciousness.

One area that nagged at me was the little window in the upper right of the screenshot termed "Worked/Confirmed." I kept getting info automatically popping up there and wasn't sure what was causing it. Another trip to the Help and it became clear.

I wasn't seeing a true representation of contacts I had made because most of the

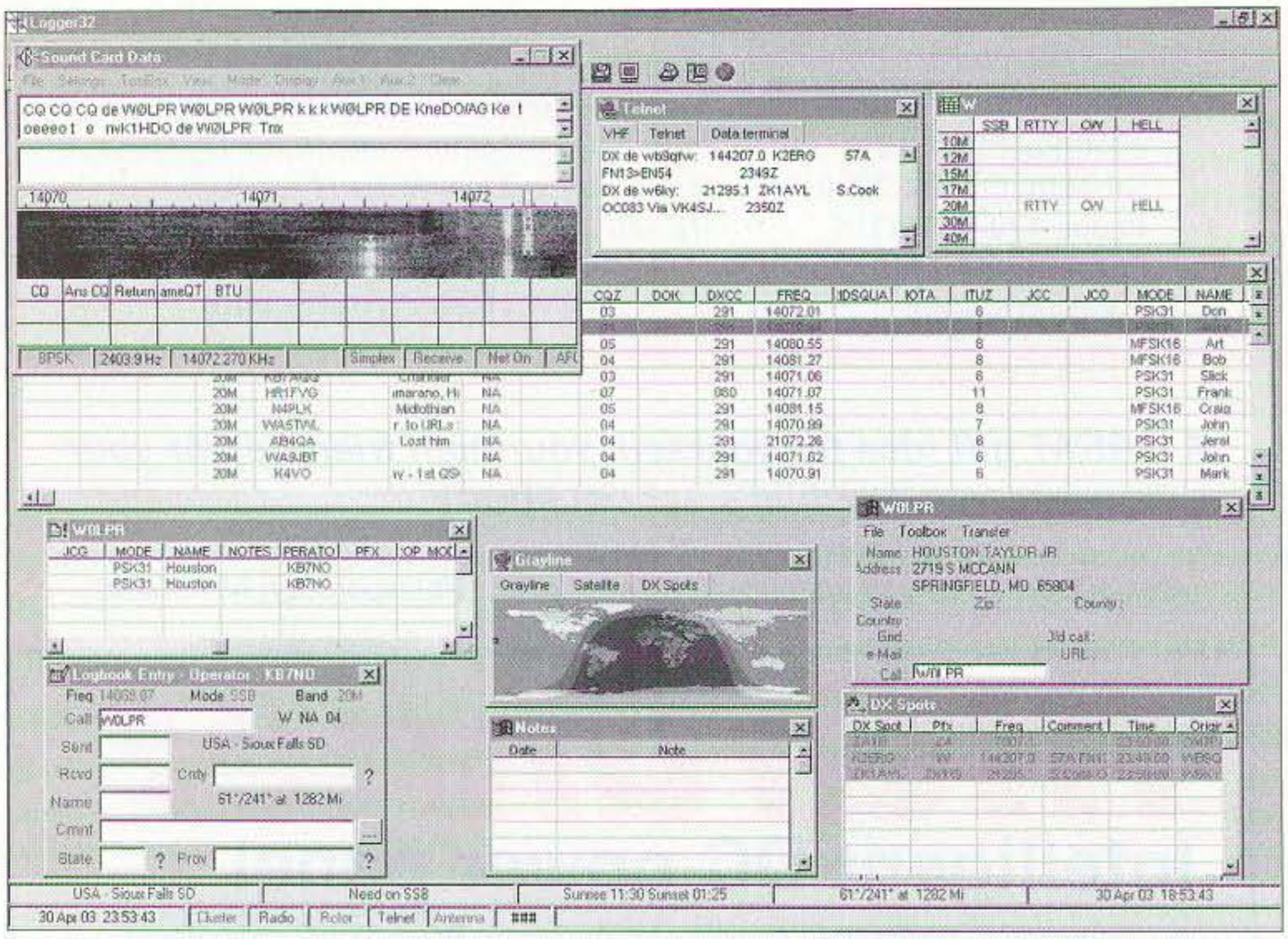
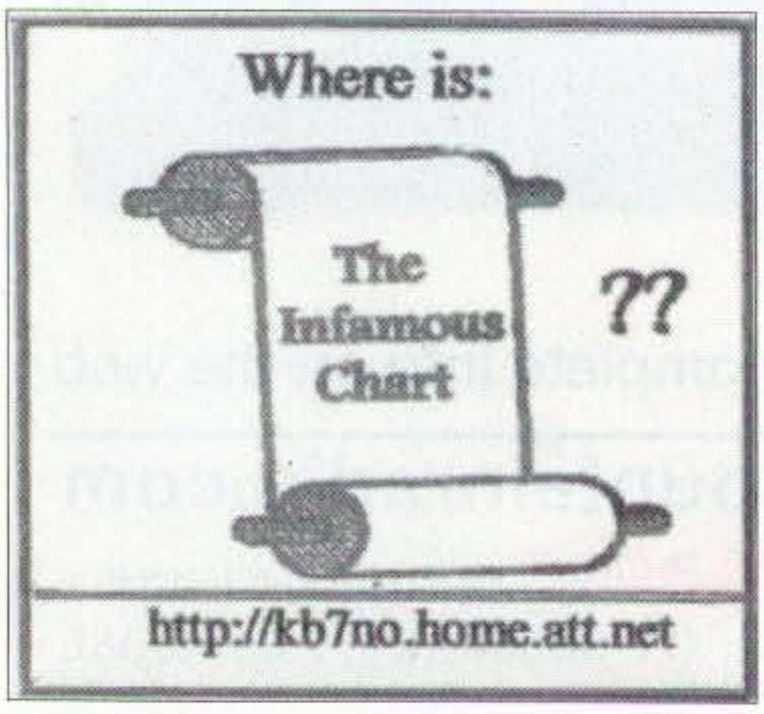


Fig. 1. *Logger32 — Here it is. Just about everything you ever wanted, all at once, on a screen near you. I left the Sound Card Data window visible, though at a minimal size and covering some of the icons and menu buttons, just so you could see that this really has a communication mode. The obvious wide (and this is only a small portion) log page is in the center. It has nearly 50 columns to fill all your logging info needs. Many fill automatically. The Grayline display in the middle works well. The Telnet connection is functioning with 3 DX reports indicated in the lower right window. I had clicked on WØLPR in the Receive pane and 2 previous QSOs popped up, plus the CD-ROM disk displayed info for that station. The dark bar in the log indicates a station with whom I have contact and confirmation, so these indicators are throughout the log. The Entry window has been modified to reflect some of my choices and also to show beam headings automatically. I had only inserted a few macros at this time, but found that the macros from Zakanaka transfer and work nicely. The program works with radio control, will control an antenna rotor, select antennas and work with packet cluster. A great piece of work and it is — FREEWARE!*

contacts in my log are PSK31 and other digital modes. I need to revise the "band plan" information in Logger32 and this will all make sense. The two (of my) popular modes displayed are Hell and RTTY, and those are working just fine. I just need to get it to recognize the rest of my laundry list of modes. Not hard to do, but "will take care of that tomorrow."



Edit the Entry window

Speaking of entering callsigns and QSO info, I entered a couple of QSOs manually to experience the process firsthand. I had two that were not in the imported file and felt this would be educational.

I found quickly that though I could struggle through the process, there was some learning to be done. Back to Help. Along the way, I determined that the best way to navigate the Help File is to use the Contents tab. There are a myriad of subjects listed there that I could not find in the normal Search or Index modes. Not to say the writers of the Help File have goofed, but there is just a bit more to do at this writing to make it simple for us to find the good stuff they put in there.

You will find the Entry Window is one area you want to know more about and a visit to the Help File on this subject is worth the read. It can be found under Contents > Logger32 features > Windows > Logbook Entry Window. It explains how to add fields to the Window to meet your needs, as well as how it works and the best way to use it.

I noticed one thing that bugged me a bit and that was that the little teeny boxes in the Entry Window were not tall enough to display the call letters and other text properly. Simple to fix. What I did was reposition all the little windows on my monitor so I could "grab" the edges and expand the size of the window about 25 or 30 percent. I found that all the windows respond this way and allow you to customize the layout to suit your needs.

Managing the display

Your eye has without a doubt been drawn to the screenshot for this, and I am sure you wonder how you could work with all the seeming confusion presented by all this much information. Well, take heart, you don't really have to have all these windows up and running all the time. Those you do not want can be deleted and brought back to life with the click of the mouse. I merely wanted to give you one quick bird's-eye view of the possibilities.

As a matter of fact, this is shot on a 19-inch monitor and I resized and moved several windows to get them to display all at once. Even so, I did not do it 100% justice. The communications window labeled "Sound card data" in the upper left really needs to be expanded to about twice the overall dimension shown when you are using it. If you are not using some of the other small windows you can do away with them and there are buttons in the toolbar to bring them back individually and instantly as you need. This kind of screen management will do away with what might be labeled confusion by some not so stout in heart.

One point of interest to me was the activity on the Telnet DX spot and how easily it is set up. The first time I connected to the K4UGA Telnet service, it went so quickly I was connected before I realized it had happened. This was the second foray into that area and I knew what to watch for.

I still use a dial-up Internet connection so that connection had to be made. Then, as nothing was happening, I moved the cursor over the Telnet button at the bottom and the tool-tip told me, "Socket closed," so a right click brought up a small menu and a proper click got the action going. The window at the top middle asked for a callsign and password (my choice seemed to please the system) and it was off to the races. Within a minute or two the three DX stations were showing in the bottom right window. The

default coloring renders them barely readable, but I am sure there is a remedy I will find for that small inconvenience.

You may notice the beam heading numbers in the QSO Entry window. It took me a while to find where to permanently enter the longitude and latitude for this QTH. I again found the answer in the Contents section of the Help File. The secret is to right click on the callsign box and go to the setup option listed in the pop-up menu.

Elsewhere in my reading of this extensive Help File I found reference to the many instances where, should a dilemma present itself, a right click in the appropriate spot answers many questions. This is a very intuitive piece of work once you begin to get inside the author's head. It is very complete and as far as most of us average everyday hams go, about as complete a log system as will ever be wished for.

I did not find instructions to print QSL cards or labels but there is reference to making lists not only for cards but for using eQSL. I am sure it is simply my own rush to get this in the mail that has caused me to miss a part I am sure is either in place or coming soon.

All in all, the gigantic size of this undertaking, as well as the near perfection of the finished product, symbolizes tons of patience on the part of the author, Bob Furzer K4CY. A great contribution to the ham community.

Other stuff

There has been a lot of activity in the DXSoft camp. I see messages that TrueTTY and AALog have a lot of updates including a waterfall in TrueTTY and some other amenities. I have to get copies and see what is happening. There is usually more happening than I can shake a stick at with out poking myself in the eye.

Also, I hear rumors of great things emerging from MixW in the 2.08 version. They are keeping it pretty well under wraps at this time, but I hear of a new filter claimed to be very effective and some work being done on a TOR mode. We shall see what pops up.

Back to smoke signals?

We just got back from a trip into a portion of northern California with our recently acquired travel trailer. I have not mounted radio stuff as yet, but it would not have helped much. We did carry a cell phone, which was out of range of anything most of the time we were camped. It is quieter that way, but we were attempting to contact our son whose only phone is a cell and it became about hilarious to me how futile high-buck technology becomes when it competes with small mountains.

So, just possibly, there is still room for primitive means of communication such as smoke signals or beating on hollow logs.

That's about enough for this month. Keep those digital fires lit. See you on the air. 73, Jack. 73

Yes, I Built Sixteen Log Periodic Antennas!

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16. "High-Gain Log Periodic Antenna for 10, 15 and 20," G.E. Smith W4AEO, Ham Radio, Sept. 1973.

17. "Vertical Monopole Log Periodic Antennas for 40 and 80 Meters," G.E. Smith W4AEO, *Ham Radio,* Sept. 1973.

18. "Mono-Band Log Periodic Antennas," G.E. Smith W4AEO, *73 Magazine,* Part 1, Aug. 1973. Part 2 — Sept. 1973.

19. "The Log Periodic Dipole Array," Peter Rhodes K4EWG, *QST,* Nov. 1973.

20. *Beam Antenna Handbook,* Bill Orr W6SAI, p. 104.

21. "Fixed Log Periodic Beam for 15 and 20 Meters," G.E. Smith W4AEO, *Ham Radio,* May 1974.

22. "Designing Log Periodic Beam Antennas by the Graphic Method," G.E. Smith W4AEO, *Communications News,* June 1974, pp. 82–87.

23. "Feed Systems for Log Periodic Antennas," G.E. Smith W4AEO, *Ham Radio,* October 1974. 73

Batteries to the Max!

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Battery test equipment

Battery analyzers have become an important tool to test, exercise, and restore batteries. The Cadex 7400, for example, accommodates NiCd, NiMH, Li-ion/polymer, and lead-acid batteries, and is programmable to a wide range of voltage and current settings. A quick-test program measures battery state-of-health in three minutes, and a boost program reactivates dead batteries. There is even a program to measure the battery self-discharge.

Battery analyzers are capable of solving a multitude of battery problems. Regular exercise doubles the service life of NiCd and reduces replacement costs. Unserviceable batteries are weeded out before they cause problems. Most important, battery analyzers improve battery reliability, an issue that is of significance in critical mission applications.

This article contains excerpts from the second edition book I wrote entitled *Batteries in a Portable World — A Handbook on Rechargeable Batteries for Non-Engineers.* In the book, I evaluate the batteries in everyday use and explain their strengths and weaknesses in laymen's terms. The 300-page book is available from Cadex Electronics, Inc., through [book@cadex. com], tel. 604-231-7777, or most bookstores. For additional information on battery technology, visit [www. buchmann.ca].

About the author

Isidor Buchmann is the founder and CEO of Cadex Electronics, Inc., in Richmond (Vancouver), British Columbia, Canada. Mr. Buchmann has a background in radio communications and for two decades has studied the behavior of rechargeable batteries in practical, everyday applications. The author of many articles and books on battery maintenance technology, Mr. Buchmann is a well-known speaker who has delivered technical papers and presentations at seminars and conferences around the world.

About the company

Cadex Electronics, Inc., designs and manufactures advanced battery chargers, analyzers, and battery management software. The award-winning products are built with one goal in mind — to make batteries run longer. They are used in wireless communications, emergency services, mobile computing, avionics, biomedical, broadcasting, and defense. Cadex is ISO 9001–certified and has products that are sold in over 100 countries. 73

Morse-by-Mouth

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Armed with these CW helpers, we can cut our talk time and get our message across faster, with more clarity. And learning them can expand our code knowledge and ability.

The Code is alive and well

With the diminishing use of code requirements in the FCC licensing structure, and the cessation by the U.S. military, you'd think that the death knell had been sounded for CW. Far from it. Morse remains a much used mode among thousands of amateurs around the globe. Just tune down to the CW portion of any active band during an ARRL CW Sweepstakes or WPQ CW contest. Or, ask any DXer — they'll tell you that when it comes to cutting through the band clutter and QRN to make that tough contact, Morse is the only way to fly. 73

A Tale of the Tape

continued from page 41

Obviously, he noted my keen interest in his products. It must have been the careful inspection I was giving each piece, or perhaps it's because I talk to myself (but often get the wrong answers to questions I ask).

"Which one interests you," he asked politely?

"The VHS tape, what's that one for?" I asked, pointing to a black case.

He handed me the VHS tape closure and said, "Go ahead, open it."

Inside was a very nicely assembled Vectronics VEC-1220 transmitter with a battery pack for operating and a solar panel as an additional source of power. Now that's what I call "ham ingenuity." See **Photo A**.

The binder of the VHS case was labeled, "How to Operate QRP//14.060 @ 1 Watt." The matching receiver VHS assembly had become the property of some other lucky amateur at the hamfest. I was told that it included a QRP tuner and antenna, all contained within the VHS tape case.

Sometimes we overlook the obvious when searching for ways to "house" our latest creations. This is the answer to those amateurs who have little space at their QTH for a large assemblage of gear but want to remain active in the hobby. Multiple single band rigs could be built and stored on book shelves inconspicuously. They are there, ready and waiting to be used on the next QRP outing away from the QTH. Even if "away from the QTH" is out on the balcony of a condo!

There are other QRP kits available from various sources. MFJ, Ramsey, Hamtronics, and Vectronics are a few manufacturers of commercial kits, and that's not mentioning those available from NJQRP, NORCAL, etc. Or how about a home-brew rig? Something from past issues of *73*, or one of the QRP designs proliferating the Internet these days? Kits are a great way to build, and I have completed many. But there is also the joy of creating from "scratch," and there are many designs that are suitable for this type of endeavor.

Now that CD players are dominating the market, the need for VHS cases is diminishing. And the "Dollar Store" often has them for sale in bundles of four, five, and even six for a dollar. An attractive finish to a small project can't become much more inexpensive than that, unless of course you can get them for free. See **Photo B**.

Ingenuity and creativity are the hallmarks of QRP building. So get out there and put together a rig. You'll be amazed at how much you really can accomplish! 73

Daddy's Girl

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From that day forward my daughter had orders to call home on the HT if she was going to be late or if she needed help. Since I had radios in my vehicles and she had use of an HT and knew how to use the local repeater to make a phone patch, I figured that I had all of the communication options covered fairly well. A short while later she got her driver's license and was released out into the world.

It worked fairly well for a while, but one day she came home asking another question. My worst fears came to fruition when she asked if she could go on a backpacking trip with her boyfriend on a portion of the Appalachian Trail. After she answered many more of my questions, I found some comfort in the fact that his parents were also going along.

When you are backpacking, weight is a primary concern. Items are weighed in ounces to keep your pack as light as possible, but my request was honored that an HT with extra batteries be taken along. We also established a schedule for making contact through a repeater on a mountain located between our two positions.

On their first night out I listened and called on the agreed-upon frequency, and was about to give up, when I heard a scratchy FM signal come back to my call. She said that they were camped down in a valley and that reception was poor, but she was okay, having a good time, and that everything was fine. As I sat there and we both signed off, it struck me that daddy's girl was not going to be Daddy's Girl much longer. I am grateful to this day that she was gracious enough to cut the ties slowly, to keep her dad from going into "loss of children shock."

To bring you up to date on this story, Daddy's Girl is pregnant, but this grandpa-to-be doesn't care. She's been married now for four years to a wonderful, outdoor-loving son-in-law. No, it isn't the tall, red-headed, gangly boy! For some reason he just no longer came around anymore. Well, what did you expect? The boy didn't like radios much anyway. 73

Calendar Events

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awarded when four or more logs are received. A total of two plaques have been donated by the ARRL Section Managers for NNJ and SNJ to the highest scoring single operator station residing in each of their sections. (7) Logs must also show the UTC date and time, QSO exchange, band, and emission, and be received no later than September 13th, 2003. The first contact for each claimed multiplier must be indicated and numbered and a check list of contacts and multipliers should be included. Multi-operator stations should be noted and calls of participating operators listed. Logs and comments should be sent to *Englewood Amateur Radio Assn., Inc., P.O. Box 528, Englewood NJ 07631-0528.* A #10 size SASE should be included for results. (8) Stations planning active participation in New Jersey are requested to advise EARA by August 1st of your intentions so that they may plan for full coverage from all counties. Portable and mobile operation is encouraged. 73

On the Go

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used. The advantage is that only one antenna is needed. The disadvantage is that you cannot change bands except while stopped.

In my most recent mobile HF installation I agonized over which type of antenna to use, and eventually decided on a series of single band HF antennas. I tend not to band switch a lot while operating, but I still wanted the ability to easily change bands. Although these antennas tend to run up to nearly 8 feet, the coil is at the bottom and the top section is a flexible whip. I run a piece of monofilament fishing line to the tip of the whip, and when pulling into the parking garage I pull the line in so that it clears the low overhang. Besides, it makes sense to put the least expensive component (the whip) closer to those overhanging supports.

While there are a number of manufacturers and distributors of single band antennas, I decided to go with the Iron Horse line from ATOC Technologies. They make resonators for all the bands from 80 meters to 6 meters and you can buy a bundle that includes 10-15-20-40- and 75-meter antennas. The antennas use the popular 3/8" 24 mount, but with the optional quick disconnect mounting kit you can push and twist an antenna on and off in just seconds. Plus, once the SWR has been set, quick disconnect will minimize changes when moving the antenna from one vehicle to another.

Recently ATOC announced a new line of mini HF antennas. Like their full-size products, these utilize the 3/8" 24 mount and can be fitted with the quick disconnect mounting kit. However, these antennas are roughly half the size of the standard HF sticks. The shorter antennas have a fiberglass stick of less than 36 inches (depending upon band) and can handle up to 250 watts PEP — more than adequate for mobile operations. Also, you can get the same five band bundle as with the full-time sticks.

Your needs may determine a different selection of antenna type than what I decided, but hopefully the information presented here will help in the process. Next month, I'll focus on installing and using the antennas.

Contact ATOC at ATOC Technologies, Inc., 23 South High Street, P.O. Box 36, Covington, OH 45318; 937-473-2840; [www.atoctechnologies.com]. 73

Never Say Die

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Waste?

Newsweek had a report on our troops overseas. I can understand the need for troops in Iraq, not for fighting, but to help get the country working again. And 5,000 more in Afghanistan, which also is in desperate need of building.

But, how come we have 71,400 in Germany? And 39,700 in Japan? I'd like to see the 38,000 in South Korea brought back home. All told, we have 255,000 troops in foreign countries around the world, not counting Iraq and Afghanistan. At how much a day? No wonder our military budget is more than all the other countries in the world's combined.

Then there's our foreign aid bill, with Israel leading at $2.8 billion, then Egypt at $2 billion, and a dozen other countries getting over $100 million a year. Like Pakistan with $921 million.

I proposed long ago that we stop being Daddy Big Bucks and swap off aid for land that we could develop into free enterprise zones. For Pakistan, even at $1,000 an acre, we'd be getting a million acres a year to develop. In that way our foreign aid would pay for itself in no time, benefiting both us and the aided country. All these countries desperately need business development and trade. At a thousand an acre, we'd own all of Israel in a few years.

Imagine!

How about an America with no bars or liquor stores? No candy stores? No McDonald's, Burger King, Pizza Hut, Taco Bell as we know them? No General Foods, General Mills, Starbucks, Dunkin' Doughnuts, Sara Lee, Dairy Queen, Baskin Robbins, Breyers, Ben & Jerry's, Kellogg's, cigarette machines, candy machines, Famous Amos, Pepperidge Farms, Keebler, Oreos, National Biscuit, Boston Market, Bob Evans, Howard Johnson, TCBY, Domino's Pizza, Budweiser, Miller, Coors, crack houses, and so on?

An America with a tenth of today's

Continued on page 61

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Multiple Returning Coronal Holes

Solar activity will range from quiet to active in July, with occasional geomagnetic disturbances expected.

Multiple returning coronal holes will cause the most trouble this month, with minor storm conditions forecast for the periods from the 1st to the 5th, the 13th to the 20th, and the 24th to 28th. Solar flares and CMEs should be less of a problem as sunspot numbers decline, but look out for large older spots that are capable of producing M-class and X-class flares.

Large "mature" sunspots can be unusually persistent in the declining phase of the solar cycle, and they also tend to become magnetically more complex over time as they drift near the solar equator. Two particularly large spots of this variety suddenly became active at the end of April, producing some very large eruptions that created widespread blackout conditions and spectacular auroral displays.

Sporadic-E propagation should be intense and widespread this month, helping to liven up the seasonally impoverished lower bands, especially 10 meters. Sporadic-E skip is caused by large, intensely ionized regions in the E-layer of the ionosphere that are reflective to HF signals in the 10–15 meter range. The exact mechanism behind sporadic-E is not known, but it has been associated with such disparate phenomena as geomagnetic activity and thunderstorms. The general consensus is that solar activity is not the only cause, or even the primary one. Studies show that peak summertime periods of sporadic-E propagation in the mid-latitudes are from 10 a.m. to noon and 6 p.m. to 8 p.m.

Most of the time sporadic-E will rapidly dissipate after sundown, but some very intensely ionized regions have been known to persist well after dark. Due to prevailing winds in the lower ionosphere, e-clouds tend to drift at more than 100 mph, so the length of any opening is directly related to the size of the cloud you are working. Sporadic-E propagation appears more or less at

July 2003

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

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
Central America	15-20	(15-40)	20 (40)	20 (40)	(20)	(20)	(15) 20	15 (20)	15 (20)	15 (20)	10-20	(12) 20
South America	15-20	(15)	(15) 20	(20-30)	x	(20)	(15-20)	(15)	(15)	(10-15)	10 (20)	(10) 20
Western Europe	20 (40)	20-40	(20-40)	(20-40)	20	(20)	(15-17)	(15)	x	(15-20)	(15) 20	(17) 20
Southern Africa	(40)	(40)	20	20	x	x	x	(12) 15	(15)	(20)	(20)	x
Eastern Europe	20 (30)	20 (40)	(20-30)	x	x	x	x	x	x	(15-20)	(12) 20	(17) 20
Middle East	20 (40)	20 (40)	(20-30)	x	x	(20)	x	x	(15)	(15-20)	15-20	(15) 20
India/ Pakistan	(15-20)	(20)	x	x	(20)	x	x	x	x	x	x	(15)
Far East/ Japan	x	x	x	x	x	(20)	(20)	x	x	x	x	(15)
Southeast Asia	(15-20)	x	(20)	x	x	(20)	x	x	x	x	x	(15-20)
Australia	15	(15)	15 (20)	20 (30)	(20-40)	(20)	(17) 20	(20)	x	x	x	(15)
Alaska	(15)	(20)	(20)	(20)	(20)	(20)	(20)	x	x	x	(15)	(15)
Hawaii	15 (20)	(15) 20	20 (30)	20 (30)	20 (30)	(20-30)	(20)	x	x	x	(15)	(10-15)
Western USA	(12) 20	(12) 40	(20) 40	(30) 40	(30) 40	(30) 40	(40)	x	(17) 20	(12) 20	(10) 20	(10) 20

CENTRAL UNITED STATES TO:

Central America	15-20	(15) 20	20 (40)	20 (40)	(20)	20 (40)	20	(15) 20	15 (20)	(10-20)	10 (20)	(10) 20
South America	10- 20	(12) 20	(15-40)	(20-40)	x	(20)	(20)	(15)	x	(10-12)	(10-15)	10 (20)
Western Europe	(17) 20	20 (30)	20 (40)	(40)	x	(20)	(20)	x	x	x	x	(15) 20
Southern Africa	x	x	(30-40)	(20)	x	x	x	(15)	(15)	(20)	(20)	x
Eastern Europe	20	20 (40)	(20-30)	(20)	x	(20)	(20)	x	x	(15)	(15-20)	(20)
Middle East	(17) 20	20 (40)	(20-30)	x	x	x	(20)	x	x	x	(15)	(15-20)
India/ Pakistan	(15-20)	(15-20)	(20)	(20)	(20)	(20)	(20)	x	x	x	x	x
Far East/ Japan	(15)	(15)	(15)	x	(20)	(20-40)	20 (30)	(17) 20	(20)	x	x	x
Southeast Asia	(15)	(15)	(20)	(20)	(20)	(20)	(20)	(20)	x	x	x	x
Australia	(15)	15	(15-20)	20 (30)	20 (40)	(20-40)	20 (40)	20	x	x	(15)	x
Alaska	(15-17)	15 (17)	(15) 17	(20)	(20-30)	(20-40)	20 (30)	(20)	x	x	(15)	x
Hawaii	(10-20)	15 (20)	(15) 20	20	20 (40)	(20-40)	20 (30)	(20)	x	x	(15)	x

WESTERN UNITED STATES TO:

Central America	(12) 20	(15) 20	20 (30)	20 (40)	(20-30)	(20-40)	(20-30)	20	(15-20)	(10-17)	(10-17)	(10-20)
South America	12 (20)	(12) 20	(15) 20	(17) 20	(20-40)	(20)	(20-30)	(15-20)	x	x	(10-15)	(10-15)
Western Europe	(17) 20	20	20	(20)	x	x	x	(20)	(15-17)	(15)	x	(15-17)
Southern Africa	x	x	x	(20)	(20)	x	x	(20)	(17-20)	(15-17)	x	x
Eastern Europe	x	x	20 (30)	(20)	x	x	x	x	x	x	x	x
Middle East	(20)	(20)	(17) 20	(20)	x	x	x	x	x	(15)	x	x
India/ Pakistan	x	x	(15)	x	x	x	(20)	(20)	(20)	(15-17)	x	x
Far East/ Japan	(15)	x	(20)	(17) 20	20	20 (40)	(20-40)	20 (30)	(17) 20	(15-20)	x	15
Southeast Asia	x	x	(15)	x	(20)	(20-30)	(20-30)	20 (30)	(17) 20	(17-20)	x	x
Australia	(10-15)	(10) 15	(12) 15	(15-20)	20	20 (40)	20-40	(17) 20	(17) 20	x	x	(12-15)
Alaska	(12-15)	(12-15)	(15-20)	(17-20)	20 (30)	(20-30)	(20-40)	20 (30)	(20)	(17)	x	(15)
Hawaii	(10-15)	(10) 15	(12) 15	(15-20)	20-40	(20) 40	(20) 40	20 (30)	(20)	x	x	(15)
Eastern USA	(12) 20	(12) 40	(20) 40	(30) 40	(30) 40	(30) 40	(40)	x	(17) 20	(12) 20	(10) 20	(10) 20

Table 1. *Band, time, country chart. Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. Numbers in parentheses indicate bands usually workable on Good (G) days only. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only.*

random and there is no way to predict exactly when or where it will occur, but back-scatter radar has been used successfully to map and model it.

A good home-grown technique to spot a sporadic-E opening is to orient your antenna northeast-southwest and listen for back-scatter on 10 meters. Try monitoring one of the beacons in your area between 28.2 and 28.3 MHz, and if there is back-scatter from one of those, there could be good reason to start calling CQ, even if the band appears closed. Sporadic-E is an interesting phenomenon that can spice up an otherwise dull summer day. 73, Jim.

Band-by-Band Forecast

10–12 meters. Good openings will generally only be available on north-south paths, but Europe and Africa may still be workable, especially if multi-hop sporadic-E is present. The strongest and most reliable paths will be to Central and South America from shortly after noon through early evening. Daytime short-skip will range from 1,000 to approximately 2,300 miles.

15–17 meters. Sporadic-E openings will be worth watching for this month, especially multi-hop paths to the east before noon. Fair to good "normal" propagation will also be available to most areas of the world from sunrise through sunset, but South America will be your surest bet. On good days, Europe and parts of Africa ought to be workable in the morning and Australia or Southeast Asia should provide steady fare up to midnight. Short-skip will average from 1,000 to 2,200 miles.

20 meters. Expect good worldwide daytime opportunities and fair to good evening conditions. Some nighttime openings will be available, but these will be quite limited. Look for peak periods an hour or two after sunrise and again in the late afternoon. Europe and Africa should provide good hunting grounds from the eastern US, while on the west coast you'll find that the South Pacific and Australia will offer better openings. Short-skip can fluctuate between 500 and 2,300 miles.

30–40 meters. Good opportunities should be available from sunset to sunrise on good days, especially to the Southern Hemisphere. As always, atmospheric static due to nocturnal thunderstorms will be the main problem, but on the quieter nights you should find solid pipelines from the Caribbean to northern South America and across the Pacific to New Zealand, Australia, and Indonesia. Short-skip at night will range from 500 to 2,500 miles but will be limited to less than 1,000 miles during the day.

80–160 meters. Fair to good worldwide DXing should be available from sunset through sunrise on the quieter days. If 40 meters is doing well, some good opportunities should also be available on 80, but 160 will usually be buried in atmospheric static. Daytime skip will be very short — under 250 miles — but nighttime short-skip can range from 1,000 to 2,000 miles. 73

NEVER SAY DIE

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hospitals, doctors, dentists, HMOs, clinics, assisted living, nursing homes, and nurses. No major pharmaceutical companies. Millions of lawyers forced to turn to honest work!

Once we get the word around about health, this is the possible future for Americans.

Considering the $4.5 billion a year bribing of our media by the above interests through their advertising, we aren't going to get much help from our newspapers, magazines, radio, TV, billboards, etc. So where can we turn for help? To the people who will benefit the most from Americans being healthy: employers who are tired of robbing their bottom lines for health insurance payments. Oh, and to "health nuts" like me.

How much could our town, state, and federal governments save if their employees stopped making themselves sick? And the Post Office? Would it only be hundreds of billions, or trillions?

Imagine our farming conglomerates converting to super-organic farming, with no more need for chemical fertilizers or pesticides?

Dr. Weston Price, early in the last century, visited primitive societies not yet contacted by the rest of the world. He documented people who were living well over a hundred in perfect health. See page 36 of my *Wisdom Guide* for a review of his 1939 book, *Nutrition and Physical Degeneration.* Before the arrival of our "modern diet" cancer, Alzheimer's, heart disease, stroke, and most other causes of death today were almost unknown. As was the need for doctors or police.

Geothermal Systems

Looking for a new business? How about installing geothermal heating/cooling systems?

What you do is dig a trench a couple hundred feet long and about six feet deep, where you bury a six-inch pipe which leads to a home. Install a blower to suck the outside air through the pipe into the home.

The idea is that since the temperature of the earth at that depth the air passing through will be cooled in the summer, saving a bundle on air conditioning … and it will be warmed in the winter, saving on heating costs. Plus no pollution. This will pay for itself in a fairly short time.

Bypass Danger

Time reported that almost half the people getting bypass surgery suffer brain damage which results in cognitive decline. Permanent IQ and memory decline. D'uh?

Before you report in for bypass surgery maybe you should take a couple hours and read Dick Quinn's *Left For Dead.* It's reviewed on page 7 of my *Secret Guide to Wisdom.* Dick had a heart attack and bypass surgery. What the doctors neglected to explain to him was that he was causing his problems with his diet and that unless he changed that he'd be back for another bypass … if he survived a second heart attack.

Then he accidentally discovered that cayenne pepper could roto-root his arteries. I add a heaping teaspoon of it to a small glass of V-8 juice. Yes, it burns twice.

Better yet, change your diet!

Music, Music

I've come across many articles on the benefits of listening to good music. It helps prenatal babies' brain development and thus their IQ. It helps children study and learn better. *60 Minutes* had a segment on the amazing success with slum children in Venezuela when they formed school bands.

So I was excited when I came across Sharlene Habermeyer's *Good Music Brighter Children,* 344p, 1999, Prima Publishing, $16, ISBN 0-7615-2150-X.

She makes a good case for listening to good music, and even better, that learning to play an instrument helps a child with math and science. Considering that by 2010 it's projected that America will have a shortfall estimated at a million scientists and engineers, we'd better start making some changes if high-tech isn't going to move elsewhere.

When I was in the third and fourth grades in New Jersey I had classes which taught me how to read music … in art appreciation, with guides as to why the composition of famous paintings was so good … and in poetry, complete with encouraging us to write poems. When I got interested in photography that art background was very valuable … and more so when I started out as a TV cameraman at WPIX Channel 11

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NEVER SAY DIE

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in New York. My work was so good that I was soon doing the one hour Gloria Swanson variety show just on my one camera. My early music classes made it easy for me to become a St. Paul's Church chorister and then, in high school, sing with the Erasmus Hall Choral Club, doing radio performances, and with Robert Shaw's Brooklyn Philharmonic Choir. Shaw went on to become a legend, with his chorus singing with the Atlanta Symphony Orchestra.

At PS-99 in Brooklyn there were weekly music appreciation sessions for the entire student body where we learned little ditties to help us recognize classical music selections. Schubert's 8th had us singing, "This is the symphony that Schubert wrote, but never finished."

I'll bet the schools don't do any of that anymore.

Many of the famous composers and scientists claim that their mothers played music or sang to them prenatally. Even fathers are getting into the act with "pregnaphones," which allow them to talk, sing, read poetry, and so on to their unborn child. Researchers have found profound dramatic development difference to children exposed to what they're calling a "prenatal university."

Children so exposed are starting to talk and sing back simple melodies sung to them at five months, singing short sentences at nine months, and teaching themselves to read at two years of age. Infants as young as two months were able to imitate the pitch and intensity of songs their parents sung to them.

Take classical music to the hospital and play it while the baby is being born. This helps calm the baby during what otherwise could be a very traumatic event. By the way, there should never be any talking during the birth process. Silence, except for classical music. Probably Mozart.

So what?

When the International Association for the Evaluation of Educational Achievement tested the science proficiency of 14-year-olds throughout the world fifteen years ago, America came in 14th out of the 17 countries tested. Considering that we spend twenty-nine times more on math and science programs than any other country in the world, this is a most revealing testimony to how crummy our schools are. Since then, I understand, we've now sunk to the bottom on international tests.

How ignorant are our students? Just listen to a few of Jay Leno's street interviews with them.

The three top countries were Hungary, Japan and the Netherlands. So what's different? For one, extensive music training is part of their curriculum from kindergarten through high school. They study music, music appreciation, and learn to play an instrument.

Hundreds of studies have shown the role music plays in brain development. So why have we seen music programs eliminated in so many schools? Well, they cost money, and the teachers, administrators, and school boards who make the decisions on programs are unaware of the research.

So what've we got? Well the California State University says that 75% of their freshmen needed remedial classes in math and, like, that English thing. Of course, in California more than 30,000 classrooms are being taught by teachers without teaching certificates … a "no experience necessary" job.

Our 19th century school system was designed to get kids off the farms and provide workers for factories. Now the factory jobs are disappearing to Mexico and Bangladesh and we have entered the information age. We don't need to just improve our schools, we need to totally reinvent them. Oh, and start the music playing, early and often.

If your K-12 education did not, like mine, include music appreciation, then you'll need to invest $3 in my 100-CD Classical Music Library book.

WMD

Golly, those weapons of mass destruction that we went into Iraq to find sure seem to be elusive. Were they just an excuse for taking over the country with another goal actually the main reason, or the result of lousy intelligence?

None of the sites where the Pentagon was insisting they would be found have turned up anything.

Rumsfeld

The Defense Secretary has been in the news quite a bit of late, so I was surprised when his name popped up in a book Sherry was reading, *The Fat Fallacy* by Will Clower, a 2003-published paperback.

It had to do with the FDA's approval of aspartame (a.k.a. NutraSweet or the blue stuff) for human consumption, a saga worthy of being made into a documentary. Hello, *60 Minutes?*

It started thirty years ago when J.D. Searle first applied for approval. An independent board of scientists concluded it was not safe.

When, in 1974, it was approved in dry form for restricted use, the scientists objected. When they checked Searle's data they found that of seven baby monkeys given aspartame in their milk one died and five suffered from grand mal seizures. This data, of course, had not been given the FDA when they applied for approval.

The FDA turned to the U.S. Attorney's office to investigate Searle's concealing the harmful evidence. The case was dropped after the office let the statute of limitations run out without acting on the complaint.

In 1979, under growing pressure from a cascade of tumor reports, the FDA investigated again … and rescinded their okay.

In 1981, the day after Ronald Reagan took office Searle, without supplying any new data, again applied for aspartame approval. With Searle's CEO, Donald Rumsfeld, on Reagan's transition team, how could they lose?

The new FDA head, Arthur Hays, had an advisory panel look into it. They said absolutely no. So Hays overruled the panel and approved NutraSweet for dry products.

The National Soft Drink Association lobbied against the approval because when aspartame gets above 86°F it breaks down into free methanol (wood alcohol) a common poison. This is a problem because it breaks down into formic acid, which is used to strip off epoxy, and formaldehyde (embalming fluid). So this is what you get when you use the blue stuff in hot chocolate, coffee, tea, or make diet Jell-O.

Despite this, Hayes approved aspartame for use in carbonated beverages … and then, within four months, left the FDA to become a very highly paid consultant for Searle's PR firm.

Now, twenty years later, and an article in *Fortune,* where I see that Rumsfeld was on the board of Zurich-based engineering giant ABB, when a $200 million contract to build two nuclear reactors for North Korea was signed. Now that we sure wish that had never happened, since weapons-grade nuclear material could be extracted from the reactors, Rumsfeld has declined to comment.

So what's Rummy done for us lately? Well, as Defense Secretary he almost single-handedly planned the Iraq invasion … ignoring the advice of the military brass. The quick coup made Rummy the hero of the war. For a little while. But then the almost total lack of preparation for dealing with Iraq without Hussein has created an awful mess. Soldiers aren't trained to be police or deal with getting food, water and electricity working again. Or with tens of thousands of looters. Or with an angry population stirred up by religious leaders.

Continued on page 64

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

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 serious lifestyle 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, but I can help you cure yourself of cancer, heart trouble, or any other illness. Get this new, 2002 expanded edition (160p). $15 (#04)

The Secret Guide to Wealth: Just as with health, you'll find that you have been suckered 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 (#03)

The Secret Guide to Wisdom: This is a review of around a hundred books that will boggle your mind and 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. You'll have plenty of fascinating stuff to talk about on the air. $5 (#02)

My WWII Submarine Adventures: 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? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. $5 (#10)

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 (#11)

Writer's Guide: It's easy, fun, can pad your résumé, and impress the hell out of your friends. $0 (#78)

Wayne's Caribbean Adventures: My super budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. $5 (#12)

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 (#20)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can 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 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like that of Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. 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, a bioterrorist attack? I'm getting ready, how about you? $5 (#31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the NASA videos, looked carefully at the photos, read the astronaut's biographies, and talked with some readers who worked for NASA. This book cites 45 good reasons I believe the whole Apollo program had to have been faked. $5 (#32)

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 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields, including our HTs and cell phones. $3 (#34)

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 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. $40 (#52)

Reprints of My Editorials from *73*. Very few things in this world are as we've been taught, and as they appear. As an iconoclast I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

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Four Small Booklets Combo: Super Organic Food: a trillion dollar new industry; Schools in 2020: another $ trillion industry. Anthrax, a simple cure. Dowsing: why and how it works. $3 (#86)

My 1992 **We The People Declare War! On Our Lousy Government** book—360 pages and packed with ideas that'll get you all excited.Was $13. While they last $10. Just a few left, found in the warehouse. Last chance for this classic.(#06)

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. $30 (#90)

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, etc. $30 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. $25 (#92)

1982 General Class License Study Guides. Teaches the fundamentals of radio & electricity. Was $7. I found a few in the warehouse. $3, while they last. Great book! (#83)

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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 September 2003 classified ad section is July 10, 2003.

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NEVER SAY DIE

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Talking Plants

The American Society of Dowsers quarterly digest had a fascinating reprint of a chapter from a book by Keith Varnum. I'll have to get it and read the whole book.

This had to do with him going to work for Michio Kushi, where he was responsible for a garden about half the size of a football field, where the food was grown for Kushi's East-West Institute in Los Angeles. This was a huge garden to water, fertilize, and weed.

When he complained about the enormity of the task Michio explained, "You know, you don't really have to weed the fields. You can talk to the spirit of the weeds and ask them to grow in balance and harmony with the vegetables."

That's crazy, he thought ... but since everything else Michio said he'd tried had worked, what the heck. So he began talking aloud to the weeds, asking them to grow in harmony with the vegetables. Then he also talked to the vegetables, urging them to grow tall and in harmony with their weed neighbors. After a few weeks he began to see a change. The weeds grew, but not enough to harm the vegetables.

Next month: Then the voices started. 73

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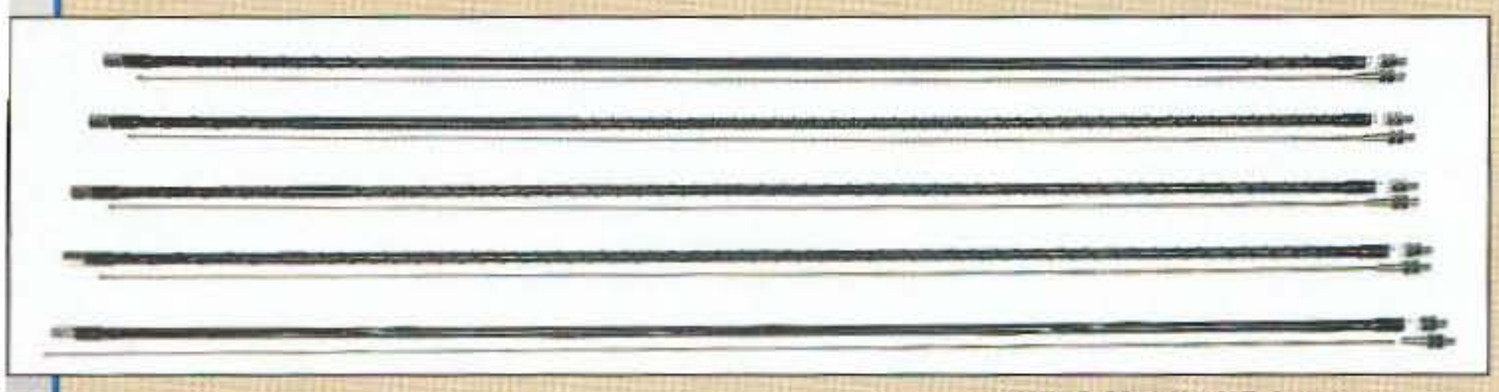

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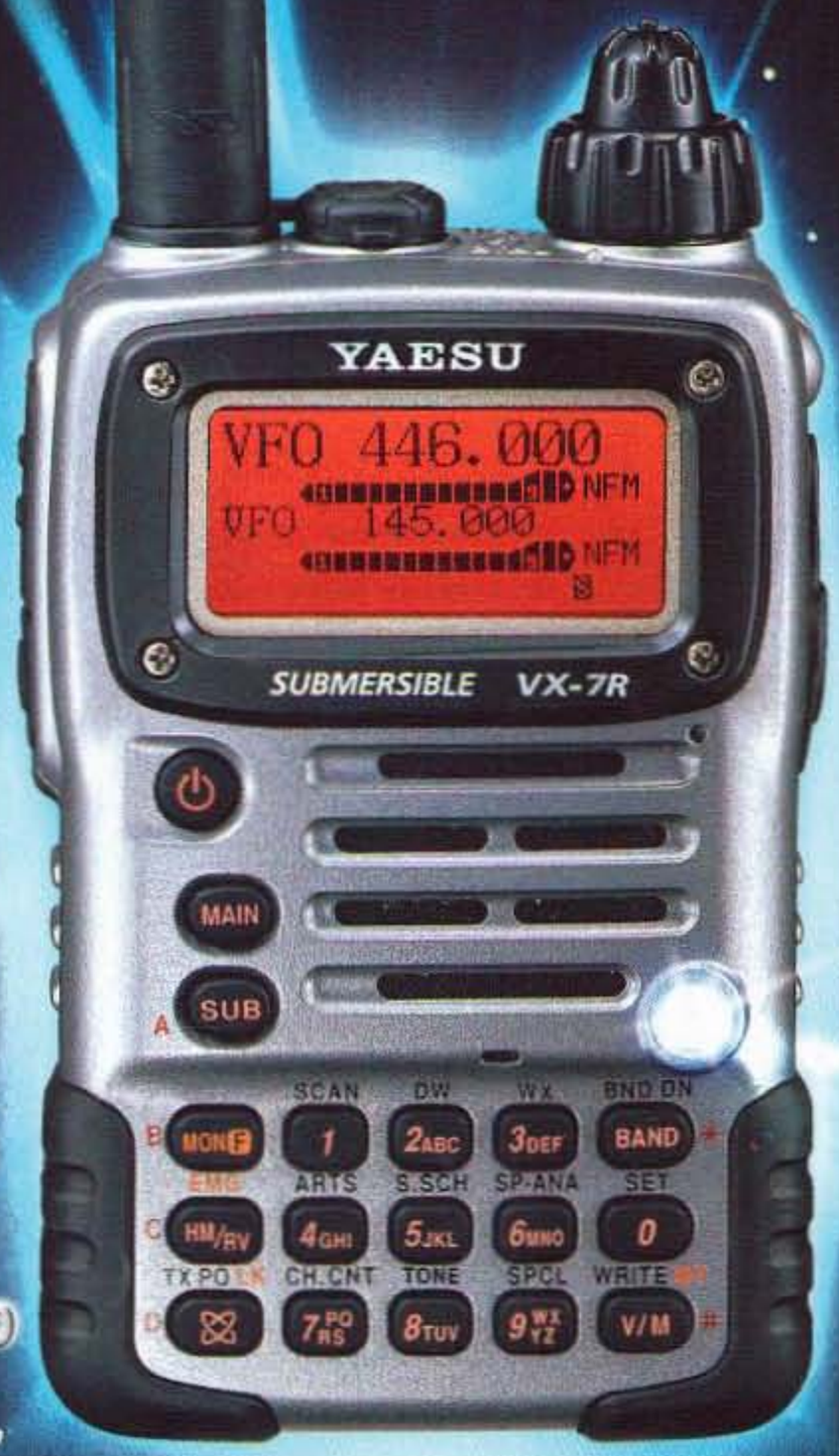

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