73® Amateur Radio Today

JANUARY 2003
ISSUE #506
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New

DR-620T VHF/UHF Dual-Band Mobile/Base

First Amateur Twin Band Mobile To Support Optional Digital Voice Communications*

- RX-VHF 108-173.995 MHz, UHF 335-480 MHz
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- Receives Airband and Wide FM
- Front control unit separation (optional EDS-9 kit required)
- Advanced 10F3 digital mode with speech compression technology (EJ-47U required)*
- 200 memory channels
- Advanced EJ-50U TNC (optional) supports digi-peat mode
- Remote control features including parameter setting and direct frequency entry through the microphone
- Dual-Band receiver with V/U, V/V, U/U capability
- CTCSS/DCS encode/decode and European Tone-bursts
- OUTPUT: H/M/L-50/10/5 watts VHF
- OUTPUT: H/M/L-35/10/5 watts UHF

DR-605TQ VHF/UHF Dual-Band Mobile/Base

Full 2 Meter/440 Performance

- 100 memory channels, + a "call" channel for each band
- CTCSS encoded+decoded and tone scan
- Cross-band repeat and full duplex capability
- 9600 bps packet ready with dedicated terminals
- Internal duplexer - one easy antenna connection
- RX-VHF 136-173.995 MHz, UHF 420-449.994 MHz
- TX-VHF 144-147.995 MHz, UHF 430-449.994 MHz
- MARS capability (permit required)
- OUTPUT H/L - 50/5 watts VHF, 35/5 watts UHF
- Time-out timer (ideal for repeater and packet operation)

DJ-V5TH VHF/UHF Dual-Band FM Transceiver

5 watts of output power, in a compact package.

- Alphanumeric Display, up to 6 characters
- TX-VHF 144-147.995 MHz, UHF 420-449.995 MHz
- 200 memory channels plus two call channels
- Full VHF + UHF Amateur Band Coverage
- Receive Range, (76 - 999MHz) includes Wide FM capability
- Up to 5 watts output, 3 output settings
- CTCSS encode+decode DTMF squelch and European Tone bursts
- 4 scan modes, 5 programmable scan banks
- MARS capability (permit required)

IronHorse®

Ask your dealer about the full line of Iron Horse antennas & accessories!

DJ-596T VHF/UHF Dual-Band HT with Digital Voice Option*

Loaded with features! The breakthrough design supports optional digital voice communications and you can easily switch the unit between analog and digital modes!

- Full 4.5 watts output VHF/4w UHF
- Powerful NiMH battery
- 100 memories in any combination of VHF or UHF channels
- Direct frequency input from keypad
- Each memory capable of "odd split" operation.
- Alphanumeric channel labels
- CTCSS/DCS encode+decode plus tone bursts
- Full 2m and 440 band coverage
- Accepts 6 to 16 VDC direct input
- Illuminated Keys and display
- Wide and narrow FM modes
- 10 autodial memories
- Theft alarm feature
- Optional EJ-40U Digital Voice Board!*
- Programming/Clone software available

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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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JANUARY 2003
ISSUE #506

THE NEW!

73 Amateur Radio Today

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design73@aol.com

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COVER: House and antenna of Romeo HI3BRR, Santiago, Dominican Republic. Photo by SMØJHF.

QRX . . .

Dollar Power

Take out a one-dollar bill and look at it. The one-dollar bill you have first came off the presses in 1957 in its present design.

This so-called "paper" money is in fact a cotton and linen blend, with red and blue minute silk fibers running through it. It is actually material. We've all washed it without it falling apart. A special blend of ink is used, the contents we will never know. It is overprinted with symbols and then it is starched to make it water resistant and pressed to give it that nice crisp look.

If you look on the front of the bill, you will see the United States Treasury Seal. On the top you will see the scales for a balanced budget, and for fairness. In the center you have a carpenter's square, a tool used for an even cut. Underneath is the key to the United States Treasury. That's all pretty easy to figure out, but what is on the back, of that dollar bill is something we should all know.

Turn the bill over and you will see two circles. Both circles together comprise the Great Seal of the United States. The First Continental Congress requested that

Continued on page 6

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MODEL SS-12IF

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- MEETS FCC CLASS B

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SPECIFICATIONS:

INPUT VOLTAGE: 115 VAC 50/60HZ OR 220 VAC 50/60HZ SWITCH SELECTABLE

OUTPUT VOLTAGE: 13.8VDC

AVAILABLE WITH THE FOLLOWING APPROVALS: UL, CUL, CE, TUV.

MODEL SS-18

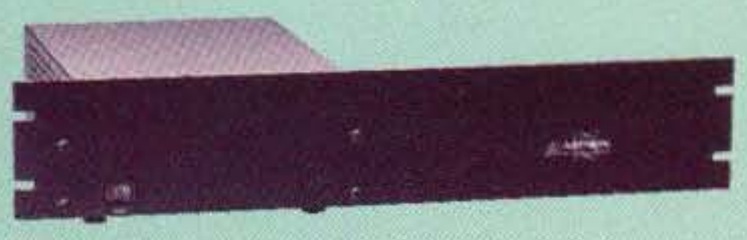
DESKTOP SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅜ x 6 x 9	3.4
SS-18	15	18	1⅜ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅜	4.2
SS-30	25	30	3¼ x 7 x 9⅝	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9⅜	4.2
SS-30M*	25	30	3¼ x 7 x 9⅝	5.0



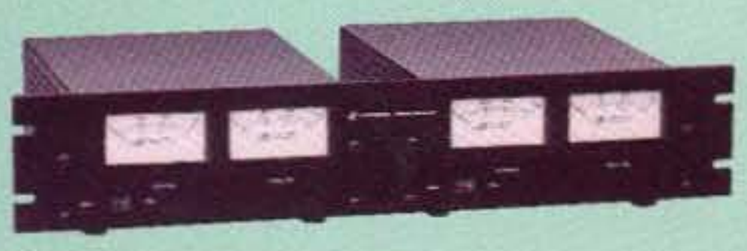
MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅜	6.5
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 9⅜	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 9⅜	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 9⅜	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅝	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
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
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

*ICS – Intermittent Communication Service

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35 WATT LPFM STEREO TRANSMITTER

✓ 35W RF output, VSWR protected
✓ Automatic audio & power controls
✓ Digital synthesized PLL
✓ Full front panel control
✓ 110/220VAC, 12VDC operation

Whether your application is export or LPFM, the PX1 has you covered. From the over-rated continuous duty power supply & power amplifier to the 2 line vacuum fluorescent display, your station will be the easiest to setup and the most reliable for continuous operation. Full microprocessor controls provide a "virtual engineer". Check out www.highpowerfm for full details.

PX1	**35W Professional FM Stereo Transmitter**	**$1,795.95**

TOUCH-TONE TONE GRABBER NEW!

✓ New-built-in RJ11 phone jack
✓ Large memory holds over 500 numbers
✓ Big bold 8 digit display, auto insertion of dashes
✓ New-output latch jack

Dialed phone numbers on the radio, repeater codes, control codes, anywhere touch-tones are used, you can read and store them! All new design for 2002. Capture those tones with the TG2!

TG2	**Tone Grabber Tone Reader Kit**	**$59.95**
CTG2	**Matching Case & Knob Set**	**$14.95**
AC125	**110 VAC Power Adapter**	**$9.95**

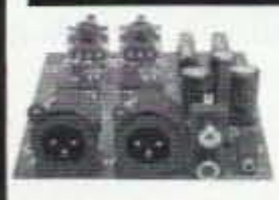
ELECTROCARDIOGRAM HEART MONITOR

✓ Visible and audible display of your heart rhythm
✓ Re-usable sensors included; just like visiting the hospital!
✓ Bright LED "beat" indicator
✓ Monitor output for oscilloscope display NEW!

Enjoy learning about the inner workings of the heart while covering the stage by stage electronic circuit theory of ECG/EKG systems. Be heart smart and learn at the same time!

ECG1	**Electrocardiogram Heart Monitor Kit**	**$34.95**
CECG	**Matching Case & Knob Set**	**$14.95**
AC125	**110 VAC Power Adapter**	**$9.95**
ECGP10	**Replacement Reusable Probe Patches (10-Pack)**	**$7.95**

XLR TO RCA AUDIO CONVERTER NEW!



✓ Connect consumer outputs to XLR inputs
✓ Left & right audio gain adjustments

So you're trying to connect consumer audio outputs with RCA connectors (unbalanced) to XLR (balanced) inputs. Always a problem...Not anymore with the R2XL1!

R2XL1	**Unbalanced to Balanced Audio Converter Kit**	**$49.95**
CR2XL	**Matching Case & Knob Set**	**$14.95**
PWR25	**12VAC Power Adapter**	**$9.95**

GIVEAWAYS & SPECIALS EVERY MONTH!

Register to receive our E-Mail specials and you will automatically be entered in our monthly drawing! New deals, new specials, new giveaways every month!

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PROFESSIONAL FM STEREO RADIO STATION

✓ Synthesized 88 to 108 MHz with no drift !
✓ Built-in mixer – 2 line inputs and one microphone input!
✓ High power module available for export use
✓ Low pass filter for great audio response

Our FM100 is used all over the world by serious hobbyists as well as churches, drive-in theaters, and schools. Frequency synthesized PLL assures drift-free operation with simple front panel frequency selection. Built-in audio mixer features LED bargraph meters to make setting audio a breeze. The kit includes metal case, whip antenna and built-in 110 volt AC power supply.

FM100	**Super-Pro FM Stereo Radio Station Kit**	**$249.95**
FM100WT	**1 Watt, Wired Export Version**	**$399.95**

SYNTHESIZED FM STEREO TRANSMITTER

✓ All new design & features for 2002! NEW!
✓ Fully adjustable RF output

Our #1 kit for years has just gotten better for 2002! Totally redesigned, the FM25B has all the features you've asked for. From variable RF output, F connector RF output jack, line input, loop output, and more. Includes case, power supply, whip antenna, audio cables.

FM25B	**Synthesized FM Stereo Transmitter Kit**	**$129.95**

AUTOMATIC COLOR/BW IR CAMERA

✓ Color during the day, IR B&W at night!
✓ Automatically turns on IR Illumination!
✓ Waterproof to IP57 standards! NEW!
✓ Black anodized housing with universal mount

Best of both worlds! This video camera is a waterproof COLOR camera during the day. When the light level drops, it automatically changes to B&W and turns on its built-in IR illumination, with 10 IR LEDs. Powered by 12VDC and terminated with a professional BNC connector. B&W only model also available if color is not needed. Both in heavy anodized black housing.

CCD309	**Color/B&W IR Waterproof Bullet Camera**	**$169.95**
CCD308	**B&W IR Waterproof Bullet Camera**	**$109.95**
AC125	**110 VAC Power Adapter**	**$9.95**

MINI B&W CAMERA WITH IR ILLUMINATION

✓ Built in IR illumination!
✓ Sees in total darkness! NEW!

What a deal! This miniature B&W video camera has 6 high power IR LEDs built into it to provide illumination in total darkness! No need for external IR illuminators. Attractive black aluminum housing easily mounts at any angle with the built-in swivel bracket. Runs on 12VDC, and includes professional BNC output plug-in harness.

CCD303	**Mini B&W IR Illuminated Camera**	**$59.95**
AC125	**110 VAC Power Adapter**	**$9.95**

Check out all our other new cameras at www.ramseykits.com

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X Again

Has my tolling the Planet X bell of coming doom got you worried yet? If you've been able to whistle yourself past this potential graveyard then one of the last things you'll want to do is read James McCanney's *Planet-X, Comets & Earth Changes.*

This $18 book, ISBN 0-9722186-0-2, is self-published. See [www.jmccanneyscience.com]. It's a chronicle of Jim's 22-year fight, mostly with NASA, for recognition of his theory that comets are not dirty snowballs, and that comets have had and still are having a profound influence on Earth.

Using his model he's been able to accurately predict hurricanes, tornadoes, and typhoons. His model also explains how and why Planet X, though still far out in our solar system, has already had a profound influence on the Sun, extending the sunspot maximum beyond all previously recorded cycles. He's predicting that as Planet X gets closer, we'll be seeing devastating weather on Earth, with the risk of repeating what's happened with past extinction events.

So why haven't we been hearing anything about all this in the news? It turns out that all NASA scientists are restricted by an NSA decree to not discuss or admit publicly to any event or situation that might cause public alarm. Data about the arrival of Planet X is not being allowed to be released.

And, just to make sure the lid is on tight, NASA has Congress muzzled. Senators and representatives know that if they cause NASA any problems, their district will be cut from any further government funding of projects.

NASA = Never A Straight Answer, and National Astronomy Security Agency.

Jim says that our mountain ranges, coal, and oil deposits were all formed in a matter of hours as the result of passing comets or past Planet X visits — and that they don't even have to pass very close to cause severe effects.

This helps explain the recent discovery of a city 2,500 feet under the Caribbean, near Cuba. And the sudden disappearance of Atlantis, and its colonies all around the world around 10,000 years ago, which would be three passes ago for Planet X.

As Alfred E. Neuman says, "What, me worry?"

We Did, Too!

NASA made worldwide news (my thanks to LA4YE for an Oslo newspaper clipping) by funding the writing of a book debunking the crazies who have been questioning the reality of those astronaught Moon visits thirty years ago. The writer sure has his work cut out for him.

Why am I reminded of the famed Condon Report which debunked the presence of UFOs? It didn't help Condon's credibility when his assistant 'fessed up later that Condon got the project with the proviso that he was not to find any credible evidence for UFOs being real.

I hope the new book will explain the footprints and tire tracks in the dust on the Moon. Since it requires some sort of atmosphere for there to be any dust, a fact which can be substantiated in any lab with a bell jar and a vacuum pump, how did they make those famed Moon boot footprints? Plus 44 other damned good reasons to be convinced the Apollo trips were hoaxes.

Weird

Hillary gets $8 million for her memoirs. Bill gets about $12 million for his as-yet-unwritten memoirs. This from two people who spent eight years being unable to recall, while under oath, anything about past events.

Roger

Roger on the rig there. Roger on the antenna. Roger on the weather. Thanks for the nice QSO. 73.

The Hobby Growth

The latest FCC figures show that the number of licensees has grown by about 1,800 over the last two years. (Yeah, see that stuff in "QRX," and then read this.) That's about an eighth of a percent per year. If that isn't bad enough, this figure includes tons of silent mikes. With today's ten year licenses, there are nine years of dead hams still being counted — like the voters in Chicago.

Now let's do a quick calculation and estimate the actual live ham population. With 680,000 licensees on the FCC rolls, with today's average life span being about 75 years, and with the average ham age today at about 63 years, we should see about 28,333 die per year (unless they read *73* and change their diets). That's about 255,000 possible silent mikes over a nine year period that the FCC is still counting as licensees. That would bring the total down to more like 425,000, somewhat lowering that growth figure.

Counting the silent mikes, about a quarter of one percent of Americans (dead and alive) have ham tickets. That's a pretty exclusive club, eh? No wonder we don't get no respect.

Please let me know when you think it's time for some group to start promoting the hobby so we'll see some growth. Oh, and tell me what group you recommend for the job.

Iconoclast

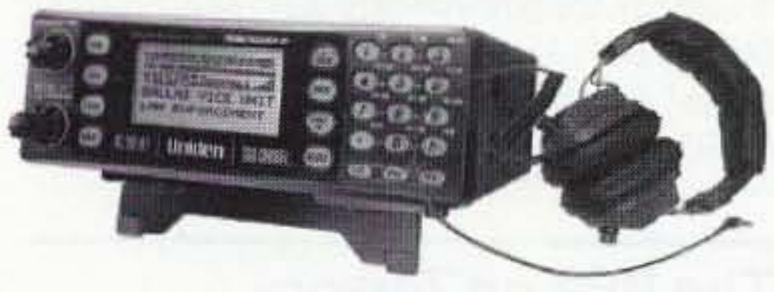
Iconoclast: a person who attacks cherished belief systems or institutions which he thinks are wrong or foolish.

Well, that sure describes me. I'm out here with my little pocket knife attacking 800-pound gorillas such as our public school system-NEA, the AMA-FDA-pharmaceutical industry, the coal-oil-natural gas industries, the power industry, the post office, the farming and food processing industries, colleges and universities, NASA, and a bunch more...like our bribed-to-the-gills Congress.

Continued on page 33

Big Savings on Radio Scanners

Uniden® SCANNERS



Bearcat® 785DGV APCO P-25 Digital Ready with free deluxe scanner headset
CEI on-line or phone special price $339.95
1,000 Channels • 27 bands • CTCSS/DCS • S Meter
Size: 6$^{15/16"}$ Wide x 6$^{9/16"}$ Deep x 2$^{3/8"}$ High

New Product. **Scheduled for initial release January 10, 2003. Order now.**
Frequency Coverage: 25.0000-512.0000 MHz., 806.000-823.9875MHz., 849.0125-868.9875 MHz., 894.0125-956.000, 1240.000-1300.000 MHz.

When you buy your Bearcat 785D state-of-the art Digital Capable Trunktracker III package deal from Communications Electronics, you get more. The GV means "Great Value." With your BC785D scanner purchase, you also get a **free deluxe scanner headphone** designed for home or race track use. The Bearcat 785D has 1,000 channels and the widest frequency coverage of any Bearcat scanner ever. When you order the optional **BCi25D, APCO Project 25 Digital Card** for $299.95, when installed, you can monitor Public Safety Organizations who currently use conventional, trunked 3,600 baud and mixed mode APCO Project 25 systems. APCO project 25 is a modulation process where voice communications are converted into digital communications similar to digital mobile phones. You can also monitor Motorola, EDACS, EDACS SCAT, and EF Johnson systems. Many more features such as S.A.M.E. weather alert, full-frequency display and backlit controls, built-in CTCSS/DCS to assign analog and digital subaudible tone codes to a specific frequency in memory, PC Control with RS232 port, Beep Alert, Record function, VFO control, menu-driven design, total channel control and much more. Our CEI package deal includes telescopic antenna, AC adapter, cigarette lighter cord, DC cord, mobile mounting bracket with screws, owner's manual, trunking frequency guide and one-year limited Uniden factory warranty. For maximum scanning enjoyment, operate your scanner from your computer running Windows. Order Scancat Gold for Windows, part number **SGFW** for $99.95 and magnetic mount antenna part number **ANTMMBNC** for $29.95. Not compatible with 9,600 baud APCO digital control channel with digital voice, AGEIS, ASTRO or ESAS systems. For fastest delivery, order on-line at www.usascan.com.

Bearcat® 895XLT Trunk Tracker
Manufacturer suggested list price $499.95
Less -$320 Instant Rebate / Special $179.95
300 Channels • 10 banks • Built-in CTCSS • S Meter
Size: 10$^{1/2"}$ Wide x 7$^{1/2"}$ Deep x 3$^{3/8"}$ High
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.

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QRX . . .

continued from page 1

Benjamin Franklin and a group of men come up with a Seal. It took them four years to accomplish this task and another two years to get it approved.

The left-hand circle contains a pyramid. Notice the face is lighted, and the western side is dark. This country was just beginning. We had not begun to explore the West or decided what we could do for western civilization. The pyramid is uncapped, again signifying that we were not even close to being finished. Inside the capstone you have the all-seeing eye, an ancient symbol for divinity. It was Franklin's belief that one man couldn't do it alone, but a group of men, with the help of God, could do anything.

"IN GOD WE TRUST" is on this currency. The Latin above the pyramid, ANNUIT COEPTIS, means "God has favored our undertaking." The Latin below the pyramid, NOVUS ORDO SECLORUM, means "a new order has begun." At the base of the pyramid is the Roman numeral for 1776. If you look at the right-hand circle, and check it carefully, you will learn that it is in every national cemetery in the United States. It is also on the Parade of Flags Walkway at the Bushnell FL National Cemetery, and is the centerpiece of most heroes' monuments. Slightly modified, it is the seal of the President of the United States, and it is always visible whenever he speaks, yet very few people know what the symbols mean.

The Bald Eagle was selected as a symbol for victory for two reasons: First, he is not afraid of a storm; he is strong, and he is smart enough to soar above it. Second, he wears no material crown. We had just broken from the King of England. Also, notice the shield is unsupported. This country can now stand on its own. At the top of that shield there is a white bar signifying Congress, a unifying factor. We were coming together as one nation. In the eagle's beak you will read, "E PLURIBUS UNUM", meaning "one nation from many people."

Above the Eagle, there are thirteen stars, representing the thirteen original colonies, and any clouds of misunderstanding rolling away. Again, we were coming together as one. Notice what the eagle holds in his talons. He holds an olive branch and arrows. This country wants peace, but we will never be afraid to fight to preserve peace. The Eagle always wants to face the olive branch, but in time of war his gaze turns toward the arrows.

It is said that the number 13 is an unlucky number. This is almost a worldwide belief. A room is seldom numbered 13, and few if any hotels or motels have a 13th floor. But consider: 13 original colonies, 13 signers of the Declaration of Independence, 13 stripes on our flag, 13 steps on the pyramid, 13 letters in the Latin above, 13 letters in "E Pluribus Unum," 13 stars above the eagle, 13 bars on that shield, 13 leaves on the olive branch, 13 fruits, and if you look closely, 13 arrows. And, for minorities: the 13th Amendment.

Your children don't know this, and their history teachers don't know this. Too many veterans have given up too much to ever let the meaning fade. Many veterans remember coming home to an America that didn't care. Too many veterans never came home at all.

Thanks to Internet author(s) unknown, via The Tuned Circuit, bulletin *of the L'Anse Creuse (MI) Amateur Radio Club, October 2002.*

Barcodes Can Save Lives

You know those barcodes that grocery workers scan to let you know how much your cereal costs? Well, hospitals are now using the same technology to help save lives, thanks to a computerized medication system. A nurse scans the barcode on a patient's I-D bracelet, along with a barcode found on the medication itself, before administering the drug. This enables the computer to verify and check the barcodes to make sure the patient is getting the correct medication. A green signal tells the nurse it's okay to proceed. An error warning, and red signal, alerts the nurse if something is not right.

To date, only about two percent of the nation's medical facilities use barcode technology to verify medication administration, but that number is expected to rise. Statistics show that the system prevents anywhere from 84 to 264 potential errors a week at one hospital alone.

Thanks to Science Today, *via* Newsline, *Bill Pasternak WA6ITF, editor.*

FCC Honors World War II Comanche Code Talkers

The Comanche Code Talkers were members of a specialized communications unit of the U.S. Army 4th Signal Corps. Using their ancestral Comanche language, they created an unbreakable code used by Allied Forces in World War II. Now, decades later, our own Federal Communications Commission has paused to honor this group of Native Americans for their meritorious service to our nation.

Charles Chibitty of Tulsa, Oklahoma, was the FCC's guest of honor at the recent ceremony. He told how he and 16 other young men, who had grown up together and were all members of the Comanche Tribe of Oklahoma, used the Comanche language and their Army communications skills to create a military intelligence code that was never broken by the enemy.

Even more interesting, Chibitty also shared anecdotes from their enlistment and training. He explained that they even had to create Comanche code words for "bomber" and "tank." These are words that did not exist in the Comanche language.

Chibitty is a decorated veteran and the last surviving member of the 16 Comanche Code Talkers. You can read more at [http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-228074A1.doc]. *Thanks to* CGC Communicator *and the FCC, via Norm Seeley KI7UP in* Newsline, *Bill Pasternak WA6ITF, editor.*

The War on Terror: a Banner and a Link

Pieter Wycoff KG4UPX says over the Internet that he has found an important tool that every concerned ham should have on his or her personal Web site. Wycoff says that the Homeland Security Knowledge Database has a banner that can be posted to any web site notifying visitors of the current color status of alert to terrorist threats.

The site also contains lots of other information relevant to homeland security and how you can play a part. You can even sign up to receive threat notification updates by E-mail. To learn more on how you can add this feature to your ham radio Web site, take your Web browser to [http://www.twotigersonline.com/resources.html].

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

How Slow?

Thirteen (yes, 13) reasons why the English language is so hard to learn:

1. The bandage was wound around the wound.
2. The farm has land and was used to produce produce.
3. What dump was so full that it had to refuse more refuse?
4. We must polish the Polish furniture.
5. He could lead if he would get the lead out.
6. The soldier decided to desert his dessert in the desert.
7. Since there is no time like the present, they're ready to present their present.
8. A bass was painted on the head of the bass drum.
9. When shot at, the dove dove into the bushes.
10. I did not object to the object.

Thanks to The Tuned Circuit, *bulletin of the L'Anse Creuse (MI) Amateur Radio Club, October 2002.*

Be Careful What You Say On the Air

Use discretion on the air, and help defeat the terrorists. That's the sub title of Bill Sexton's MARS column that appeared in the December issue of *Worldradio Magazine*. And in it, Sexton, who holds the call N1IN, says that Americans

now face a new concern over the indiscreet transmission of material that may seem harmless but which could be used against us by a terrorist enemy.

By way of example, Sexton cites the well-published airline schedules that were used by al-Qaeda terrorists to coordinate their September 11th attacks on New York and Washington. This is material still available on every airline's Web site.

Sexton says that we all must be concerned with what the military calls Operational Security or OPSEC. And he indicates that it is very important for hams to consider what they are saying on the air, because you can never tell who is listening in. And he says that even the most seemingly innocuous tidbits of information, monitored by hostile ears, are probably being handed on to the enemy's intelligence analysts in the hope that it will reveal some weakness or secret that can be used against us.

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

Good Numbers in the USA

Last year at this time, there were nearly 683,000 hams licensed by the FCC. As of October last year, there were 2,235 fewer — but numbers are not always what they seem. The reality is that ham radio in the United States is growing once again.

First, the General and Extra classes have increased substantially since the 13- and 20-word-per-minute Morse code exams were eliminated on April 15th of 2000. In fact, the number of people holding these licenses has increased by well over 25,000 for each license class. And that's great news for ham radio equipment suppliers, since they rely on higher dollar high frequency transceiver sales for much of their yearly income.

The Technician class is holding its own, too. The number of new Tech license holders is keeping pace with the number of hams either upgrading or dropping out of amateur radio. The net change is close to zero.

Only the Novice and Advanced classes are seeing significant drops in numbers. No new Novice or Advanced class tickets have been issued since April, 2000. And while existing licenses can be modified and renewed, it appears as if that's just not happening among Novices. They appear to be fading away, and quickly — there were 65,000 Novices in 1997, but now there are only about 37,000.

The bottom line is that for the last 12 months ham radio has seen an average of 1,600 brand new ham licenses issued each month. That's an improvement of 160 a month over the previous year. And that improvement is very good news for ham radio.

As to the state with the largest number of hams? It's still California, which can now claim being home to more than one seventh of all the nation's hams. Latest figures show there are more than 100,000 hams now living there.

The state with the fewest hams? North Dakota with only 1,575.

The bottom line is this: Restructuring seems to be doing the job it was intended to do. It's now up to those in the hobby to work to swell its ranks even more.

Thanks to W5YI via David Black KB4KCH in Newsline, *Bill Pasternak WA6ITF, editor.*

Radio Redux

A self-organizing electronic circuit has stunned engineers by turning itself into a radio receiver. What should have been an oscillator became a radio.

This accidental reinvention of the radio followed an experiment to see if an automated design process that uses an evolutionary computer program could be used to "breed" an electronic circuit called an oscillator. An oscillator produces a repetitive electronic signal, usually in the form of a sine wave.

Paul Layzell and Jon Bird at the University of Sussex in Brighton applied the program to a simple arrangement of transistors and found that an oscillating output did indeed evolve.

Continued on page 58

LETTERS

From the Ham Shack

Dain Lones KC6WZK, 3332 Palos Verdes Dr. N., Palos Verdes Estates CA 90274. After reading Carl Herbert's article on writing a short story, on page 41 in the August issue of *73*, I thought the enclosed might be of interest to some of your readers, even though there are not many "home-brewers" around these days. Maybe this might crank some of them up.

First, a little background might also be of interest. Some 72 years ago while in elementary school, I built my first transmitter, a spark gap unit, with which I spoiled all the neighbors' radio reception, and at which time I also built my first crystal set. A couple of years later, while in junior high school, I built my first tube-type transmitter (a one-tube 201A), as well as a two-tube receiver. High school found me more interested in cars, girls, and sports, and as a result I got away from ham radio for many years.

After retirement 21 years ago, my interest peaked once again. I got my license and started building home-brewed projects. To date I have completed some 440 of same. In so doing, I use segments of many articles in *73*, *CQ*, and *QST* magazines, and the ARRL handbooks, to build modules which I can choose in building my final projects — none of which are built from kits, including what is shown here.

So there you have a little history on how I got started and learned a lot. I recommend the same to others.

The photo and the following describe my present all-home-brew station: The bottom unit is my 6-band (3–30 MHz) superheterodyne receiver with a home-brew worm gear as modified for an old General Radio dial providing a 200:1 ratio. On top and at the front of the receiver is my digital readout for the receiver that can be set for any IF value (I use 10.8 MHz). On top and at the rear of the receiver is my QRP, CW, and voice 10-meter transmitter. On top of the transmitter is my roller coil transmatch with cross needle, digital and bar graph, and power/SWR readout (for those who want a choice). On top of the transmatch is my 50W CW, 35W voice linear broadband power amp. The driver is my QRP transmitter. So there you have it, a complete all-home-brew station.

Here's to getting some of the newcomers interested in home-brew!

Arnold Samuels KH6COY, Ocean Shores WA. It is my sad duty to announce the death of my good friend, Joseph "Pop" Bushnell WA7BLE, on Nov. 9, 2002. He was 76 years old.

Joe was in the Army Air Corps during World War II. He served in the Asian/Pacific theater with the 5th Air Force, 22nd Division. He also served in the Germany airlift and flew with the Hurricane Hunters while stationed in Bermuda. He married Diana J. Kilber WA7BLF in 1949.

Joe retired from 21 years of active duty. He earned his bachelor's degree in education. In 1974, he earned his master's degree in education. He was a leader in the Boy Scouts of America.

Joe was a joiner and very active person around this area. He taught first aid for the Red Cross, and amateur radio in the local North Beach High School. He was a member of the local VFW post. He was also a member of the Ocean Shores Elks Club. He was a member of the Grace Harbor Amateur Radio Club for as long as I have known him (21 years). Joe was a doer all his life and was always willing to help. He will be missed by the radio group of Grace Harbor.

Ray J. Howes G4OWY, Dorset, England. Was it serendipity or what? There I was, moaning about the lack of QRP coverage in *73*, and lo and behold, in the October issue, an article courtesy of KF6FJU, interviewing Marshall Emm N1FN — QRP devotee and president of Milestone Technologies, Inc. Well done!

Like KF6FJU, I too fondly remember my first kit build many years ago. However, unlike KF6FJU's first effort, mine ended up a bit like a mini-nuclear explosion. I forgot to reduce the volts input! Silly me. The second attempt worked fine — and still does.

* * *

Just got my November issue of *73* in the daily deluge of mail, and as a fan of QRP, guess which page I turned to first? Yep, page 53! — written of course by the irrepressible Michael Bryce WB8VGE. After my moans about the lack of QRP columns of late, someone at the top must be listening. Keep 'em coming, now!

By the way, been enjoying "The History of Ham Radio" series. I'm a sucker for all things nostalgic — I just can't help myself.

Photo A. *KC6WZK's all-home-brew station.*

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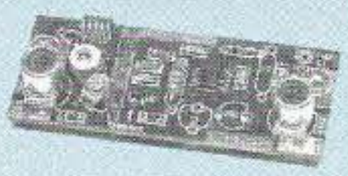

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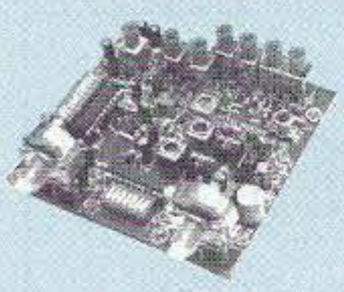

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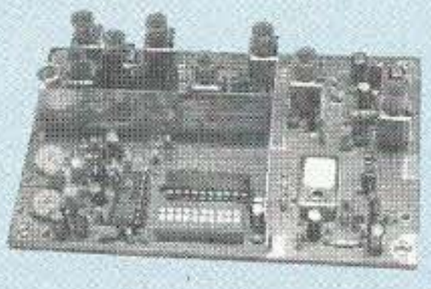

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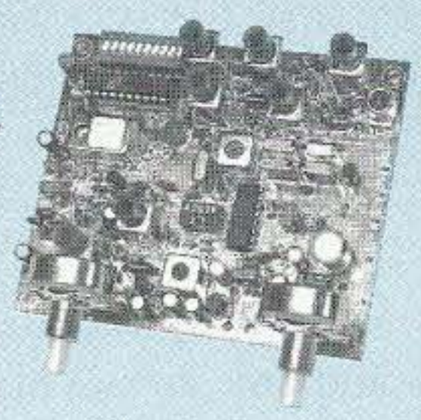

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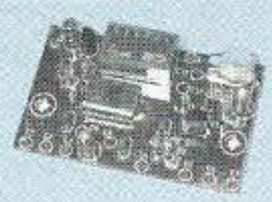

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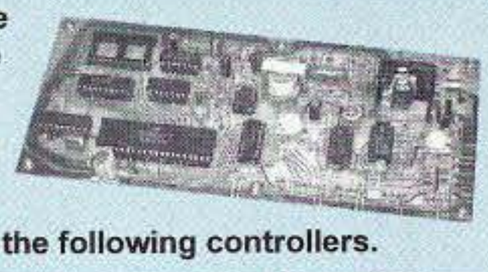

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Build This Amazing ESR Meter

A simple project for everybody's shack.

There are only two types of electrolytic capacitors in your equipment — those that have failed and those that will fail. Only a small percentage of bad electrolytics fail as a short circuit. Rather, most dry out and gradually become less effective at their filtering, coupling, or bypassing job.

Troubleshooting a dried-out electrolytic isn't the easiest task, even if your workshop is equipped with a capacitance bridge. A relatively new test instrument, the equivalent series resistance (ESR) meter, makes this task simple. Although ESR meters are commercially available, it isn't hard to build one. This article takes you through the design and construction of a simple ESR meter.

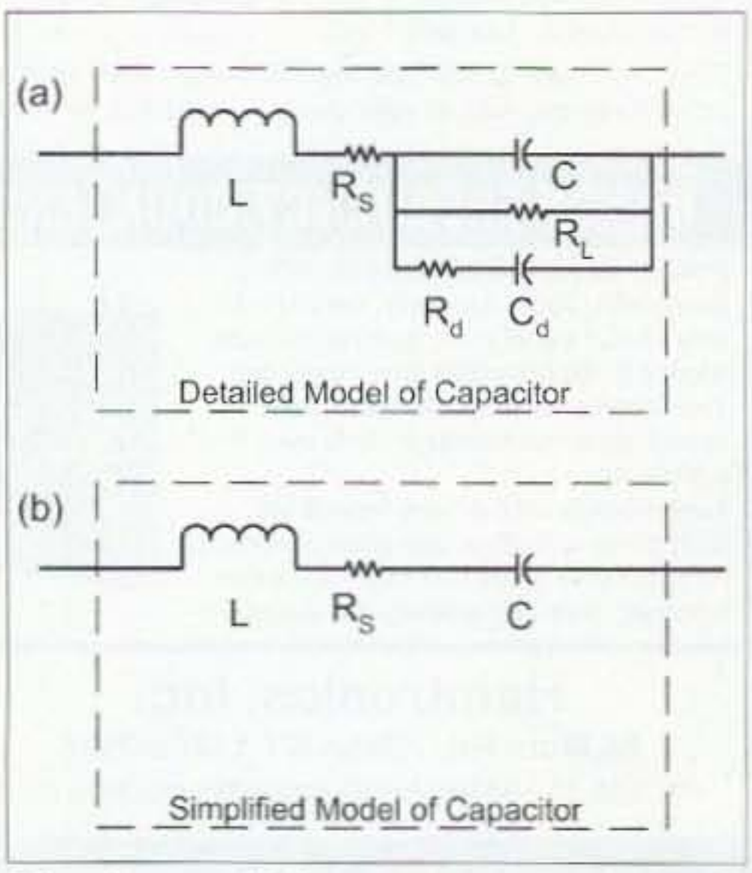

Fig. 1. *A real-life capacitor can be modeled differently depending upon the level of detail necessary.*

What is equivalent series resistance, and how do you measure it?

A real capacitor isn't the simple perfect device that the schematic symbol might lead one to believe. Two common capacitor models are shown in **Fig. 1**. We'll be concerned only with the simplified model:

- L represents the inductance of the lead wire and capacitor construction.
- R_S represents all the loss elements of the capacitor, including lead wire loss, capacitor electrode loss and dielectric loss.
- C is an ideal capacitor, with no loss and zero inductance.

As an electrolytic capacitor dries out, R_S increases, while L and C remain relatively constant. Thus, if we can measure R_S, we can detect faulty capacitors. We obviously can't measure R_S with a standard DC ohmmeter; C blocks DC current flow and at most we would measure the leakage resistance R_L in **Fig. 1(a)**.

However, suppose we had an ohmmeter that worked with AC instead of DC. With such a device, we would then measure the composite impedance Z of the series combination of the reactance of L and C and R_S. If we use a reasonably high frequency, typically 100 kHz, the reactance of L and C will be negligible in comparison with R_S for reasonable capacitance values. We can illustrate this with an example.

Consider a 10 µF nominal aluminum electrolytic capacitor. From measurements, at 100 kHz we know that C = 12.4 µF, R_S = 1.5 ohms, and L = 35 nH (including 1/2-inch leads).

Photo A. *Finished ESR meter.*

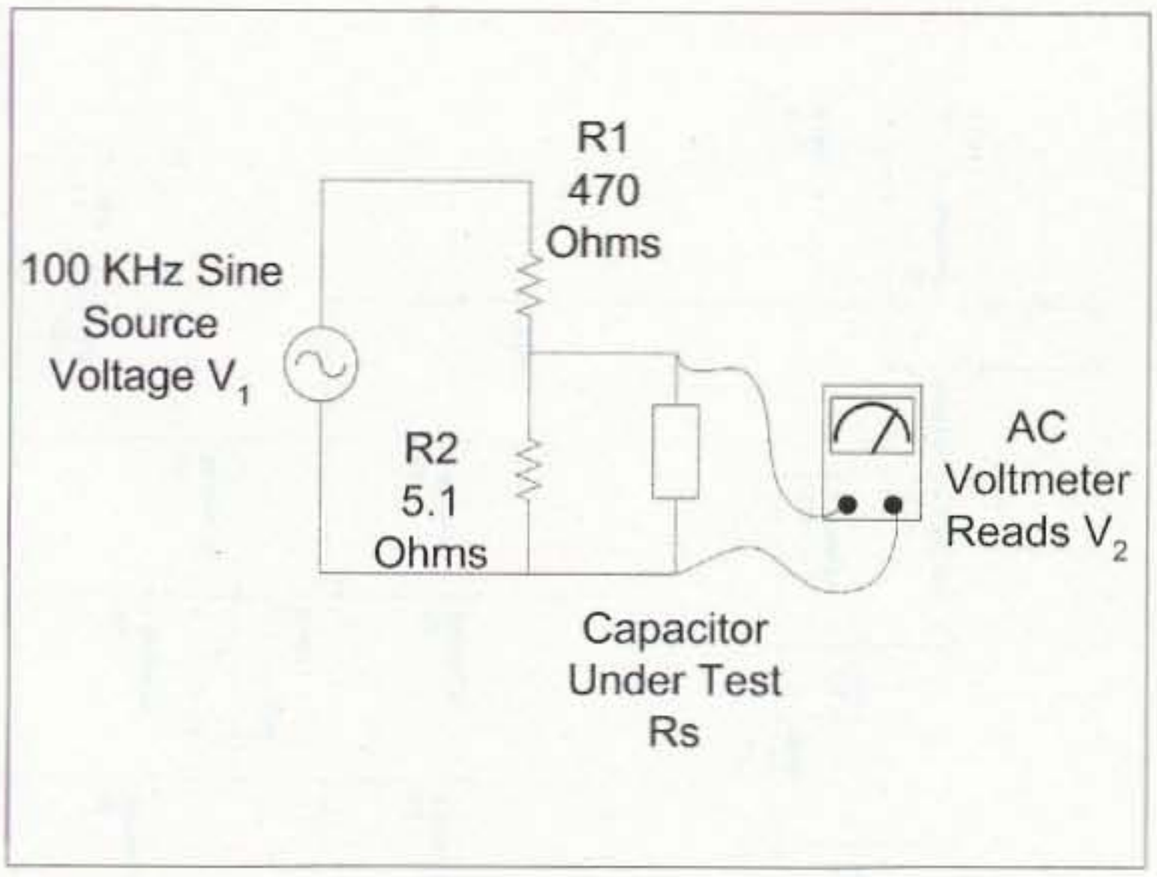

Fig. 2. *The principle behind the ESR meter.*

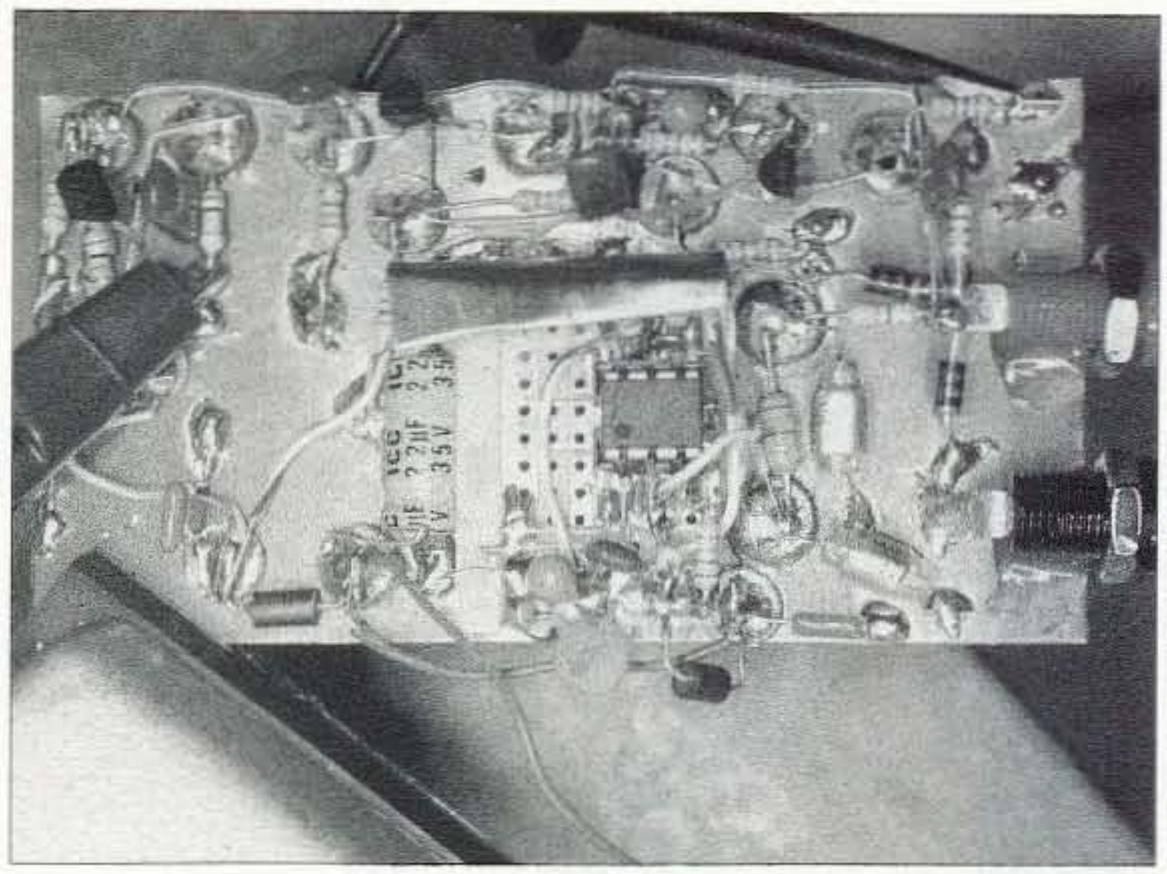

Photo B. *I built the prototype using Manhattan-style construction.*

We now calculate the reactive components of the model at 100 kHz:

$X_C = 1/(2\pi FC) = 1/(2\pi \times 100 \times 10^3 \times 12.4 \times 10^{-6}) = 0.128\Omega$

$X_L = 2\pi FL = 2\pi FL = 2\pi \times 100 \times 10^3 \times 35 \times 10^{-9}) = 0.022\Omega$

The impedance magnitude of the capacitor is thus

$$|Z| = \sqrt{R_S^2 + (X_L - X_C)^2} =$$

$$\sqrt{1.5^2 + (0.022 - 0.128)^2} = 1.503\Omega$$

Thus, at a frequency sufficiently high to make X_C small, yet low enough for X_L to also be small, Z is approximately equal to R_S. **Fig. 9** shows estimated |Z| over the range 100 Hz to 100 MHz and illustrates that between 10 kHz and 5 MHz, the impedance is dominated by R_S, the Equivalent Series Resistance. (**Fig. 9** is only approximate, as it assumes that L, C, and R_S remain constant. In fact, these parameters are all somewhat frequency dependent.)

Our "AC ohmmeter" can be as simple as **Fig. 3**. If the ESR dominates the impedance of the capacitor under test, a bit of simple algebra shows that the voltage V_2 is proportional to the ESR:

$$ESR = (V_2R_1R_2)/V_1R_2 - V_2(R_1 + R_2)$$

Fortunately, we won't have to use this equation; rather, we will simply calibrate the voltmeter scale in terms of ESR. The scale won't be linear, of course.

Circuit description

Our ESR meter has three main elements:

- A 100 kHz sine wave source
- An AC voltmeter (calibrated in terms of ohms of ESR)
- An LED bar graph display

U5 is a CMOS version of the popular 555 timer chip. It generates a 100 kHz, 50% duty cycle square wave. The square wave is fed through a low pass filter consisting of L1, C9, and C10. By stripping off the higher harmonics, the low pass filter converts the square wave into a reasonably good sine wave.

The 100 kHz sine wave feeds the voltage divider R16 and R18. The unknown capacitor is connected across R18, a 5.1 ohm resistor. Diodes D2 and D3 protect the instrument from damage, should the capacitor under test have some residual charge.

The maximum (open circuit) voltage applied to the capacitor under test is about 110 millivolts, peak-to-peak. By intentionally limiting the test voltage to such a low value, it is possible to test a questionable capacitor in-circuit, even if a diode or transistor junction shunts it. A silicon PN junction requires about 600 millivolts to

Continued on page 13

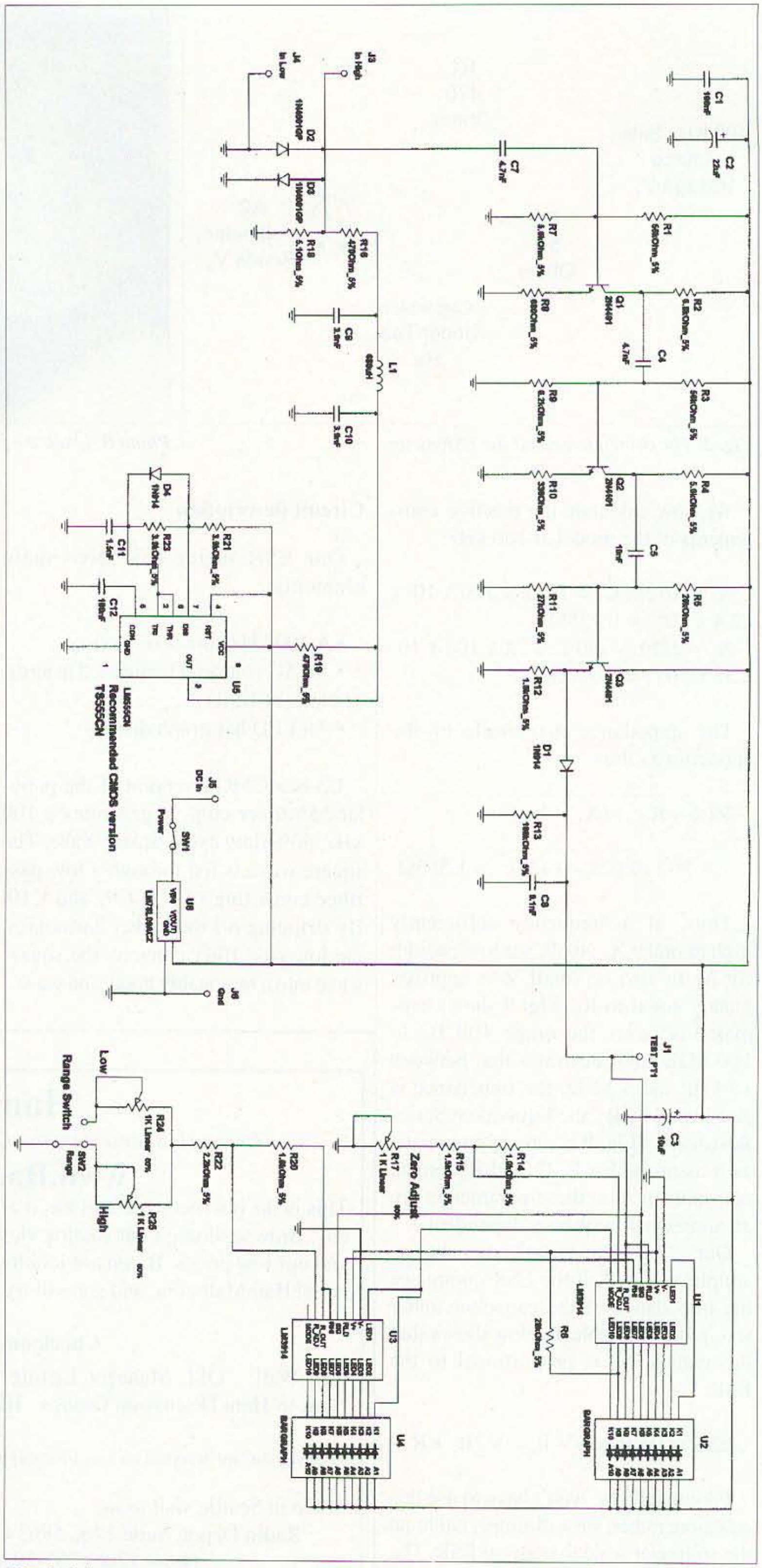

Fig. 3. Schematic diagram of the ESR meter.

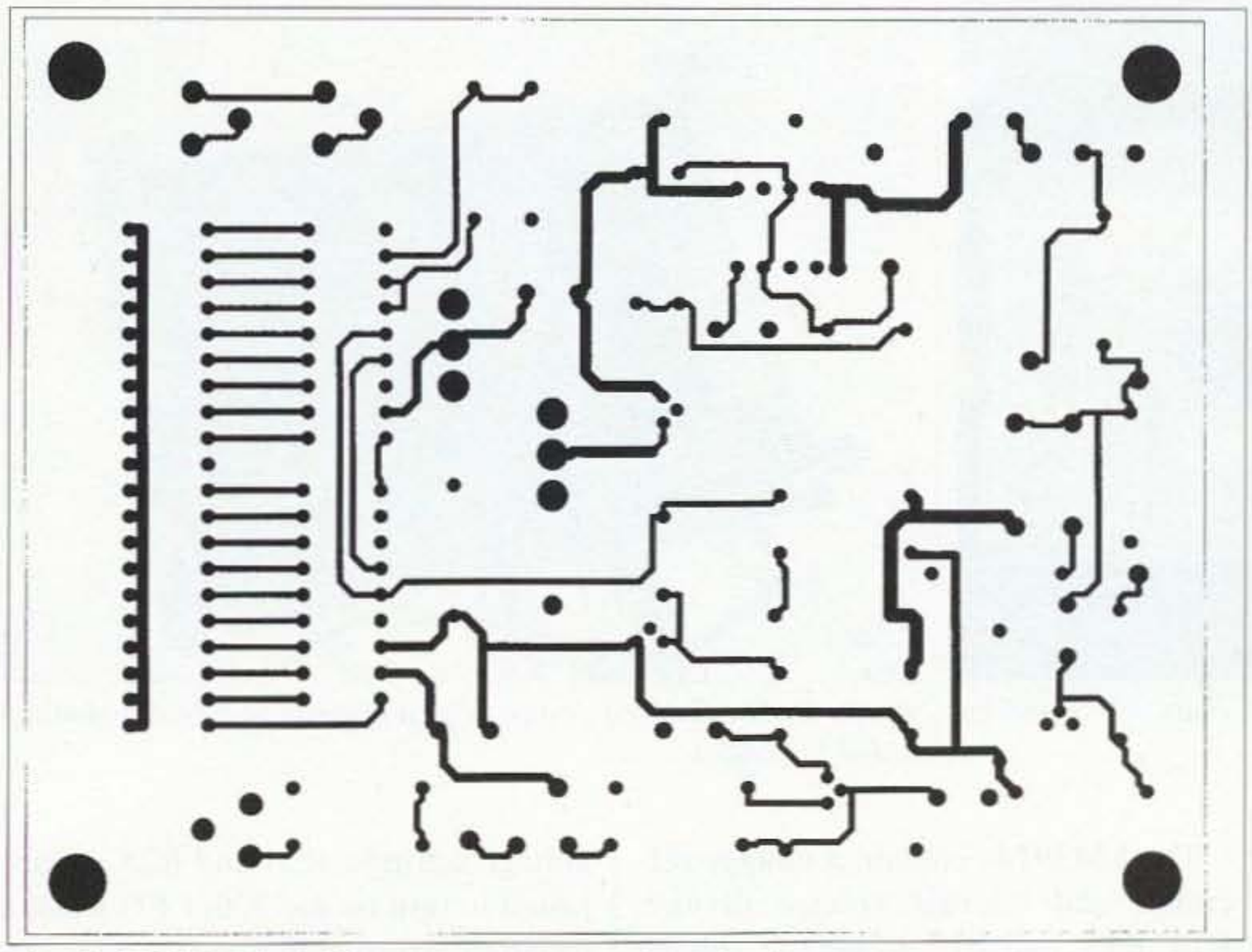

Fig. 4. 100% PC board layout — top copper (top view).

Build This Amazing ESR Meter

continued from page 11

cause significant current flow, so it looks like an open circuit to the test voltage.

Q1 and Q2 are a simple RC-coupled amplifier. The coupling capacitors (C7, C4, and C5) have been chosen to roll off frequencies below 100 kHz. The emitter resistors (R8 and R10) are intentionally not bypassed to increase stability.

The amplifier output feeds Q3, an emitter follower. D1 is forward-biased by the DC across R12, so D1, R13, and C8 act as a peak detector. The voltage at Test Point 1 ranges from 3.9 volts (short circuit across the input) to 5.5 volts

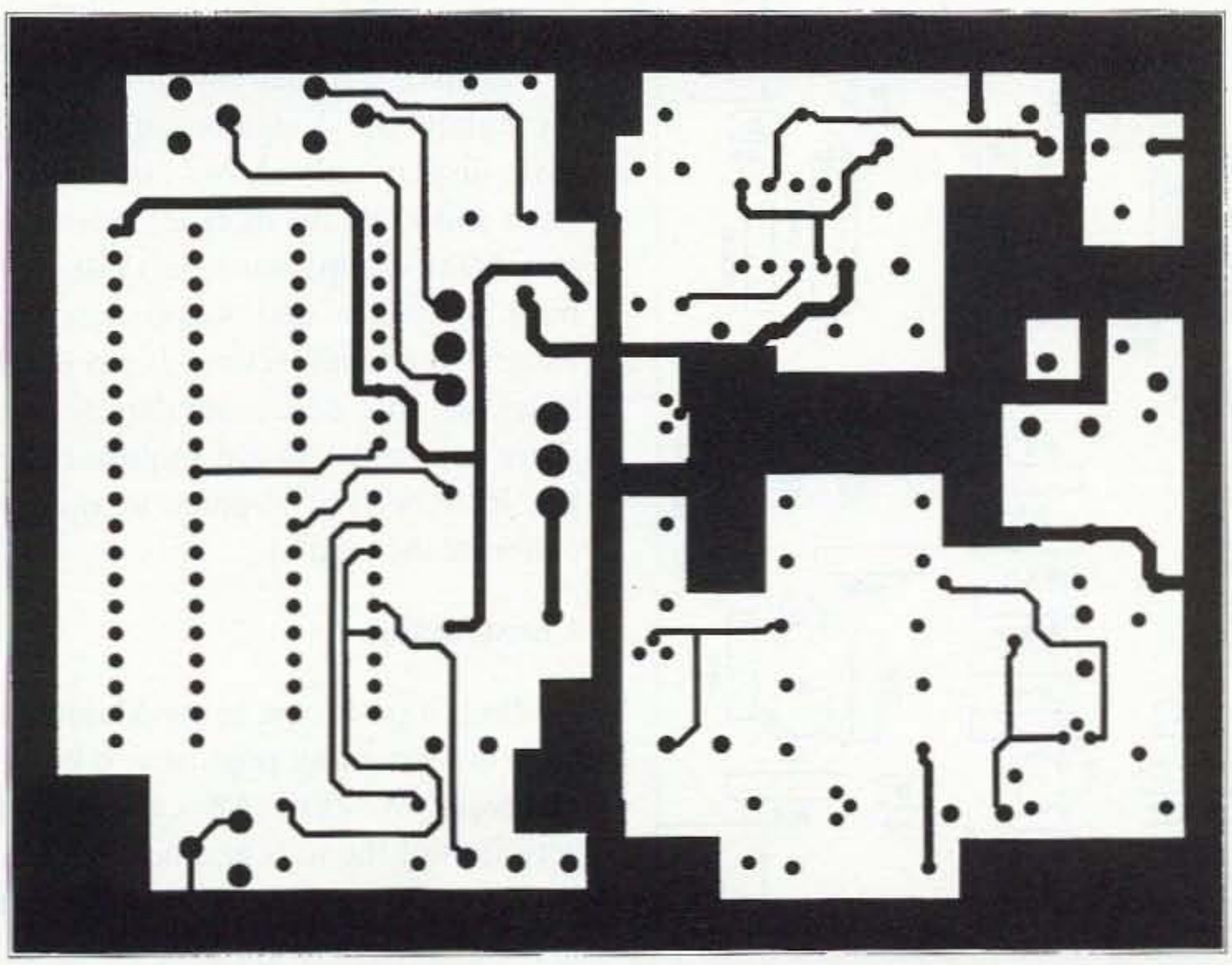

Fig. 5. 100% PC board layout — bottom copper (top view).

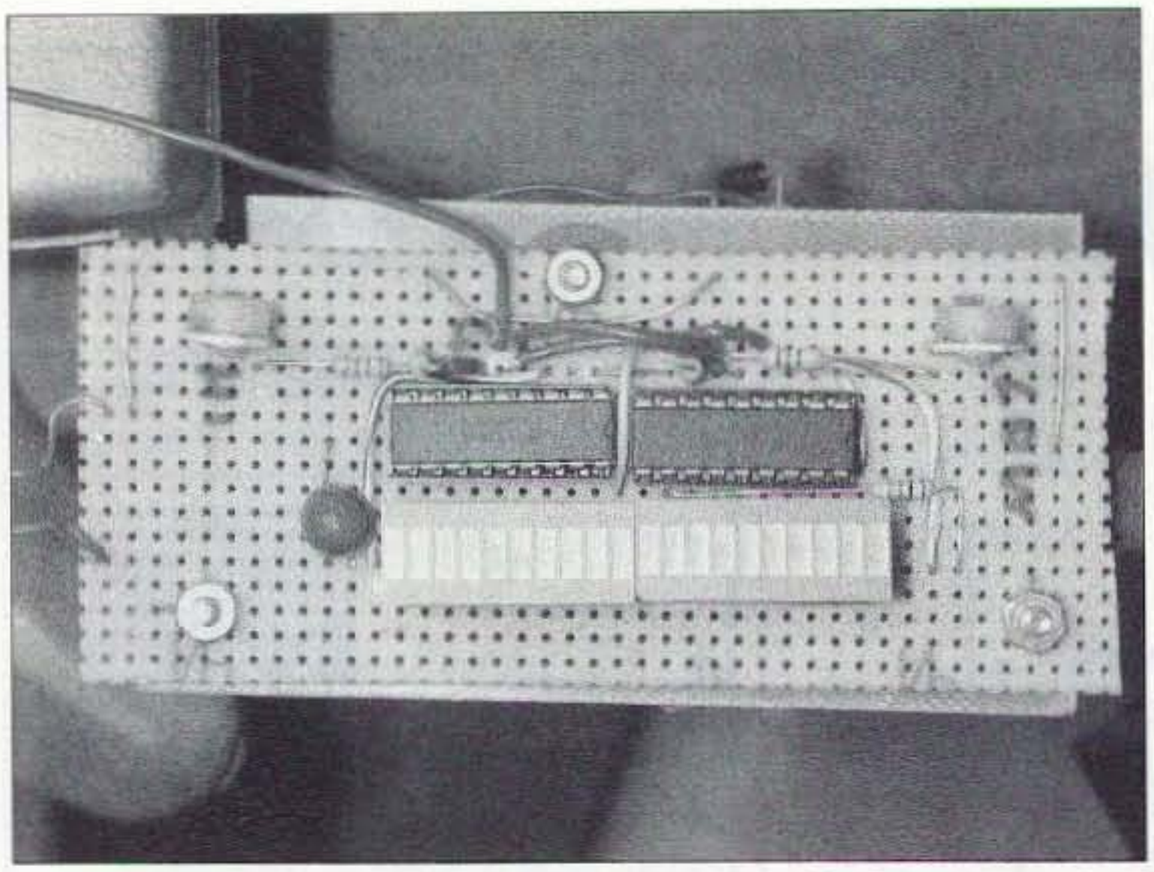

Photo C. *The prototype display unit is built on standard perfboard.*

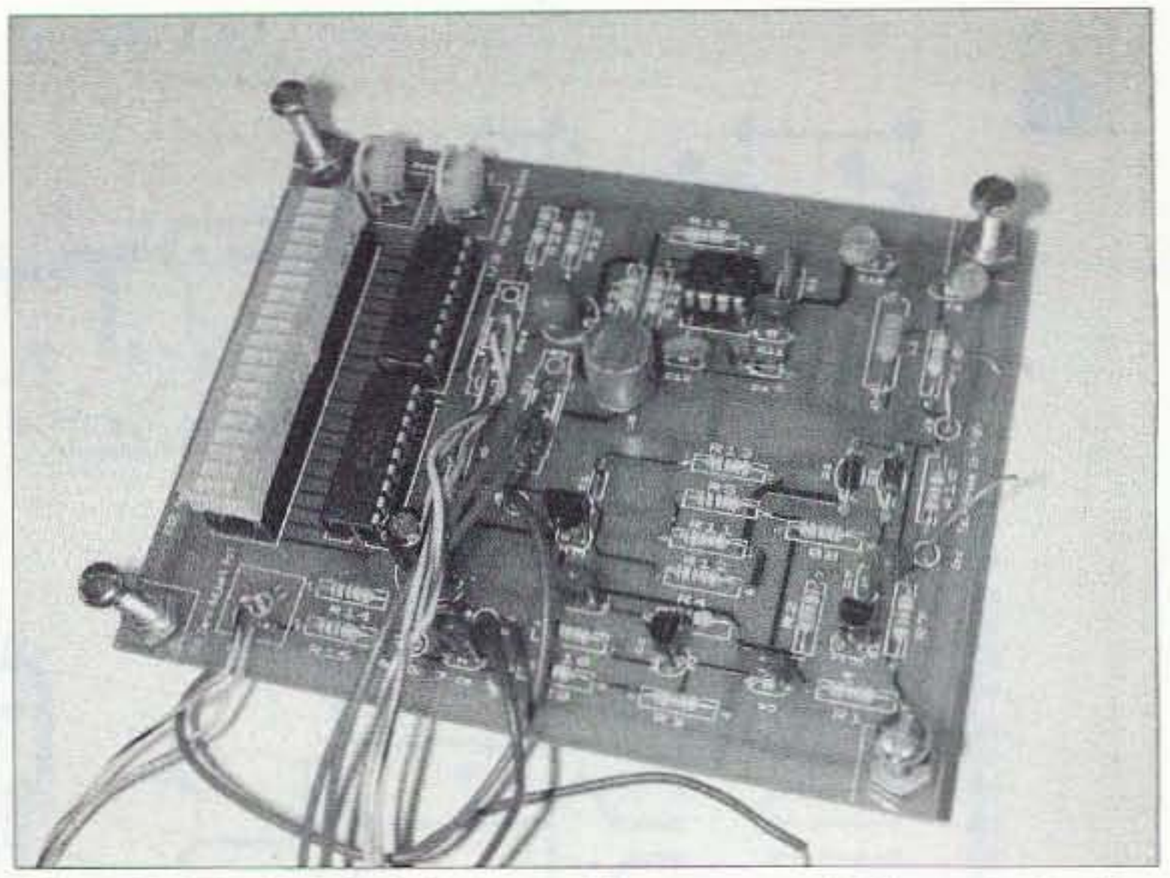

Photo D. *The finished design, with a commercially made double-sided PC board.*

(50 ohm resistor across the input). This voltage is applied to the signal input of the display section.

U1 through U4 form a moving dot LED bar graph to display the DC output voltage from D1. The circuit is taken directly from National Semiconductor's data sheets for the LM3914 linear bar driver. By cascading two LM3914s (U1 and U3), the voltmeter range is spread over 20 LED segments. U2 and U4 are LED bar graph displays. I used red displays because they are brighter for a given current consumption than other colors.

The LM3914s contain a voltage reference and internal voltage divider. R14, R15, and R17 adjust the voltage applied to the low end of the voltage divider chain. R17 is used to adjust the bar display "zero" setting, corresponding to the voltage output when the test terminals are short-circuited. R14 also functions as an LED display current control and is set for approximately 12.5 mA.

R20, R22, and either R24 and R25 perform the same function for the high end of the voltage divider chain. A switch permits selecting between two voltage settings. R24 and R25 are adjusted to turn on the 20th LED when a resistor corresponding to full scale (10 ohms or 50 ohms) is connected across the test terminals. R20 also functions as an LED display current control and is set for approximately 12.5 mA.

Power for the circuit is regulated by U6, a low-power 9 volt integrated regulator. DC input power should be in the range 12–14 volts, or up to 18 volts if U6 is equipped with a slip-over heatsink. I've powered the LEDs from the +9 volt regulated bus. If power consumption or regulator power dissipation is a concern, the LED drive current can be provided from a separate source of 4 volts or more.

I've used 5% carbon film resistors throughout the design because the ultimate display only shows 20 resistance steps and using the more expensive 1% metal film components isn't justified. I built two units and found the stated values were satisfactory. It's possible, however, that an accumulation of resistor tolerances might require changing R15 or R22 slightly in order to calibrate the display.

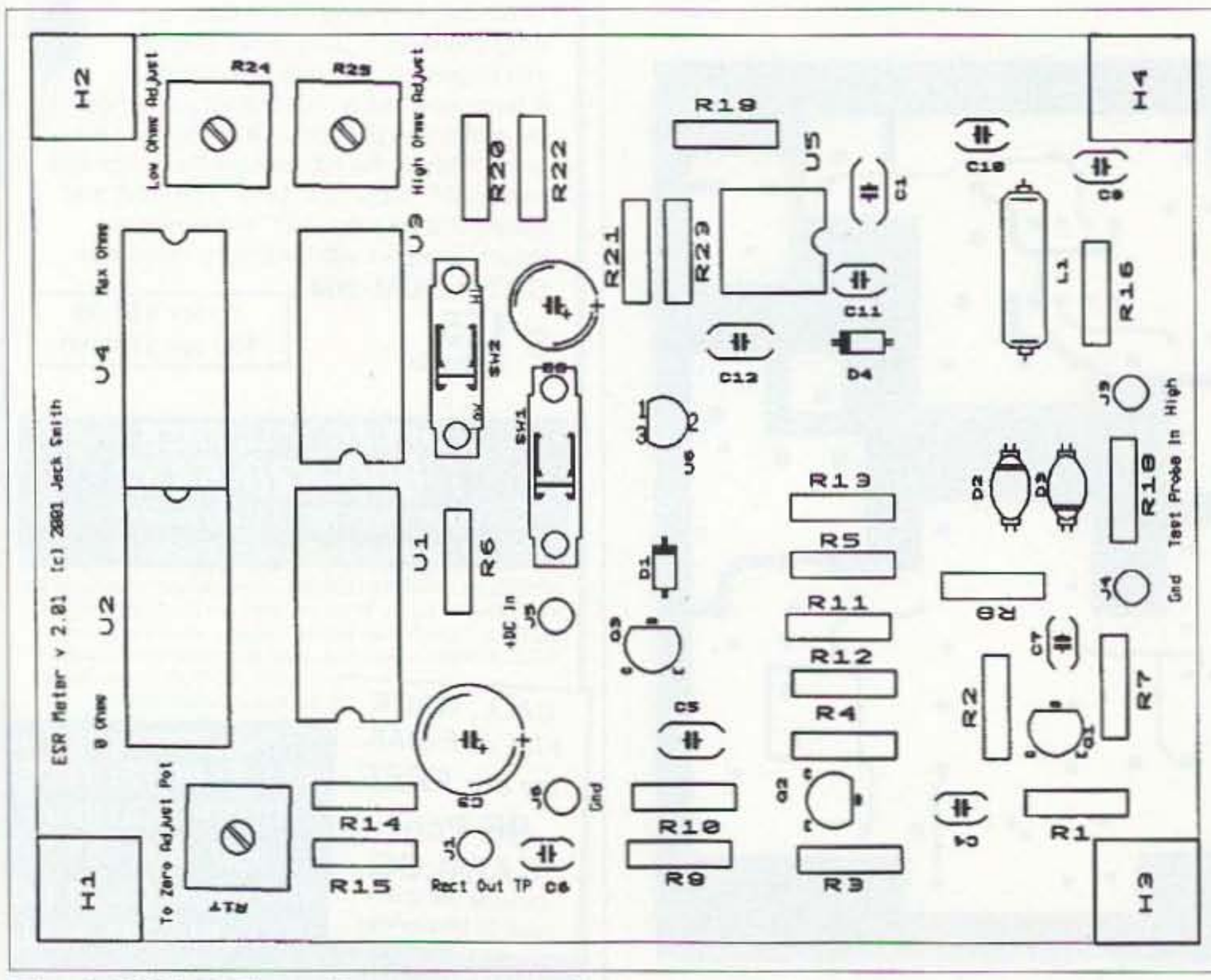

Fig. 6. 100% PC board layout — parts placement (top view).

Construction

I built a prototype using Manhattan-style construction, popularized by Wes Hayward W7ZOI. An excellent description of the nuts and bolts of Manhattan-style construction can be found at K7QO's Web page [http://www.qsl.net/k7qo/]. The display section used

conventional perfboard. Manhattan-style construction goes rapidly, and I built the prototype in a couple of hours. So, don't feel that a printed circuit board is necessary.

I also laid out a double-sided printed circuit board and had it fabricated by a prototype board house. I used this professional board for the completed unit.

It's always a good idea to build and debug a project in stages. The ESR meter has three logical stages that you can build and check sequentially:

The 9-volt regulator circuitry, the 555 timer and low pass filter (including R16 and R18). The output of U6 should be between 8.55 and 9.45 volts. At U5 pin 3, you should see a 100 kHz square wave, with a peak-to-peak voltage of about 8 volts. The precise frequency isn't critical, but it should be within 15% of 100 kHz. At the output of the low pass filter (junction of L1 and R16), you should see a clean 100 kHz sine wave with a peak-to-peak amplitude of approximately 10 volts. At the test lead connections (across R18), you should see a 100 kHz sine wave with a peak-to-peak amplitude of about 110 millivolts.

The amplifier and peak detector (Q1, Q2 and Q3 and D1). The following measurements are all peak-to-peak and assume the 100 kHz signal levels in the previous stage are correct. At the base of Q1, you should measure about 105 millivolts; at Q1's collector, 390 millivolts. At Q2's collector and at Q3's emitter, 3.8 volts. All should be clean 100 kHz sine wave signals. Check the DC voltage at the junction of D1, R13, and C6. With the input terminals open-circuited, you should measure about 5.5 volts. With the input terminals short-circuited, this

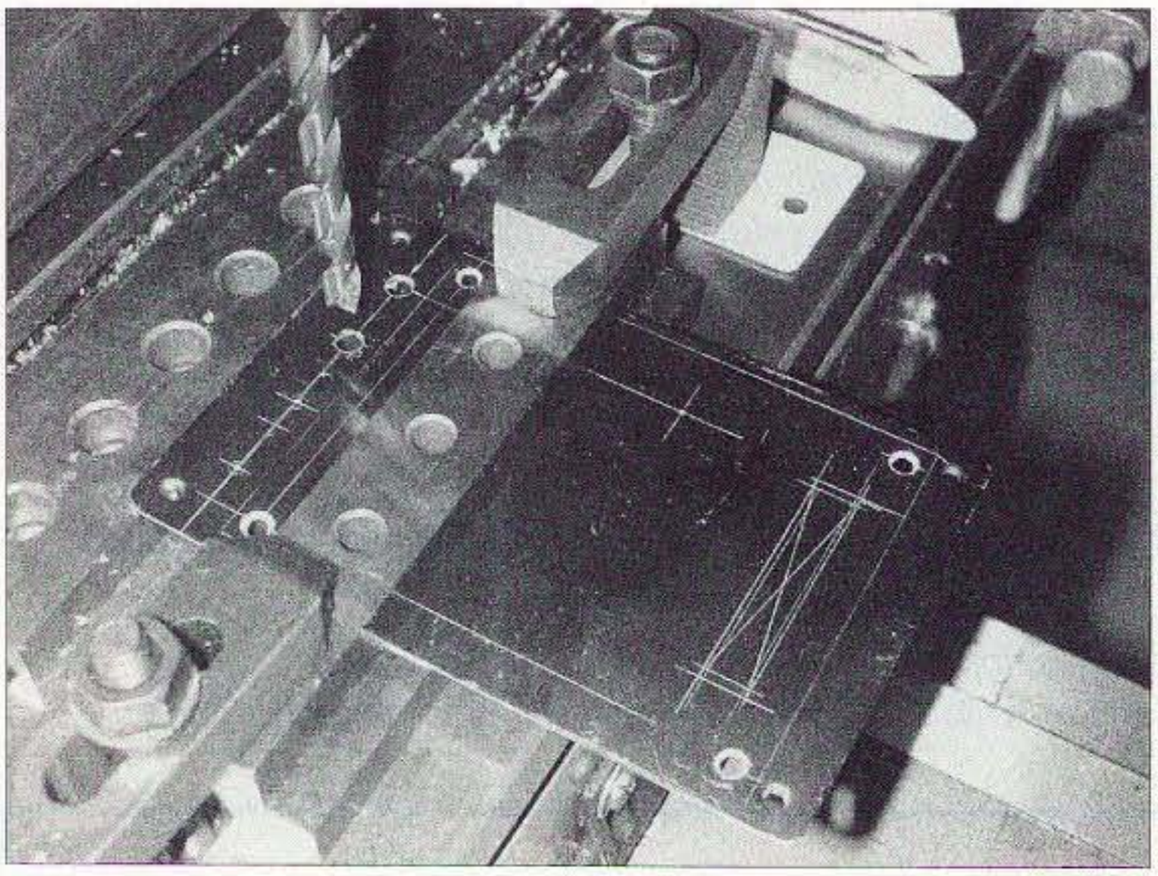

***Photo E.** Drilling the front panel.*

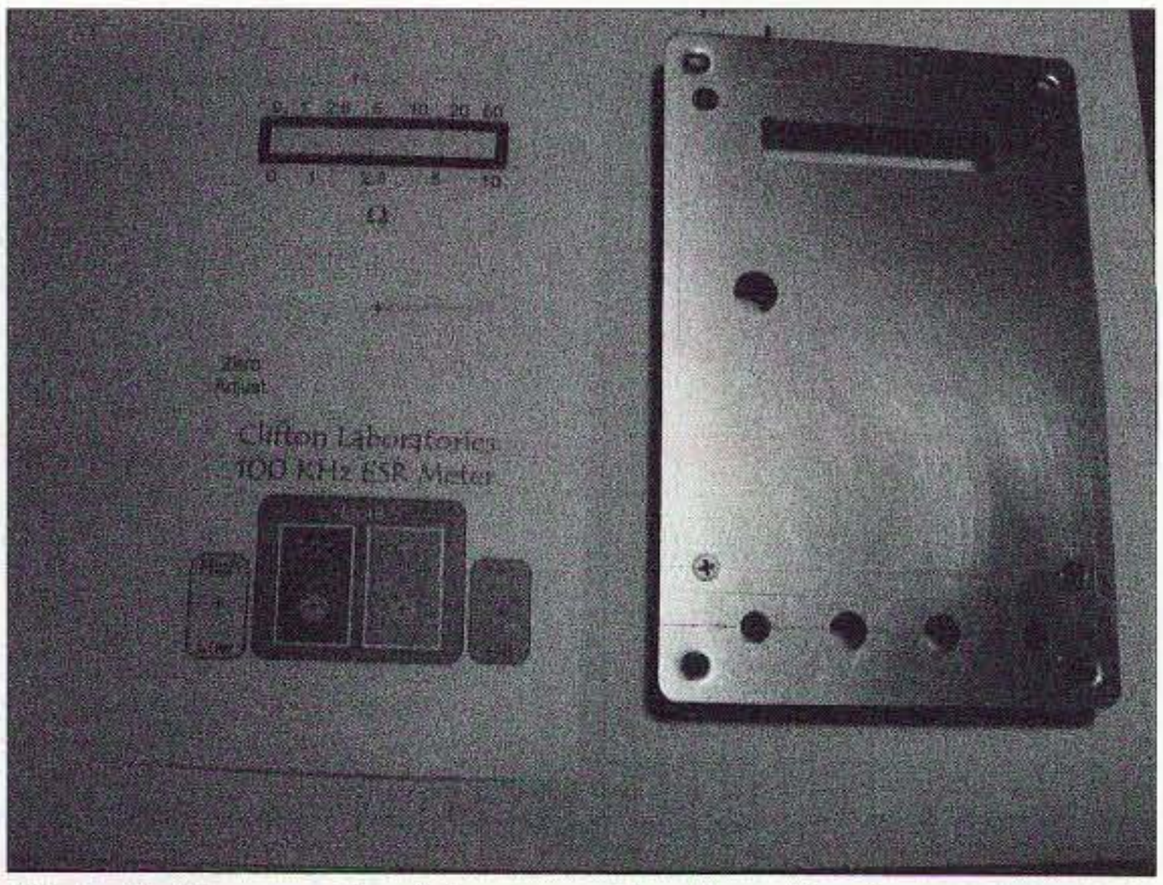

***Photo F.** The completed front panel and appliqué.*

voltage should drop to 3.7 volts. These values are not overly critical, but you should see a good 1.75 to 2 volts swing between open-circuited and short-circuited input conditions.

LED display. With the input terminals short-circuited, you should be able to adjust the "zero adjustment" pot, R17, so that the first LED segment is illuminated. Temporarily connect a 10 ohm resistor across the input terminals. With the range switch, SW2, in low position, you should be able to adjust R24 so that the last LED is illuminated. Remove the 10 ohm resistor, connect a 51 ohm resistor across the input terminals, and place the range switch to the high position. You should be able to adjust R25 so that the last LED is illuminated. You may see a slight degree of interaction between the zero adjustment pot and R24 or R25.

Calibration

To calibrate the display, first verify the zero adjustment and that R24 and R25 have been accurately set as described earlier. With the range switch in low position, connect a 1 ohm resistor across the input terminals and note which LED is illuminated. Repeat with 2.7 and 5.1 ohm resistors. Switch to the high range and repeat with 1, 2.7, 5, 10, and 20 ohm resistors. The spacing will not be linear. You should use short leads when connecting the calibration resistors.

Mechanical

I designed the printed circuit board layout to fit a Radio Shack 270-1806 plastic box, 6"x4"x2". This box is a tight fit and requires the zero pot to be squeezed between the board and the front panel, but it permits a compact package.

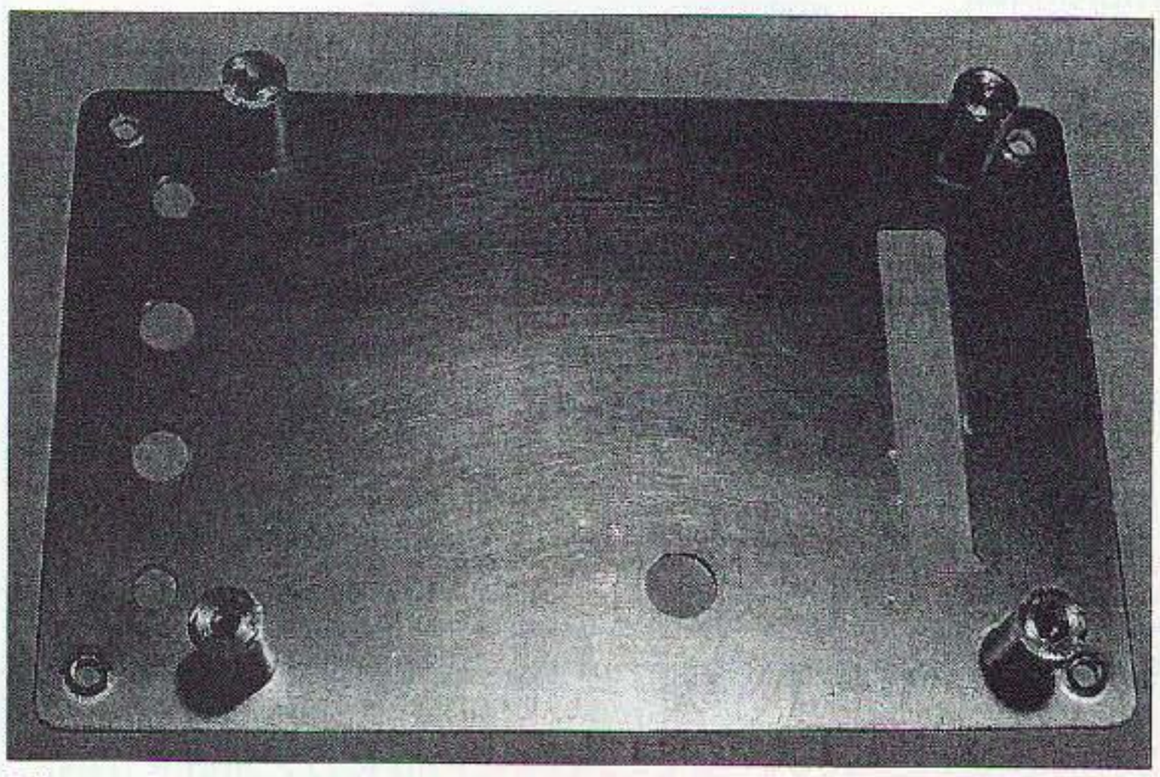

***Photo G.** Back view of the front panel showing the mounting spacers installed.*

I milled a slot 2 inches long and 3/8 of an inch wide for the LED display. I also milled a 2-1/2 inch x 3/4 inch piece of 1/8-inch-thick red Lucite plastic to fit flush into the slot. (The Lucite lens resembles a mesa when done; a 2" x 3/8" rectangular section sticks up 0.040" from the body of the plastic.) I attached the plastic lens to the aluminum panel with a couple drops of super glue. Although a milling machine makes these tasks easy, you can accomplish the same with an electric drill and file.

I also made four custom-length spacers from 3/8-inch-diameter aluminum round stock and attached these to the front panel with countersunk 4-40 x 3/8-inch Phillips flat head screws. For my board, choice of IC sockets, and LED displays, the spacers were 0.680 of an inch long. I drilled and tapped the spacers for 4-40 threads. The aluminum cover plate is only 0.038 of an inch thick, so part of the tapered screw head appears on the inside of the front panel. Hence, you should countersink the spacer as well — otherwise the spacer will not be tight against the panel.

It's important that the heads of the screws be flush with the front panel if you intend to use a panel appliqué. It will be impossible to retighten the screws without destroying the appliqué once it is in place, so I used Loctite thread locker to prevent loosening.

I laid out the front panel appliqué using Visio Technical for Windows, but any drawing program would work. When you lay out the appliqué, place the calibration numbers to coincide with the spacing you recorded during calibration. I then printed the appliqué on an inkjet printer, and laminated it with a thin, flexible, self-adhesive transparent plastic sheet. After cutting

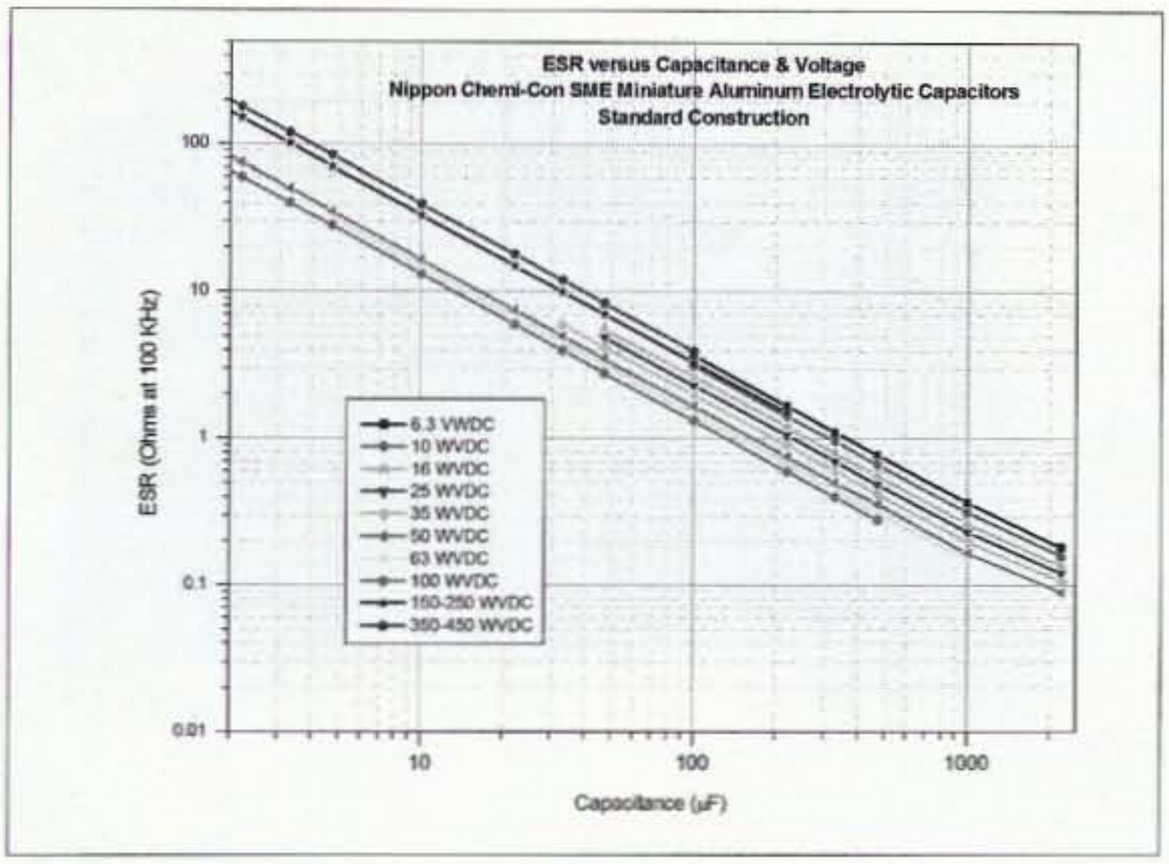

Fig. 7. ESR vs. capacitance & voltage: Nippon Chemi-Con SME miniature aluminum electrolytic capacitors, standard construction.

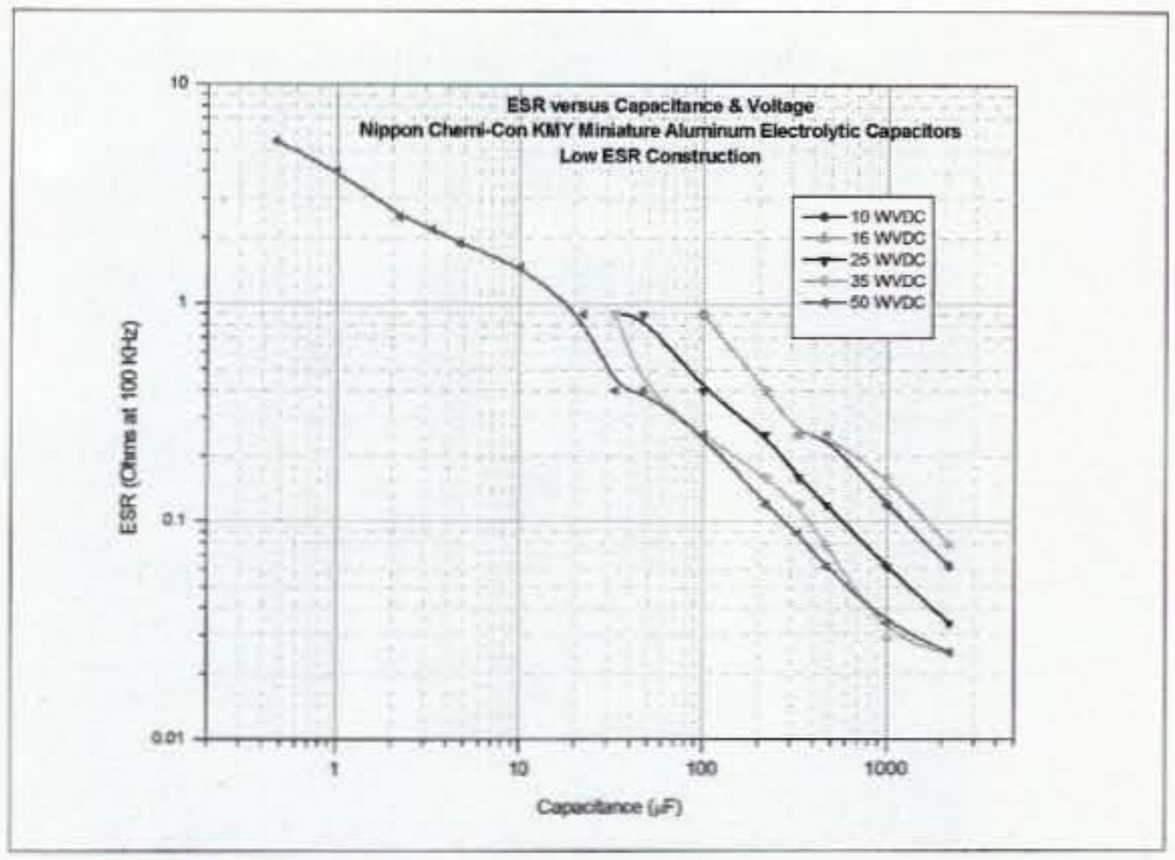

Fig. 8. ESR vs. capacitance & voltage: Nippon Chemi-Con KMY miniature electrolytic capacitors, low ESR construction.

out the LED window, I then attached the appliqué to the aluminum front panel with 3M artist's spray adhesive.

I had to do three panels before I got it close to right, so you can benefit from my mistakes:

• It's difficult to get the LED slot exactly right in the aluminum panel, so cut it a bit oversize and add a thick black mask to the appliqué. Cut the opening of the appliqué slot to match the LED size.

• Use special inkjet paper and use the high quality setting on your printer.

• A full-size zero adjustment potentiometer doesn't clear the PC board by much and requires bending some components out of the way. A miniature pot is a good idea.

• Give the Loctite enough time to set up before attaching the appliqué. I didn't, and you can see a blue circle where one screw leaked onto the backside of the appliqué.

• The front panel is only 0.038 of an inch thick, so it requires attention to prevent the countersink from going right through the panel.

• Precisely aligning the appliqué takes a bit of time. Accordingly, use an adhesive that allows sliding the appliqué over the panel. Contact cement is not a good idea!

• In general, remember the old carpenter's maxim: Measure twice, cut once.

Although I originally thought I would run the ESR meter from a 12-volt wall-wart power supply, I changed my mind and decided to make it battery-powered. I epoxied two 9-volt battery holders to the plastic case to provide 18 volts in series connection. A pair of fresh alkaline batteries will give about 10–12 hours running time. Using a 78L09 with 18 volts input and a current draw of 50 mA places it at

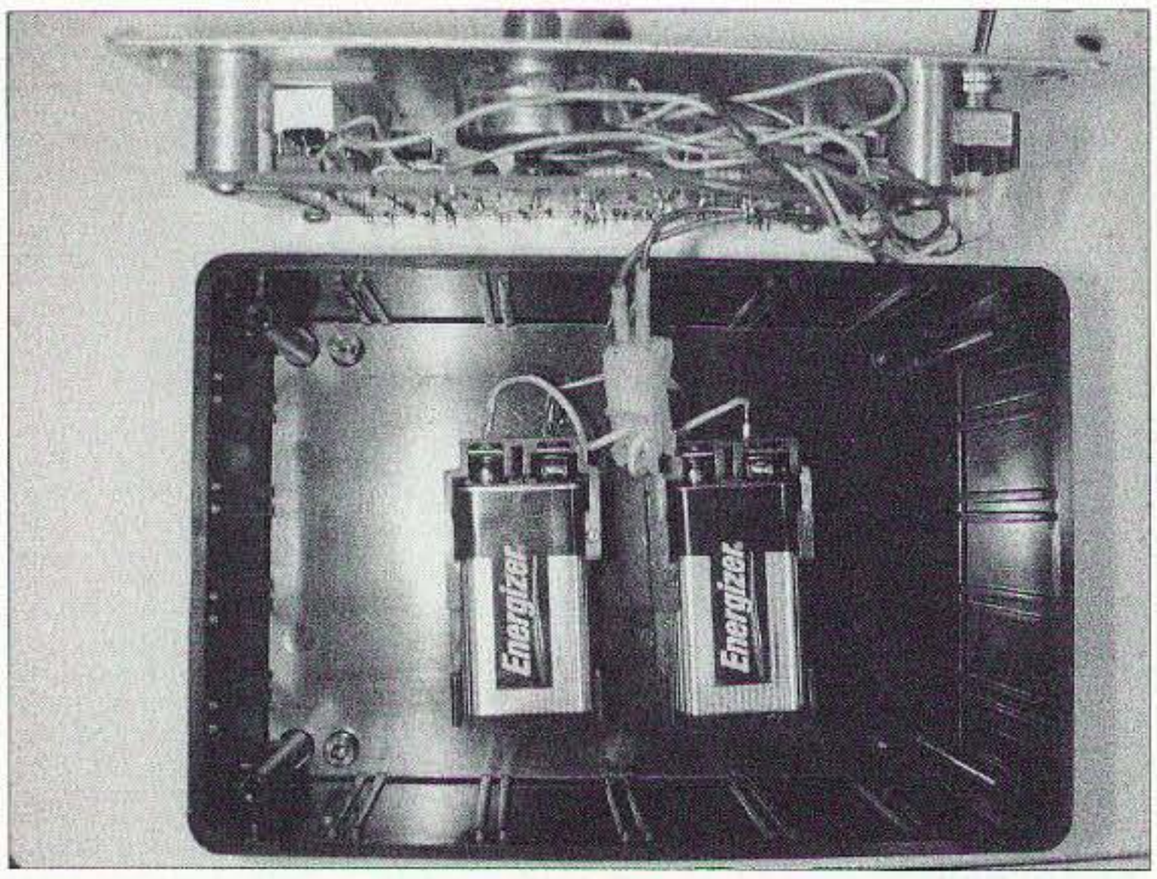

Photo H. *Board mounted to the front panel and battery holders.*

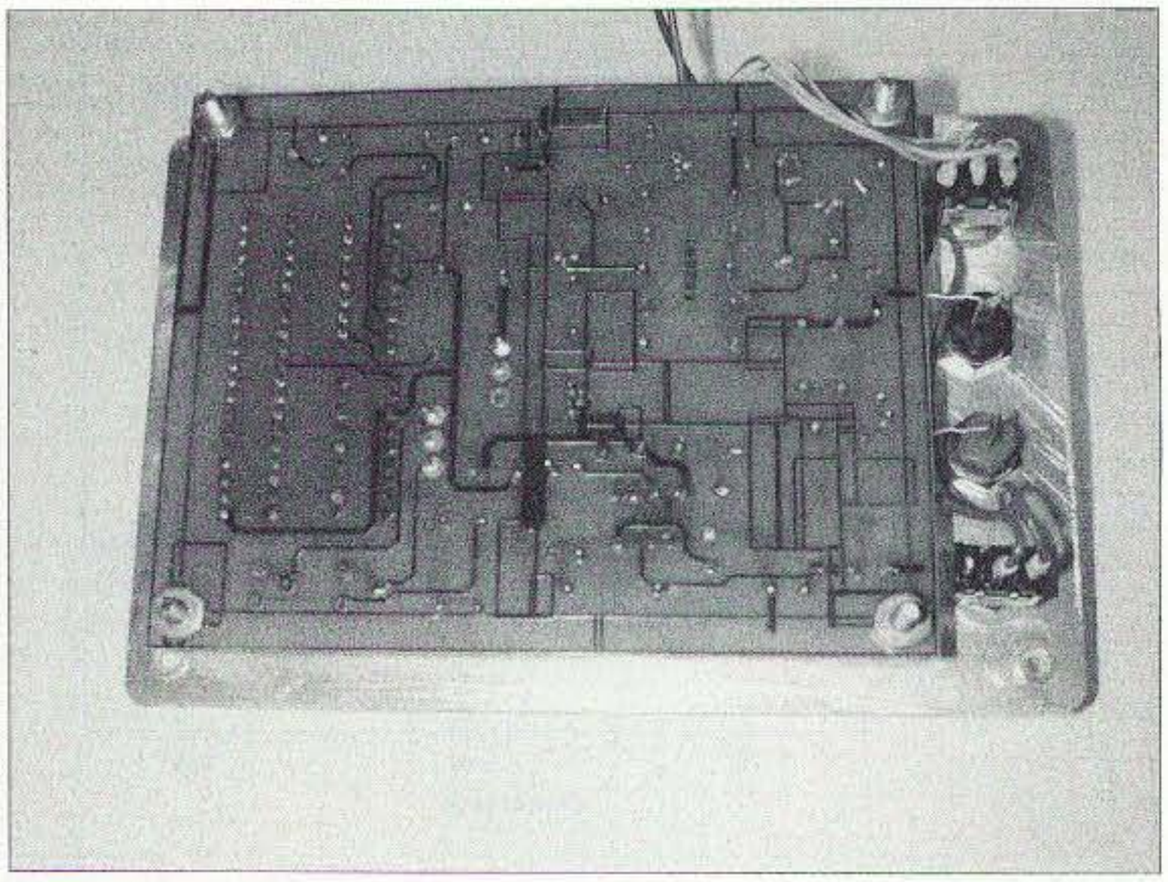

Photo I. *Back view of PC board mounted on the panel.*

the edge of its dissipation specifications. Hence, I made a heatsink out of a piece of 3/8-inch-diameter aluminum rod and slipped it over the 78L09.

How to use the ESR meter

It isn't usually necessary to remove a capacitor from its circuit before testing. Just put the test leads across the capacitor and read the ESR. Of course, first remove power from the equipment and allow time to discharge the capacitors. If you inadvertently attempt to measure a charged capacitor, diodes D2 and D3 will limit damage to the instrument.

Remember that long test leads, or coiled test leads, add inductance and will add some apparent ESR.

In general, the higher the voltage rating, the lower the ESR for the same capacitance. The larger the capacitance value, the lower the ESR. Tantalum capacitors have much lower ESR than an equivalent aluminum electrolytic. In addition, special low-ESR capacitors are made for switching power supplies and can have an ESR of a few milliohms.

I've plotted 100 kHz ESR data for two types of leaded aluminum electrolytic capacitors manufactured by Nippon Chemi-Con. These are only guides, however, and the best comparison will be a known good capacitor of similar value and voltage rating by the same manufacturer.

A defective electrolytic will display an ESR of several times that of a good unit.

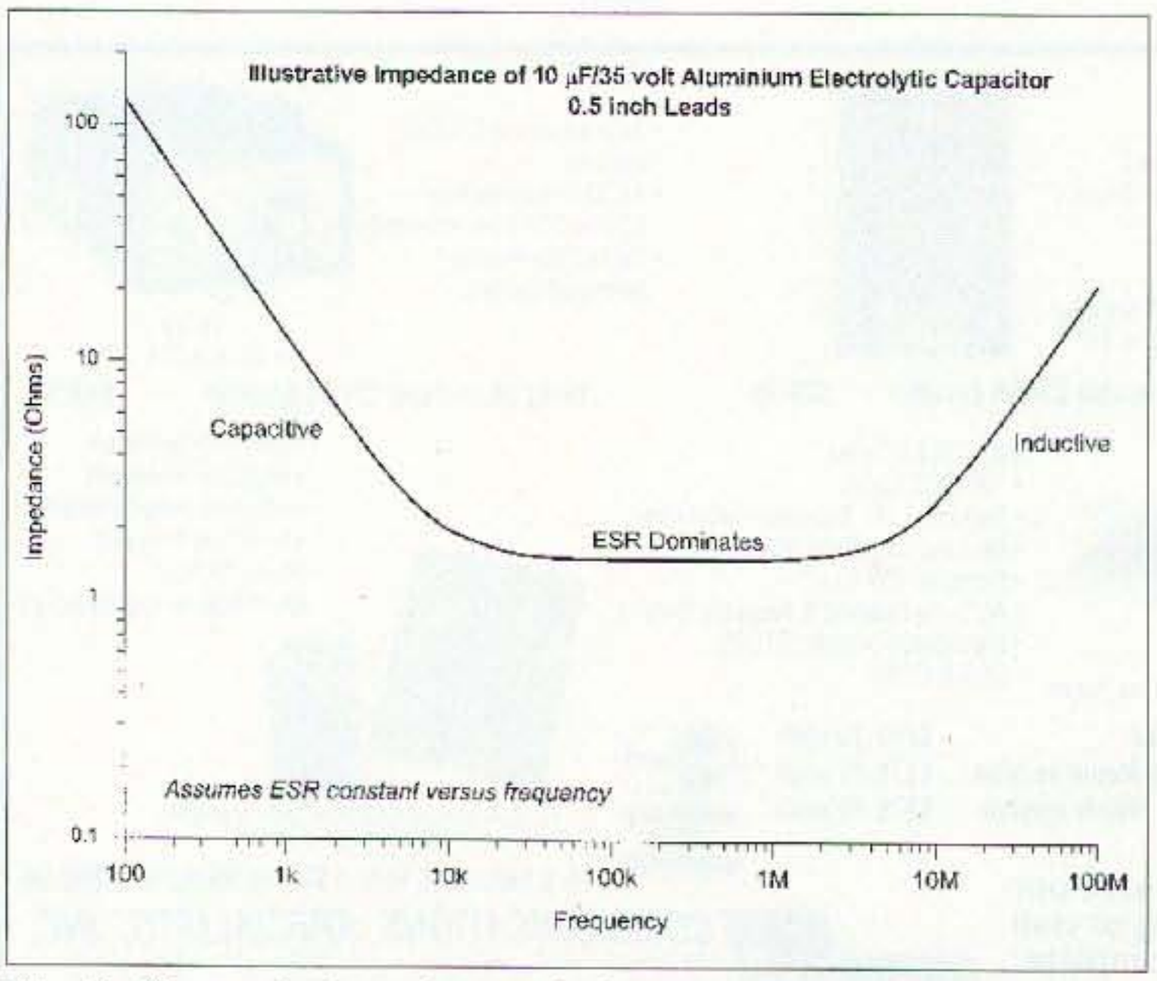

Fig. 9. *Illustrative impedance of 10 µF/35 V aluminum electrolytic capacitors, 0.5-in. leads.*

References

1. Kemet Electronics has several technical notes available at its Web site [http://www.kemet.com]. Of particular interest are: *What is a Capacitor?* F-2856E; *Tantalum Leaded Performance Characteristics* (09/01 edition).

2. A data sheet for the LM3914 LED graph display chip can be found at National Semiconductor's Web site [http://www.national.com/ds/LM/LM3914.pdf].

3. Many capacitor manufacturers provide detailed ESR data. See, for example, Cornell Dubilier Electronics [http://www.cornell-dubilier.com/]. Nippon Chemi-Con's electrolytic capacitor catalog is available at [http://www.chemi-con.co.jp/pdf/catalog/ALUMINUM/E/all/al-1001d-e-all-010730.pdf]. AVX Corporation's ESR data for tantalum capacitors can be found at [http://www.avxcorp.com/docs/masterpubs/tantlead.pdf]. 73

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K.I.S.S. Trickle Charger

And the ABCs of battery maintenance.

After my battery charger article in the March 2000 issue of 73 Magazine was published, I received dozens of letters, calls, and E-mails asking if some chargers might OVERCHARGE some batteries. The simple answer is "YES."

When we have a discharged battery, we generally want to quickly recharge it and get it back in service as soon as possible. The only way to achieve that is to use a charger with a high current output. But high current creates heat and heat destroys batteries.

In the 1960s, Motorola developed the famous HT 200 "BRICK" handie-talkie, and the charger was as simple as it could get. A transformer, a diode, a pilot light, a line cord, a fuse, and a case to put it all in. There was no filter capacitor. The pilot light was used to limit the amount of current that would charge the nicad battery.

When someone discovered that this circuit could overcharge the battery if left on for an extended period of time, another pilot light and an SPDT switch were added. One light was used for high current and the other for trickle charge.

Fig. 1 is the simple circuit that was used at that time.

Most batteries are "CURRENT" sensitive, not "VOLTAGE" sensitive, except for the relatively new Li-on, "lithium ion" types. These are quite voltage sensitive and SHOULD NOT BE CHARGED IN OTHER THAN AN APPROVED Li-on charger. Limit the current and you can charge most batteries with almost any voltage higher than the rated battery voltage.

Nicad batteries, as well as other types, are rated in ampere hours. Manufacturers rate their batteries according to the chemistry used. One may rate an AA battery at 600 mAh (milliampere hours), while another may rate theirs at 800 mAh. **Table 1** shows some examples of popular battery cell manufacturers as they rate their cells.

This means that an 800 mAh battery cell is expected to deliver 800 mA for 1 hour, before dropping to the 1.1 volt per cell rating that is a standard adopted by most of the industry. Some manufacturers say 1 volt per cell. This is true in all nicad battery packs of all sizes and types. If a cell is allowed to

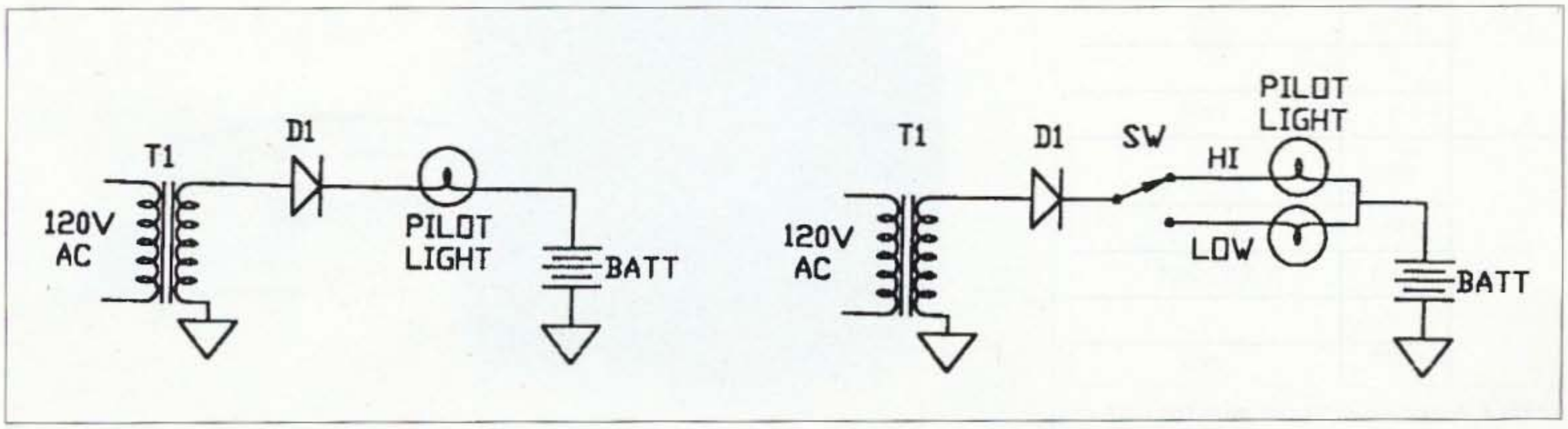

Fig. 1. Motorola HT200 charger circuits.

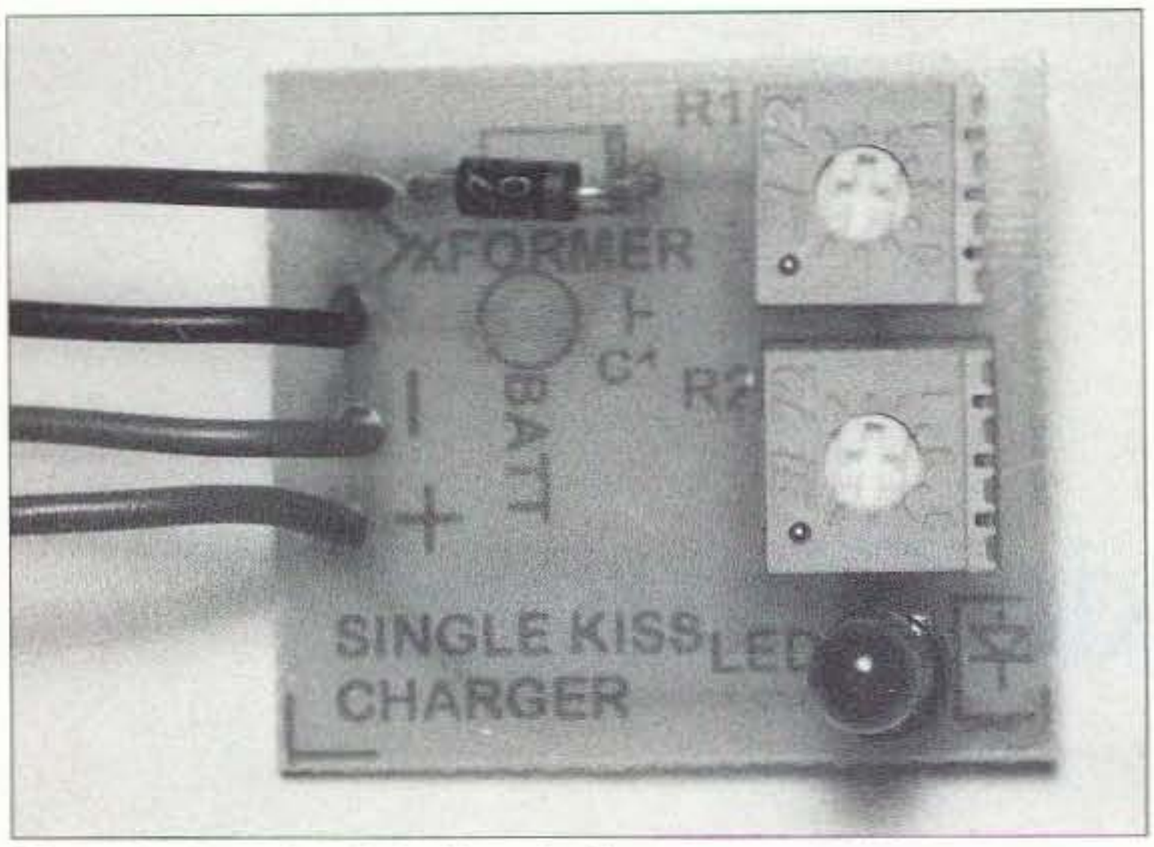

***Photo A.** Completed single-unit charger.*

go to zero volts, there is an 80% to 90% chance of cell voltage reversal, and resulting destruction of that cell. It is almost impossible to ever reverse this problem.

Never discharge a battery completely

Most manufacturers of battery-operated equipment such as HTs, camcorders, and laptop computers tell us to "COMPLETELY" discharge the battery once in a while and then recharge it. Taking this literally, you might be tempted to use a pilot light or a short piece of wire across the terminals to DISCHARGE the battery completely. DON'T DO IT! In most cases this will destroy the battery. What the manufacturers really mean is to use the low voltage indicator that is built into most devices that shuts down the equipment when the battery reaches approximately 1.1 volts per cell, as an indicator, and to then recharge the battery. They don't mean to run the battery down to zero volts.

Most of us have many battery-operated devices and if we had to have a separate, expensive charger for each of the devices we could fill a small room with the chargers. Would you like to have a charging device that could charge and or maintain charges on AAA, AA, sub C, C, D, and 9-volt types almost all at one time? Well, read on …

Remember, nicads and most battery types are not voltage-sensitive. Depending on your choice of the power transformer for the circuit, you could easily charge 8 battery cells at one time, except the "D" and 9-volt types. D cell types would need a little more current for trickle charge than the standard 20 mAh LEDs will handle. For the D cells use the high-current 50 mAh LEDs. Use 2 volts per cell to calculate

Type	Size	Capacity (mA)
Globtek NiCad	AAA	300
	AA	600–900
	Sub C	1300–1800
	C	2000–2500
	D	4000–4500
Globtek NiMH	AAA	550
	AA	1200
	Sub C	1800–2400
	C	3200–3500
	D	9000
Panasonic NiCad	AAA	250–280
	AA	580–1080
	Sub C	1350–2100
	C	2300–3000
	D	4400–5500
Panasonic NiMH	AAA	550–650
	AA	1000–1500
	Sub C	2800
	C	—
	D	6500
Sanyo NiMH	AAA	730
	AA	1450–1650
	Sub C	2100–3000
	C	—
	D	7300

***Table 1.** Some examples of popular battery cell manufacturers as they rate their cells.*

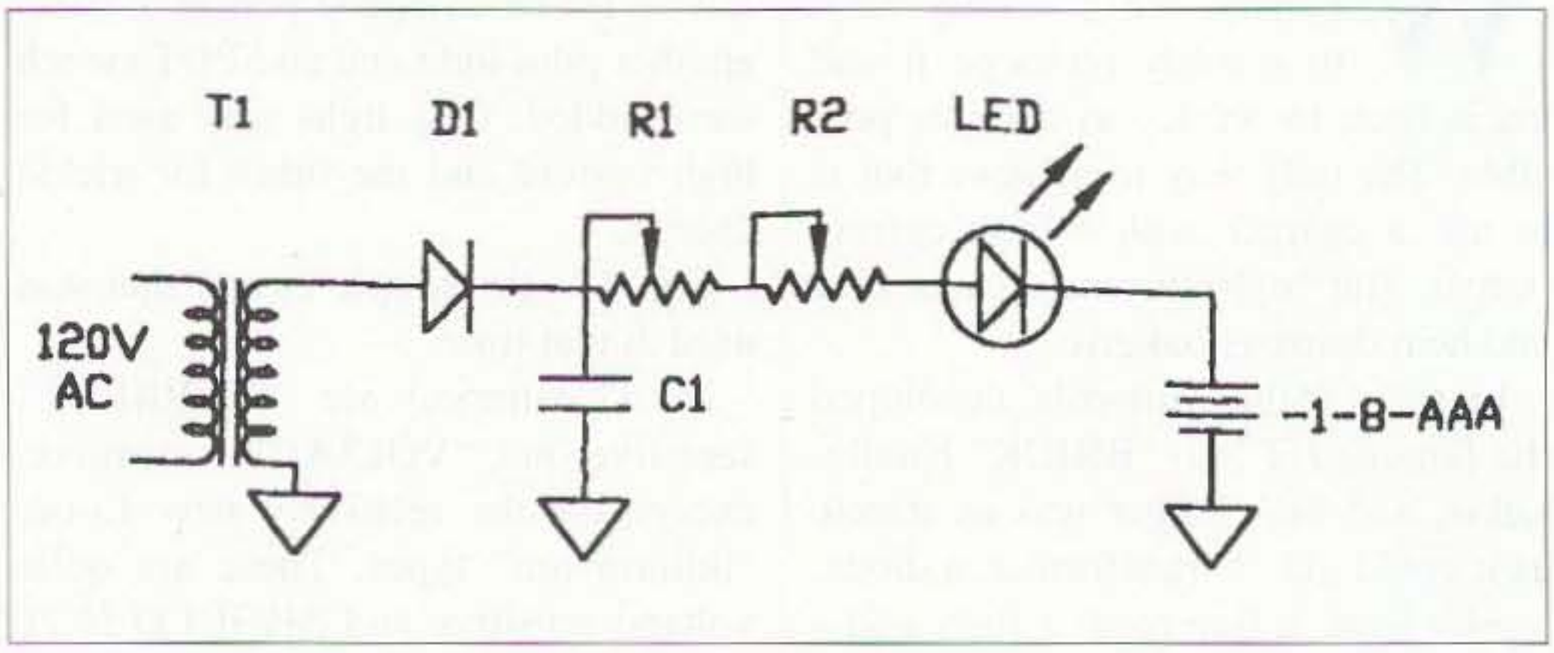

***Fig. 2.** New charger, single circuit.*

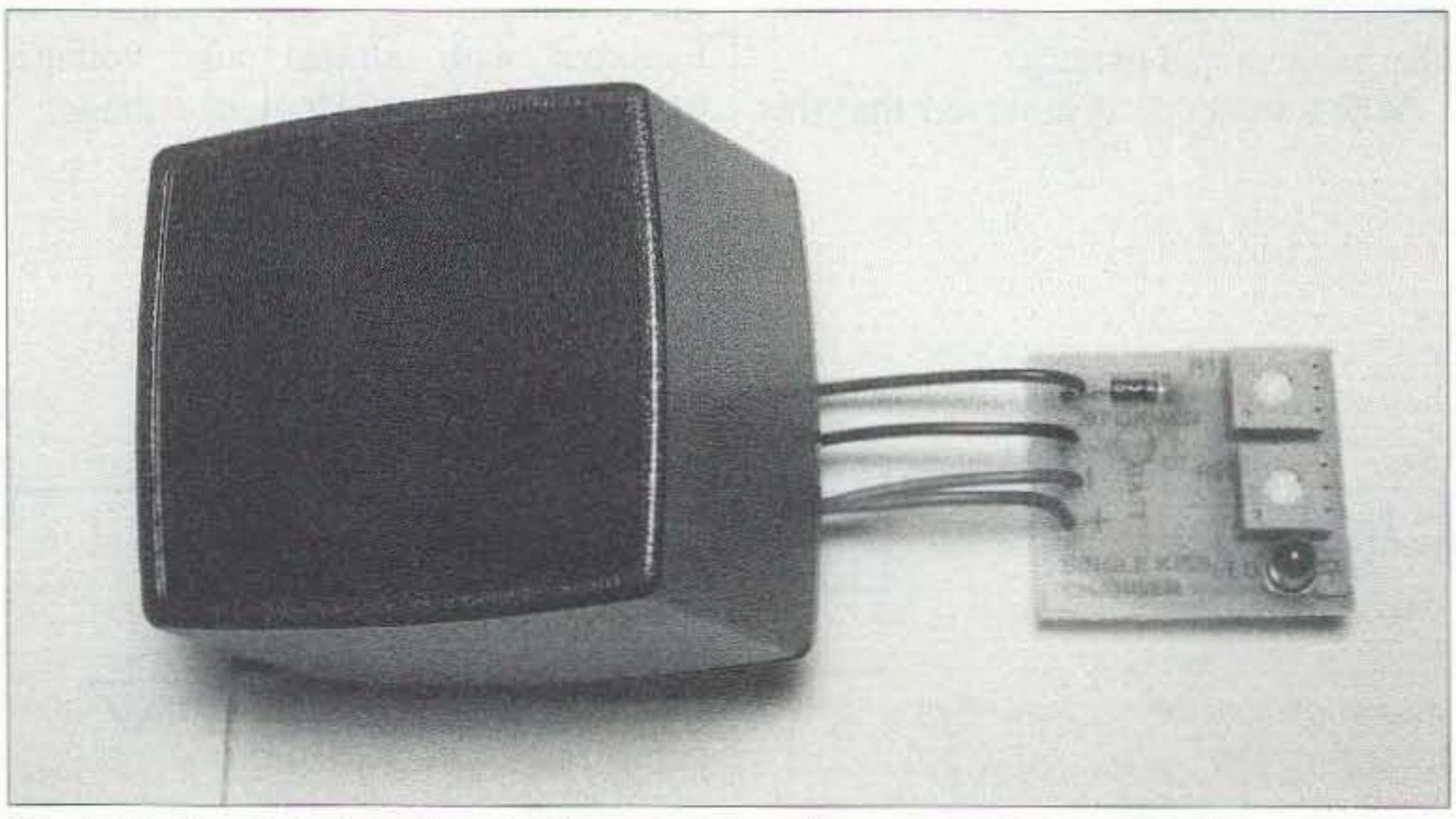

***Photo B.** Completed single-unit charger with wall-wart–type power supply.*

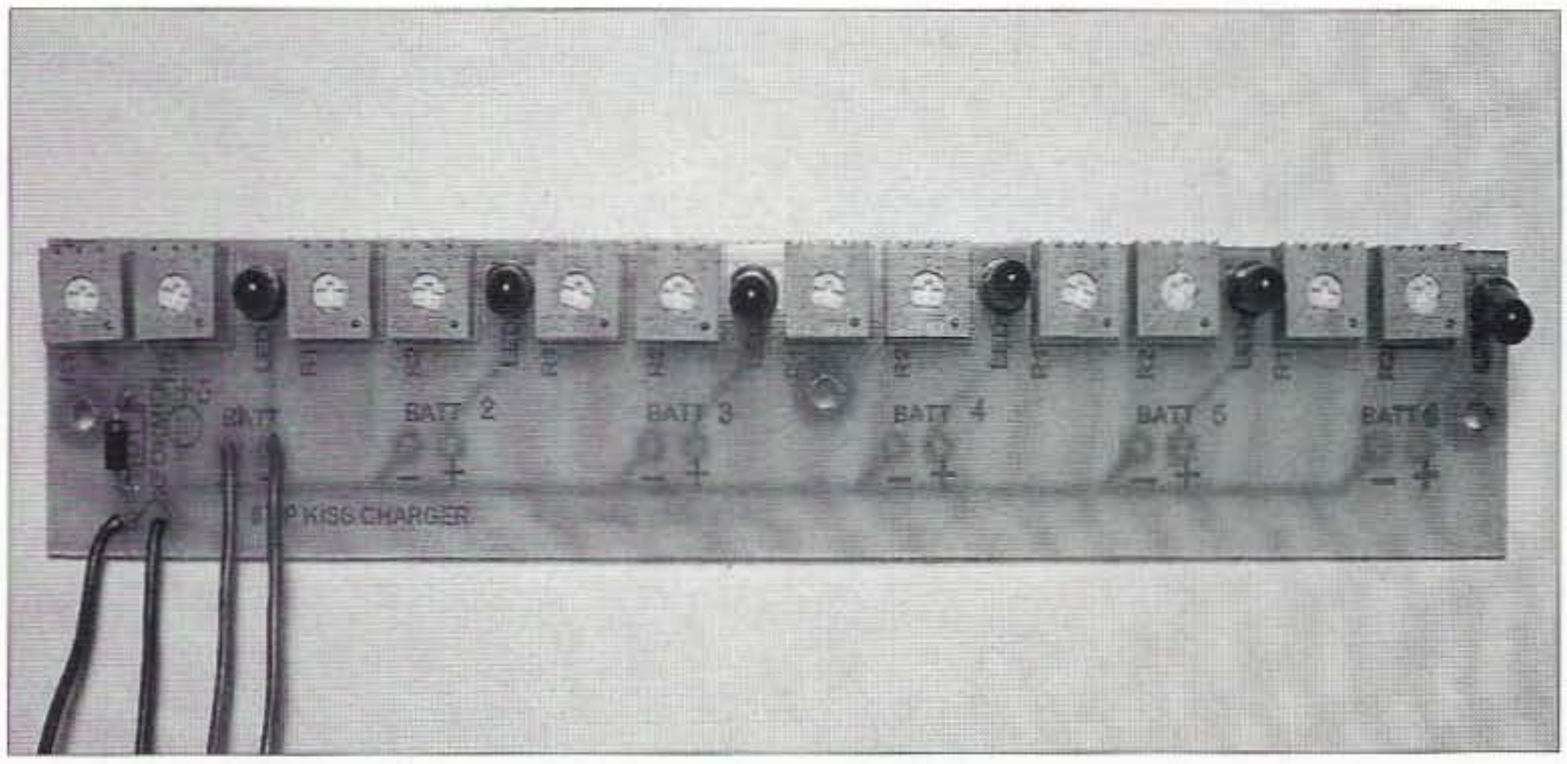

***Photo C.** Completed six-unit charger.*

your transformer size and you won't go wrong. All 9 volt batteries are NOT really 9 volts. There is not enough room in the standard package for enough high current cells for 9 volts. Some battery packs use more lower

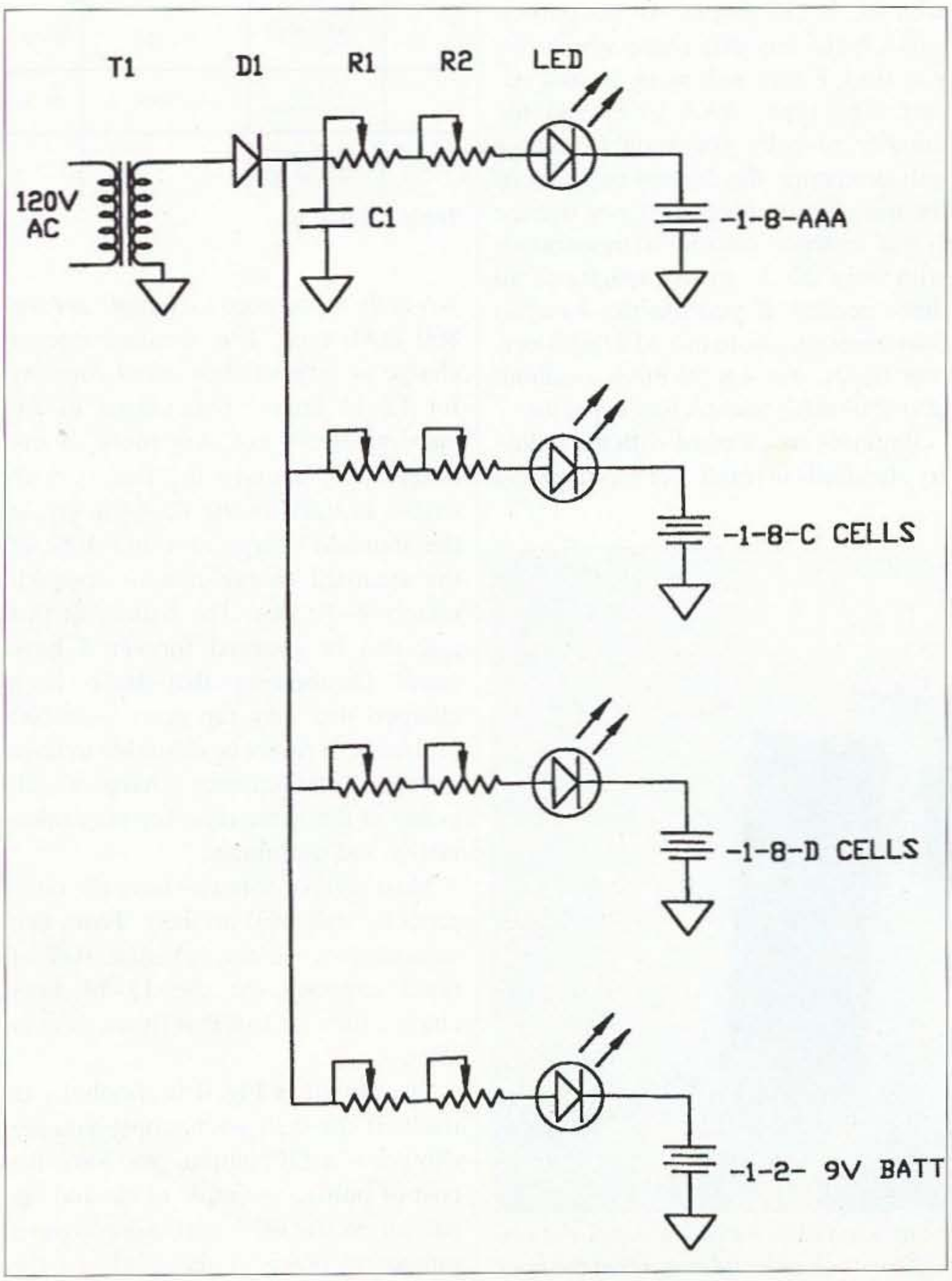

***Fig. 3.** New charger, 4 circuits.*

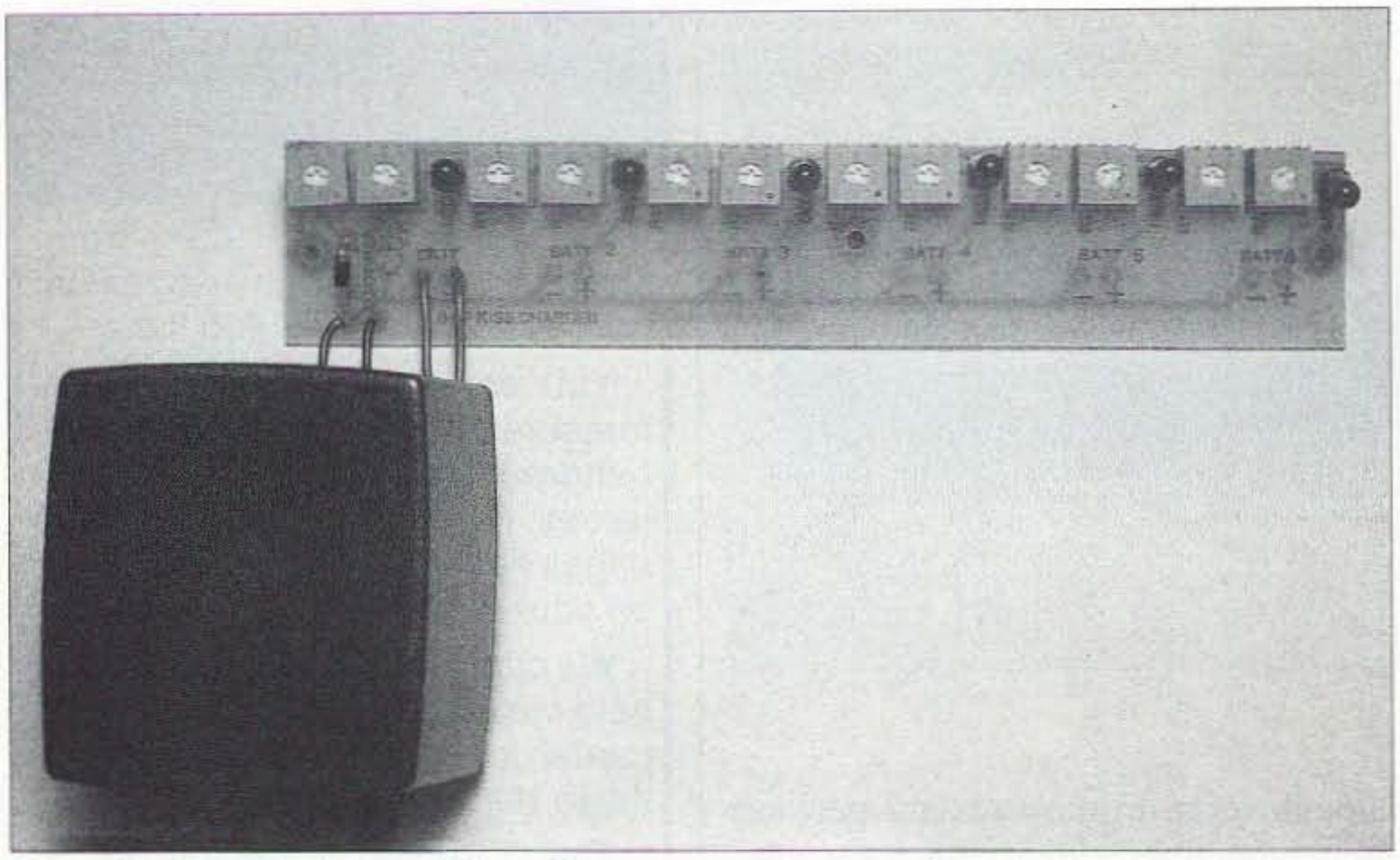

***Photo D.** Six-unit charger with wall-wart-type power supply.*

current cells that add up to 9 volts but have lower current available. Read the battery label carefully.

Let's look at a circuit that will charge and or maintain the health of ALL rechargeable batteries including lead–acid, nicad, and nimh. ALL of these battery types can be charged by limiting the charging current.

Let's use 8 "AA" batteries for starters. So 8 x 2 volts = 16 volts. There are lots of 18-volt transformers available at hamfests, Radio Shack and other stores for not much cost. Look for a "wall wart" or plug-in transformer with AC or DC output. At this point it won't make any difference which one you find. Either will work in this circuit. The type, AAA to D and the number of cells you want to charge will determine the current capacity of the transformer needed. If you use the single charger circuit, a transformer with only 20–30 mAh capacity is all that's needed. If you use the 4-circuit board and choose to use ALL high-current LEDs, use 4 x 50 mAh, or about 200–250 mAh transformer capacity.

Batteries are charged with the industry standards in mind. Let's assume the

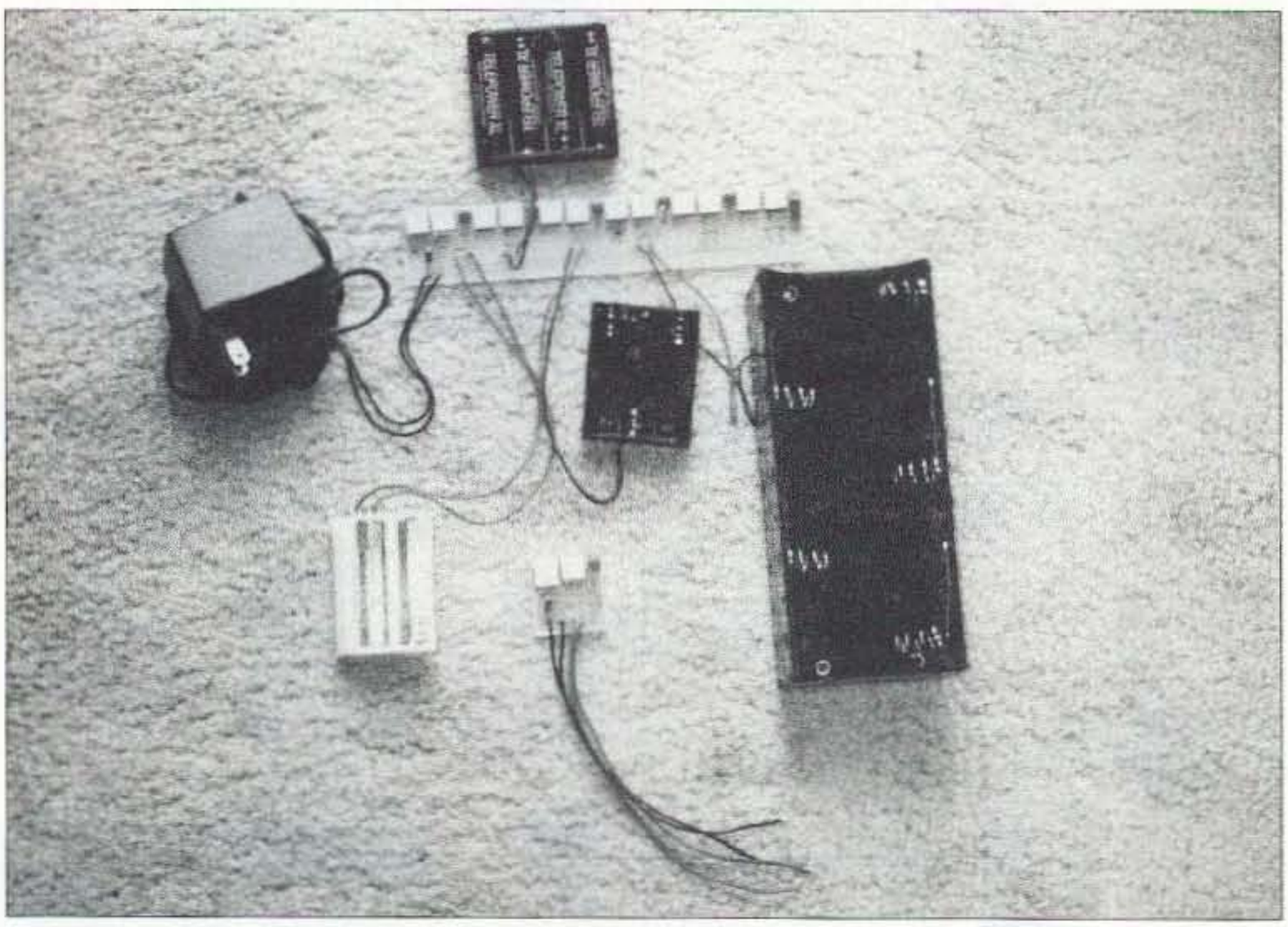

***Photo E.** This versatile charger is able to charge up to six different configurations of batteries, from single cells to battery packs, all at different voltages and currents at the same time.*

Part	Description	Radio Shack #	Cost
T1	Pri 120 VAC, Sec 25 VAC	273-1366	$5.99
D1	Diode, 2 per pack	276-1102	$0.59
R1, R2	2k pot, each	900-4673	$1.19
LED	Regular 20 mA LED, 2 per pack	276-330	$1.29
	AAA dual battery holder	270-398B	$0.99
	AAA quad battery holder	270-411	$1.49
	AA dual battery holder	270-408	$1.49
	AA quad battery holder	270-391	$1.69
	C dual battery holder	270-385	$1.49
	C quad battery holder	270-390	$1.59
	D dual battery holder	270-386	$1.69
	D quad battery holder	270-396	$1.79
C1	Almost any small filter cap	—	—

***Table 2.** Parts list.*

AA cells in the above example are the 800 mAh type. The standard rate of charge is 10% of their rated capacity for 12–14 hours. This comes to approximately 80 mA. Any more, or any longer may damage the battery with excess heat. After the 12–14 hours, at the standard charge rate, use 10% of the standard charge rate or approximately 8–10 mA. The battery at this rate can be charged forever. I have some Dustbusters that have been charged this way for years with NO problems. It might be desirable to have several "maintenance chargers" all going at the same time for maximum utility and usefulness.

Most cells or batteries have the rated capacity indicated on them. From that information you can calculate 10% of rated capacity for the 12–14 hour charge, then 10% of that figure forever after.

The circuit in **Fig. 2** is simplicity in itself. If the wall wart supply you are using has a DC output, you save the cost of putting a simple diode and capacitor on the PC board. Simply put a jumper in place of the diode on the board and leave out the filter cap. If the

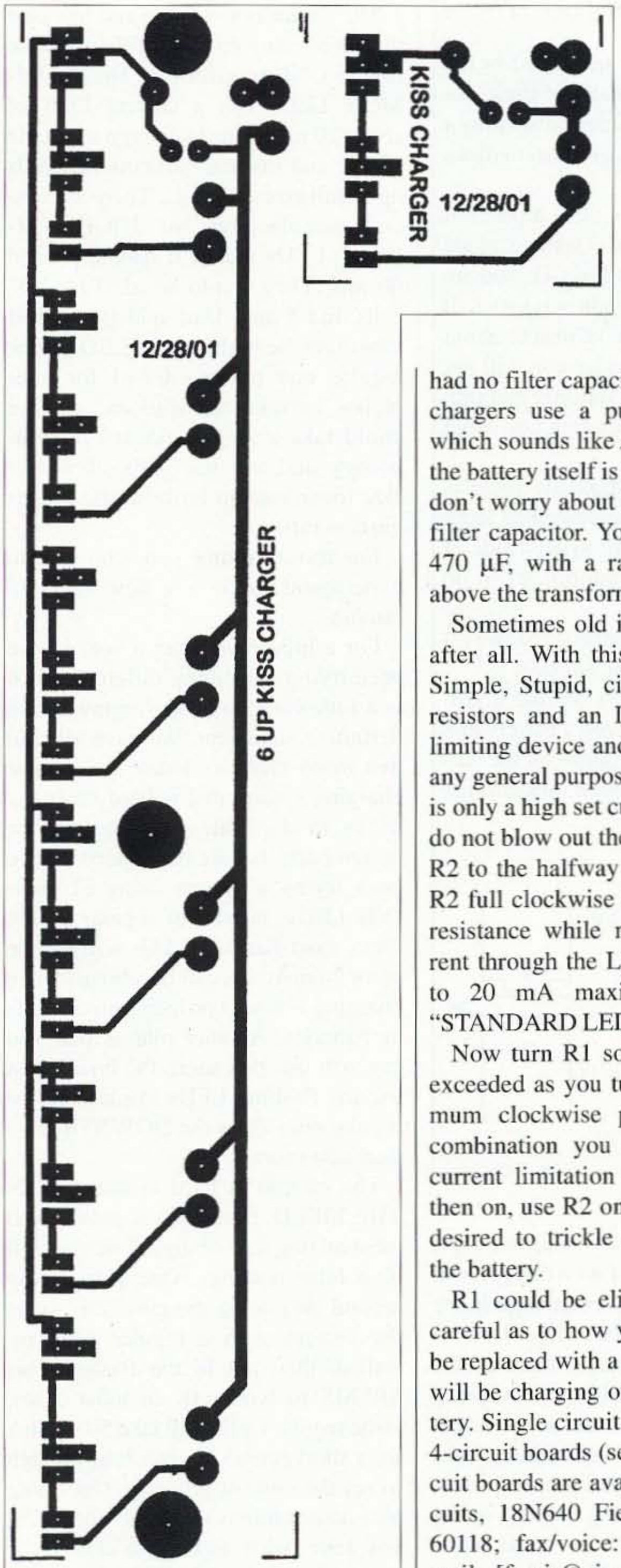

Fig. 4. PC board foil layout, 1-up and 6-up.

wall wart is AC output, install D1 and the filter cap on the PC board.

Remember, the Motorola charger had no filter capacitor. Most of today's chargers use a pulse charge circuit, which sounds like AC, doesn't it? Well the battery itself is a very good filter so don't worry about installing much of a filter capacitor. You can use 22 µF to 470 µF, with a rated voltage that is above the transformer output voltage.

Sometimes old ideas are not so bad after all. With this NEWER, Keep It Simple, Stupid, circuit, we use small resistors and an LED as the current limiting device and an indicator. D1 is any general purpose rectifier diode. R1 is only a high set current limiter so you do not blow out the LED. Turn R1 and R2 to the halfway position. Then turn R2 full clockwise slowly to minimum resistance while monitoring the current through the LED; and the battery to 20 mA maximum if you use "STANDARD LEDs."

Now turn R1 so that 20 mA is not exceeded as you turn R2 to the maximum clockwise position. With this combination you cannot exceed the current limitation of the LED. From then on, use R2 only to set the current desired to trickle charge or maintain the battery.

R1 could be eliminated if you are careful as to how you set R2, or it can be replaced with a fixed resistor if you will be charging only one type of battery. Single circuit boards (see **Fig. 2**), 4-circuit boards (see **Fig. 3**), and 6-circuit boards are available from Far Circuits, 18N640 Field Ct., Dundee IL 60118; fax/voice: 847-836-9148; E-mail: [farcir@ais.net]. Or the circuit can be built in about the size of a postage stamp on a simple vector- or prototype board.

Remember, I stated that you could literally charge as many types and

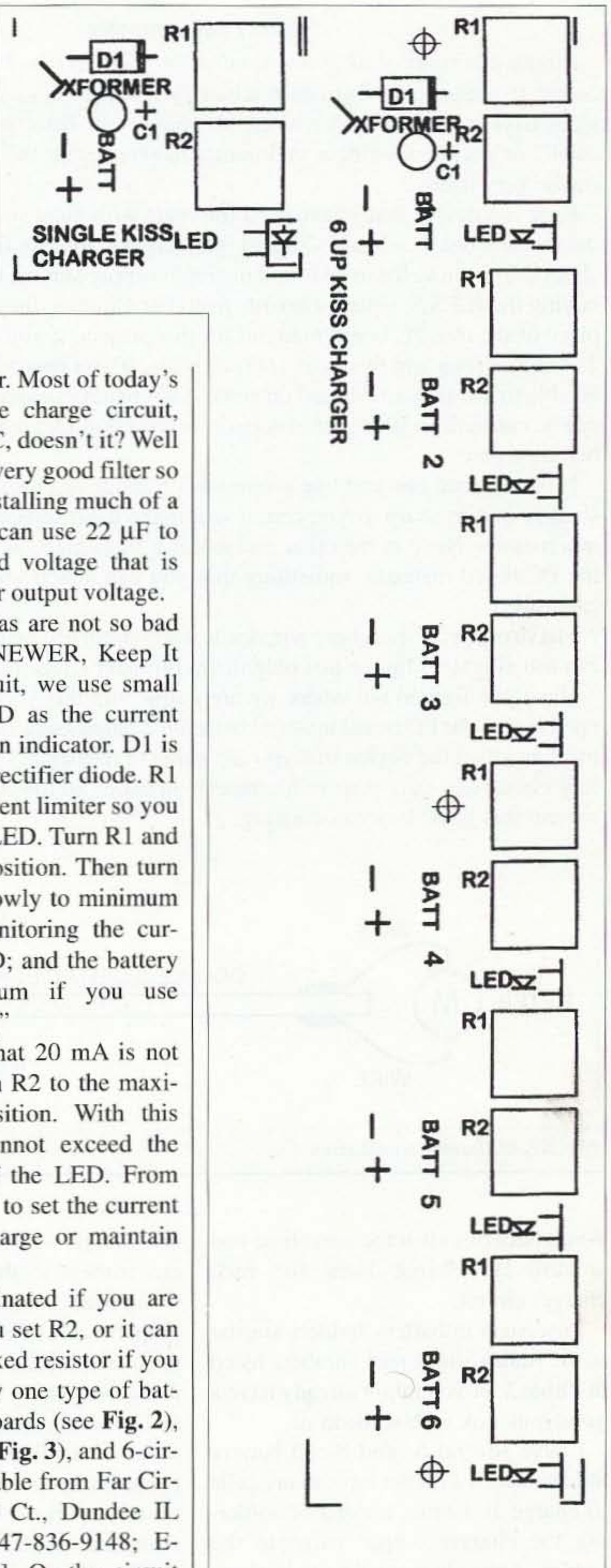

Fig 5. Component placement.

quantities of batteries as your heart desires. With the 4-circuit board you could charge some AAA, AA, C, and

Handy Milliammeter

I think that most of us at one time or another have had the need, and or the desire, to measure the current in a battery-operated device. Many of these devices have a battery holder where the battery or batteries snap down into a "well" or pocket. Getting a multimeter in series with the batteries sometimes can be very trying.

Here is a device that I have used for years with great success. Get a piece of the thinnest double-sided PC board material that you can find — some is made about 0.015 thick. It can be found in ample supply at most hamfests. (If you are buying the K.I.S.S. Charger boards from Far Circuits, they might send a small piece of the thin PC board material for this project, if you ask.) Cut it to about 2–3 inches long and by about 1/4 inch wide. If you make it wider you will not be able to use the same board on some AAA battery devices. Material that thin can be cut easily with a pair of scissors — just don't let the YL catch you using her good pair …

Next, sharpen one end like a screwdriver blade or chisel. Make the angle as shallow and as sharp as you can; it will make the insertion, as described later, much easier. Next, at the other end solder a short piece of wire to each side of the PC board material, something that you can attach your multimeter to on each side.

I have one with short bare wire leads AND small test lead sockets; that way, I can use alligator clips or just plug the multimeter leads into the sockets.

Have you figured out where we are going with this yet? Just slip the sharpened end of the PC board material between 2 batteries or between a battery and the contact on the device that you are going to measure. This opens up the battery circuit and puts your milliammeter in series so that you can measure the current that your device is drawing.

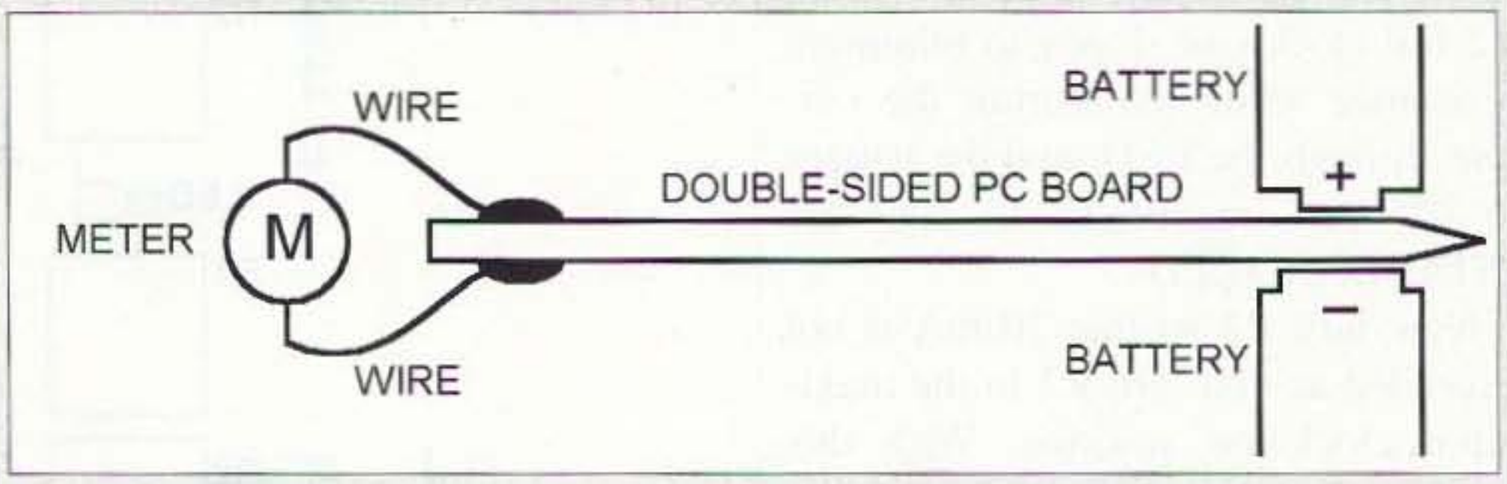

***Fig. S1.** Milliammeter adapter.*

9-volt batteries all at the same time and at different charge rates for each charger circuit.

I use snap in battery holders similar to the Radio Shack part numbers listed in **Table 2**, or you might already have a good junk box with some in it.

I have several 6- and 8-cell battery holders and if I do not have many cells to charge at a time, instead of soldering the charger output wires to the holders, I use alligator clips to hook up the needed number of cells. The individual cell connections are easy to get at in most of the cell holders.

If you have battery packs, such as used in HTs, camcorders, computers, etc. with no way to attach alligator clips, etc., to them, try this. Take a thin piece of wood with 2 nails driven through in the proper place, fasten the charger leads to them, and lay the battery contacts on the nails. Something a little more universal and easy to configure would be a thin piece of cardboard, with thumb tacks pushed through in the proper places; again, just lay the battery contacts on the sharp end of the tack … crude but it works, and can be configured for most battery types. The contacts on most batteries are steel, does that light up a bulb in your mind? Try using small magnets with wire leads to the charger. This works just fine.

The circuit is so simple and low cost that almost any number of them can be tied to ONE transformer. The "COMMON LED" has a current limit of about 20 mA. This is enough to trickle charge and maintain all common cells up to full size "C" cells. There are several manufacturers of HIGH-CURRENT LEDs that will handle 50 and 60 mA. They would be ideal for "D" cells and 5-amp lead acid types. Just substitute the high current LED for the regular one on one board for your higher current applications, or you could take a step backward in technology and use the grain-of-wheat-size incandescent bulbs at the proper current rating.

For those among you who like to experiment, here is a new route to pursue …

For a little more than a year I have been trying something different, but it is a little early to make too much of a definitive statement. We have all read that many chargers today use a pulse charging system that is hard for many of us to duplicate with the surface mount parts that are being used. I have been trying a system using FLASHING LEDs, instead of regular LEDs. First, most flashing LEDs will handle up to 70 mA; this can be a bonus when charging C and D or high-current cells or batteries. Another plus is that you can still use this same PC board; just use the flashing LEDs in place of the regular ones. Now the DOWNSIDE — they cost more.

The current is hard to measure IN THE FIELD, because it is pulsed, and most analog and or digital meters will give false readings. One partial way around measuring the current is to set the current with a regular LED installed, then put in the flasher. This SEEMS to work OK in most cases; some regular LEDs will take 50–70 mA for a short period of time, long enough to set the current properly. One more plus and/or minus is that in "theory" it will take twice as long to charge the battery because of the 50% duty cycle flashing on and off. On the other hand, pulse charging is supposed to take less time to charge.

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Experimenting with Hall-Effect Sensors

For fun and knowledge.

There are times hams get involved in some interesting technological experiments. Some of those experiments develop projects that apply to electronics and ultimately to ham radio.

Because of my interest in both experiencing technology and developing test equipment to make my life easier at the workbench, I tackled Hall-Effect sensors to see what I could learn about them and perhaps find an application for ham radio.

What's a Hall-Effect sensor? I'm glad you asked that question. Hall-Effect sensors are semiconductor devices that are sensitive to the presence of a magnetic field. When in the presence of a magnetic field they provide a voltage change response as a function of the flux field intensity. In fact, the sensors are also sensitive to the flux line direction as produced by a magnet.

I have an early date code sensor made by TI and I've been told that those early sensors were subject to thermal drift — mine exhibits a little. But the sensors being manufactured today by Allegro Micro Systems are temperature-stabilized using a technique referred to as "chopper-stabilization." Perhaps the using circuit is more subject to temperature effects than is the sensor itself.

I suppose your next question is, "So what is a Hall-Effect sensor good for?" Again, that's a good question as it leads me into a discussion of them. Actually, the use/application of a Hall-Effect sensor is limited only by your imagination. They come in two types: switching and ratiometric (linear). I'll limit my discussion and experiments to the linear sensor, since it offers the greatest window of opportunity for ham project development.

Applications

My personal interest in the Hall-Effect sensor was in understanding the linear device, though switching sensors are very important contributors to many project applications. In fact, Hall-Effect switching sensors were used in some computer printers to sense the end of carriage travel. They also work well in burglar alarm window and door movement detection in addition to a multitude of other uses.

I'll cite a few applications to give you a kick-start with ideas, but you need to think of additional applications as they apply to your needs and environment. Here is just a sample of possible uses: magnetic flux indication and intensity measurement; magnetic polarity detection; current sensing (AC and DC); power sensing; current trip point detection; strain gauge sensor; movement sensing and direction of movement; rate of change (movement); proximity sensing; liquid-level sensing; noncontact sensing; RPM measurements; object speed of acceleration/deceleration; position limit detection/switching; antenna position sensor; and wind direction and velocity sensor.

Experiments

To gain an understanding of how Hall-Effect sensors function, I set up a series of experiments on my workbench to evaluate the linear device that was available to me. It was a sensor manufactured by TI, circa 1985. The first step was to set up a circuit with sufficient metering to allow interrogation of the device to see how it reacted. **Photo A** shows the top side of my test board, and **Photo B** shows the bottom side. Operating at DC levels, the only purpose of the board was to keep all of the parts conveniently flying in formation.

Having limited previous experience with Hall devices, I wasn't sure what to expect, so that metering was essential. **Fig. 1** shows the basic circuit that I used to begin experimentation. For the first experiment, the objective was

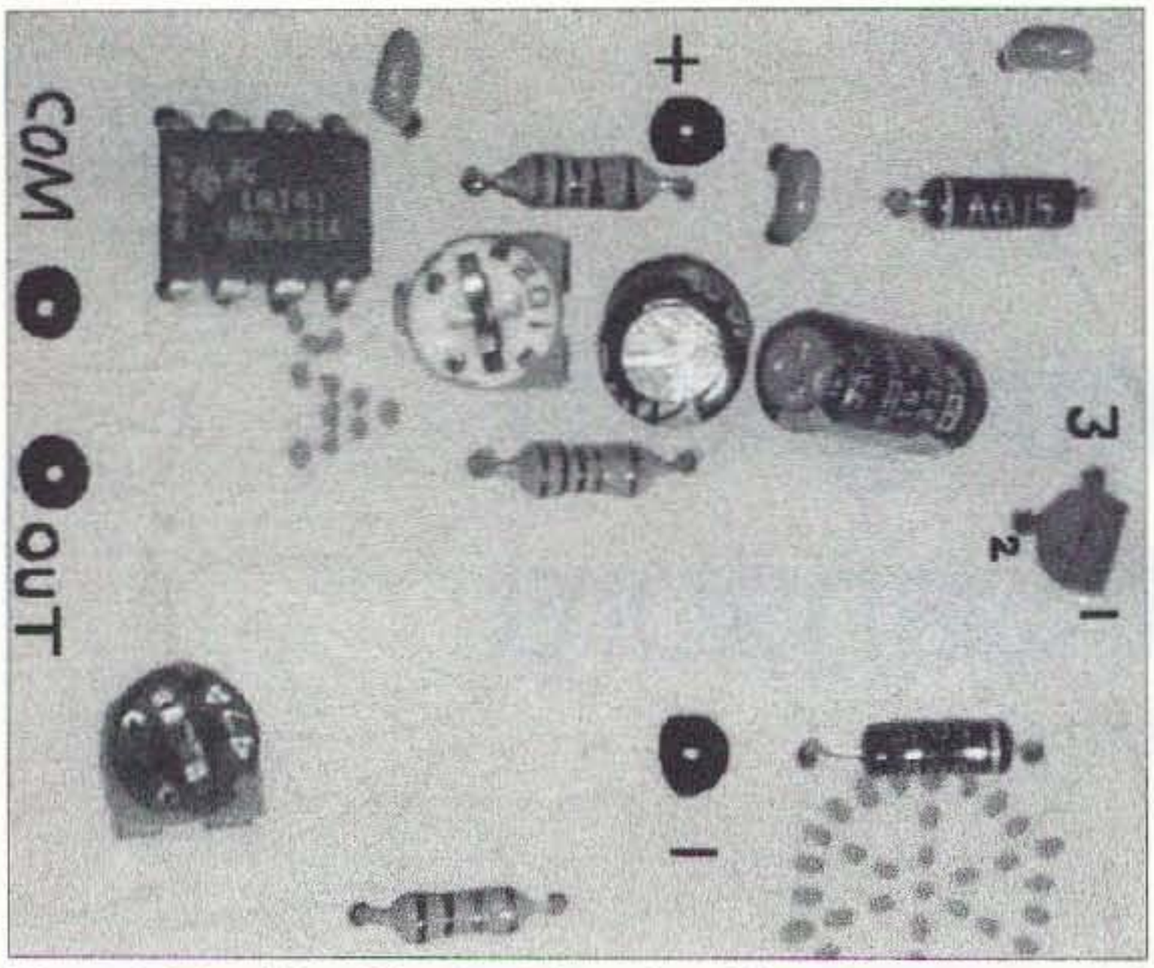


Photo A. *Top side of the circuit board used for experimenting with Hall-Effect linear sensors.*

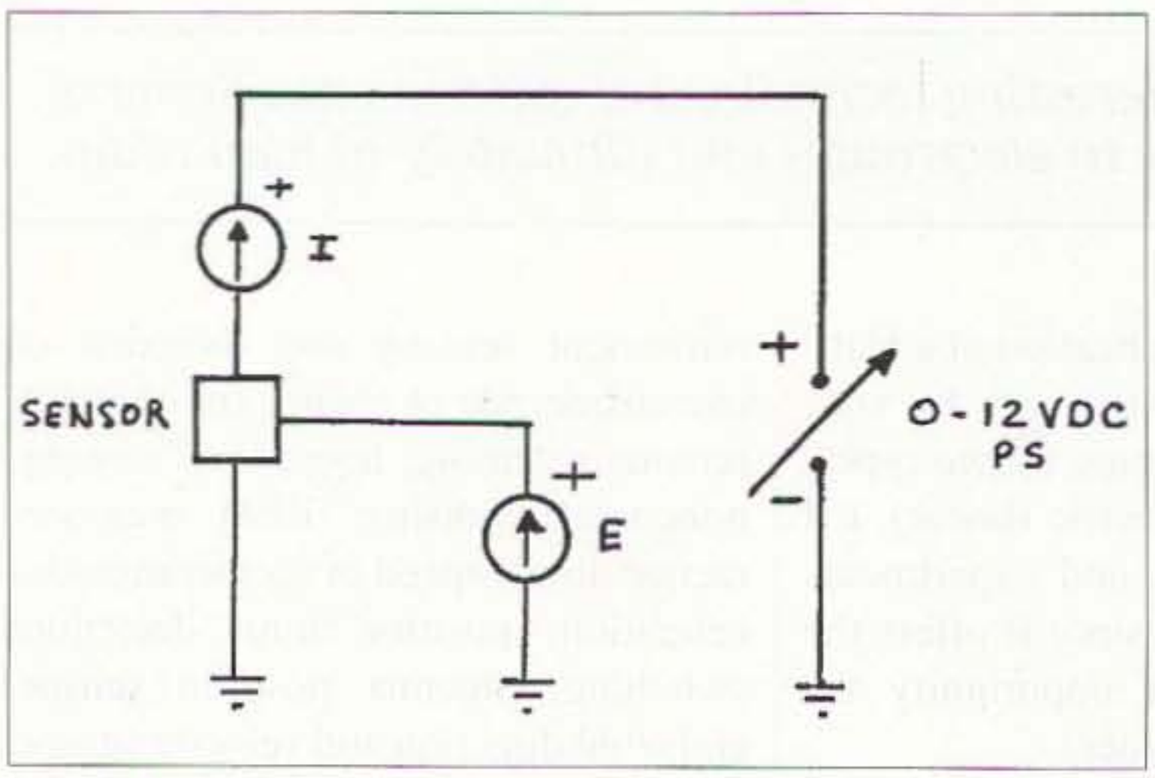


Fig. 1. *Basic circuit used for the first tests performed with a Hall-Effect sensor.*

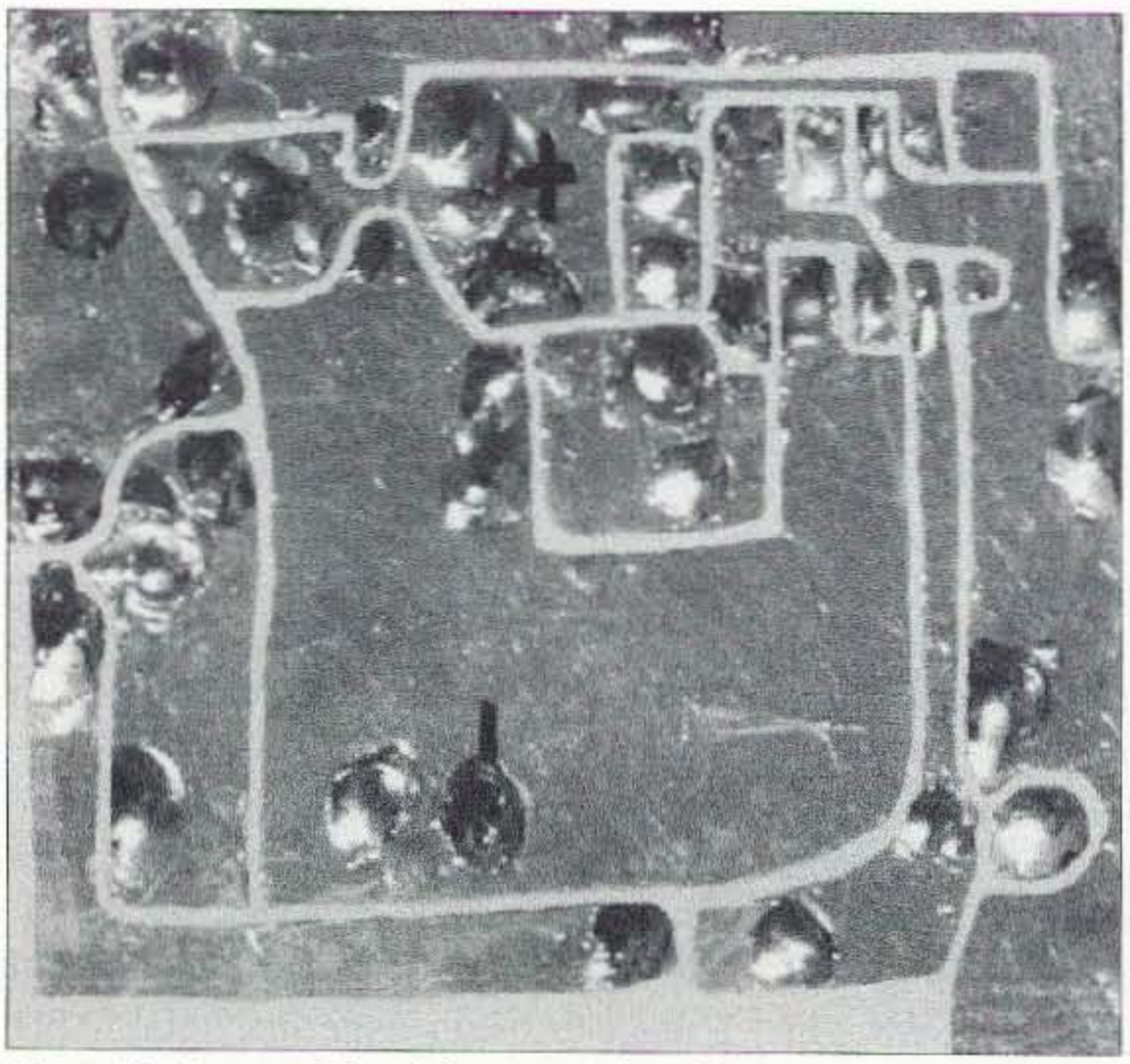


Photo B. *Bottom side of the circuit board.*

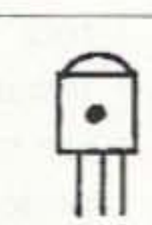
to determine device pin functions and to apply a suitable voltage to see how the device would respond. After doing an Internet search I determined that no test or technical data was available for my sensor. However, I did obtain comparable data from Allegro Micro Systems. **Fig. 2** shows the basic empirical spec information that I discovered through experimentation, allowing the TL173C sensor to be used in a project.

Once power was applied I determined that the nominal output voltage was approximately Vcc/2, and that was a good sign, but at that moment I didn't know what else to expect in the way of a response to a magnetic field. I did note that the sensor's output voltage was subject to change as a function of Vcc. Therefore, stabilizing the Vcc value with a regulator would be required for solving any serious stability issues. But for my experiments, only a small amount of regulation was used.

Knowing that a Hall device is sensitive to a magnetic field, I did wave a magnet close to the sensor and got an indication, though at a magnitude well below that expected. What I expected was the output voltage to swing between Vcc and ground during the test — but a much lesser swing was observed. **Fig. 3** shows the second test that I performed and the response obtained. The graph shows a generalized operational curve and a voltage swing away from QOP (Quiescent Operating Point) along the curve relative to the presence of a magnetic field.

It occurred to me that the magnetic lines-of-force had to pass through the device for it to respond properly. As I determined later, the Hall device that I was using provided a response perhaps in the range of 1–2 mV/gauss. Devices available from Allegro Micro Systems vary in detection sensitivity by device and provide an output from about 1 mV/gauss up to 5 mV/gauss.

With a VOM set to the 3-volt range and attached to the output pin of the sensor, a horseshoe-shaped magnet was



1 Output

2 Ground/common

3 + Vcc

Derived information

Vcc	3-5.5VDC
Vcc max	6V
Ic	4ma nominal
Sensitivity	Estimated to be 1-2mv/gauss
•	"sweet spot" for max sensitivity
Output swing	+/- 35mv
Gauss response	Linear
Response time	43 microseconds
Package	TO-92

Fig. 2. *The above data on the TL173C linear Hall-Effect sensor was derived empirically from experiments performed during bench testing.*

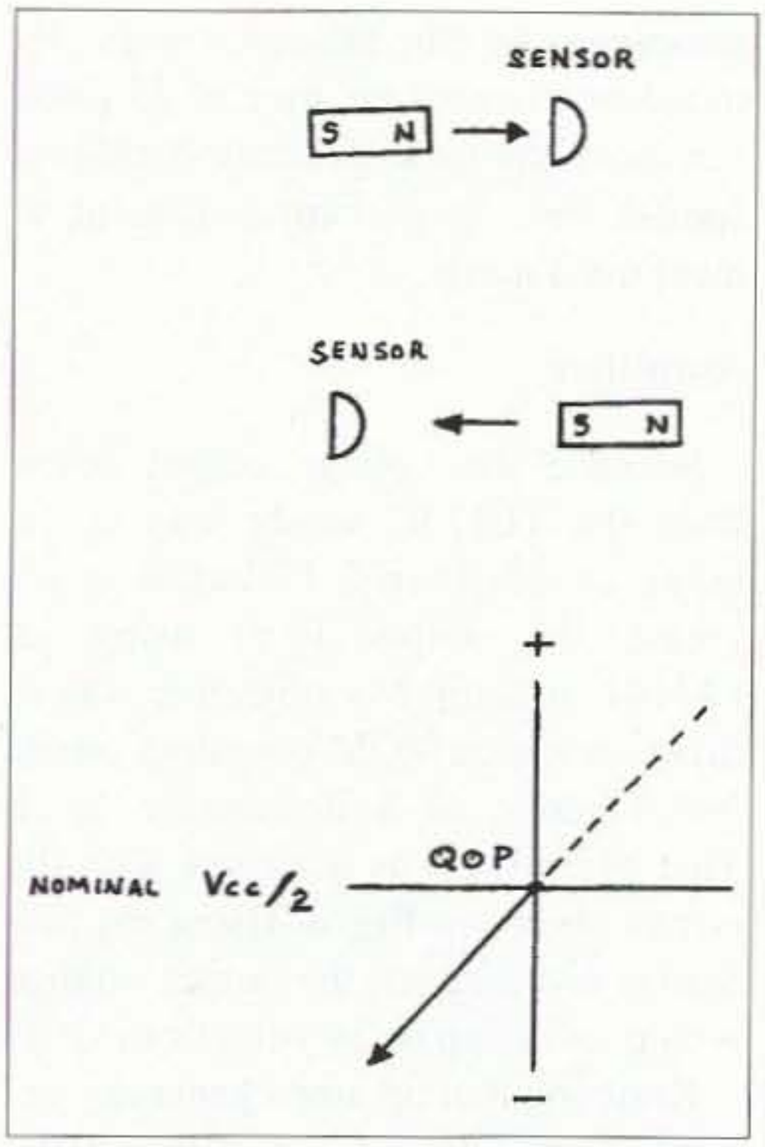


Fig. 3. Experiment showing the direction of voltage output from the sensor as a magnet of given polarity approaches the sensor. Approaching as shown, the output voltage decreases.

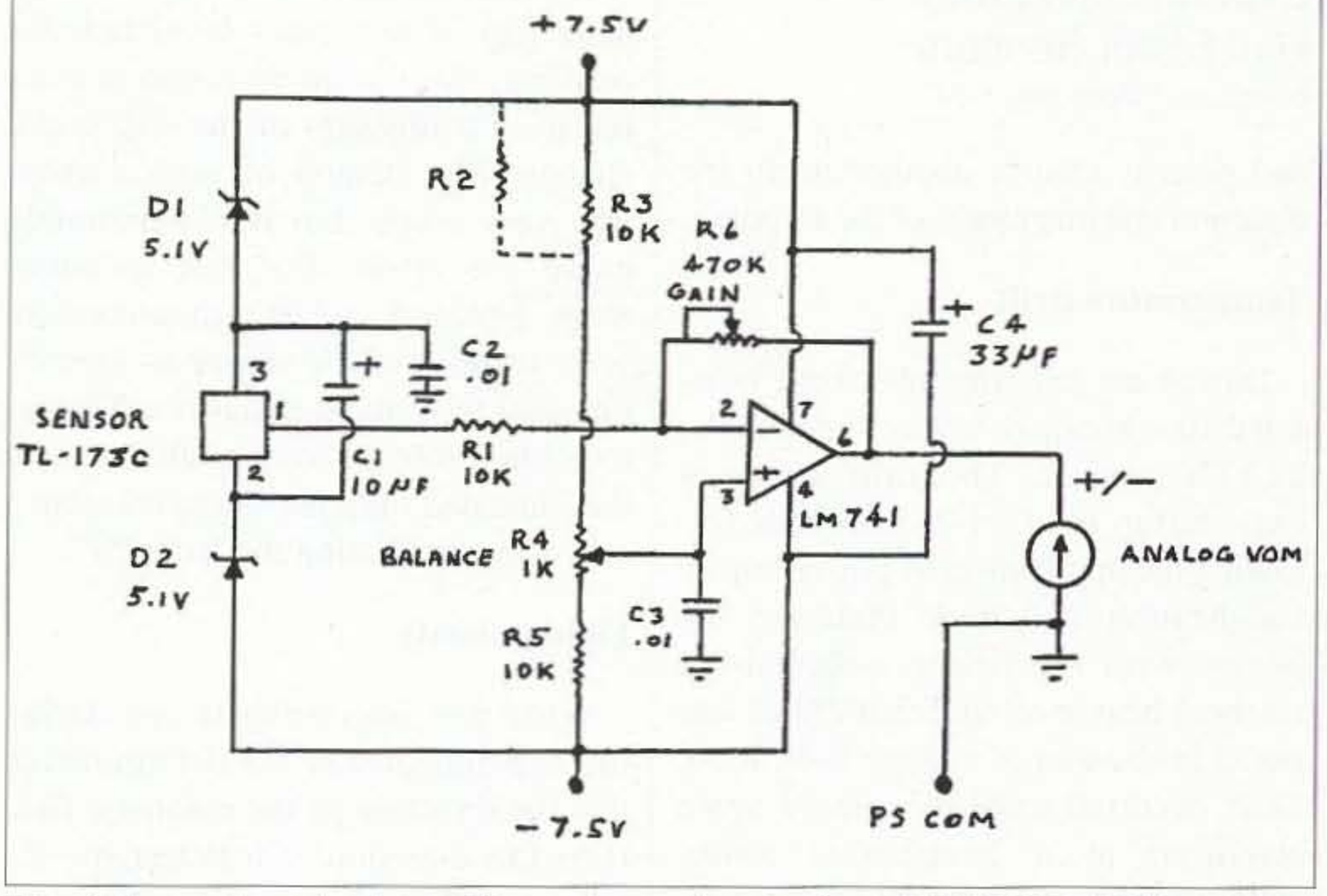


Fig. 4. A complete circuit used for testing and evaluating a TL173C Hall-Effect sensor. An op amp is used to raise the sensor's output voltage swing sufficiently to drive an analog VOM. Resistor R2 is used to create a balanced input into the op amp.

slipped over the Hall sensor. The output responded sufficiently to be evident, but not at a desirable level. However, the response was markedly greater than when only a single magnetic pole approached. My particular sensor provided a direct output voltage swing in the range of 25–30 mV. To obtain a larger output voltage swing, I assembled an amplifier using an LM741 op amp. A complete test circuit is shown in **Fig. 4**. Details of the amplifier will be discussed in another section. Now, knowing what to expect from the device made the remaining experiments much easier.

Several setups using magnets utilized in various positions provided some really interesting insight into possible device applications. During the initial experiment, a horseshoe-style magnet was used. A "sweet" spot was determined to exist at the near center of the device package. Another experiment involved placing a fixed magnet on one side of the sensor while approaching the sensor with a different magnet from the opposite side. The first magnet biased the sensor and shifted QOP along the response curve. Although the biasing magnet caused the output voltage to shift up or down (flux polarity) the operational curve, the detection sensitivity appeared to remain constant. Biasing the sensor to one side of its operational curve allows the device more room to swing in a given direction, placing the output voltage above or below the nominal Vcc/2 value. With an approaching magnet, the output would change as a function of field strength and distance to the opposite voltage value (if biased below, it would swing to a value above nominal).

In addition, with a biased sensor, as shown in **Fig. 5**, the approaching metal needn't be a magnet as long as it is ferrous. I tried approaching the sensor with a nonmagnetized metal shaft of a screwdriver, and the sensor was able to detect both the presence and movement of the shaft. This experiment implied that a biased sensor would work well as a tachometer or as a position sensor of a rotating antenna system.

Fig. 6 shows how the sensor may be used as a "null" or "off-null" sensing device. Any movement of the magnet right or left of the null point will cause the sensor's output to create a voltage

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Experimenting with Hall-Effect Sensors

continued from page 27

and polarity change appropriate to the direction and magnitude of the response.

Temperature drift

During my experiments, some heating drift was noted; it was traced to the TL173C sensor. The drift occurred only during the first 2–3 minutes following the application of power before stabilization occurred. Pinching the device with my fingers reduced the internal heat level and that effect was noted in the output voltage indication. Drift occurred until the sensor again stabilized at a temperature value. Judging from the Allegro Micro Systems' published information, sensors manufactured by them are chopper-stabilized to reduce or stop the tendency for thermal drift susceptibility.

Response linearity

From my experiments, I was able to determine two very important facts that relate to any application of the device. The output response is absolutely linear within the limits of the device as a function of gauss level. The assumption is that any open gap between the sensor and metal flux conductor remains constant as the gauss level varies.

The second fact relates to the magnetic gap. If the gauss level remains constant, the output response is nonlinear as a function of the gap width change. My method of measurement was very crude, but it did definitely prove the effect. For this measurement, I placed a plastic measurement scale in front of the sensor to identify physical movement distances. Magnet location distances were plotted against the indicated output voltage creating a curve approximating the letter "S".

Field polarity

What was interesting to me during the experiment was the determination that the direction of the magnetic field (flux line direction) was detectable. As shown in **Fig. 3**, reversing the magnetic poles caused the output voltage to reverse direction. As an example, if the output was indicating a positive offset of 1 volt from QOP (VOM reading), reversing the magnetic polarity caused the output voltage to drop 1 volt from QOP. This experiment also supported the theory of a linear response as a function of flux density.

Frequency response

Hall sensors are sensitive to motion that translates to an AC function. But what is the highest frequency that can be detected by a sensor? Actually, the frequency response is very low as compared to most ham radio applications where RF is involved. The highest-response frequency, from what I've been able to determine, was 23 kHz for the TL173C device. Perhaps newer sensor designs will allow for an increase in response frequency. For non-RF applications, a response of 23 kHz is generally fast enough to be usable as a movement sensor/detector. The frequency of 23 kHz translates to a response time of 43 µsec. For most any ham application, that response time is perhaps sufficient to meet most needs.

Amplifier

Because the voltage output swing from the TL173C sensor was in the range of 25-30 mV, I elected to increase the output level using an LM741 op amp. My objective was to drive an analog VOM operating on the 3-volt range to a discernible level. That objective was achieved with the circuit shown in **Fig. 4**. Using my particular test magnet, the output voltage would swing up to 2+ volts from QOP.

Knowing that op amps generally exhibit some output offset, and my TL173C produced an output voltage of approximately 1 volt above Vcc/2, I elected to equip the amplifier with two potentiometers. One pot was to provide a voltage to balance the offsets, and the other was for gain control. With the nearly 1 volt offset of the sensor's output voltage, I found it necessary to parallel the upper resistor, R3, with a shunting resistor, R2. When

Continued on page 56

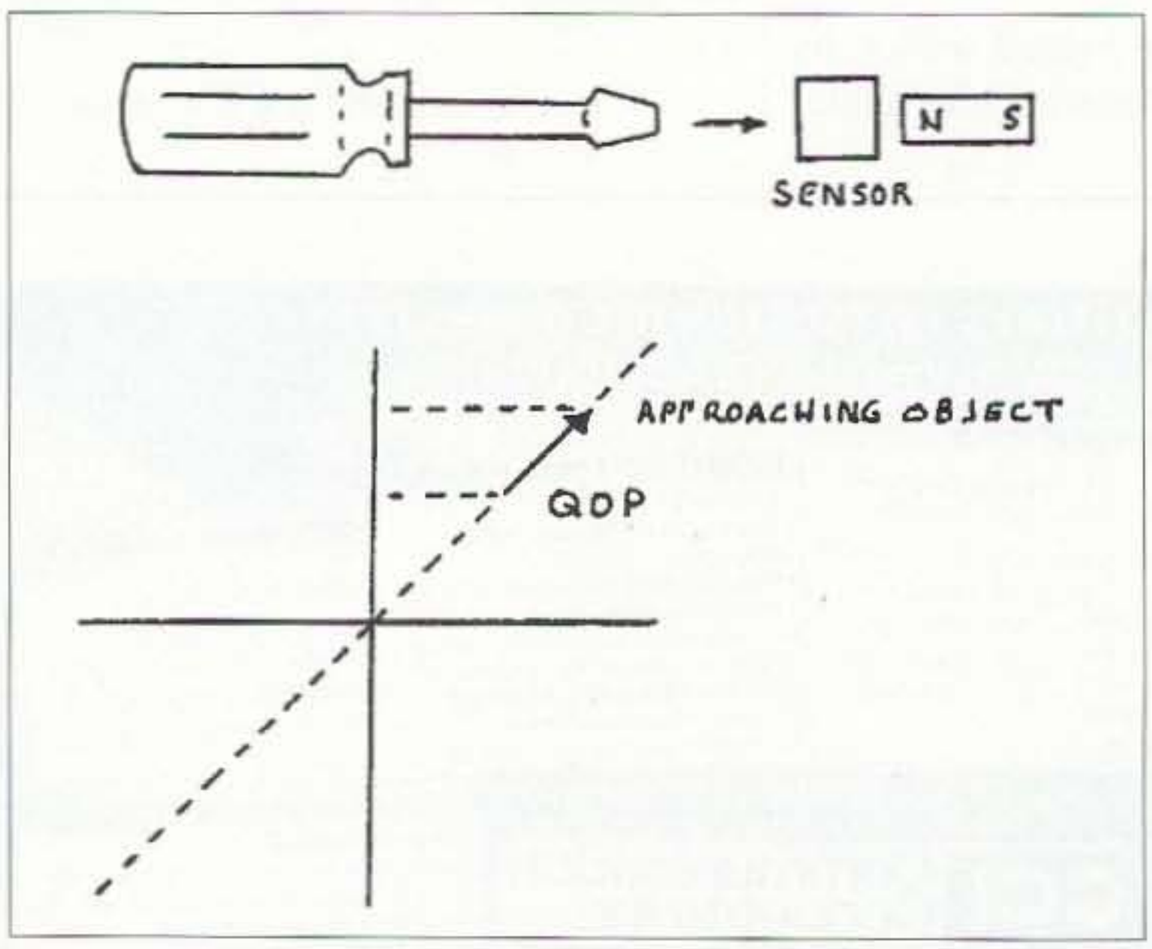

Fig. 5. *Experiment showing how the sensor responds to the movement of a non-magnetized ferrous object. A biasing magnet is placed on the opposite side of the sensor from the ferrous object.*

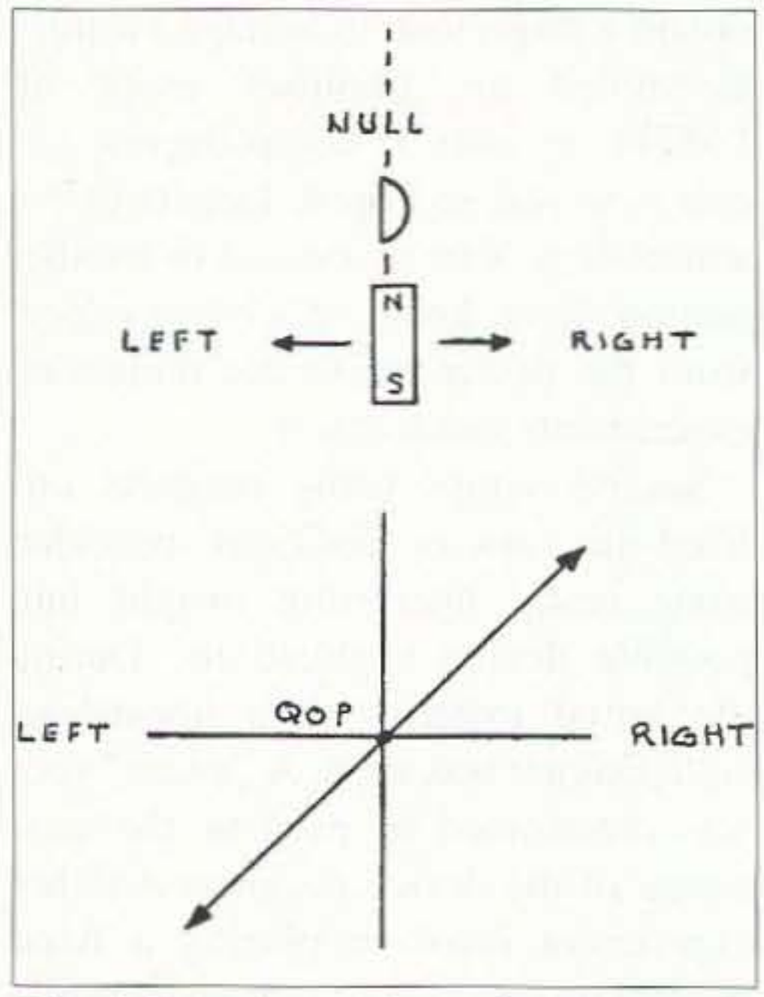

Fig. 6. *Experiment shows the output voltage change as a function of a magnet's position. A null occurs (at QOP) when the magnetic pole is centered with the sensor. Reversing the magnetic poles also reverses the output voltage response.*

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On the Face of It, A Good Idea

How to ace those finishing touches on your home-brewed pride-and-joys.

Sometimes all the hard work and technical expertise that goes into creating your own home-brewed equipment can be for naught if the finishing touches of the unit are less professional-looking than the remainder of it. Some prior planning and carefully applied labels can be the difference, producing a piece that works and looks great.

When deciding to make a particular unit — let's just suppose the project is to be a QRP receiver — take a good look at the schematic and identify all of the variable controls, e.g., RIT, VOLUME CONTROL, TUNING CONTROL, AUDIO FILTER CONTROL, etc. Next, lay out the controls according to their usage. For a right-handed operator this usually means placing the tuning control either in the center of the front panel or to the extreme far right side of the front panel. Other controls are placed from the left edge of the panel.

Placing the tuning control on the right side or center of the panel creates an easier, more comfortable operating position for the operator. Avoid placing the headphone jack near the tuning control. The plug and wire protruding from the panel often interfere with the operator's hand motion during tuning, and can be avoided by placing this jack as far away as possible.

The "key" jack can be placed immediately above or below or alongside the "phone" jack if the tuning control is on the right side. If the tuning control is in the center, other jacks can be mounted in the area to the right provided there is ample room. Use your own judgment here. See **Photo A**.

Before drilling holes to mount front panel controls, measure the needed height from the bottom of the panel to ensure that variously sized controls will "fit" above the bottom edge of the front panel.

Once you are satisfied that all the controls will fit acceptably, measure how far up the panel the mounting holes will have to be placed. Now, using the knobs you intend to place on the controls, ensure that the outer edge or "skirt" of each knob clears the bottom edge. Knobs having a flare or "skirt" on their outer edge call for more room at the bottom of the panel for clearance.

Lettering to be placed *below* a control also requires additional space. Large knobs block the operator's view of the lettering, especially on smaller pieces of equipment. The identity of controls not easily visible to the operator can be confusing during operation and detract

Photo A. *Finished project with tuning control in the center.*

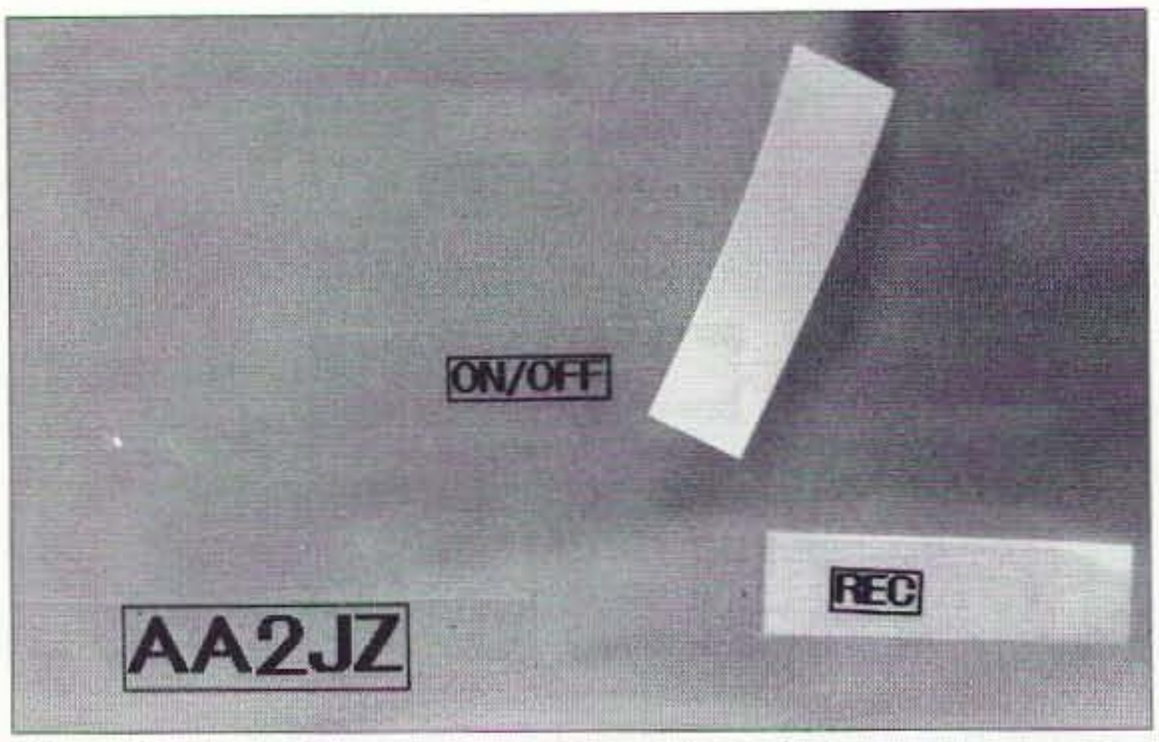

Photo B. *Place lettering on a clean sheet of glass to ensure that you can make straight cuts when you remove the excess backing material.*

Photo C. *Painter's tape is used to guide lettering into perfect alignment.*

from the "professional" appearance desired in a finished project. This also applies to multiple rows of controls. Allow additional space between rows for lettering if needed.

Lettering the project requires some prior planning. I use a "tape writing machine," a device which uses clear tape with white or black lettering imposed on it. With this device I can select a type size or style that pleases me and fits the area available on the front panel. Computer-printed lettering can be used. Experiment with various gummed labels, paper, and adhesive-backed tape on label sheet backings to see what is acceptable to you.

After typing and printing the required data, I peel the backing and adhere the tape or label to a clean sheet of glass. Avoid putting finger prints in the adhesive material. They are often impossible to remove, and are readily visible forever. Use the tip of an object (knife, razor blade, screwdriver, etc.) to pick up the label and place it on the glass. Once applied to the glass, using a straight edge and razor, cut away the excess backing material and leave only the desired lettering. I usually cut away the bottom excess material in a straight line. Doing this will enable me to evenly place lettering along a straight edge later. See **Photo B**.

With the front panel removed from the project, without knobs or jacks attached, use painter's masking tape to create a straight line for placement of lettering. Painter's tape is an adhesive-backed paper tape used for masking during painting and is easily removed without leaving a residue. Office "clear tape" and other tapes I have tried sometimes peel paint finish from the freshly painted panel. This can be very disconcerting. Painter's masking tape is available at most hardware or home improvement stores and is very inexpensive. This also provides a resting surface for your fingers that will protect the surface of the panel from scratches and contaminants.

With the tape in place providing a straight edge, pick the needed label up from the glass using the tip/point of a razor knife or tweezers. Moving them in this manner avoids placing unwanted fingerprints in the adhesive on the back of the label. Carefully place the label where desired, ensuring that the edge of the label is parallel with the straight line provided by the painter's tape. When all labels to be placed along the line have been applied, remove the painter's tape. Rub down labels to ensure total adhesion and removal of air pockets, etc. Once all labels have been applied, carefully place knobs on the panel to prove to yourself that adequate clearance has been allowed and that lettering is aligned correctly, and that you haven't misspelled any words. See **Photo C**.

Once you're satisfied with your front panel, it can be clear-coated with clear spray, which will protect the lettering from wear and effectively make the clear backing disappear if you are using a clear tape method.

When creating your front panel, paint a scrap piece of the material with the paint you intend to use. Apply "practice" lettering to it, and then spray it with the clear coat you plan to use. Different types of sprays from different manufacturers are often not interchangeable. The resulting piece using the wrong products produces a slimy, wrinkled mess which is very disconcerting following all of your careful planning and work. I cannot over emphasize this careful selection of products prior to doing all this work.

The "masterpiece" you have labored lovingly over now has a more professional appearance, using materials easily available. The keys to a clean look are planning, patience, and care.

Good luck! And enjoy showing off your latest creation! 73

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NEVER SAY DIE

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What about the ARRL, you ask? The only belief I have in the League is that someone should wake up the gang sleeping at HQ and tell them to get their ass in gear and start promoting the hobby before it dies. Maybe you can energize your local director to do more than rubber stamp what the HQ gang asks for at the next board meeting.

Have you even a remote clue about how much the number of licensed amateurs has grown in the last five years? Make a guess? Wrong! It was 0.5%. Compare that to the 1946-1963 17-years of 11% per year growth — a five-year growth of 168%.

You know what I'd like to see? The ARRL do a survey of today's ham activity on the bands. They could get volunteers ... retired hams ... to do signal counts on our HF bands once an hour 24/7 for a couple of months. Maybe from Washington, Southern California, Texas, Maine, and Florida. I'll bet they'll find that there are a lot less than 100,000 active U.S. hams on the HF bands. I'd like to be wrong, but never in my 64 years on the bands have I heard them so empty.

I'm going to keep hacking away at the public's belief in doctors, hospitals, and prescription drugs, using common sense and damned good research as my weapon. I'll leave it to you to either activate the League HQ gang or see our hobby blow away through your neglect. Every time you renew your ARRL membership you are making sure that HQ does nothing. That's the only vote you have.

Jet Lag

Pretty soon you'll be seeing jet lag prevention glasses in the gadget catalogs. They'll have blue LEDs built in, powered by a 9V battery in your pocket. You wear them for three hours a day for two days before your trip and three hours during the trip. No jet lag.

I keep such weird hours at home that my body is never sure when to give me jet lag on trips to Europe or Asia. At home I go to bed when I get tired, whether it's 7 p.m. or 2 a.m. I sleep until I wake up, and take an hour nap during the day if I get tired. Works for me.

Health Notes

A daily banana helps ward off strokes. It's the potassium. Oranges help, too. Hmm, I eat a couple bananas and an orange for breakfast every day.

Optimists are healthier and live longer, according to a Mayo Clinic study.

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Travels with Henryk — Part 9

The Dominican Republic, where the main mode is merengue.

The Dominican Republic (DR) is centrally located in the Caribbean Sea, sharing the island of Hispaniola with Haiti. Only recently, the DR became economically accessible from my part of the world, so one cold and dark December morning I jumped on the bandwagon and took a 12-hour nonstop flight from Stockholm, Sweden, to Puerto Plata, DR.

Puerto Plata is a medium-size town on the north coast, not far away from the place where Columbus landed in 1492. This place, Cabo Isabela, was the first target of my trial ride in a rental car. By the way, renting a car is inexpensive, but Scandinavian tourists are advised to avoid it because the majority of native drivers have no license. Yet, during my two weeks there I did not witness any road accident — which indicates that one does not have to hold a license to be an alert driver. It might be true in case of ham radio operators, too, but all the HI hams I met proudly display their amateur radio tickets.

Driving back to Puerto Plata from Cabo Isabella, I suddenly saw a large shortwave yagi in the distance on the left side of the road and instinctively drove in that direction. It was Rafael HI3RF's impressive antenna. Rafael spent 20 years as the mayor of Puerto Plata. Now retired, will he devote more time to his on-air activity? (**Photo A**.)

He helped me to locate other hams in this area and made a few calls, both on 2m FM and telephone. Without Rafael's help I would never have found Cosmo HI3CVV, who is very active on the bands, including 11m CB. Cosmo lives in a neglected suburb called San Marcos, but his home is very neat and he works at Teleferico — a cableway running to the mountain ridge just south of Puerto Plata. Cosmo has helped visiting hams to operate radio from the top. His son, named Cosmo

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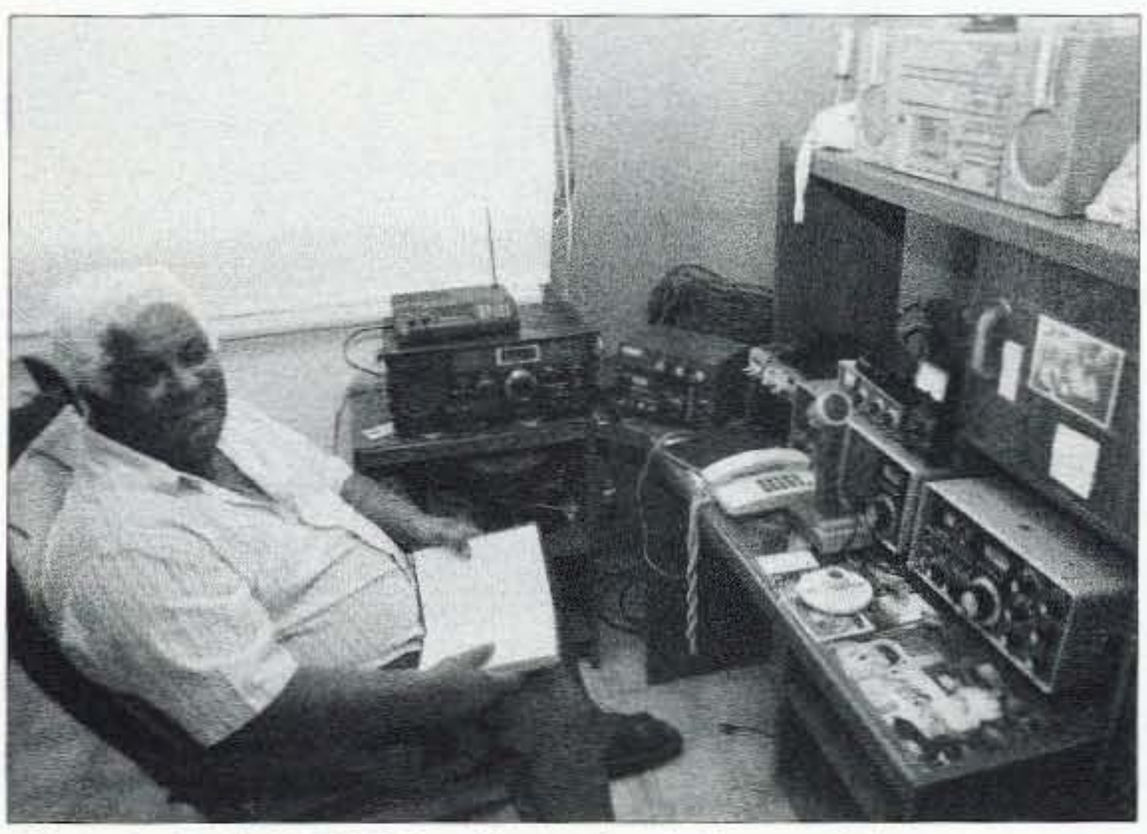

Photo A. *Rafael HI3RF at his station in Puerto Plata.*

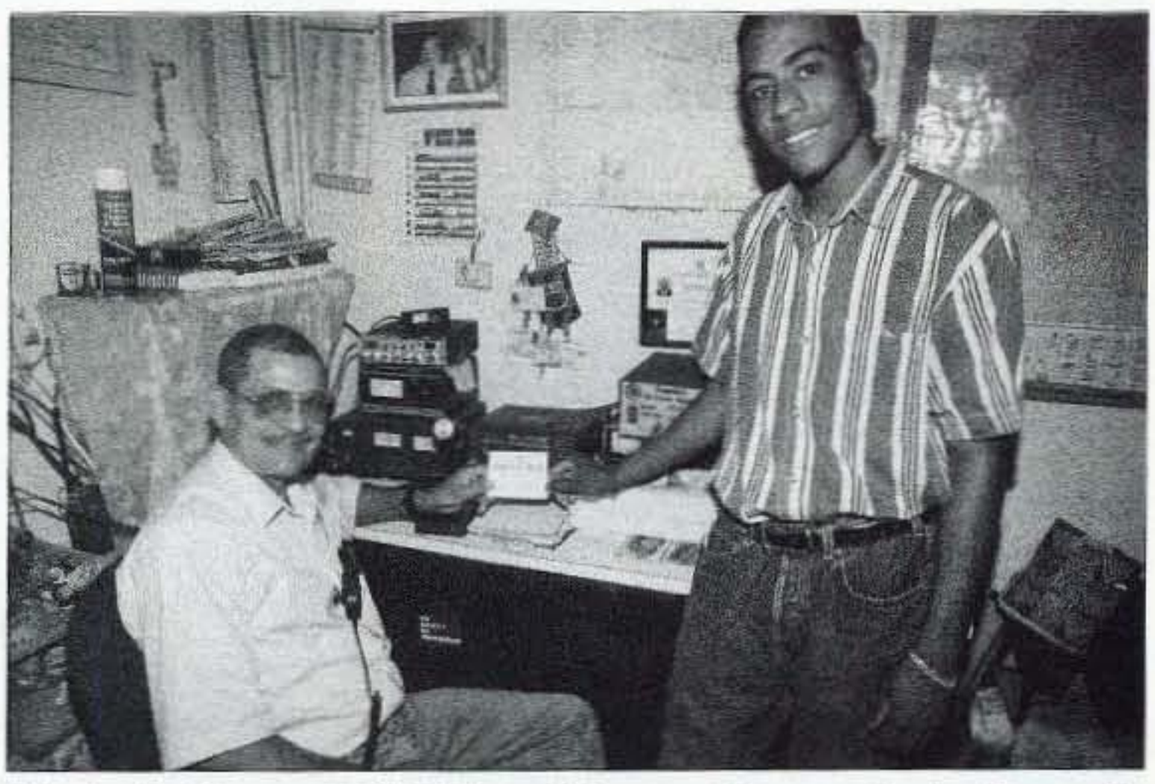

Photo B. *Cosmo HI3CVV and his son Cosmo, Jr., in the radio corner, Puerto Plata.*

Photo C. *Constantino HI3CCP sitting at one of his modern rigs, Edwin HI3NR behind him.*

Travels with Henryk — Part 9

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Jr., is a bright student of computer science but is not interested in radio. (**Photo B**.)

Another day, passing through a wealthy precinct of Puerto Plata, I remembered another hint of Rafael's. I found the street he had mentioned but could not see any amateur radio antenna. The street was deserted but a car pulled over just a few steps from where I was standing. Scanning for any aerial, I asked the driver if he knew any radioaficionado in this area. "I am," he answered. "My callsign is HI3NR." That was Edwin, who had come to visit his parents' home. The 3-element HF beam was waiting in the backyard to be relocated to Edwin's new house. Edwin acted as my liaison with local hams for the next few days. He had lived in Florida for some years and is fluent in English. His Web page is at [www.qsl.net/hi3nr/].

One day we drove to Santiago through the picturesque Cordillera Septentrional. Santiago is the second largest city of the DR and the center of tobacco industry and is well represented on amateur radio bands. One person, Constantino HI3CCP, is responsible for a large amount of this activity (**Photos C** and **D**). He patronizes a few repeaters around Santiago, supports the local club, is often on the air himself, and collects vintage radios. I was stunned by his collection of American-made receivers and transmitters from the '50s and '60s. I could only look at their pictures and dream about them from the time when I was a newcomer ham in Poland in the early '60s. Funny, at that time you could count active Dominican hams on the fingers of one hand, and possession of a radio receiver was forbidden here.

Other active hams in Santiago I managed to visit were Chuchu HI3JJS (**Photos E** and **F**) and Romeo HI3BRR (**Photo G**), and the local radio club HI3JR, where, in spite of Christmas season, a few members turned up (**Photo H**). A heated discussion took place here, concerning the use of our 2m band by the Civil Defense. It is quite common in countries with low

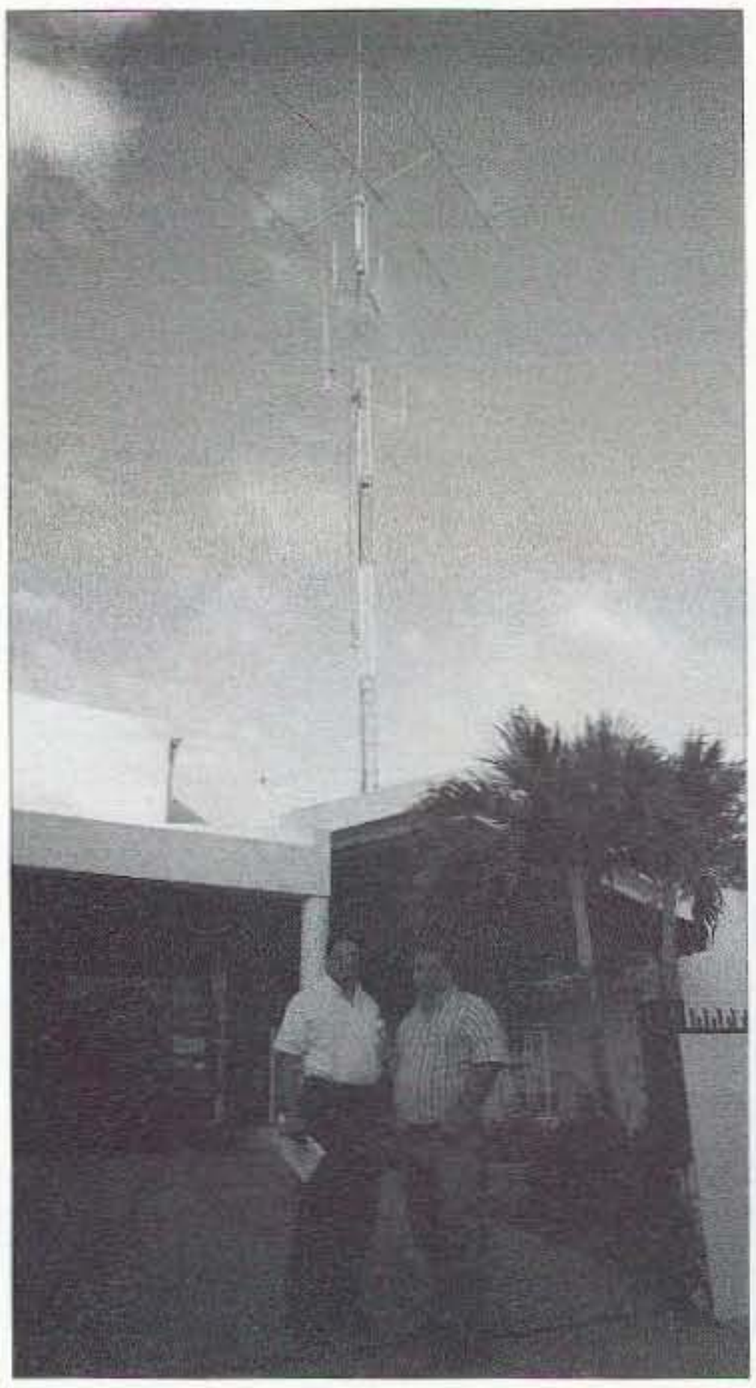

Photo D. *HI3CCP's antenna.*

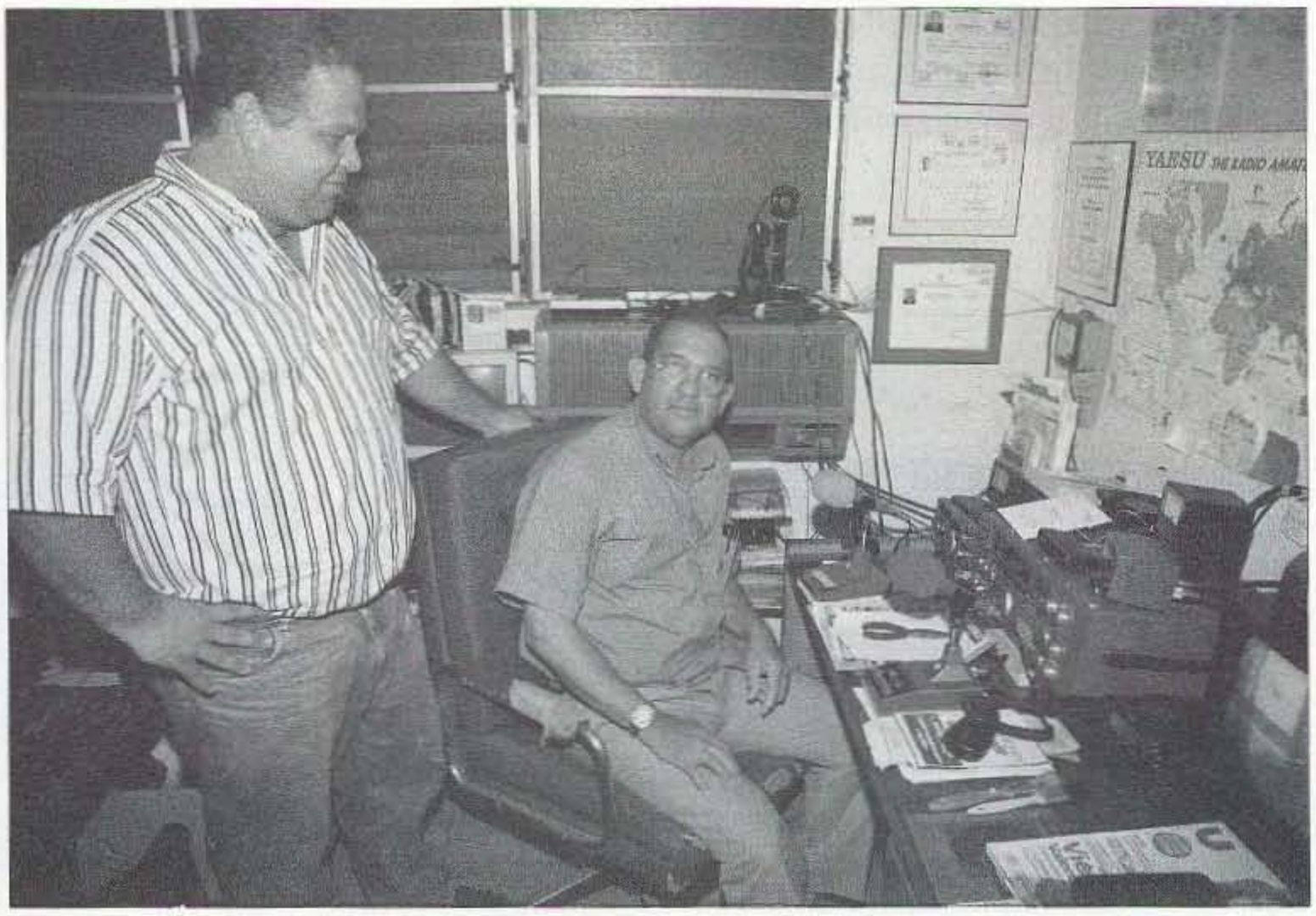

Photo E. *Chuchu HI3JJS at the rig. Edwin HI3NR standing.*

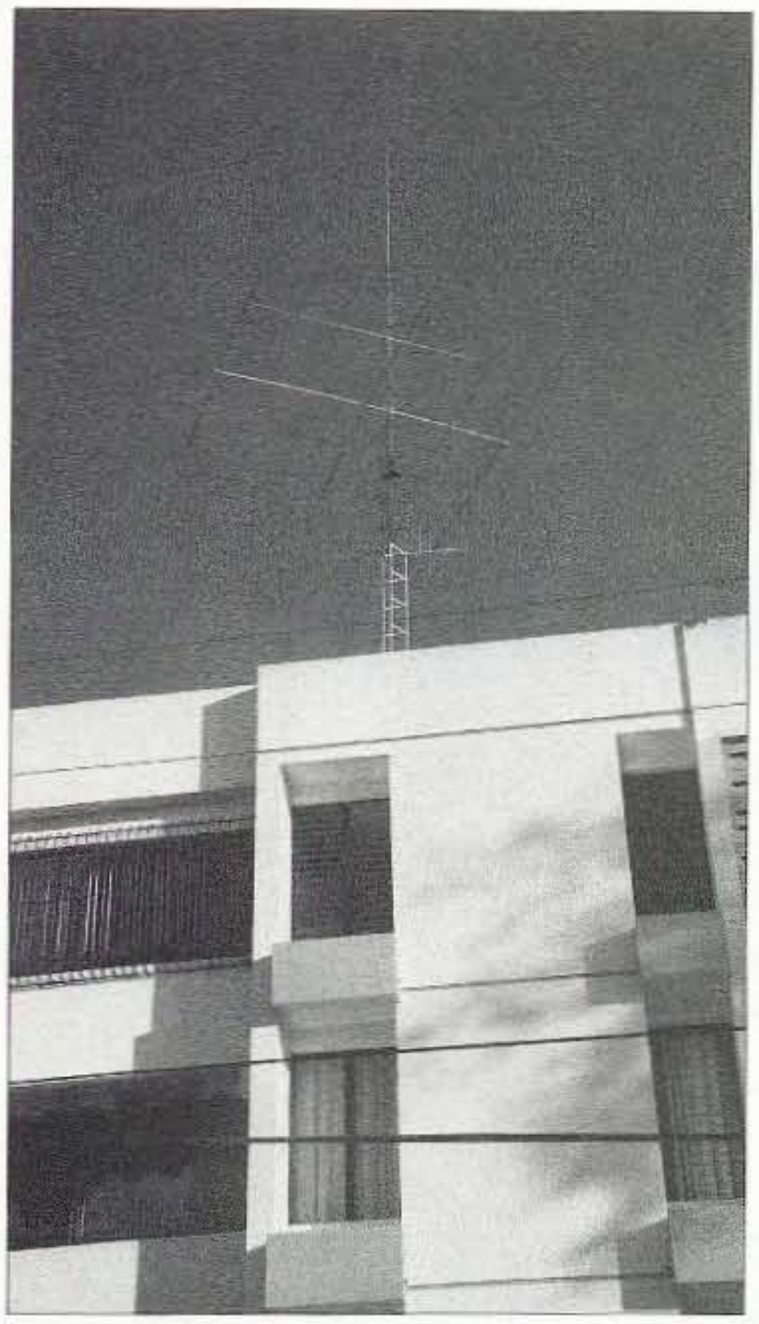

Photo F. *HI3JJS's antenna.*

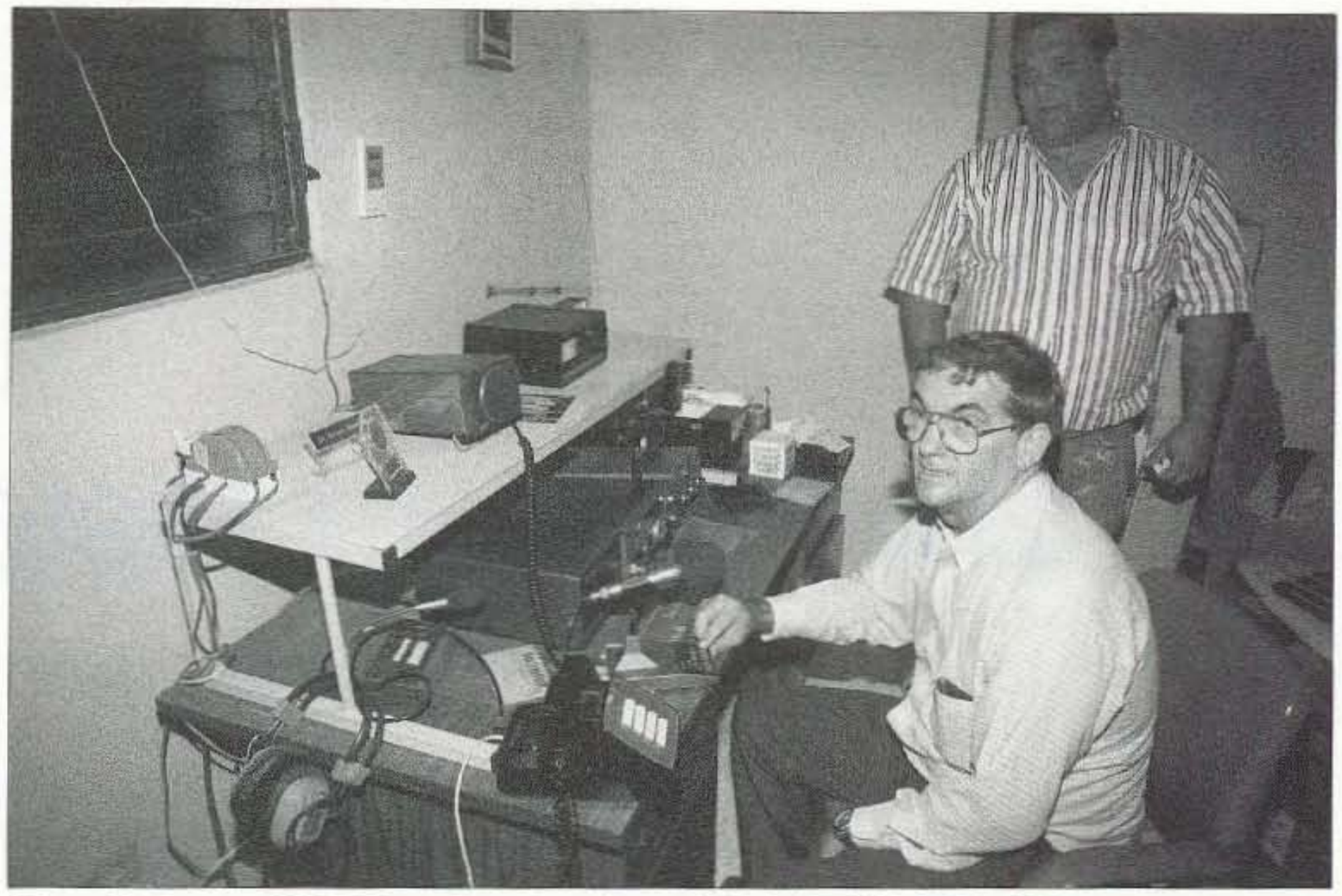

Photo G. *Romeo HI3BRR at the microphone, Edwin HI3NR behind him.*

amateur radio populations to find that cheap and easily available 2m FM radios are used by non-amateurs, but here the hams are numerous. Going back from Santiago through the town of Imbert, I stopped by to visit José HI3JBV, alias "El Arabe" (**Photo I**) on the 11m CB bands.

The licensing authority is, after restructuring, the Instituto Dominicano de las Telecomunicaciones in Santo Domingo. A visitor's license is easy to obtain; however, power outages are common, so better hotels have their own generators. And a lot of people who can afford it have inverters supplying 110 VAC from 12 V batteries installed at home. Every ham I visited has a set of 12 V batteries as backup.

To a tourist, the country offers long, sandy beaches, caves and mountains, excellent fruit and fish, first-class tobacco, and delicious rum. It's warm and humid here, people are friendly, and the merengue music is addictive.

I'll be back here, and will bring my radio next time. 73

Photo H. *Radio Club of Santiago HI3JR. From left: HI3AP, HI3AW, HI3CCP, HI3FI, HI3NR.*

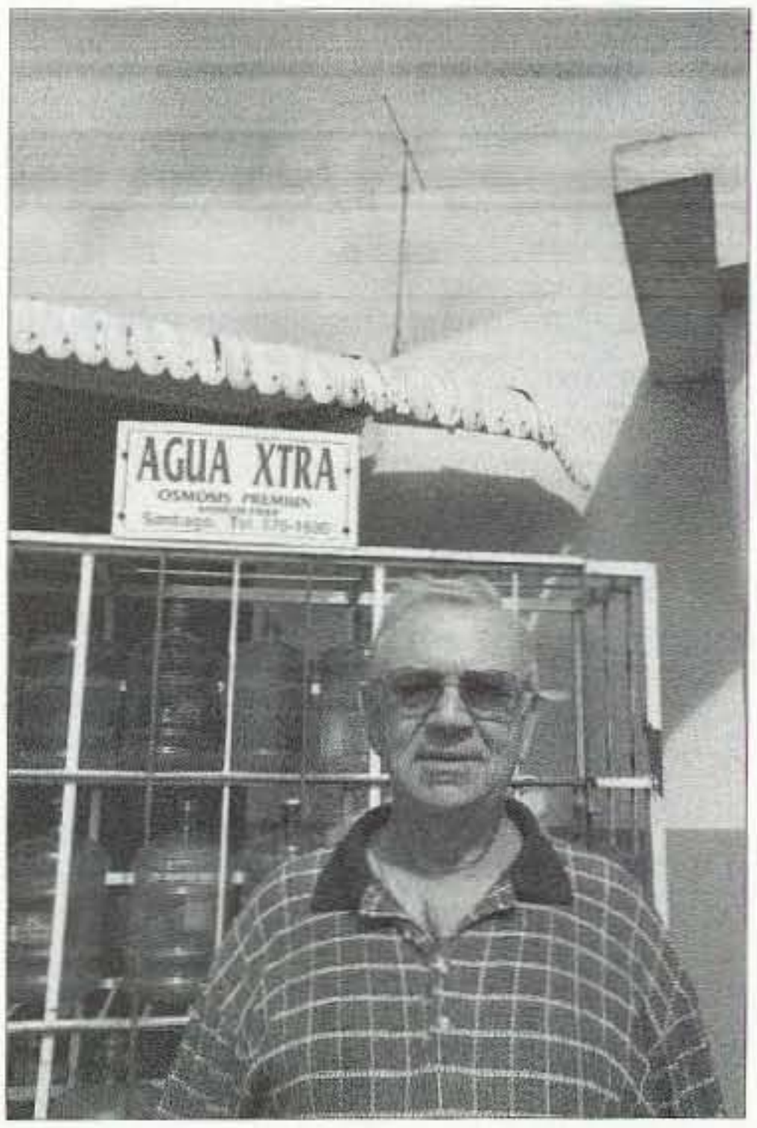

Photo I. *José HI3JBV, "El Arabe," in the town of Imbert, between Puerto Plata and Santiago.*

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2m FM Ham History 101

It's time you got your degree.

To know where we are going, it helps to know where we have been.

Here are three "lectures" that tell us a bit about our ham heritage, as well as give the origin of some of the conventions we may tend to overlook, ignore, or forget.

Why do we announce we are leaving the frequency?

Were you ever listening to the dead, empty repeater output frequency, when all of a sudden someone said, "W1blah-blahblah leaving the frequency" or "KB1yadayada clear"? Did you ever wonder why they announced they were no longer listening? Didn't make much sense, eh? Here's an explanation of why that person did it.

First, it is wrong to do so in amateur practice. However, it is proper in different services, but only in a historical context. Unless considered a one-way broadcast of general interest to amateurs, it is an announcement that the ham is not listening for responses nor conducting a test. Furthermore, it is impolite to tell everyone within listening range that you are not going to listen to them any longer!

But why was it OK to do so in different services? In the old days, the '50s and '60s, when commercial (business) two-way radio was in its infancy, there were few radios and few frequencies available and in use in any geographic area. Consequently, frequencies were shared. The oil delivery company used the same frequency as taxis, fire departments, the automobile travel club's trucks, municipal services, and so on. Since frequencies were shared, it was necessary to listen before talking to avoid interfering with another service's transmissions. As frequencies were shared resources, people were careful not to interfere, or else they might be interfered with themselves. The Golden Rule applied.

It was more than a courtesy to announce that a series of transmissions was complete — it was a requirement. It was necessary to announce that a station was going out of service or off the air so that other listeners would know the frequency was available again and they could use it. Also, a dispatcher would know a truck, for example, was not going to be available for a call.

So what does this have to do with ham radio? In the early days of ham FM radio, using converted commercial equipment, the primary users were hams who were two-way radio service people who knew how to put commercial gear on ham frequencies. These first adapters brought with them the practices they used in commercial services. Initially, "everyone" used 146.94 Mc — megacycles, now MHz — simplex. Repeaters were yet to come. This common frequency was a shared resource and it was necessary to use courtesy for all the same reasons the commercial services did. Therefore, the hams announced they were leaving or clearing the frequency.

And so, some of the next generation of hams copied the practice, and then the next generation, and so on and on. In ham radio, announcing that one is leaving or clearing the frequency is a practice that no longer makes sense, nor is it desirable or needed. But now you know why some people do it — it is a borrowed practice from long ago. It is just one vestigial trace of our heritage in the radio arts.

But that accounts for some of the single-frequency simplex activity that characterized early FM activity. The practice continued even when repeater operation became commonplace. But repeaters use two frequencies. How and why did that come to be?

Why do some repeaters shift up or down?

Until about the mid-1980s, Technician-class hams could only use two-meter band frequencies up to 147.00 MHz. Only General, Advanced, and Extra-class could go above 147.00. So, if a repeater used by the majority of users with Technician-class licenses used a frequency below 147.00, the repeater could only shift downward in frequency because the users could only transmit at the lower frequencies; those repeaters with outputs above 147.00 shifted up. (Some hams called them "exclusive" because those ops would not talk to Techs! The concept of exclusivity was disparaged by some and lauded by the rest.)

After the FCC rules changed, allowing Technicians to use the whole band, the exclusivity was lost and we now simply refer to the shift as up or down, positive or negative. In fact, we only have to know the repeater's output frequency to know whether the input is up or down in frequency, and by how much. For example, if a repeater uses an output of 146.70 (once a popular frequency for RTTY repeaters), we know that the input is 146.10. (146.70 is below 147.00, so the input is lower in frequency. Furthermore, it is 600 kHz lower. The same logic applies to repeaters operating in the 145 MHz range — 145 is below 147.0 MHz and is, therefore, a downward shift. There is no need to indicate the shift or its direction unless the repeater does not follow convention.

As a historical footnote, this was not always the case. In an effort to squeeze more repeaters into the available space of a given megahertz, there was a plan in effect in some areas of the country to use so-called interstitial splits. This meant that in an area where repeaters were spaced 30 kHz apart (146.64, 146.67, 146.70, and so forth) and used a downward shift, there would be room to insert repeaters on the intermediate frequencies and use an UPWARD shift (146.655, 146.865, 146.715 inputs with 146. 055, 146. 265, and 146.115 as outputs, respectively, and so forth). Why? Because ham receivers were not sufficiently selective to separate signals as close as 146.64 and 146.655. Therefore, the plan called for the intermediate frequencies and inverted split directions. Thankfully, this idea did not gain widespread acceptance!

Why do we have 600-kHz repeater splits?

In the beginning of ham FM radio involvement in the 1950s, the only equipment available was from manufacturers such as Bendix (yes, the brake people), Aerotron (yes, the same people who brought Gonset to hams), Federal Signal (which made railroad equipment), and others such as Link, Carphone, and RCA. You might also have heard of Motorola and General Electric. The equipment was commercial and required conversion to ham frequencies. Most radios were wired only for single-frequency operation. You might get a working radio for free, but two crystals were required for each frequency (transmit and receive) and they cost $5 to $15 each. By informal agreement, all two-meter rigs (that is, converted high-band equipment) operated on 146.94 simplex. There were no repeaters at first. All communication was station-to-station. Rigs and antennas were optimized for that one frequency.

Eventually, repeaters were invented. Actually, they were put into use on ham frequencies, just like they were for commercial users. Physics and experimentation showed that repeater receivers at sites where the transmitter and receiver were at the same location suffered less desensitization if the transmit and receive frequencies were far apart. Ham repeaters used various separations, but that meant that a tuned antenna or tuned receiver front end had to be adjusted quite differently from the tuned antenna for a transmitter.

What to do to ensure peak performance? Practically, it was discovered that a split of 600 kHz was about as far apart as you could separate a transmitter and receiver in frequency to enable a single antenna tuning network to work well for both functions. Of course, the antenna would be tuned for a midpoint frequency, and that opened a bit more of the band for other repeater frequencies to be within tuning range with minimal compromise.

But it wasn't always that way! The concept of 600 kHz splits was not intuitive. It required repeater owners be convinced they should conform to this radical idea. That is, repeater owners and operators had to be convinced that they should spend money to buy more crystals and tune antennas just for conformity to a concept that meant nothing to them locally, especially when the repeater was coming in just fine, thank you.

Now, aside from the practicalities of allowing as many repeaters in the available frequency allocation, this was the tightest frequency split that would work. As repeaters' ranges extended, it became necessary for repeater users and owners to adopt a wider set of principles. (There were overlapping super-repeaters everywhere. You could use a walkie-talkie in downtown Boston and talk to hams in Albany!) The big picture became more important than local concerns and needs. A national norm was needed, developed, and adopted. That norm was 600 kHz.

True history ... a practical example of local cooperation

In New England in the early 1970s, we had three major repeaters, each of which gave fine coverage that overlapped in Boston and its northwestern suburbs. The Concord, NH, repeater had an output on 146.94 and an input of 146.31: a 31-94 repeater. Waltham, MA, repeater's output was 146.64, input 146.34: it was set on 34-64. (It had less than a 600 kHz split because its receiver and transmitter antennas were separate and far apart.) Mt. Greylock, in North Adams, MA, had an output of 146.91, input 146.04: set for 04-91. As you see, none used 600 kHz splits. Each repeater trustee was reluctant to change because of their expense and the expense of their users to buy new crystals.

But reason prevailed. One fateful day around 1973, the repeaters realigned to 600 kHz splits. Users in each area voluntarily swapped crystals (some met

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Peter Egypt KE6FBO
P.O. Box 804
Redwood Valley CA 95470

To the Rescue

A story about 2m and winches — we hope.

This is a little tale about how a car and two tow trucks got stuck in the mud, and how it took a search-and-rescue member to save the day.

I hadn't been a ham radio operator for all that long of a time, but I was more than happy to have access to an autopatch — I had no cell phone. But who really needs a cell phone when you have the ability to talk on 2 meters?

This is how it happened

It was a cool fall evening, about five o'clock on a Saturday. Dad and I decided it would be a good time to fly our remote control gliders. Because we are both hams (dad is KE6FBN), he and I have the privilege of using a special band just for us licensed radio operators. We headed out to the model aircraft field just south of Ukiah.

As we made our way to the airfield, we monitored one of the 2-meter repeaters. Not too many people were talking, but we always liked listening anyway.

After Dad and I put in a few hours of flying our gliders, we decided to pack up and make our way home.

That's when the trouble began. When I tried to back the car out of the mucky place where I had parked, all the tires would do was spin. Dad got out to check on the situation. He saw some wood next to the road so he decided to place the wood under the spinning wheels — it was useless. And what was the point to keep on trying?

"Call Mom and tell her we need a tow truck," Dad told me.

I grabbed the mike and dialed in for an autopatch.

"Juliet is dialing the phone," the repeater said.

The phone rang and mom answered. Thank goodness I didn't get the answering machine.

"Mom," I said, "we need a tow truck, we are stuck in some mud." I had little time to say much else before the autopatch went dead. Luckily, Mom got all the information we needed to be saved from that muck. The tow truck was on its way.

I walked down to the end of the muddy road. A few minutes later the tow truck arrived. I flagged him down, jumped into his truck, and we started on the way back to my car.

"Do you have four-wheel drive on this thing?" I asked the young man.

"No, are you kidding?" he answered.

I had a *bad* feeling about this …

Then a somewhat funny thing happened — the tow truck got stuck in the mud. The tow truck driver went right when he should have gone left. His tires were spinning, but nothing else was happening. He got out of his truck and tied his winch to a nearby tree. He turned the winch on and pulled his truck off to the side of the road. Obviously, his situation was made worse.

"Say again?" the dispatcher said.

"Yeah, that's right! I need another tow truck because I am now stuck, too," the driver said.

I guess I should have warned the driver of that tow truck, but he is supposed to be a pro.

At about that time, our friend Blair Mitchell K6CPY called my dad on the two-meter repeater.

"What's going on, Al?" K6CPY asked.

"Well, Blair, we got stuck in the mud out here at the airfield. The tow truck got stuck, too, so they are sending another tow truck."

A search-and-rescue worker was monitoring the same repeater. He called out to my dad, "Do you need some help? I have a heavy-duty truck and can pull you out."

"Thanks!" Dad said.

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

JAN 11

GREENWOOD, SC The Greenwood ARS 2003 Hamfest will be held at Greenwood Civic Center, January 11th, 2003. Contact *W4JAK, President, GARS, 106 Dorchester Dr., Greenwood SC 29646,* for further information.

JAN 25

LOCKPORT, NY The Lockport ARA Inc. will host a Hamfest/Auction on Saturday, January 25th, at the South Lockport Firehall, Transit Rd. (RT. 78), corner of Ruhlman Rd. in Lockport NY. Talk-in on 146.820 PL 107.2. Setup for vendors is at 6 a.m. The hamfest is open to the public at 7 a.m.; auction starts at 11 a.m. Admission $5. 8 ft. tables $5 each. Refreshments available. Contact *Duane Robinson W2DLR, P.O. Box 142, Ransomville NY 14131.* Phone *716-791-4096;* E-mail *[W2DLRHAM@AOL.COM].* Please visit the Web site at *[http://lara.hamgate.net].*

JAN 26

NEW PHILADELPHIA, OH The Tusco ARC Hamfest will be held at New Towne Mall, 400 Mill Ave. SE, New Philadelphia OH, Sunday, January 26th, 8 a.m. to 2:30 p.m. Setup is at 6 a.m. Admission is a $4 donation at the door, dealers admitted at no charge. Tables $11 each. Food will be available on site and starting at 7 a.m. at the restaurant next door. Directions: Exit 81 off I-77 to SR 250 East to SR 416 Exit. At end of ramp, turn left at light (under SR 250 bridge), then turn right at the first light. New Towne Mall is on the left. Talk-in on 146.730(-). Free parking available at the mall. Dealers welcome. ARRL/VEC sponsored exams by appointment. For additional info and to reserve tables, contact *Gary Green KB8WFN, 32210 Norris Rd., Tippecanoe OH 44699.* Phone *740-922-4454;* or E-mail *[kb8wfn@tusco.net].* Reservations must be paid in advance and received by January 20th to insure the return of reservation confirmation. Remember to enclose an SASE. Make checks payable to Tusco Amateur Radio Club.

ST. CHARLES, IL The Wheaton Community Radio Amateurs' Midwinter Hamfest will be held at Kane County Fairgrounds, 525 S. Randall Rd., St. Charles IL, 8 a.m. to 1 p.m. on January 26th. Talk-in on 145.390. Heated indoor flea market tables and commercial booths. Free parking. Hourly prize drawings with a grand prize of $500. VE exams. Tickets $6 in advance with four door prize stubs, $8 at the door with one door prize stub. Contact *WCRA, P.O. Box QSL, Wheaton IL 60189.* E-mail *[info@wheatonhamfest.org],* or phone *630-604-0157.* Visit *[http://www.wheatonhamfest.org].*

FEB 9

MANSFIELD, OH The Mansfield Mid*Winter Hamfest/Computer Show will be held Sunday, February 9th, at the Richland County Fairgrounds, Mansfield OH. Plenty of prizes and an over 400-table flea market in three large modern heated buildings. Doors open to the public at 6:30 a.m. Tickets $5 in advance and $6 at the door. Tables $12. Talk-in on 146.34/.94 W8WE. Advance ticket/table orders must be received and paid by February 1st. Send SASE to *Dean Wrasse KB9MG, 1094 Beal Rd., Mansfield OH 44905;* or call *419-522-9893* and leave a message for a return call. Info is also available at *[www.MASER.org].* There will be a League Night banquet the night before the hamfest. More info on the banquet will be available on the Web site, or call *Bill Martin N8TQ* at *419-526-4661.* 73

Never say die

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People who don't get enough sleep have double the heart attack risk. Angry and depressed people are also more likely to have heart attacks.

Super germs have escaped! The widespread overuse of antibiotics has resulted in the breeding of drug-resistant germs. These are now escaping from hospitals on the clothes of patients, workers, and visitors. Germs used to quickly die after exposure to the outside world, but the new resistant germs are able to stay alive, even for months, waiting for a new host to attack.

There's much to be said for keeping your immune system at industrial strength, plus a supply of silver colloid on hand. Just in case.

The Staph of Death

D'ja see the five-page article in *Fortune* on the latest Staphylococcus mutation? Infections by this mutant staph are now routine in hospitals. This is a nightmare that doctors have been dreading (and expecting) for years.

Several years ago I reviewed the wonderfully documented 750-page book by Eileen Garrett, *The Coming Plague.*

According to the CDC, of the ten million patients who entered hospitals in 1999, two million caught bacterial or viral infections, and over 90,000 died of them. This makes hospital infections the number 5 killer in the U.S.

The research looking for a cure for staph is being done by the pharmaceutical companies. Are they checking out silver colloid? Of course not. That's not an option since it can't be patented and sold in $20 a day doses.

In the meanwhile, perhaps you'd do well to do everything in your power to stay the hell out of hospitals … where, if the staph of death doesn't get you, a surgeon's oops, prescription error, or some other hospital-gained infection may. The *Archives of Internal Medicine* published a study in September tracking drug use in 36 hospitals and nursing homes in Colorado and Georgia. The report showed that in the average 300-patient institution an error was involved in one out of five cases. Seven percent of the errors were "really, really bad." That's more than 40 really bad errors per day.

Russia Today

What's happened to the "other" superpower? Today Russia has a GDP smaller than California's. Its birthrates and adult life expectancy are declining, so much so that by 2050 it could have fewer people than Iran.

Maybe you've noticed that while a lot of

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New home of *The Chart*

Vive la France!

Do you suppose if the French can build the highly successful Concorde *SST airplane, would it be safe to bet one of those folks could write a good PSK31 program? Well, one of them did and has not said much about it. So here it is for you to observe and enjoy.*

This is another program written utilizing the AE4JY PSK engine, with the author's (F6GQK) own innovations and preferences built-in. I must say, right to begin, this is an intuitive program to use that will not disappoint the casual user, and the more you use it the more you find it may just cover your needs — plus, of course, the price is right: free!

I happened on this software at Dave's (G3VFP) Web site as I was searching for something new for your reviewing pleasure. There are several pieces of software that haven't gotten a lot of play in this column due to conflicts with some of the installed TSR programs. Those are good pieces of work but I like to work with stuff that downloads, installs, and plays which is exactly what DXPSK does. My favorite kind of program to talk about.

Funny I should say that, as I think about it, because on the very first contact with this program someone was asking for help with MixW2 over the air. So I never got to tell what fun I was having with this software. (Funny to me, you had to be there.)

Back to the setup. It is simple enough. You notice something right away. There are no pull-down menus across the top of the display. Instead, there is a row of icons on the left side with "Tool-tips" that tell you what the icon stands for when you touch it with your cursor. One of those says "General setup" when you touch it.

Naturally, there is a box where you can insert your callsign and choices for your PTT port and pin along with a few other available choices you can make at the time or get back to later. Three or four choices and you are in business.

The next thing I noticed was that there was no activity in the waterfall. The rig was on and the cables in place, so before checking for something broken, I checked those icons again and the uppermost icon suggested "Connect soundcard." I clicked it and the waterfall began to play. Now we were getting somewhere.

Did I neglect to mention that I did not make the proper effort to download and install a Help File? This software is intuitive enough that even I can get it going without crutches — okay, up to a point anyway. Later, however, I found the Help File residing nicely in the DXPSK folder and double-clicked it and got the Help displaying just fine. Still later, I clicked the Help icon and it worked just like one would expect. Goofy Windows!

There followed a number of pleasant surprises. First, I took the time to write a few macros. One might look at these and say, "They are a bit different from the 'norm' or the way we are used to writing our macros," but as soon as you get into it after clicking the "Create/edit a macro" icon you will find that this system is also very intuitive.

You have the capability of 20 macros. I quickly wrote seven, one of which I duplicated due to being too quick, and that was almost the extent of my preparation. I added a few more that do not show in the screenshot after I determined there were no hot keys for transmit and receive. A review of the macro commands revealed it was simple enough to assign macros to perform those functions.

There was one more step. I attempt to have a log handy that will tell me of previous QSOs when I enter a callsign. DXPSK has a very good log system built-in, but it is not that sophisticated. My quickest solution I could think of was to get the Logger database up-to-date and run it with the DXPSK program. It worked as you can see. There was one little hitch. I found no way to keep DXPSK from sneaking into the background when I accessed Logger.

Use the Task Bar

This merely meant I had to click the DXPSK button on the Task Bar to reawaken its panel on the monitor so I could see what was happening and control/participate in a QSO. You will see the advantage in the screenshot. I happened across a familiar callsign and double-clicked it so it was in the call cell in DXPSK, then entered it in the Logger entry panel which showed the previous QSOs in another pane. There is no connection between these two programs, but I like this info available so it is worth the effort to me.

One of the neat features you will discover right away is that changing receive panes is as intuitive as it gets. When you place the cursor on the waterfall a tool-tip pops up to remind you that left click is Frequency 1 (upper receive pane) and right click is Frequency 2 (lower pane). The marker is numbered and everything associated is color-coded. You soon have your brain thinking upper is green and lower is yellow and you can look to see what is that color and you know what trace, frequency, report, and text belongs to whomever.

Plus, when you click with one or the other mouse keys in the waterfall, the Channel 1 or Channel 2 tab is actuated for you so that all the figures apply immediately. Of course you can click on either of those tabs to make the change from one Channel to the other with your mouse. Just as good as I could have ordered it.

You will notice more hidden features as you use this program. I had already successfully had two QSOs when I got to looking during a lurking session that the transmit and receive frequencies were way different

as displayed. A quick experiment showed the transmit frequency to immediately jump to the receive frequency when going into transmit mode.

One of the minor aggravations when working with a program for a short time is logging those test QSOs with pencil and pad to be transferred later. This program has the answer in place. No pencil needed. There are two little icons just below the Call and Name boxes. One of those is to delete or clear the entries in those boxes. The other starts you into a log dialog which, when you finish, produces an adequate ADIF log within the DXPSK folder. You can import it directly into whatever popular log you are using, no conversions needed. Just do it.

All-in-all, this program is well thought out. You can see that the programmer customized features to fit his own tastes and these qualities result in a package that is very easy to get acquainted with. So be careful, in just an hour or so you could get hooked on some of the unique ideas.

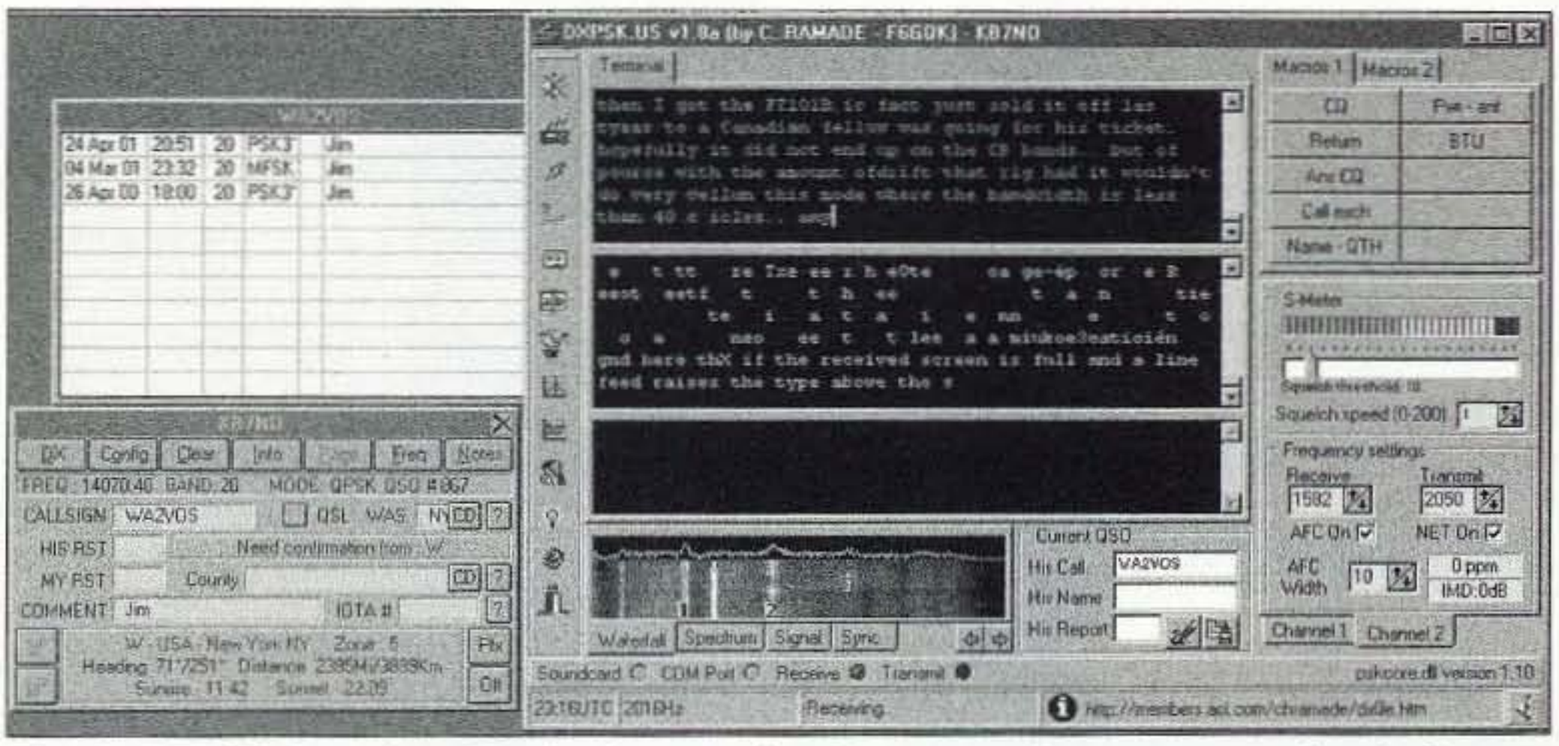


Fig. 1. *DXPSK in action. Monitoring two signals at once. You may recognize the Logger panes to the left. The programs do not talk to each other. It is simply that invariably, when I test a new program, I will contact a call I should recognize and it is hard to explain why I "don't keep records." The value is obvious as I entered a callsign in the log and 3 previous QSOs came up. The important part is the intuitiveness of DXPSK. The macros are simple to write. The color coding of the 1st and 2nd channels make it a snap to tell which station you are copying. The width of the waterfall is adjustable quickly from setup. The icons on the left are in lieu of pull-down menus. When you click on them, as well as most other places in the display, "tool-tips" gives you a description of their function. A very nice piece of work that includes limited but adequate log capabilities. (See text.) And it is a free download!*

Another special application

While nosing about recently, I ran across a handy little program that I did not know existed when I wrote the November article on the early PSK31/PSKGNR software combo. I mentioned that PSKGNR would write a log file, but there was no other log facility available. I was not quite correct.

There is a program named PSKlog, by Cristi YO3FFF, that is meant to fill that need. I downloaded it and it is shown running in a cropped screenshot (**Fig. 2**) along with the other two programs. I found that my computer had a conflict of interest with this little program having to do with one or more of the TSR programs.

However, the program is available and is likely to work on your nice "clean" machines that aren't cluttered with all these toys. Just wanted to let you know I stand corrected on my statement about log programs for this setup. It exists and is listed in *The Chart* on the Web. Plus, you will see it is a serious log effort as you read the info on his Web page. Incidentally, as I looked on the YO3FFF Web site, I found there were updates available that could relieve my problems. Only hitch was the download didn't work, so it became too late to experiment this month.

DXAtlas software

Another area of interest for some of you is a program called DXAtlas. This has been available for some time and has been upgraded since I reviewed it a year or so ago. Since all the changes in the shack computer, I had not reinstalled it. Recently I noticed some discussion on the MixW reflector concerning a macro to bring it up from within the MixW program.

That motivated me to reinstall this clever piece of software and get it accepting information from the MixW 2.06 program, which it does exceptionally well. It is a lot of fun to use besides being very useful and, to me at least, educational as well. Lots of things you can discover about geography when you click a world atlas into full screen mode for a bit. Just for a challenge, try finding the exact opposite spot on the other side of the world from where you are sitting. It can be done using this software.

One thing I discovered as a little aside as I attempted to get the macro described in the somewhat dated MixW Help File to work was a minor flaw in the macro language. Here was another learning moment.

I copied and pasted the macro language from the Help File to the MixW macro, closed the macro edit screen and clicked on it. It did not work. After a quick look, I realized there is some version of the Windows operating system, in use, I assume in other parts of the world that does not have a folder named "Program Files" but rather "Programmer."

The described macro contained Programmer in the path to open the files and all that was necessary was to change that to

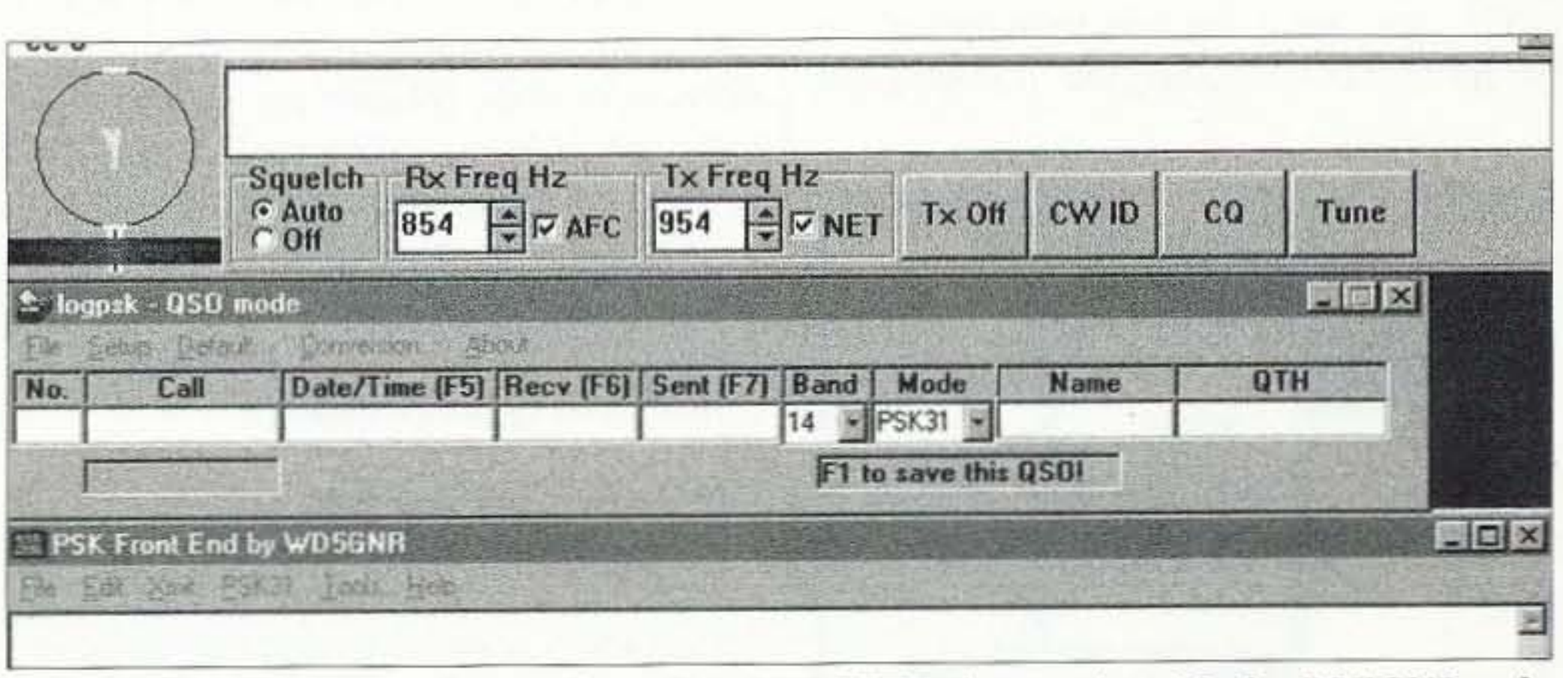


Fig. 2. *This is the log software from Cristi YO3FFF, that works with the PSKGNR software mentioned in the November column. I mistakenly mentioned there was no log function included, but here it is. It appears to be an ambitious effort to develop a comprehensive log program. See text and Web site.*

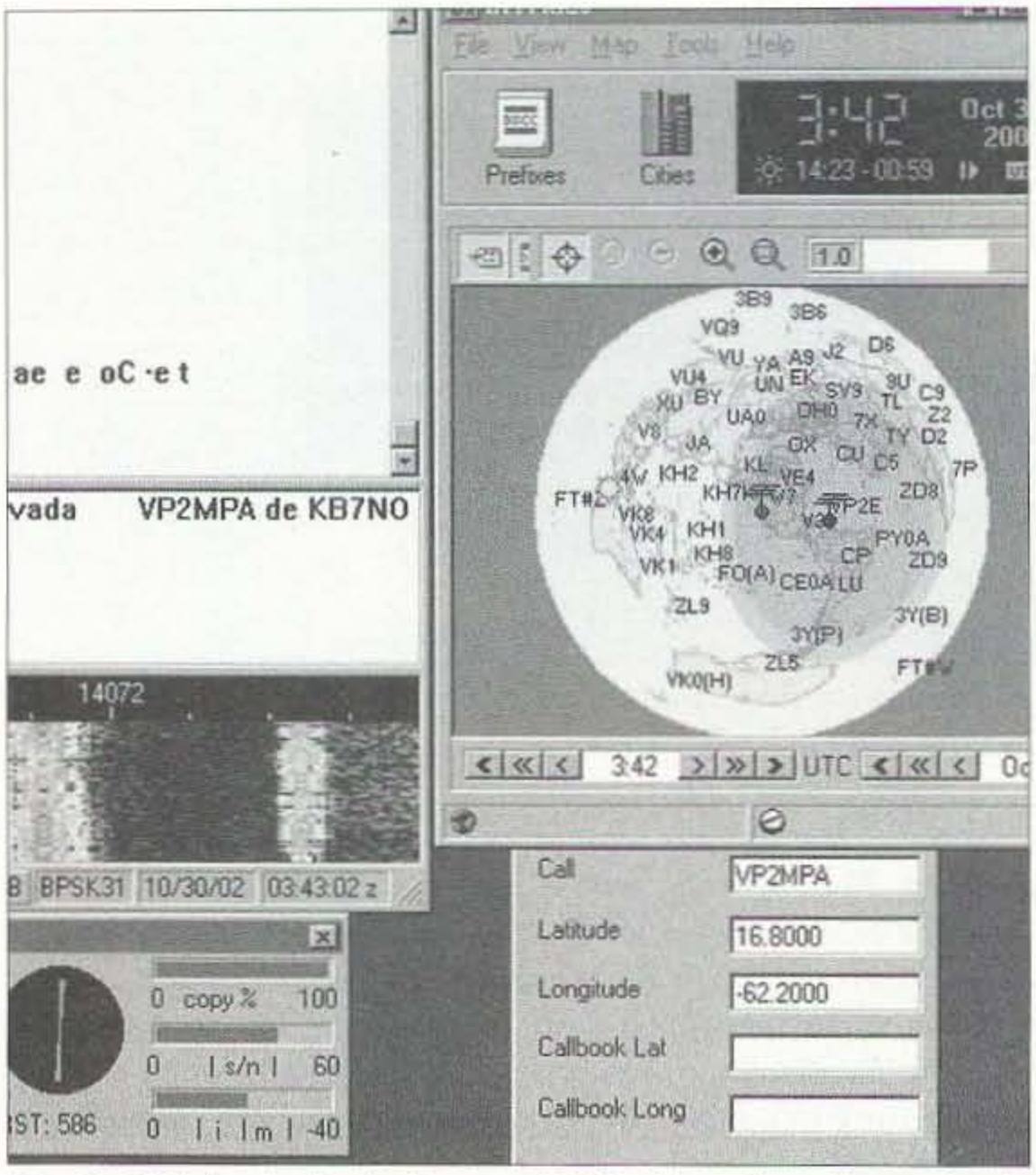
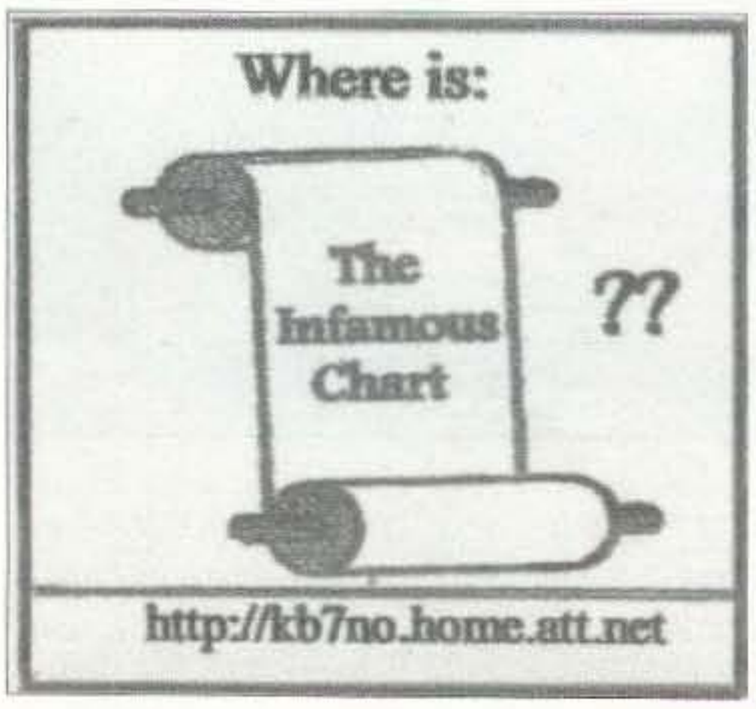


Fig. 3. *DXAtlas is displaying my QTH in Nevada and a station in Montserrat with data supplied by MixW. I usually like to use the rectangular display when I go to full screen just because it seems traditional. Works either way. The longitude and latitude figures are displayed in the partially hidden MixW2DXAtlas pane at the lower right. If my CD gave those figures for the other station they would also be shown. See text for a macro fix needed to bring up this program from within MixW. A new twist for me. The DXAtlas is a fine shareware program with many features and will run standalone. There are upgrades available on the Web site listed in* The Chart.

Program Files and Presto, the macro worked fine. So, for my English-as-a-first-language Windows-using friends, there is another one of those bits of trivia that will help you through life. Someone will probably send me a note on this and I will learn where "Programmer" is the norm as a Windows operating system folder.

For those who are wondering where to get info for downloading the little program (MixW2DXAtlas) and related items, go to the MixW home page, click on "Addendum" and follow the path, "Exporting to map programs." DXAtlas is a standalone program that does not have to be run with MixW. Therefore you can download it from the URL listed in *The Chart* on my Web site.



New antenna thoughts

I have had two on-air discussions with Jack WØKPH in Colorado, concerning a novel limited-space antenna design project that appears to work very well. From what I can see, this is not an entirely new concept. I have seen antenna design theory that backs up what is being done here, but this is the only extensive effort I have seen where the theory is implemented into a working model that is proving to be a viable answer to many hams' dilemma caused by the restrictions imposed on antennas in urban U.S. cities.

The design lends itself well to mounting almost inconspicuously on a backyard deck and when I have worked the owner of this tiny array the signal reports in both directions were in the S9 category. It is worth a look and, if you are like me, you may be spurred to do a little experimenting. My brief exposure to this project and the signal reports are very motivating. This is also listed in *The Chart* on the Web. The URL is [http://www.qsl.net/w0kph/].

News item revelations

In the past several months I have run across a few news items that may be of interest to more than just myself. I know there are readers of this column who are very knowledgeable concerning Linux because when I mention my inadequacies concerning attempts to get that system up and running, I usually get a few notes of encouragement.

So, briefly, the first news item concerned the announcement of an operating system that would allow the use of both Windows software and Linux applications. "Hmm?" says I, "I will check into that." I looked briefly and it was, as of some months ago, an underdevelopment process that allowed us to participate with the authors for around a $100 investment. The name of the system is Lindows. I didn't feel the need to contribute, so the idea was relegated to the bottom of the think tank pile here.

The second, more recent, news item concerned a seemingly strange mention of a computer for sale from Wal-Mart, of all places, for $200 with Lindows installed. That got my attention. It was only available from the retailer via their on-line storefront.

At this time, I have it on order. The producer of this equipment has a brand name of Microtel. I went to their Web site where they describe several computers but refer you to Wal-Mart on-line for specifics. Strange indeed, but they admit to an existence, which is a bit more substantial than some back-porch computer assemblers I have dealt with in years past.

One thing in the computer's favor is that it has enough processor speed (800 MHz) to handle whatever should be necessary. On the downside, the motherboard seems a bit deficient in available slots (1). But what can I ask for at such a price?

We shall see what comes of this adventure. By the time you read this, I will either have gotten this up and running and doing semi-great things with it or will have learned another lesson. In any event, there will be a page on the Web in *The Chart* concerning my findings, good or bad. It is one of those peculiar things to me that so little has come to my attention on this matter other than through a few relatively obscure news items.

One last thought and then I will be done for the month. I have noticed an apparent decline in the use of eQSL.cc cards of late. I wonder if it is the same with others. The site is a bit intimidating at first, but even I eventually figured it out. It seems most hams are sending hard copy cards these days. I don't care either way. It just looks like a trend is ebbing away. It is especially nice to exchange QSLs with foreign stations.

So much for what is happening lately. It is fun to hear from you and know how involved you are in these strange modes. Keep up the good work. 73 for now. Jack KB7NO — [KB7NO@att.net]. 73

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SGC STEALTH Antenna

One of the challenges in a disaster situation may involve getting an HF station on the air quickly and easily. The radio and the power supply are relatively straightforward, but the antenna is often a problem. Enter the SGC STEALTH antenna as a viable answer to this problem.

In the past we've discussed various approaches to antennas that can be used for HF applications, but most of these were variations on antennas designed for fixed operations and adapted for emergency work. As such, they are less than optimal versions of a design with reduced operational utility. On the other hand, SGC has designed its STEALTH antenna specifically to be a rapidly deployed, no hassle, easily used antenna.

In one small box are all the pieces needed to erect a loop antenna under virtually any circumstances. There is the 80-foot wire to be used for the antenna itself, nylon ropes with insulated clips for suspending it and the antenna tuner. There are also two manuals — one for the STEALTH configuration and one for the Smartuner. The wire and ropes are wound around reusable forms so that the materials can be easily accessed, and after use the entire unit can easily be returned to the same box for storage.

The heart of the STEALTH antenna is the SG-237 Smartuner. The Smartuner is a self-contained antenna tuner that requires only four connections. There is the PL-259 coaxial connection to the radio, a 12 volt power supply, and, for the STEALTH configuration, both ends of the loop antenna. The Smartuner has been a well-proven antenna coupler for long wire antennas. In general use, the antenna is connected to one side of the Smartuner and a ground to the other. By using loop configuration, the ground is replaced by the other end of the antenna wire. Electrically this works well, and from a mechanical standpoint, a loop also makes sense because a wire in a loop can be easily supported.

The SG-237 is essentially a custom-designed microcomputer with a Pi & L tuning system. Whenever the system senses forward RF power, the system activates and the software tunes to the new frequency. Once a frequency is tuned, the SG-237 stores the solution for that frequency and tries that solution first. Because of this technology, it can tune a wire antenna from 1.8–60 MHz and handle up to 100 watts PEP at a 40% duty cycle for most modes. This would mean that a maximum of 40% of the time would be spent transmitting. Basically, keying the microphone is the only action required by the operator, the Smartuner does the rest. It is durably mounted in a waterproof case, and in some configurations is mounted by suspending it with the antenna. This is fine for emergency operations, but for long-term exposure to the elements some additional protection should be provided. This can be as simple as a plastic bucket mounted over the Smartuner.

As would be the case for emergency operations, I erected the antenna using available

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Photo A. *The SGC STEALTH antenna is lightweight and comes in a cardboard case that can become an easy addition to your "Grab & Go" emergency gear.*

Photo B. *The kit contains 80 feet of wire, nylon lines with insulated clips, reusable cable ties, the Smartuner, and manuals. Add a radio and 13.8 volts DC, and you're on the air.*

Andy MacAllister W5ACM
14714 Knights Way Drive
Houston TX 77083-5640

The Hunt

It was supposed to be a bear hunt in the wilds of New Mexico. In October of 2002 Mike WA5TWT and I headed for the Pecos Wilderness via Albuquerque and Santa Fe. Bill WA5VQH was our host and provided transportation as far as wheeled vehicles could go. We had everything needed for hiking and hunting in the mountains, plus a few radios that couldn't be left behind.

It's a lot cooler at 9,000 feet in the Pecos Wilderness than at sea level in Houston, Texas. Mike and I thought we were ready for the change to near-freezing temperatures at night and high altitudes, but it was a shock. When it freezes in Houston, you make sure that the kids go outside to see frozen things, because it's so rare. Here it looked more like the norm.

There's no air above 9,000 feet. Our first foray into the hills was just after dusk on the first day. Mike and I were having trouble with anything that even looked like it might be uphill. All of the air is down on the coast. How do people live up here? We doubted if it was possible, and to prove it, I pointed out that we hadn't seen anyone since we had left a small town many miles earlier. Just to complicate matters the temperature was dropping rapidly.

After what Bill called a light evening walk, Mike and I were ready for heat and some sleep. Bill's comment about getting up at 4:30 a.m. and heading back up the mountain to hunt for bear was vetoed. Maybe later, much later.

Our first full day was to be a scouting trip on horseback. Unfortunately the outfitter with the horses had backed out (probably ran out of air), so Bill suggested we simply walk to Grass Mountain. He said it wouldn't take long, and we could have lunch and a great view when we got to the top. Several hours later Mike and I collapsed on the summit of Grass Mountain. Fortunately we hadn't seen any sign of bear. We weren't interested. Finding air and keeping hydrated were our only thoughts. My pack seemed too heavy, but then again anything would have seemed heavy at this point.

Backpacking

The first time out backpacking you take too much. I learned this a long time ago while hiking in the mountains in northern Iran. I had many pounds of gear that were not necessary, and I paid for it. If you don't need it, don't take it. While preparing for the trip to New Mexico I consulted my old Boy Scout handbook and an excellent Web site, [http://www.backpacking.net]. Between the two information sources I gathered the lightest equipment I could find. I had hoped to carry enough radios to work several satellites, but opted for low weight. I found that a very simple yet effective FM-only station suitable for contacts via UoSAT-OSCAR-14 (UO-14) with an uplink on 145.975 MHz and downlink on 435.070 MHz, could be packed into a 10.5" x 5" bank money bag. These bags are usually found at ham swapmeets and other surplus outlets. They are light, strong and provide enough padding to protect their contents.

***Photo A.** Andy W5ACM making satellite contacts from the top of Grass Mountain in the Pecos Wilderness.*

***Photo B.** Mike WA5TWT and Bill WA5VQH head up yet another hill.*

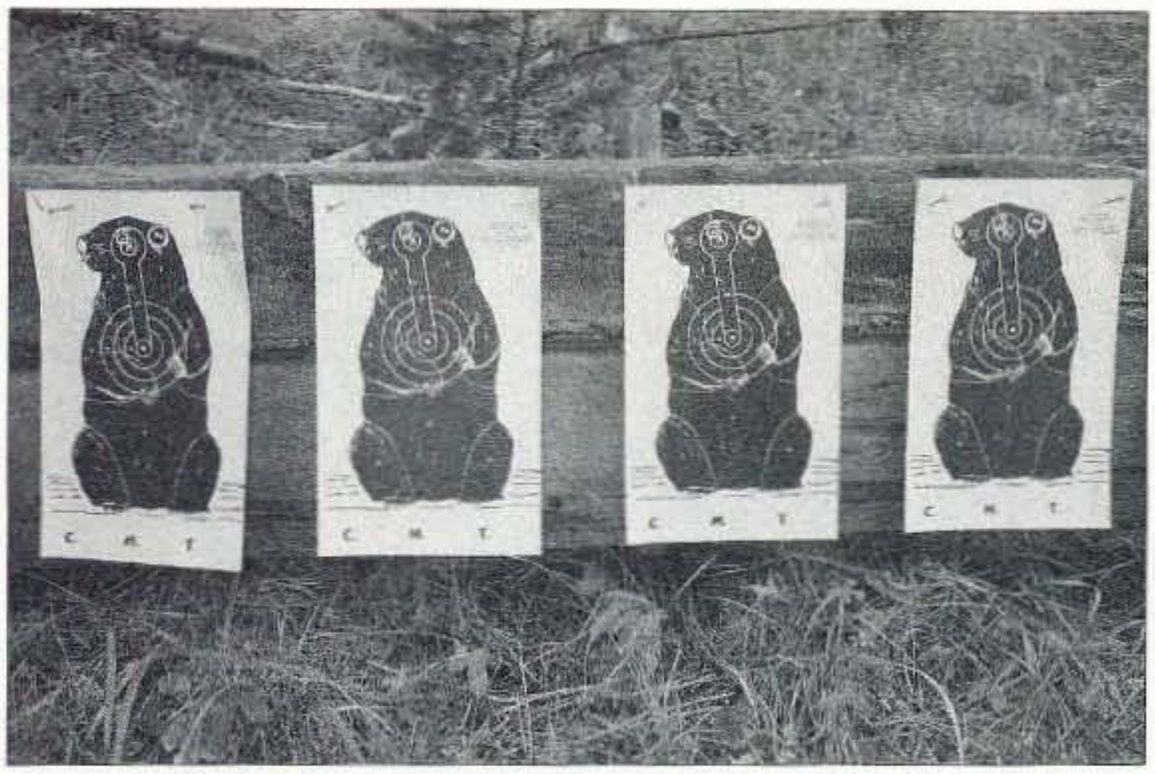

Photo C. *No bears, just paper targets and satellites for this hunt.*

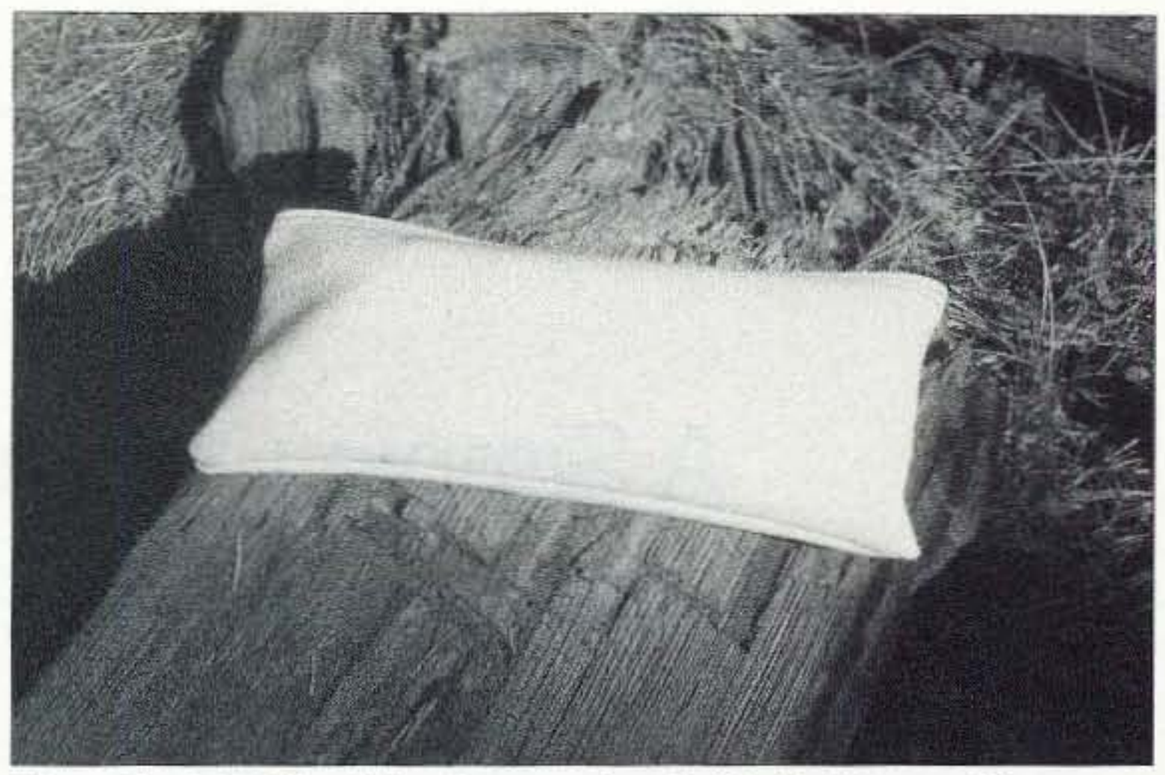

Photo D. *A 10.5" x 5" bank money bag held all of the satellite gear.*

The portable station

My complete portable station weighs the same as a typical MRE (Meal Ready-to-Eat) in the bag with chemical warmer, about one pound, 10 ounces. I know because MREs were the only food provided by our host while out on the trail. I don't like MREs anymore. All of my satellite gear was carefully chosen for light weight and usefulness. Compromises were made, but it's the results that count. There were no experiments on this trip, just sturdy, tested gear.

My radio of choice was an Alinco DJ-580T dual-band HT. It's not the newest, smallest or lightest HT for the job, but I have made many satellite contacts with it. My longtime familiarity with its simple controls, the five-watt output and full-duplex capability made it my rig of choice. Always practice at home with the radio you intend to take to the field. For power I took my highest-capacity, highest-voltage battery pack even though it added weight.

Although I prefer the Arrow dual-band yagi for portable operation, its size, and the inconvenience of putting it together and taking it apart on the trail made it a base-camp-only accessory. After trying several long "duck" antennas, I chose the Pryme AL-800 telescoping whip ($30). When collapsed it measures only 9.5 inches. When extended it has 3.2 dB gain on two meters, 5.6 dB on 70 cm, and measures an impressive 34 inches. It is also quite rigid. This helps when attempting to find the optimum orientation during a satellite pass.

When working a satellite with a full-duplex HT, an earphone is needed to avoid feedback. When you are constantly adjusting the HT with attached antenna for best up and down signal levels, a headset with microphone is best. An effective but cost-effective choice is the MFJ-293 ($25) earbud with boom microphone. There are three models, for Kenwood, Icom, and Yaesu HTs. I used the Icom version with my older Alinco radio. The MFJ-293 is extremely light and small. It fits anywhere and is surprisingly durable.

While on cruise ships I track the satellites with a Palm-VII from 3Com. An attached GPS receiver provides my location and simple Palm satellite tracking software does the rest. This time I knew my target location within 10 miles. I plotted orbits for the general hunt area (grid DM75et) and printed them to paper. It's a good idea to test your predictions before heading out. Errors are easy to make when plotting orbits for a site other than home. Incorrect location data or a bad time zone choice can make a printed page of data useless. I use InstantTrack ($30 for AMSAT members) from AMSAT [http://www.amsat.org] for my orbit predictions, and I carry a good pen to write down QSO information on the printed orbit prediction pages.

Unless you take along a GPS receiver with integral compass, carry a standard compass with your portable station. When not moving, a typical GPS receiver cannot tell direction. Knowing your orientation is helpful when following a satellite even though you will be constantly moving the HT with antenna during a pass.

The final addition to my money-bag station was a Petzl Tikka headlamp. I had never seen one before this New Mexico outing. Bill WA5VQH uses one for nighttime outings in the woods. Unlike older units that use heavy batteries and incandescent bulbs, the Tikka has three high-output white LEDs running on three AAA batteries. The operating time is amazing. It will run at full brilliance for 12 hours, and at limited light output for up to 150 hours. I was hooked, but Bill kept a sharp eye on his Tikka. I had to buy my own from an online backpack-supply store for $30. With it in place at night I could easily look at the radio

Continued on page 57

Photo E. *A complete satellite station fits in the money bag.*

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A Simple Optical Test Device for the Laser/LED Communicator

In June 2000, I published in 73 Magazine the first of three articles about an LED communicator constructed in two sections of PVC tubing or pipe looking much like a binocular with a rifle scope for pointing the system.

The basic concept was to make a light communication system different from other devices for optical communications due to the difficulty in modulating HeNe lasers and safety concerns. Kerry N6IZW, my partner, developed the concept and system designs.

What was envisioned was a high-output LED transmitter and photo detector, each housed in one section of the 4-inch PVC pipe. Rear splice unions (PVC) and end caps were used to house electronics for the system. Not wishing to re-invent the wheel, existing systems were used so we did not have to construct a full receiver system. What was done was to use a 4046 IC oscillator functioning at 35 kHz on one end and 45 kHz on the opposite end so as not to feed back to its own system. The modulation and RF driver for the LED is a 324 op amp and an electret mic. The mic can be removed and a computer sound card output can be used as well to provide PSK-31 for some very interesting applications.

In fact, Kerry N6IZW and I have accomplished a 15-mile-path full-duplex-operation FM narrowband communications from Mt. Palomar to Valley Center, using the upgraded Laser optical system shown here. Also tried was PSK-31 and computer-generated QSL cards sent via slow scan video. It was an exciting night demonstrating the systems that Kerry N6IZW had envisioned and developed.

Driving the transmitter, be it originally an LED or, in our up-graded version, a pocket laser, both are fed from the same modulator oscillator at 35 or 45 kHz. The 35 kHz transmitter is made to function with the opposite end receiver a 35 kHz photo detector. The opposite end transmitter is on 45 kHz, so there is minimal crosstalk between receive and transmit at either end (10 kHz separation between Rx and Tx).

Now, the sneaky part in Kerry's design is to feed the detected receiver (be it 35 or 45 kHz) energy and amplify it and drive an SRA mixer's IF port and feed the LO port with a synthesizer's 145 MHz RF signal source. This converts the 35 or 45 kHz receiver photo detector output to the RF port at 145.35 or 145.45 MHz, up-converting the received signal for insertion into a 2-meter HT for receiving narrowband FM with 5-kHz deviation. This receive system works unbelievably well, but just remember to never transmit on the HT — it is for receive operation only. Transmit is the electret mic in the power supply modulator for the LED/laser.

The system looks like two 4-inch PVC tubes spaced about an inch apart and a rifle scope and newly added Laser pen transmitter, beefing it up quite a bit over the original LED transmitter system. (When using the laser we cover up the LED transmitter and its optics with a 4-inch PVC pipe cap to shut the LED down.) Now comes the problem of dealing with 4 tube-like structures: (1) the LED transmitter, (2) The receive photo detector, (3) The pocket laser, and (4) the rifle spotting scope. Defining the problem is like wanting to hold four pencils in one hand and have them all be pointing in the same direction.

But first, to envision the problem let's take the four pencils, or actual devices we described earlier, and make them a half mile long, or even longer, and keep them all on the same axis pointing at the same spot at the remote target. It's obvious that some help in calibrating this octopus is needed.

First, it's somewhat easy to point one object at a far source and center it up to receive the far transmissions, be it an LED or a higher intensity pocket laser. Of course, the farther the distance the harder this problem gets, and micro positioning is a required function to make very fine adjustments in both vertical and horizontal directions. To add even more difficulty to this formula, you need very beefy tripods for rigidity, and even then they will still have some small wiggles and nonsolid movements in them. A lathe table would be excellent — but then where would you park the crane to haul it? A tripod, being what it is, will suffice and allow us to aim one single target to alignment. Getting them all to the same spot is the problem faced here.

One solution is to construct a simple oscillator at the system receive frequency (35 kHz, for example) and mount it into a tin can to serve as target to align the photo detector and tin can's LED together. Now add a small automobile reflector in the same tin can to serve as not only transmitting oscillator but also now reflecting the return of the laser spot. The laser spot is much more intense than the test LED in the tin can and will override it when focused on the laser. Using the positioning controls of the tripod, align the detector on the LED, and then turn on the laser and position the laser's right/left/up/down movement to align the laser spot in the reflector in the tin can while keeping the tin can LED aligned with the receiver. Verify by shutting down

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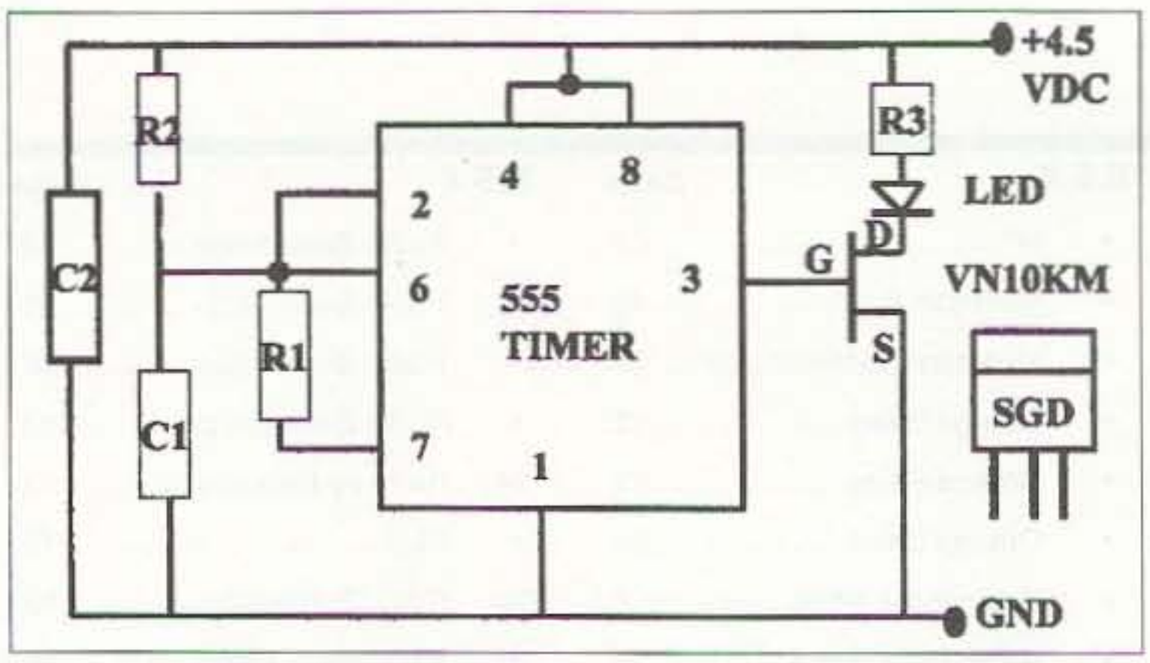

Fig. 1. Schematic of 555 oscillator circuitry, construction mounted dead-bug style on copper circuit board as common ground solder surface.

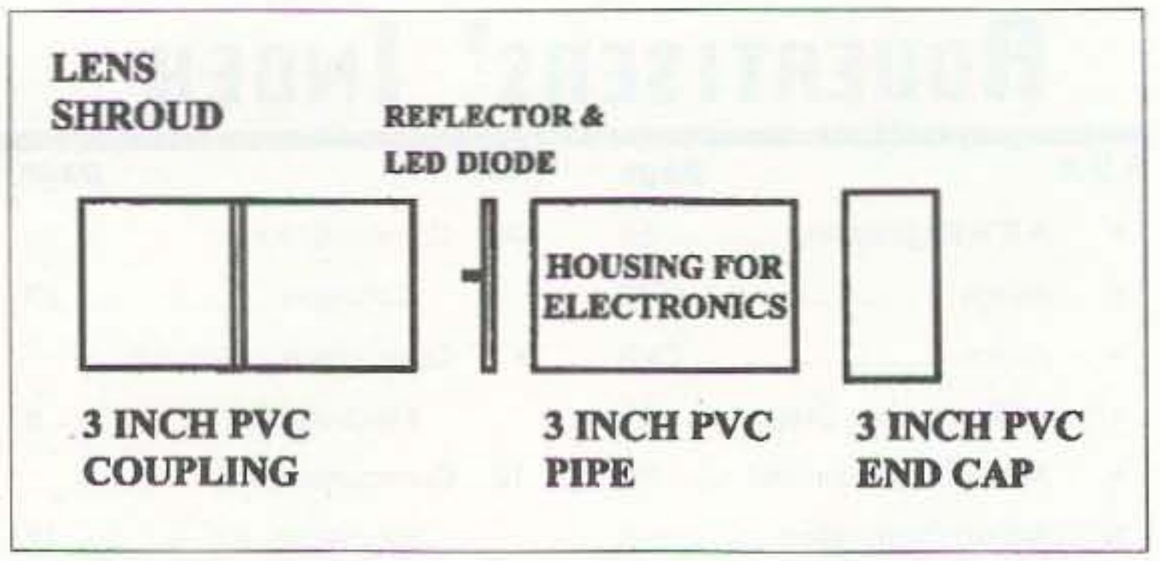

Fig. 2. Layout of construction of 3-inch PVC pipe, couplings and end caps for housing reflector and electronics for test circuitry. Reflector is pushed into coupling to touch against center ridge held in place by 6-inch or so length of PVC pipe. Front section of coupling forms lens reflector shroud.

Above & Beyond

continued from page 48

the laser. Align the receiver and turn on the laser and verify collimation between both systems. Then align the telescopic rifle spotting scope with both the receiver and the laser spot to the rifle scope.

How far away the target is positioned is a factor in how accurate you will be and at what distance you will be in alignment. It's best to make additional long distance tests on some targets (like a power pole transformer), as the gray surface gives a fair return and shows up on distant targets reasonably well. The "tin can" can be positioned out quite some distance and be hit with a well-calibrated system. For example, an optical-quality retro reflector positioned some 4 to 5 miles away can be regularly hit and return a strong signal to the source for system performance tests. For closer-in tests, the simple tin can and auto reflector is just fine for making system evaluations in a near range of a hundred to several hundreds of feet.

If your system uses a 1 kHz tone detection system, or something like our synthesized up-converted receiver system oscillator of higher frequency, the principle is the same. If you transmit a laser or LED frequency to a remote target and reflect it back to the source, you can detect it when you are in alignment between your receiver and transmitter. How, then, do you construct a simple, inexpensive oscillator LED transmitter reflector?

I located a three-and-one-eighth-inch-wide round reflector at our local Kragen auto parts store. This reflector fit like a glove into a 3-inch PVC splice union meant for joining two sections of 3-inch PVC pipe. A short section of 3-inch PVC pipe (about 6 to 7 inches long) is inserted behind the reflector to position the reflector tight up to the center ridge inside the splice union, holding the reflector firmly. A rear 3-inch pipe cap closes off the rear of the PVC pipe and allows insertion of controlling electronics inside the PVC pipe.

A high-intensity LED is selected for the transmitter LED. By using four and a half volts (3 AA cells) for a power supply, I drew about 17 mA current through the LED I selected. Pretest your LED portion of the circuit first; mine has a 150 ohm resistor to the anode of the diode to limit current. The LED Kerry and I use is from Hosfelt Electronics, 1-800-524-6464, part # 25-339, and about $5 each. Any other high-output LED will be suitable. You might have to experiment with your LED to set the desired brightness and current through the LED for the one you select. The driver circuit is nothing simpler than a good old 555 timer that uses three resistors and two capacitors besides the 555 timer chip itself. The circuitry is shown in **Fig. 1.** Place a 10 µF cap from the positive battery line to ground. For simple construction, wire the circuit dead-bug style on a small piece of scrap copper PC board. Position the chip upside down, solder pin 1 to ground on the copper surface middle, and position the other parts accordingly.

Parts values for **Fig. 1** go as follows (1-kHz frequency/35-kHz): R1 — 22k/820Ω; R2 — 51k/33.3k; R3 — 50Ω–150Ω (standard 50Ω LED used)/150Ω (high-output LED); C1 — 0.015 µF/0.0082 µF; C2 — 10 µF/10 µF.

I drilled a hole to position the large LED in the center of the reflector. Carefully drill a small hole first, and enlarge as required, so as not to shatter the reflector. I used automotive RTV to hold the LED in the center of the reflector. When dried, attach two wire leads and then heat shrink over the leads. Verify diode polarity and attach in series to the anode end a current-limiting resistor from the earlier test for your selected LED. Allow 24 hours for the RTV to set solid before going further.

This is a good time to construct your 555 oscillator on a scrap piece of copper board. The parts are not critical and can be trimmed by extra capacitance or varying resistor values. The output of the oscillator on pin 3 can be measured on an o-scope or frequency

counter. If you can't find an "N"-channel enhancement-mode MOSFET like the VN10KM or VN5001A MOSFET, send me $3 and I will send you a couple devices from my junk box (new devices). (Cost will cover postage and cost of jiffy envelope.) If you need any other parts and I have them, I will be glad to comply if I can. All other parts in this project are garden variety ones.

I selected 3-inch PVC pipe because it fit the reflector I found in the auto parts store. Use your resources, as nothing is critical in construction or parts, be it optics (reflector) or LED. A tin can or a Pringles chip container might work well for you. Just match up your reflector with a container diameter and construct away. One note of caution is that if you use a filter over your photo detector, make sure the LED you select works in the range of your filter. Our laser and LED transmitter works at 650 Nm, a very RED beam of light, and our filter is ±5 Nm wide. Some lasers are 623 Nm, and they never make it through the optical filter. Just check out what you have.

The 3-inch PVC pipe solved many problems, like centering the reflector in the housing, and the rear section on PVC pipe gave room to put a small plastic box for the PC board. I rubber-banded the three "AA" cells to the plastic box for rigidity. Then I cut some packing foam to protect the rear of the reflector and LED wiring coming out of the center of the reflector from the battery and oscillator box banging into it. Some extra foam over the far end to keep things from moving around finishes out the circuitry, save for an on/off switch on the rear cover. Use a locking toggle switch, if you can find one — it will save you on batteries. See **Fig. 2** or **Photo B** for construction of my oscillator system using the 3-inch PVC plumbing pipe and fittings.

Be it a 1-kHz laser system or a system like ours, the addition of a real retro reflector surplus can cost $95. One retro reflector (63.5 mm diam.) source is the Surplus Shed, part #L1792, [http://www.surplusshed.com], or 1-877-778-7758 for surplus optics. The retro reflector is actually a trihedral prism that reflects any beam entering it back to its source regardless of the prism's orientation. Kerry and I use a slightly different trihedral prism for our 5-mile test range described earlier. The reflector at the auto parts store cost $1.99 for two of them — quite a bargain. While it's not a retro reflector, the automobile-grade reflector

Photo A. *Picture of new laser LED transceiver system at WB6IGP. Electronics and 4-inch Fresnel lens inside white 4-inch PVC tubing. PVC coupling sleeves and short sections of pipe and end caps used to create compartments for electronics. Bottom right: photo detector; left: LED transmitter. Top center: spotting scope; just below: laser inside beam expander, laser transmitter.*

suffices for closer work and confirms basic alignment of your optics and lasers all in one test box. The reflector is simple to construct and will serve well until you can upgrade your system to greater distance and possibly a retro reflector in your test kit.

NOTE: The original article covering the LED transceiver was published in *73 Magazine*, Parts 1, 2, and 3 were in June, July, and August 2000. If you have any questions about this optical, or any other subject, send an E-mail to my address at [clhough@ pacbell.net], and I will try to answer them as best I can. Best 73, Chuck WB6IGP. 73

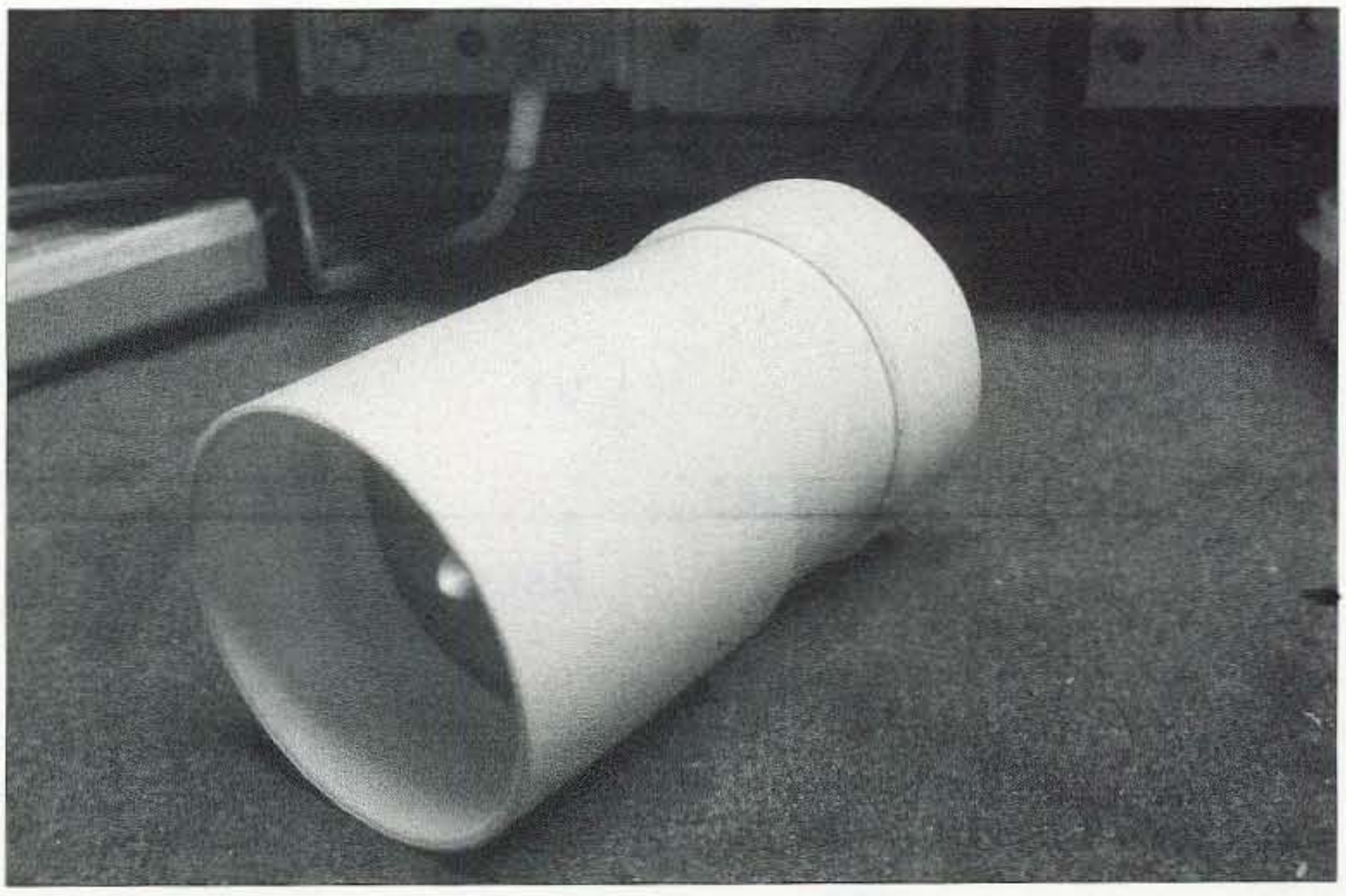

Photo B. *Optical reflector in housing with high-output LED in center of reflector. Electronics in rear of housing pipe containing 555 timer chip running at 35 kHz rate to drive LED transmitter. LED used from Hosfelt Electronics, part #25-339; cost, about $5 each (1-800-524-6464). Other LED diodes suitable.*

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Squegging: Now It Helps Us Track the Birds

You have acquired a signal. You have taken a radio direction finding (RDF) bearing. Now you're ready to track it down or make a report. But wait! Are you sure that this signal is what you're looking for?

Normally, it's obvious when you're tracking the right signal. On a transmitter hunt, you recognize the distinct tone box that the hider uses. A repeater jammer may have a distinctive voice or other signal characteristic, such as hum. At other times, it's more difficult and uncertain.

You hear dead carriers or short "kerchunk" signals. Are they all coming from the same source? What do you do when someone claims that he didn't do the jamming, because someone else was playing recordings of his voice? In such cases, measurement of subtle signal characteristics such as frequency shift during key-up can determine the truth. These "transmitter fingerprinting" techniques have been described previously in this column.[1]

For some commercial applications, a distinctive signal is mandatory, so it is designed into the transmitter. For example, the LoJack Vehicle Recovery System enables police to use Doppler direction finding for tracking down stolen cars. Each hidden vehicle transmitter sends a unique ID code, positively identifying the vehicle and permitting authorities to track multiple vehicles at the same time.[2]

In wildlife management, some tracking transmitters send ID. But most radio tags for birds and small mammals don't. These little devices must put out a signal to a ground range of a mile or so for up to a year or more, yet weigh only a few grams, including battery. To do that, most of them consist of simple blocking or relaxation oscillators with only a few discrete components. You may hear the term "squegging oscillator" used to describe them.

Too much feedback

Early regenerative receivers used positive feedback to increase gain and sensitivity without adding expensive tube stages. If you adjusted the controls for too much feedback, the radio would intermittently squeal or make a put-put sound, called "motorboating" or squegging. The advent of superheterodyne receivers took squegging out of the vocabulary of most radio enthusiasts. But in today's wildlife radio tags, this phenomenon is still put to good use.

If you set out to design a transmitter that pulsed on for a few milliseconds every second or so, your first concept might have two stages, a keyer and a transmitter. Maybe you would pick a timer IC such as the venerable 555 for the keyer and a transmitter IC such as the MC2833. I use just such a 10-milliwatt mini-T for everyone to test their RDF antennas before our southern California radio-orienteering events. But with all the other discrete components needed to support these ICs, there is no way to make that design tiny and lightweight enough to put on a small bird.

A squegging oscillator is an elegant two-for-one solution to the problem. **Fig. 1** shows how simple it can be. If you have studied for your Extra Class ticket, you'll remember that a Hartley oscillator has a tapped inductor that provides feedback to sustain oscillation. (And if you took your test 25 years ago as I did, you'll remember having to do freehand drawings of Hartley and Colpitts oscillators as part of the test!) L1 and L2 form the tapped inductor in this case. Both are wound on the same form for tight coupling, indicated by coupling factor (K) of 0.98 in the schematic.

The combined inductance of L1-L2 is resonated by C2 to set the oscillator's RF output frequency. The RF would be continuous if feedback conditions were stable. But in this circuit, C1 charges in just a few RF cycles and saturates the transistor, then discharges more slowly. The result is pulsed oscillation, as shown in the waveforms of **Fig. 2**.

Figs. 1 and **2** were created in SwitcherCAD III, a freeware circuit analysis program based on the classic SPICE analytical engine. To learn more about squegging oscillators, download the program,[3] input this circuit, and run a transient analysis. Then try varying the component values to see what happens to the RF pulse rate, pulse duration, and RF frequency.

The output of this rudimentary L-C Hartley oscillator has very high harmonic

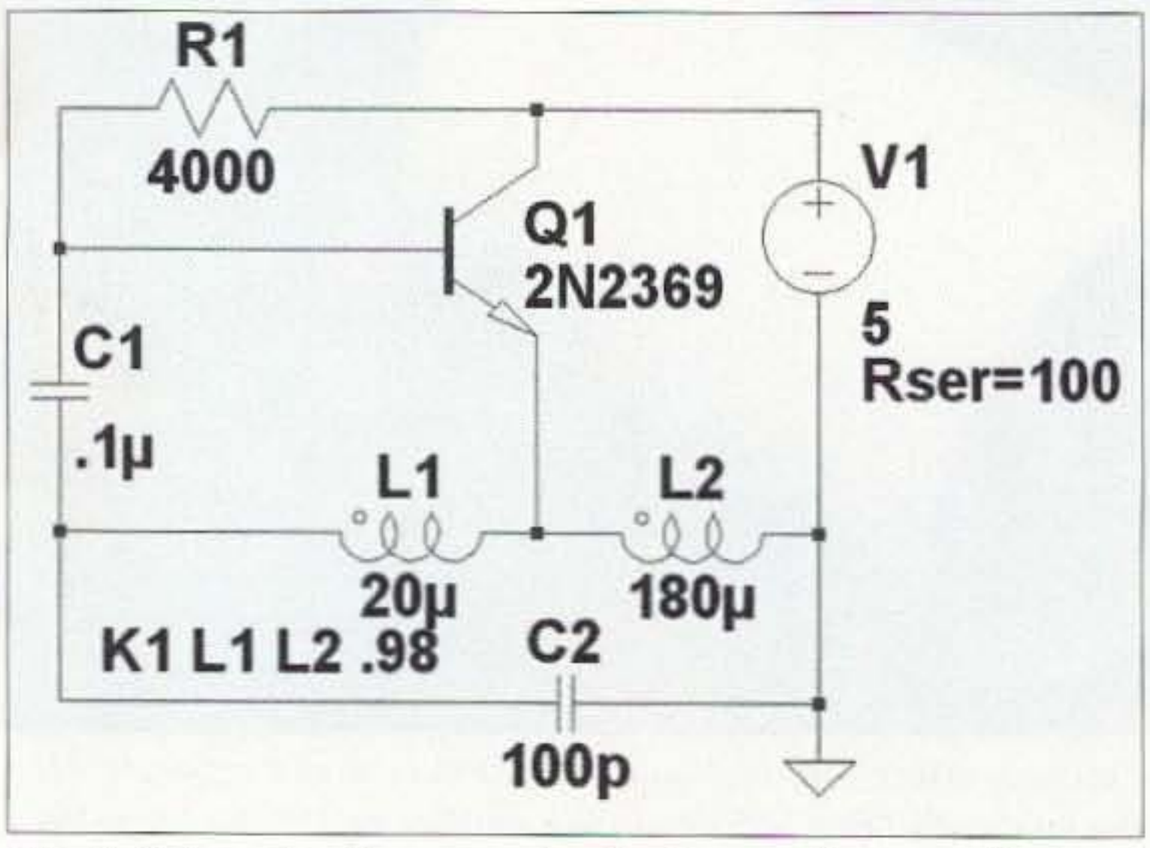

Fig. 1. Schematic of a squegging Hartley oscillator as displayed in SwitcherCAD III for Windows.

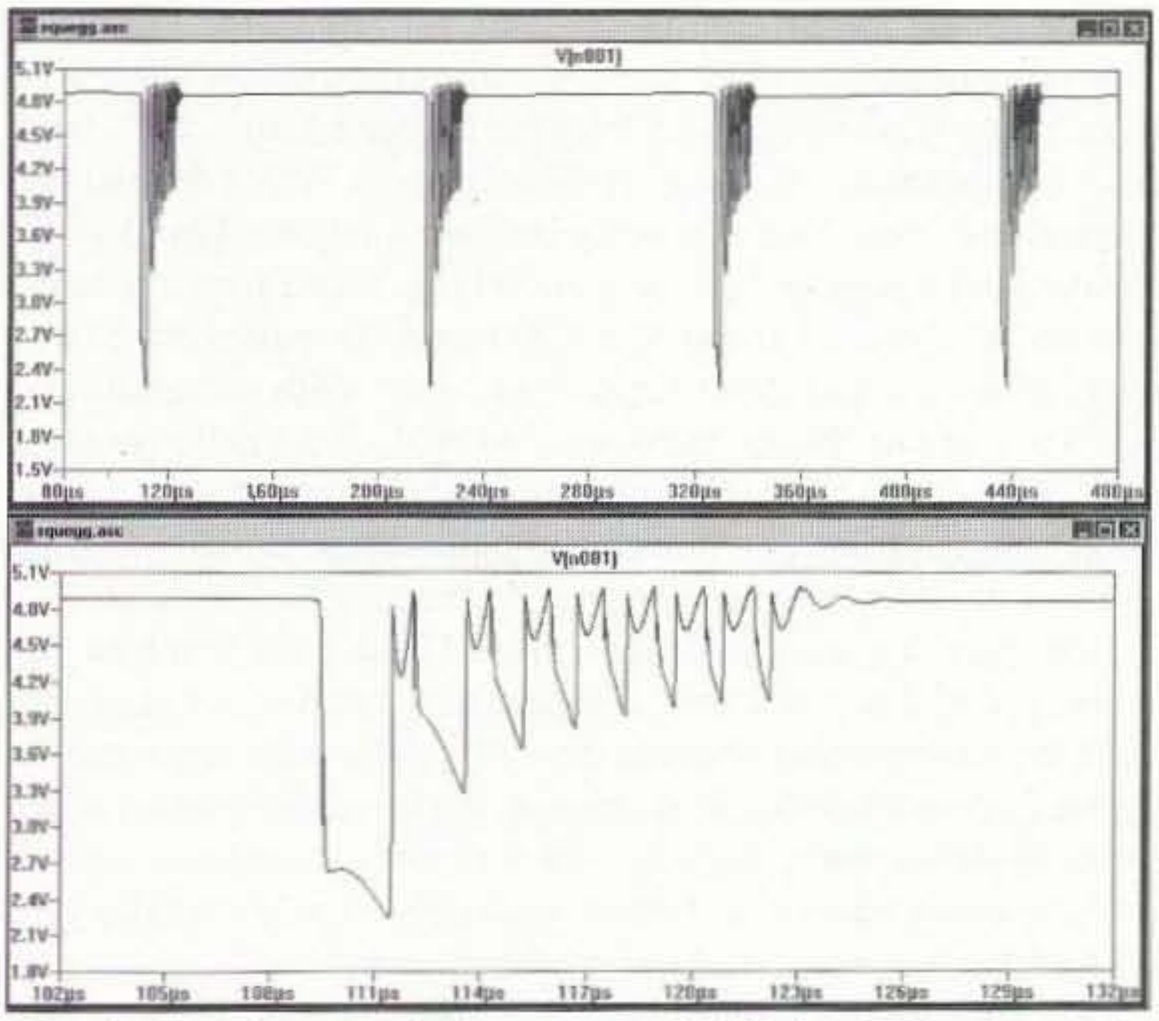

Fig. 2. *Transient analysis output of SwitcherCAD shows the pulsed RF oscillation that trails off and stops after eight cycles, then repeats at regular intervals.*

content, as the lower trace of **Fig. 2** shows. It would also have very poor frequency stability in an animal tag, due to temperature changes, varying proximity to the critter, coil movement, and battery voltage sag.[4] Micro-tags for research solve those problems

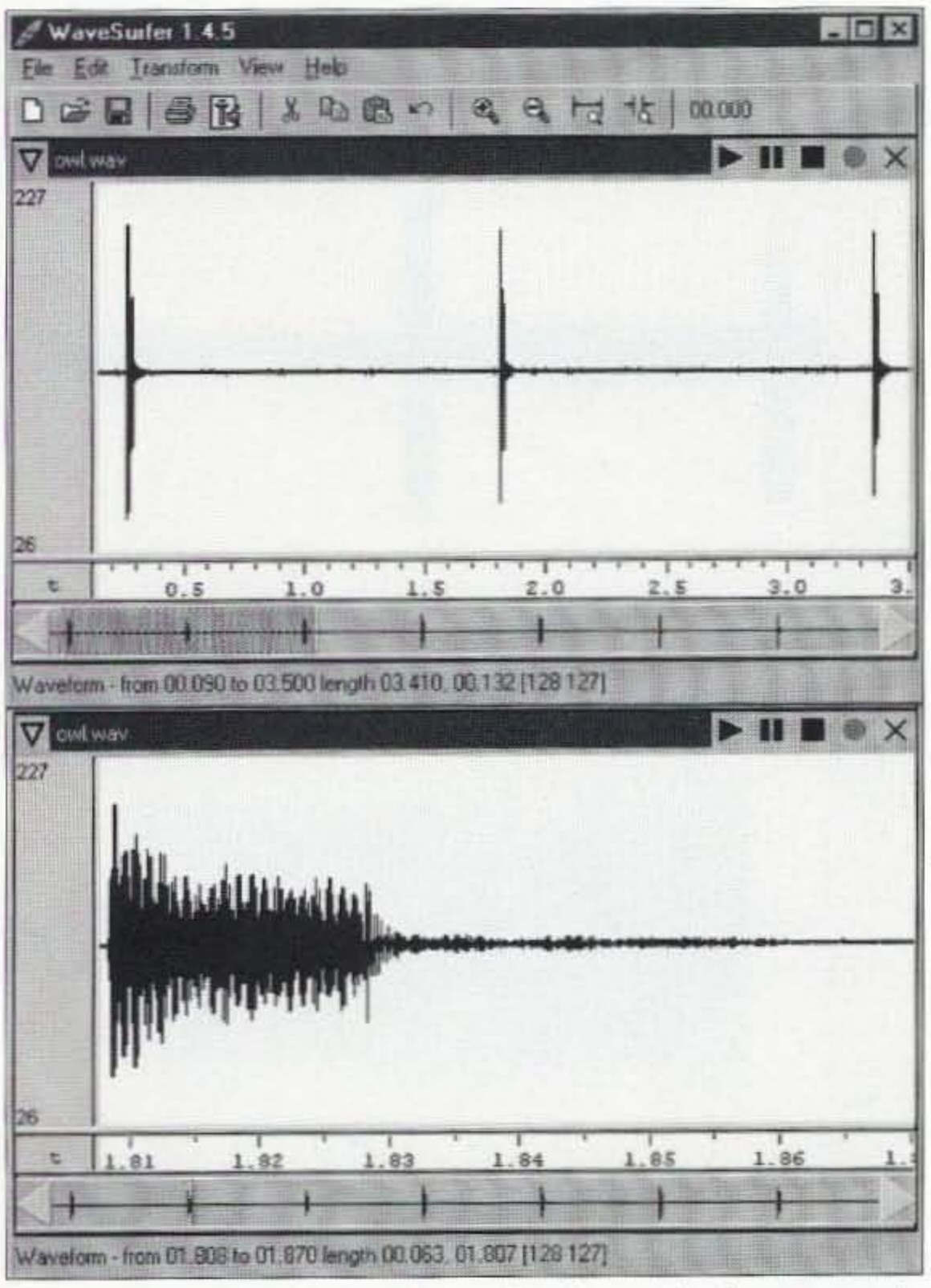

Fig. 3. *WaveSurfer display of an owl radio tag. At the top, a train of pulses, precisely spaced. At bottom, a close-up of a single pulse.*

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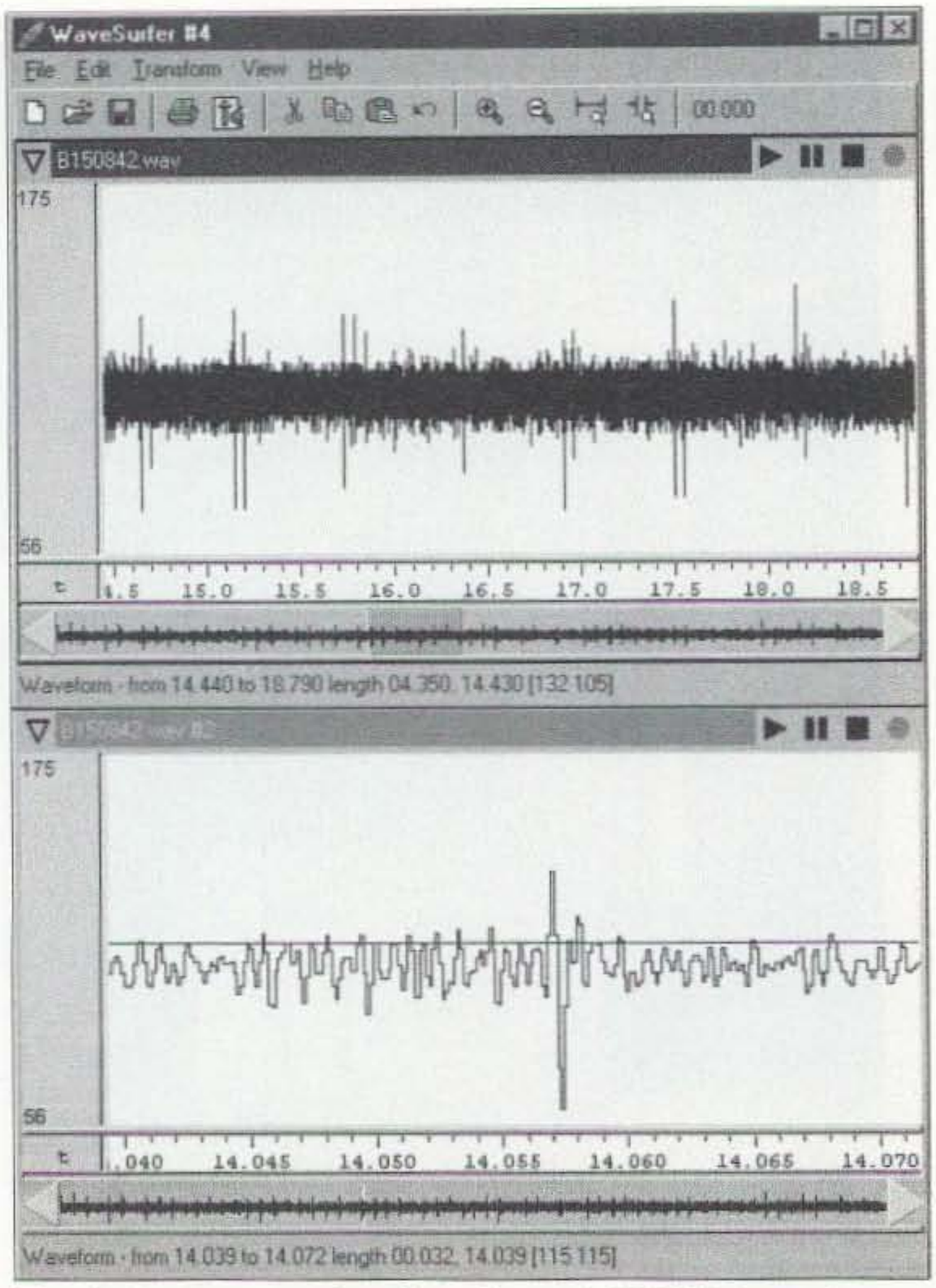

Fig. 4. *It's easy to see that this volunteer's WAV file is not from an actual radio tag, even though the clicks sound somewhat similar.*

with crystal-controlled oscillators, but their pulsing scheme is almost the same. The characteristics of the pulsing can be used as a form of ID.

Was that really an owl?

Since 1998, I have been asking hams and other monitoring enthusiasts to carefully tune their VHF receivers in hopes of picking up radio tags on migrating Burrowing Owls. Researchers in Canada and Washington state use these transmitters to keep track of hatchlings as they move away from their parents after fledging. When these owls head south for the winter, they travel too fast through bad weather to be followed with aircraft. In addition to hams along the anticipated migration path listening for the tag signals, I hoped that RDF-equipped hams would then track the signals for positive verification of the birds.

The first winter, one signal-heard report was received from Texas. In the next year, three reports came in from locations ranging from Arizona to Arkansas. As I write, this fall's effort has only been under way for eight weeks, and six reports have come in already.

The good news is that there are now many hams who are willing to do VHF monitoring. The bad news is that relatively few of them can do the direction finding. That makes it important to verify the signals in other ways. There is a sound file (OWL.WAV) of an actual Burrowing Owl radio tag at my Web site, and some hams have reported signals that sound "just like the file." But were they? This year, I have asked each respondent to provide either WAV files or a cassette tape of what they heard. There have been differences in every one I have received so far, sometimes subtle and sometimes glaring.

There are lots of sound analysis programs for PC, Mac, and other platforms. Many are freeware or inexpensive shareware. I am using WaveSurfer 1.4.5 from the Center for Speech Technology in Stockholm, Sweden.[5] It directly opens WAV files and performs both time and frequency domain analysis. **Fig. 3** is the WaveSurfer display of an actual owl tag, taken from the audio output of a receiver in the SSB/CW mode. RF pulses are 20 milliseconds long and about 1.5 seconds apart, with no variation in duration or rate. Notice the downward "tilt" of the pulse envelope, which is characteristic of the diminishing output of a squegging oscillator. Also notice the 30-millisecond "rat-tail" after the pulse, caused by lingering low-level operation of the oscillator.

Compare this actual owl tag signal to **Fig. 4**, a file sent by a ham shortly after this year's announcement went out. When I played the file, the transmissions sounded more like clicks than beeps, and the pulsing rate seemed somewhat irregular. The WaveSurfer display shows why. In the top trace, the pulses are not evenly spaced over time. In the expanded trace on the bottom, each pulse is only a single cycle. It's probably some sort of quasi-periodic noise.

My ears were enough to quickly rule out that file as a possible owl tag, but the signal of **Fig. 5** almost had me fooled. I was suspicious, because the pulses were too "clean" sounding and their rate was more rapid than anticipated. Sure enough, WaveSurfer showed that the blips were exactly one second apart, as if from some clock device. The pulses were too long (80 milliseconds), too square (very sharp rise and fall of the RF envelope), and there was no rat-tail. So this signal isn't an owl tag, unfortunately.

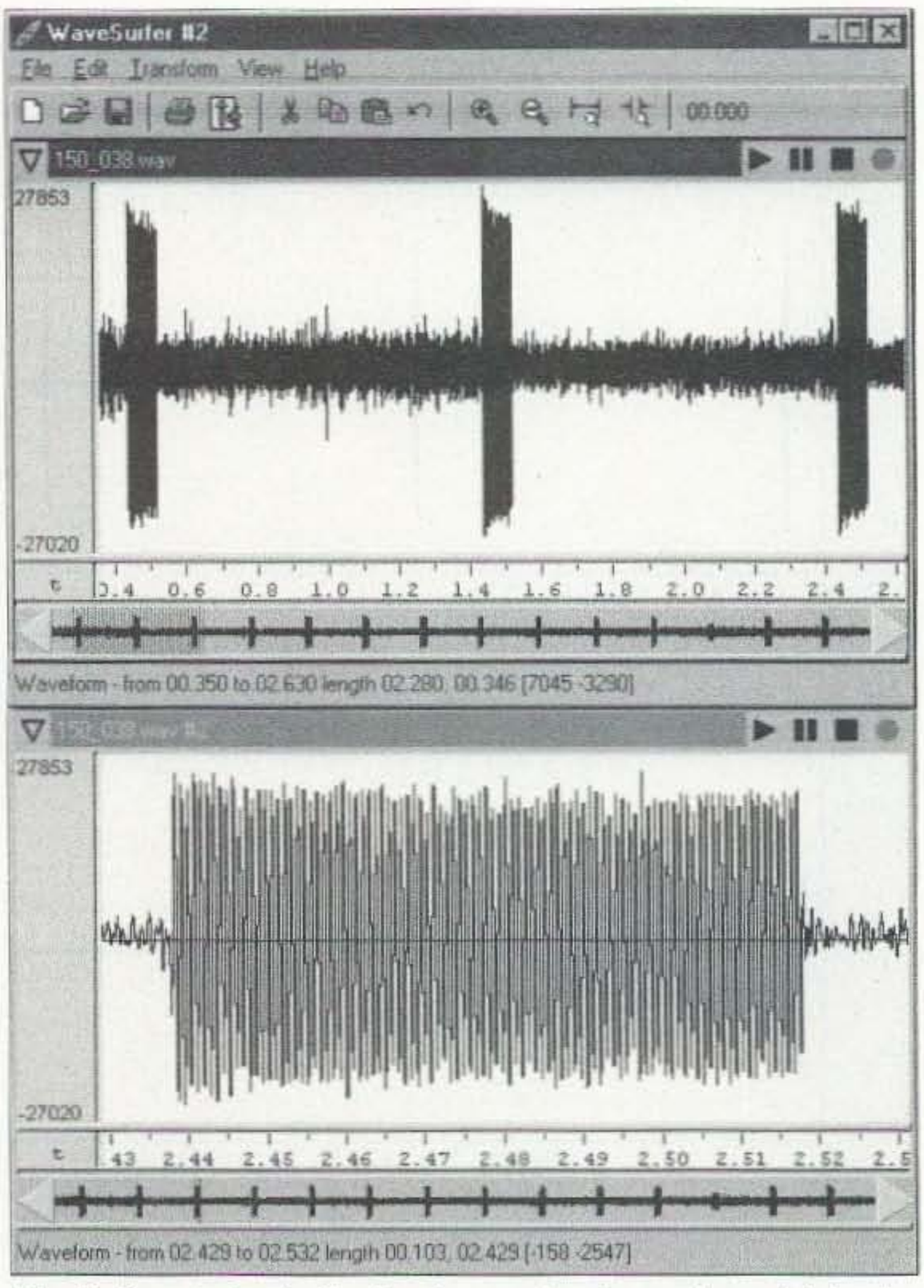

Fig. 5. *Despite its similarities in sound and waveform, this is also not an owl radio tag.*

Although not shown in the figures, WaveSurfer will perform fast Fourier transforms (FFTs) of the WAV file to display audio frequency components versus time. The pitch of a tone burst on a CW receiver varies with the BFO setting, but observing the steadiness of that tone might further refine the ID process. Try it.

Latest owl update

In previous years, hams helped determine that Burrowing Owls hatching during summer months in the Canadian provinces of Saskatchewan and Alberta travel over central states from North Dakota to Oklahoma, ending up in southeast Texas and northern states of Mexico. They sometimes fly over 2,000 miles to their winter homes. For the first time since 1998, there weren't any tagged Canadian owls to track this fall, so our listening effort has shifted to owls banded on both coasts.

Vicki Garcia at the College of Agriculture and Life Sciences at University of Arizona writes, "We'd like to thank all the volunteer monitors who participated last year. This year, we put out about 85 transmitters and have been tracking our Burrowing Owls until they leave our study area in eastern Washington state. Fifty-three are still thought to be active. The batteries should last for about 6 months, and we transmittered owls from June to mid-August, 2002.

"We have very little new information about migration. We did get one band return in the San Francisco area from an owl that was banded at a nearby study area. We also got one band return in Montana from an owl banded at the same study area. Therefore, it may be possible that migration routes exist both to the southeast and southwest of our owls' original site (Grant and Adams counties in eastern Washington). We could potentially find migrants from our study area in any state west of the Rockies.

"Even one finding would be very valuable to us and would add an additional piece to the puzzle. Although the possible area is huge, we hope that the greater number of transmittered birds, coupled with increasing numbers of volunteers in a wider geographic area, will eventually lead to some findings."

Burrowing Owls aren't the only Strigiformes being tracked by volunteers. We're also helping Scott Weidensaul of the Ned Smith Center for Nature and Art in central Pennsylvania. He writes, "Our first three radio-tagged Northern Saw-whet Owls are headed south. We tagged them with 1.9-gram radio transmitters on October 14, 2002, but they lingered for almost three weeks before leaving, a testament to the warmish weather we had most of October. All three are females. The first two are immature birds, and the last one is a three-year-old. There will be more in the coming weeks. Frankly, since I'm interested in their behavior before they leave, I'd be happy if they stuck around for weeks like the last batch.

"The Saw-whets, which weigh barely as much as a robin and stand just 8 inches tall, were tagged in Schuylkill County, Pennsylvania, about 15 miles north of Reading. They are expected to either continue south through the central and southern Appalachians, or to move south and east into the Piedmont and coastal plain. It is believed that most Saw-whets migrating through Pennsylvania spend winter in the mid-Atlantic states from Maryland to the Carolinas. But little is known about their winter range, and the tagged owls may show up anywhere between the Mason-Dixon Line and Alabama or Georgia, and west through the Appalachian and Cumberland plateaus.

"The Ned Smith team's research focuses on how the owls behave and live during the periods when they take a break from active migration, what scientists call 'stopover,' which may last days or even weeks. Owls that are caught twice within a couple of days are the ones being fitted with radios, in the hope that they will stick around at least a few days more, giving researchers a chance to study their habitat use, roost selection, and diet. But once they move south again, it is possible that hams and VHF monitoring enthusiasts will pick up their signals, providing valuable information about where they eventually wind up.

"The Saw-whet Owl, named for a rarely heard call likened to a file 'whetting' the teeth of a saw, is a small forest-dwelling bird that preys primarily on mice and small rodents. It breeds in thick forest across southern Canada and the northern USA, and down the Rockies and Appalachian mountains. Secretive and rarely seen, it is more often heard; the male's territorial call is a repetitive tooting, very much like the back-up alarm on large trucks. Transmitters are mounted on the owls using a figure-eight harness made of elastic beadwork cord, designed to allow the transmitter to fall off after several months."

Will it be a "Homing In" reader who makes the first verified intercept of a migrating Saw-whet Owl tag? If you're in the target area, please spend some time listening. Better yet, build an RDF antenna for

Continued on page 57

K.I.S.S. Trickle Charger

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Now you see why I do not have definitive information to offer on this method. All of my research so far seems to lean in the positive direction. So far I have not found any negative aspects.

I would love to hear your comments on this article.

Many thanks are due to Angelo Polvere KA9CSO, Harry Gilling W9IB, John WA9JBT, and Ron Remus WB9PTA, for helping with the editing, proofreading artwork, construction, and photography for this article. 73

Experimenting with Hall-Effect Sensors

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the sensor's nominal output is high with respect to common ground, resistor R3 will require a shunt to raise the voltage at pin 3. If the output is lower than common ground, then the shunt will have to be placed across resistor R5. The actual value of the shunting resistor will have to be determined experimentally, but in my case the value was 22k.

Controlling the op amp gain would be important only if a specific sensor output voltage ratio was desired for a given experiment. For my experiments, I operated the circuit at maximum gain to achieve maximum VOM response.

For source power, I used a 15 V split voltage power supply with the intent of giving the op amp the best opportunity for a linear output response as a function of the input signal level.

Controlling the supply voltage value was also critical to the voltage applied to the sensor. In order to provide a stiff supply for the sensor, zener diodes were used to divide the supply voltage. In my experiment, I chose a pair of matching zener diodes having a voltage near 5.1 V. The ultimate objective was to place the sensor supply voltage at a value near 5.0 V and to set the sensor's QOP output voltage close to zero volts with respect to common ground. With a sensor QOP output voltage slightly above Vcc/2, balance compensation was required as discussed earlier.

Conclusion

Please examine the listing of applications for a Hall-Effect sensor and develop some uses for ham radio.

It was both fun and interesting for me to experiment with an element of technology that I hadn't experienced previously. Learning even a little bit about "strange" technology opens up your imagination for applications that will support ham radio projects and perhaps make our life easier.

My suggestion is to develop some simple experiments for devices not currently understood. You'll be amazed at the exhilaration you get with the new experience! 73

2m FM Ham History 101

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in parking lots to make the exchanges) and few met with any expense. Concord gave its 31 input to Graylock: Graylock was now 31-91. Waltham gave its 34 input to Concord; Concord was now 34-94. Graylock gave its 04 input to Waltham: Waltham was now 04-64. Agreement and consistency!

Today, 600 kHz splits are the norm nationwide, and that frequency split is preprogrammed in all our radios. Now you know why.

Originally published by the author in The SPARC, *newsletter of the Boston Amateur Radio Club.* 73

To the Rescue

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I can't remember the search-and-rescue worker's name, but I sure remember what came next.

While the search-and-rescue member was on his way to the airfield, the second tow truck arrived. The driver pulled his truck up to the end of the muddy road and got out.

"What happened?" he asked the first tow truck driver.

"I'm stuck," was the answer.

The second tow truck driver pulled his truck back next to the first one. His tires then did the spinning-in-place thing, making him so frustrated that smoke practically came out of his ears. He jumped out of the truck and went over to my father.

"Is this your property?" the second driver asked.

My father very calmly said, "No."

The two tow truck drivers stepped off to themselves and had a short conversation. You can probably guess just as good as I can what they were saying to each other. But they wouldn't be stuck for all that much longer.

The search-and-rescue worker finally arrived and drove his four-wheel, diesel-powered work truck into the mud. But *he* didn't get stuck! Thank you, search-and-rescue.

The S&R man had a winch on the front of his truck. He hooked up the winch to the second tow truck and pulled it out. Then he hooked up to the first tow truck and pulled him out.

After the tow trucks left, we had a pretty good laugh.

The best thing about my experience? I didn't have to pay to save the two tow trucks.

Next time I go to fly my remote-controlled glider, I will make sure to do it on a dry day. I will make sure to drive on solid ground, too. I don't know if my experience is a first, but I will never forget how much two meters played an important part in the "fun."

(Ed. note: Another part of the fun of this article, you can't see — it's been edited out. Like most of our authors — and we hasten to say that, because by no means do we mean to make fun of or criticize him — KE6FBO made some minor spelling errors in his original manuscript. In this case, though, Peter accidentally misspelled "winch" with an "e". So, on first reading, we were greeted with wenches tied to trees, mounted on trucks, and so forth — at least we hope he meant "winch.") 73

On the Go

Continued from page 45

connection points. I ran one rope to a second floor window, another to a pole in the back yard. I then ran the antenna back to the house, giving me (roughly) a square — actually, more of a rhombic, but you get the idea. It was nowhere near an ideal installation. The documentation recommends that the antenna wire be at lest ten feet off the ground. In my configuration the one leg of the loop was less than ten inches off the ground. However, I told myself, this is probably more closely similar to how the STEALTH would be installed during a real emergency.

I connected the two ends of the loop to the Smartuner and ran the coax into the house. The coax has the connections for the 12 volt power supply connected to the cable, so all the terminations end up in the same place. After connecting those, I went up to 20 meters and listened around. From reading the manual (yeah, I actually do that), I knew that the tuning process doesn't begin until a transmitted signal is detected (forward RF). There was a bit of QRN on the band, but I looked for a clear frequency, hit the mike, and ID'd. Within the time it took to give my call, the match needles on my SWR meter showed that the forward power had climbed and the reflected power had dropped with less than 1.5:1 SWR. Although it went by briefly, it appeared that the starting SWR had been greater than 3 to 1. The tune-up was significantly faster and more accurate than I can do using a manual tuner, even if I know what the settings are supposed to be. Fairly impressive, I must admit. Naturally, once tuned, the antenna performed better on receive as well as transmit.

Over the next few weeks I tried the STEALTH antenna in comparison to my trusty dipole, switching back and forth between the two. While it's true that the dipole works a bit better, it's also much higher and, being horizontal, is less subject to electrical noises. It also took considerably longer to assemble and erect the dipole. On a performance output per unit of input basis, the STEALTH holds its own.

There are a number of ways that the STEALTH can be constructed. A single loop is the preferred method. The polarization of the antenna is an important consideration since the signal orientation is perpendicular to the plane of the loop. If the antenna is positioned in a vertical orientation, the radiation will be horizontal with a pattern more useful for working stations at greater distances. A horizontal loop can be used for shorter distance operations, generally accepted to be less than 500 miles. If space considerations prohibit a single loop, a double or triple loop can be used, although this will reduce performance. Usually multiple loop configurations are used indoors. The most interesting approach is a four-loop approach that uses four broomsticks as the form. The handle ends are connected together in a cross and the bristles act as separators to keep the loops from touching. A truly creative approach.

Although I tend to focus on the benefits of this product for emergency operations, if you are in a location wherein antennas are a problem, this may be a viable answer. An 80 foot loop antenna such as the STEALTH can be easily concealed and yet permit operations across the high frequency bands. It would also be an ideal addition to the gear for vacation time, allowing some quality operations from a campsite or summer cottage with only a minimum of effort.

SGC products, including the STEALTH antenna are available from your favorite ham radio dealer. You can check out this and the other SGC products at their Web site. If you're interested, you may find it useful to download the manual for more information. They have a comparison chart that shows the features of their entire range of Smartuners, so if your needs are a bit different, you may want to check that out.

For emergency operations, the STEALTH antenna provides a great solution, and the time to prepare for an emergency is when you have plenty of time. Besides, this antenna is just plain fun to play with.

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Hamsats

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to adjust frequencies, the printed predictions, my watch, and the tree limbs that were trying to eat my antenna.

Results

We never got our bear. In fact, we never saw one. This was probably good. The paper targets that we set up at base camp were our trophies. We did make some excellent contacts from some very remote places via UO-14, had fun, almost got used to the altitude, and swore off MREs. For us flatlanders it was an adventure. We hiked deeper into the Pecos Wilderness to Hamilton Mesa at 10,400 feet on the final day. The walking was actually getting easier. We had finally adapted to the lack of air, and liked it. For Bill, I guess it was just a stroll in his back yard, and a beautiful one it is.

Straight key night on OSCAR

You are invited to participate in the 30th annual Straight Key Night (SKN) on OSCAR, conducted by AMSAT. It's easy. There is no scoring and no logs. Simply operate CW on any OSCAR satellite, using a straight hand key from 0000 UTC to 2400 UTC on January 1, 2003. Work as many SKN stations as you can. The moon (OSCAR 0) also counts.

Each participant is asked to nominate one of the operators for "Best Fist." Send your nomination to Ray W2RS at [w2rs@amsat.org]. Those nominated will be recognized in the *AMSAT News Service Bulletin* for early February, and also in the *AMSAT Journal*. Blow the dust off that straight key and join us. 73

Homing In

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the tag frequencies so you have a chance of getting a visual sighting.

Your scanner or extended-range handheld amateur radio transceiver, plus an outside antenna, are all you need to join in this volunteer effort. Washington Burrowing Owl tags are between 150–152 MHz. Saw-whet owl tags are near 172 MHz. Exact frequencies, antenna ideas, and more information about the project are at the "Homing In" site. You can also join the BIOTRACKERS E-mail list for latest updates and discussions of wildlife tracking topics.

Notes

1. See "Homing In" for November 1994, "Testing the Motron Fingerprinter."
2. See "Homing In" for May 1991, "T-Hunting Stolen Cars."
3. PC (Windows) version available from Linear Technology at [http://LTspice.linear-tech.com/software/swcadiii.exe].
4. But it's stable enough for the Electronic Golf Ball. Take a look at U.S. Patent 3,782,730 at [http://www.uspto.gov/patft/].
5. Download at [http://www.speech.kth.se/wavesurfer/]. 73

QRX

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But when they looked more closely, they found that, despite producing an oscillating signal, the circuit itself was not actually an oscillator. Instead, it was behaving more like a radio receiver, picking up a signal from a nearby computer and delivering it as an output.

In essence, the evolving circuit had cheated, relaying oscillations generated elsewhere, rather than generating its own.

Layzell and Bird were using the software to control the connections between 10 transistors plugged into a circuit board that was fitted with programmable switches. The switches made it possible to connect the transistors differently. Treating each switch as analogous to a gene allowed new circuits to evolve. Those that oscillated best were allowed to survive to a next generation. These "fittest" candidates were then mated by mixing their genes together, or mutated by making random changes to them.

After several thousand generations you end up with a clear winner, says Layzell. But precisely why the winner was a radio still mystifies them.

To pick up a radio signal you need other elements such as an antenna. After exhaustive testing they found that a long track in the circuit board had functioned as the antenna. But how the circuit "figured out" that this would work is not known.

"There's probably one sudden key mutation that enabled radio frequencies to be picked up," says Bird.

Thanks to New Scientist, *via Duncan Graham-Rowe, via BJ Joseph K8LIX, via* The Tuned Circuit, *bulletin of the L'Anse Creuse (MI) Amateur Radio Club, October 2002.*

Answering An Age-Old Question

Jules-Henri Poincaré was dubbed by E.T. Bell as the "Last Universalist": a man who was at ease in all branches of mathematics.

Poincaré was also a 19th-century professor of astronomy who made fundamental contributions regarding the motions of the planets. He went on to found the field of topology, a branch of geometry, and even competed with Albert Einstein in the study of relativity.

Before Poincaré, mathematicians fully understood two-dimensional space, such as the Earth's surface, and could list all the possible shapes of two-dimensional surfaces and use mathematical calculations to distinguish between them. But the math mystery Poincaré raised regarded the properties of three-dimensional space. His question, or conjecture, was whether the two-dimensional calculations could be easily modified to answer similar questions about three-dimensional spaces.

He was pretty sure that the answer was yes, but couldn't prove it mathematically. Nearly 100 years later, math whizzes remain stuck, except for one. His name is Martin Dunwoody.

Dunwoody is described as a British mathematics expert. His answer is barely six pages long and only an outline. And as you might expect, Dunwoody's solution — complete with formulas and diagrams — has been praised and challenged in England.

No, we will not try to explain all the math here. What is interesting is the reaction of the scientific community. Professor Ian Stewart of the University of Warwick, one of Britain's most respected mathematicians, calls it the first good shot at this problem in years. But Colin Rourke, another University of Warwick mathematician, disagreed. Rourke says that when he raised a problem in the solution, Dunwoody admitted on his Web site that it could be difficult to overcome.

Once the math community has accepted the solution, the Clay Mathematics Institute in Cambridge, Mass., must conduct its own review. Only if that proves successful will Dunwoody be rewarded. And if the reaction of the British math professors is any indication, this controversy could rage on in math circles for years.

And, even if Dunwoody continues to refine his answer and eventually is proven correct, it could be a long time before it's official. First, he must get it published in a mathematics journal, and then undergo a two-year waiting period of international review.

Thanks to Science Today, *via Henry Feinberg K2SSQ in* Newsline, *Bill Pasternak WA6ITF, editor.* 73

NEVER SAY DIE

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the stuff we've been buying has "China" stickers, nothing has any "Russia" stickers on it.

So much for socialism. Humans just don't perform well using the ant or bee way of life.

Getting Out the Vote

Saddam seems to have solved one of the major problems of democracies. He also solved the problems of negative candidate advertising and keeping people up election night waiting for the results. How about his getting 100% of Iraqis to vote? And, even better, to vote for the only candidate? No write-in candidates in Iraq! No live ones, anyway.

America's Strength

The strength of America is not the *Fortune* 500 corporations, each with thousands of employees. Our real strength is in our millions of small businesses, over half of which (54%) have fewer than five employees. They're what makes it so we have the highest standard of living in the world. They're why we can afford the strongest military in the world. We're able to spend more on our military than the next 15 countries combined. Our small businesses are why America is now the world's only superpower. They're what I'm determined to help grow as a group. They're our entrepreneurs.

Alas, our universities do not teach the things small business owners need to know. Their courses are aimed mainly at preparing grads to work in large corporations, the government, or to teach. I went through that mill 60 years ago. The president of the student body at my old school recently confirmed that "nothing has changed."

Our superpower might is comforting, but in the long run we'll have a more peaceful world if we help ease world poverty and ignorance instead of trying to stomp out the fighting that results.

My sneaky plan is to encourage business incubator growth in thousands of towns in America. These would help finance (with state funding help) and manage promising new business enterprises.

Business Incubators

Even up here in rural New Hampshire we have around 200 towns large enough to support business incubators. If each incubate an average of ten new businesses a year, we'd have 20,000 new businesses in ten years.

Now, if New Hampshire, with less than 1% of the U.S. population, can generate 20,000 new businesses, the whole country should be able to generate over two million by the time the Mayan calendar ends in 2012.

My *Improving State Governments* book goes into the details of my small-town business incubator proposal.

Global Poverty

Since there isn't anything that any of us can do about it, what do we care if 73% of the people in Mali earn under a dollar a day and 58% are illiterate? Or Pakistan has 57% illiteracy? Or that most of the Third World isn't doing much better?

These people need education and a way to make money. In that order. And this is something that the world's only superpower (us) could easily handle. And it sure would be a lot cheaper than getting involved with more wars. Better yet, the payoff would be more markets for American products and technology.

By making inexpensive first-rate education available via interactive DVDs, we could sow the seeds of success. Then, with micro-loans for really small businesses and larger loans available through business incubators, we'd start them building the small business

foundation that is the real strength of any country.

What would it cost for us to start setting up baby-care centers in Third World countries where babies could be taught their native language, English, and maybe a few other languages during the year or two when they're able to easily learn them?

Well, you get the idea.

Therblig

Whazzat a therblig? Aha, you haven't read the book or seen the movie *Cheaper By The Dozen.* Or read a book on time and motion study.

What's time and motion study? It's the tool efficiency experts use to speed up repetitive tasks. The pioneer in the field was Gilbreth, who modestly gave the name "therblig" ("Gilbreth" backwards … well, sorta) to the basic elements of any repetitive action.

With people it's a Mars-Venus thing, with women tending to be patient and men tending to be impatient. Well, women have to be basically patient in order to deal with their children.

So where'm I going with this? Well, it started out when I woke up one morning and the first thing I did was rewind the video tape I used to capture the George Noory Coast-to-Coast radio talk show. It used to be the Art Bell (W6OBB) show, but Art several months ago fell off a telephone pole while putting up an antenna and hurt his back. Since then he's not often been well enough to host his old show.

The show, which runs for four hours a night, every night, keeps millions of people up listening. Here in the East it runs from one to four a.m., hours that few working people can listen, so the audience tends to be mainly the elderly with insomnia, long distance truck drivers, and prisoners.

Which is a pity, because the show often features some ver-r-r-ry interesting guests that you're unlikely to hear anywhere else.

I've solved the problem of listening to the four-hour show without losing four hours sleep by taping it with my VCR. This makes it so I can fast-forward through the half-hourly news and commercial breaks. Further, since the first hour almost always is used to air random listener call-ins, I start taping with the second hour. The fourth hour is usually used for listeners to ask the guest questions. By then the guests have to have covered their subject of expertise, so I tape the last hour, but seldom bother to listen to it.

The news and commercials take up the first twelve minutes of every half hour, so that leaves 18 minutes of actual guest interviews every half hour. Times two hours is 72 minutes. So I'm able to keep up with the work of a long stream of experts while I fix and eat breakfast and lunch. Or while I'm collating the pages of one of my books.

The show is broadcast on over 550 stations weeknights, and a few less on weekends, when Whitley Strieber and Barbara Simpson are the hosts. I can hear the show on about 20 stations as I tune my AM radio dial.

You're missing a lot of information that you aren't going to get from the regular media — interviews with experts on crop circles, UFOs, contactees, remote viewing, time travel, and a lot of health info that you're unlikely to hear about anywhere else. You know, the stuff I write about.

Gilbreth would be proud of me listening to Coast-To-Coast AM on my TV set while I eat breakfast, with me collating book pages as I chew each bite.

Rocket Scientists

Hmm, let's see now — in 1999 the $125 million mission to Mars crashed. They said that was caused by Lockheed using English instead of metric measurements in some of their calculations. D'uh? And in the same year Lockheed put a military communications satellite into an unusable low-Earth orbit instead of the wanted geosynchronous orbit. Just a little software error. D'uh? And in the same time frame five out of 25 launches failed due to design errors.

While our military are busy dreaming up more and more uses for satellites, a generation of space scientists is retiring or losing their jobs as the industry shrinks.

Gee, weren't we lucky thirty years ago when every one of those Apollo Moon mission rockets performed so perfectly?

Parkinson's

Recent research into Lou Gehrig's Disease (amytrophic lateral sclerosis - ALS) has found that it's caused by a bacterial nucleic particle called a mycoplasma. This was also found to be the cause of chronic fatigue syndrome and Parkinson's Disease.

And the cure? An immune system–enhancing diet.

Gee, what a surprise (not).

And how does one enhance their immune system? By not eating anything the immune system reacts to as toxic.

Sonograms

The use of ultrasound during pregnancy has been termed one of the biggest uncontrolled experiments in history. Now, finally, serious questions have been raised about the safety of sonograms. It's about damned time. We're finally starting

Continued on page 61

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Overall Improvement

Compared to last month, January should bring an improvement in overall conditions, but we'll still have numerous Fair-to-Poor (FP) and Poor (P) days to contend with.

As marked on the calendar the 7th–9th, 18th–20th, and 24th–26th will be the most difficult periods, but only the 25th looks as if it might bring widespread blackout conditions.

Once again, no solidly Good (G) days are in the offing, but positive seasonal influences should continue to tip the scales in our favor on marginal days. Long nights with few hurricanes or other atmospheric disturbances will help out on the higher bands and minimal daytime absorption will assist us on the lower ones. The first weekend in January is my pick for the best conditions of the month with pretty good worldwide DXing available from most locations.

Looking ahead to the rest of the year we should see a slow decline in solar activity, with the SSN (Smoothed Sunspot Number) dropping from the 100–125 range to the 75–100 range by next December. The 10.7cm solar flux values, recently around 160, should also decrease to about 100, so you can expect some revised Time-Band-Country charts to appear in the upcoming months. I've been relying on the same set of charts for about the last 18 months and have received no complaints about them, but they are based on "Very High" solar activity. We're now entering a period of "Moderate to High" activity so different DX windows will be opening up to us this year.

The Time-Band-Country charts I publish are necessarily very generalized and at best are only a guideline for finding reliable openings. Obviously, due to the size of the geographical areas involved, the vagaries of operator location and equipment, and other considerations, the openings listed are of a "ballpark" nature. These charts are based on decades of historical data collected from reliable sources all over the world, but the margin of error is still quite wide. For more precision there are many fine communication

EASTERN UNITED STATES TO:

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

CENTRAL UNITED STATES TO:

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

WESTERN UNITED STATES TO:

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

January 2003

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

analysis programs available for your computer such as CapMan, GeoClock, PropLab, WinCap, VoaCap, and Beam Finder. They range in price from free to more than $300, so there's something available for everyone's budget. You can find a review of many popular software titles on the Radio Netherlands Web site at [http://www.rnw.nl/realradio/links/html/software.html]. "73" and Happy New Year!

Band-by-Band Forecast

10 and 12 meters

Worldwide opportunities can be found from sunrise to sunset, but openings will be narrow due to our short northern days. Once again, southern Europe, the Middle East, and Africa should have reliable openings from sunrise through late morning. Central and South America will dominate these bands from mid morning through late afternoon of course, but the South Pacific and Asia should become fairly strong by sunset. Be sure to check the morning and evening gray-line paths for strong propagation into areas that aren't normally accessable at other times. Daytime short-skip will range from 1,000 to approximately 2,000 miles.

15 and 17 meters

As on ten and twenty, your openings will follow the sun and occur from sunrise to mid-evening. Southeasterly through southwesterly paths will be the strongest and most predictable but some northerly areas will begin to compete as the month progresses. Southern Europe should often be workable before noon but North Africa and the Middle East will be easier targets. Central Africa may also become readable just before noon but South African stations usually don't connect until after lunch. Pointing south, the Caribbean, Latin America, and South America should be a "no brainer" from just past noon into the evening. Look for traffic from the South Pacific, Australia, and Southeast Asia for a few hours after supper. Short-skip will average from 1,000 to 2,200 miles.

20 meters

Good DXing should be available around the clock. Look for peaks just after sunrise, during the late afternoon, and again in the early evening. Try Australia from sunrise to mid-morning, Europe from mid-morning through early afternoon, and Africa in the late afternoon. Central and South America should be open most times except around sunrise. Asia and the Orient will only be available to night owls. Early risers might try long paths across the Antarctic into southern Asia and the Near East. Short-skip can range from 500 miles during the day up to 2,100 miles at night.

30 and 40 meters

Good worldwide opportunities can be found during the hours of darkness. Central and South America will be the dominant stations, but if you live east of the Rockies you may find Europe and the Middle East good territory between sunset and midnight. Operators in the western U.S. will find the best signals in Central and South America although the Middle East may be workable for a few hours around mid-evening. Japan and Australia will also be workable, but only during the hours when most of us in the U.S. are asleep. Skip distances will fluctuate between 750 and 2,000 miles at night and will be under 1,000 miles during the day.

80 and 160 meters

Good worldwide DXing may become available from sunset through sunrise, but high sunspot activity will continue to weaken signals. Easterners should find the best openings to Europe or North Africa from just after sunset to midnight. Midwestern operators will find the Caribbean and the Americas strong all night, while stations west of the Rockies will experience weaker openings both there and in the South Pacific or Far East. Expect skip to be between 1,000 and 2,000 miles at night. 73

NEVER SAY DIE

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to see medical journals publishing peer-reviewed papers showing a relationship between sonograms and growth restriction, delayed talking, mental impairment, dyslexia, and non-right-handedness.

Considering the current interest in sonoluminescence, it makes sense to me that ultrasound exposure should cause problems, particularly with neurons (brain cells). When water is exposed to ultrasound tiny flashes of light can be seen. These are tiny explosions as bubbles are compressed by the sound waves to the point where they are heated to thousands of degrees and explode. I've published technical articles on this phenomenon in my *Cold Fusion Journal.*

Is this what we want happening to fetuses? Brain neurons which are destroyed during sonograms will never be replaced. It's no wonder that all kinds of abnormalities are popping up later … such as delayed speech development and mental impairment.

Gee, am I surprised? Not!

When the book *Dianetics, The Science of Mental Health,* came out in 1950, I immediately got a copy. The theory made sense to me, so I got together with Joe, a fellow announcer at WSPB, and tried it out. The book claimed that traumas, even during pregnancy, could affect people's lifetime behavior.

We started with Joe's having to switch off his mike to cough every time he had to make an announcement. When I regressed him to the origin of this problem it turned out to be two months before his birth. His mother had a bad cough and every time she coughed it was painful for little Joe, so the pain was equated to what he was hearing and feeling at the time. Under hypnosis I ran Joe through the subconscious memories of these pains to decondition them. Joe no longer had to cough when announcing. I wrote down his mother's words, which were automatically recorded by Joe when she coughed. The critical phrase was, "Every time I get nervous, I cough." So, 25 years later, Joe was coughing whenever he got nervous.

When Joe's mother visited, I checked the things Joe had "remembered" her saying and she confirmed it all.

I was so impressed by this experience that I quit my job at the station and went to the Hubbard Dianetic Research Foundation in New Jersey and took a six-week course to improve my auditing skills.

I confirmed that the things that happen to a baby during pregnancy can affect the child's life significantly. Several cases I audited were solved by deconditioning prenatal trauma memories.

With that background you can understand why I have been opposed to sonograms. I felt that those would have to be traumatic to the baby and could easily leave their mark on its life … and that's not counting the exploding of the baby's brain neurons and any damage to the DNA.

Why take a chance on lowering the baby's IQ?

Fatso

30.5% of Americans are obese and 64.5% are overweight. And this accounts for the $117 billion a year spent on obesity-related illnesses, plus about 300,000 deaths, second only to tobacco. The food industry knows what it's doing when it spends $33 billion a year to encourage us to eat more.

We're eating more and getting bigger portions. Muffins, which weighed an

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average of 1.5 ounces in 1957, now average a half a pound each! McDonald's fries used to be 200 calories vs. today's 610 calories super-size fries. In 1970, we drank an average of 22.2 gallons of sodas a year vs. 56 gallons now. Half of the schools now have exclusive contracts with the soft drink makers — and a nice payback for the exclusivity.

And so it goes, with more and more schools contracting to have fast food companies sell in their schools.

Kids were hit hard during the Saturday TV shows when they were exposed to an average of 225 commercials. By 1995 this was up to 997, with two-thirds of those promoting foods of little nutritional value. Kids aged 2 to 18 now spend an average of over five hours a day in front of the tube. And, wow, are they fat!

Big Brother

With our prison population now at two million, mainly thanks to Congress's support of the lucrative illegal drug industry, high tech is finally going to replace the counting of heads eight times a day system for keeping track of prisoners. It's about time!

Twenty years or so ago I proposed that we farm out our prison business to countries where the costs would be lower to house and feed our miscreants. Further, instead of building maximum security facilities, I proposed that the prisoners wear a wristband which would make it so the prison would know exactly where anyone was at any time.

I also proposed that the prisoners be fed slop (actually, probably the same as most are being fed right now), but given the opportunity to grow their own food … fruits, vegetables, chickens, pigs, cows, etc. Like a large farm.

This could cut the cost of our prisons by around 90%, plus teach prisoners the value of work and cooperation.

Now I see that Illinois has signed a $3 million contract with Technology Systems of Scottsdale to outfit a prison with a tracking system. The wristbands would send a serial number every two seconds showing where the prisoner is. The system would alert guards when a prisoner got close to a perimeter fence or spent time with a gang member or a rival. It would also prevent prisoners from doubling back on the chow line.

My proposal also included making 24/7 audio recordings of each prisoner. These could be saved for only a day or two unless something happened where the recording might be of value.

By locating prisons in Chad or Jordan, it would make it so there's nowhere to go if someone does try to escape. When I gave a talk to the hams on Guam I suggested that their island might be ideal for such an industry. It's remote, making escape very difficult. And when you plant a seed there you have to jump back quickly it grows so fast. The hams loved the idea.

The next step, of course, would be to have the employees of bigger companies wear the wristbands. Then, perhaps, kids in school. Hey, where will this end?

Lawyers

As Shakespeare said, "First, kill all the lawyers." Despite my losing a few friends in the process, and the problem of moving thousands of tons of bodies for burial to Nevada, along with the radioactive waste, it could clear up a lot of our problems and enormously improve our personal financial situations. It would also pretty well clean out Congress, which is almost justification in itself for the project.

On the positive side, this could provide a source of organ replacement parts for people who have destroyed their livers, hearts, and so on through really lousy nutrition, dehydration, and ingesting toxic substances.

Tort reform? When this is a zillion dollar industry with the fox running the hen house? Snicker.

Michael Freedman reported recently in *Forbes* that 42% of obstetricians are leaving the Las Vegas area now that 76% of them have been sued. 40% of them, three or more times!

You want to know why we have so many lousy teachers? Because it's so difficult and expensive to get rid of the rotten apples. In New York State it costs an average of $194,000 in legal bills to terminate a teacher. In Detroit it's a seven-year process.

Now, where do you think all of the money is coming from to pay for these law suits, settlements and awards? We're all being shaken down. It's we suckers who are paying for the most expensive and least productive school system in the developed countries. And ditto our sickness care system. All of us have to pay when a McDonald's customer spills coffee in her lap and sues. And we have to pay, one way or another, whether she wins or loses.

Are we totally helpless pawns in the escalating extortion, or is there something we can do about it?

Hell's bells, just go to step two in your thinking. If lawyers are feathering their nest with laws made by lawyers we have elected to state legislatures and Congress, then STOP electing these buzzards. Never, ever, contribute one dollar to a lawyer's election or re-election campaign. Ever! Whenever a lawyer runs for any office, get out there and do everything you can for his opponent, even if he's a … a … Democrat.

If we can't legally kill 'em, we can at least stop letting them take us to the cleaners by electing businessmen who will start undoing the mischief the lawyers have done.

GM Worry Wart

With genetically modified food creeping more and more into our food supply, I'm worried. If you've done much reading on the subject (which I seriously doubt), you know that GM foods are tested on mice. By the company making the seeds, not by the government. The bottom line on this is that the big companies have a long history of cheating to the max on food and medicine research in order to keep those quarterly profit figures booming. The small companies would, too, if there were any of them left.

What are the possible long-term "side effects" of humans eating genetically modified corn? No one has a clue. But I'll bet the brass at Monsanto isn't eating any. Considering the long list of drugs that the FDA okayed and then had to have pulled from the market after the side effects became no longer hidable, I'm siding with the Monsanto brass. The whole process is corrupt and, as usual, we're the patsies.

The BBC reported that a lab experiment on chickens fed GM maize (that's corn) in 1996 resulted in twice as many chickens dying as the control group fed on conventional maize.

Then we have the Monsanto suit against Percy Schmeiser. It seems that pollen drift from nearby farms using Monsanto seed crops got into his canola crop, so Monsanto sued him for violating their patent … and was awarded about $100,000. Monsanto held that Percy should have known that the patented pollen had reached his crop and notified them to come and get it.

The USDA says that this year 74% of the American soybean crop and 32% of the corn crop will be from GM seeds.

Well, if the terrorists or Planet X don't get us, maybe Monsanto will.

Don't Blame Doctors

In my estimation the medical/pharmaceutical/HMO industry is one of the big scams … right along there with our government-run public school system and Congress.

But I don't blame doctors for not knowing what's going on. They're brainwashed in medical school and never even hear about alternatives. I'll bet not one doctor in a thousand (maybe ten thousand) has

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). $10 (#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)

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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)

<u>Stuff I didn't write, but you need:</u>

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 March 2003 classified ad section is January 10, 2003.

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Never say die

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read the books by Dr. Melvin Page, Dr. Weston Price, Dr. Henry Bieler, Dr. Bruno Comby, or Dr. Guylane Lanctôt (they're reviewed in my *Secret Guide to Wisdom*).

They're all taught to "treat" symptoms with prescription drugs, shots, or surgery.

Like us, they never hear about the work of the above doctors from the media and, even if they bothered to read the medical journals, they wouldn't learn anything about alternatives. The medical journals depend on pharmaceutical company advertising and aren't about to kick billion-dollar gift horses like that in the err … slats.

Water, Water

With 75% of Americans chronically dehydrated, the odds are that you're one of 'em. So what? Well, the lack of water is the #1 trigger of daytime fatigue. How about back or joint pain? It only takes a 2% drop in body water to trigger short-term memory loss and difficulty in concentration. Five glasses of water a day decreases your potential for colon cancer by 45%, breast cancer by 79%, and bladder cancer by 50%.

By water, I'm not referring to that sewage from your faucet. Drink distilled water, and drink a lot more of it. The excess will pass. 73

Alinco Delivers HF Adventure!

Alinco's HF Transceivers Deliver Incredible Performance at a Tiny Price

You're only a few hundred dollars away from a brand new Alinco HF Transceiver. That's right! Just a few hundred dollars gets you on the air with a big 100-watt signal, great audio and an easy-to-operate package that's perfect for base, portable or mobile operations. The Alinco DX-70 and DX-77 make it easy for everyone to enjoy HF with a dependable transceiver that's backed by Alinco's 1 year warranty.

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Alinco DX-70TH Base/Mobile/Portable HF + 6 Meter Transceiver

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- Continuous coverage HF receiver + full 6 meter coverage
- 100 memory channels
- Speech compressor
- Great CW rig, full QSK, semi or automatic break-in
- Standard narrow filter fights QRM on SSB, CW or AM
- Two VFO's and easy "split" operation
- Removable face for remote mounting.
- RIT / TXIT, IF shift
- Multi function control for easy operation

Alinco DX-77T Desktop HF Transceiver

- 100 watts SSB, FM & CW, 40 watts AM
- General coverage receiver 150 KHz ~ 30 MHz
- Two VFO's; easy "split" operation
- Standard speech processor
- Front panel speaker provides loud, clear audio
- Built-in electronic keyer 6 ~ 60 wpm
- Full QSK, 7-step semi break-in or auto break-in
- Enhanced Direct Digital Synthesis (DDS) eliminates need for SSB Narrow Filter
- Front panel connections for mic, key, speaker & phones

Options

- EDX-2 automatic wire antenna tuner
- EMS-14 desktop microphone
- DM-330 MVT switching power supply
- DM-340 MVT regulated power supply

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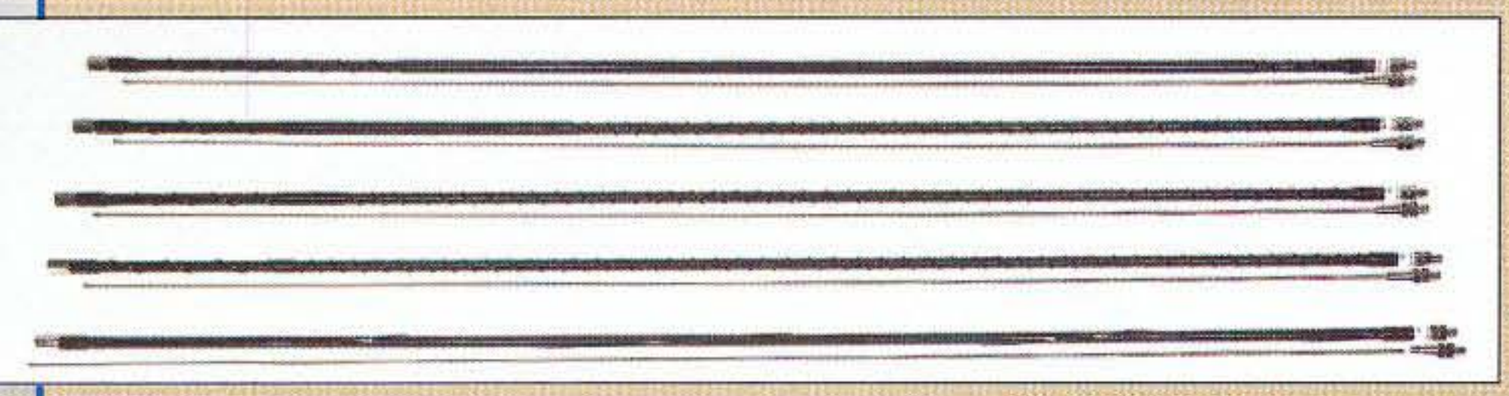
Order the Iron Horse IHF5S package from your dealer and go mobile fast!



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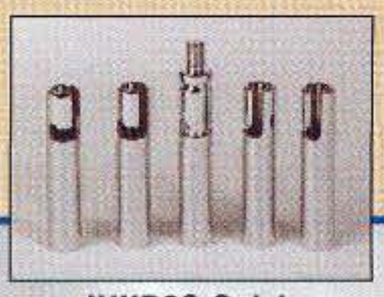

IHKD3S Quick Disconnect Kit

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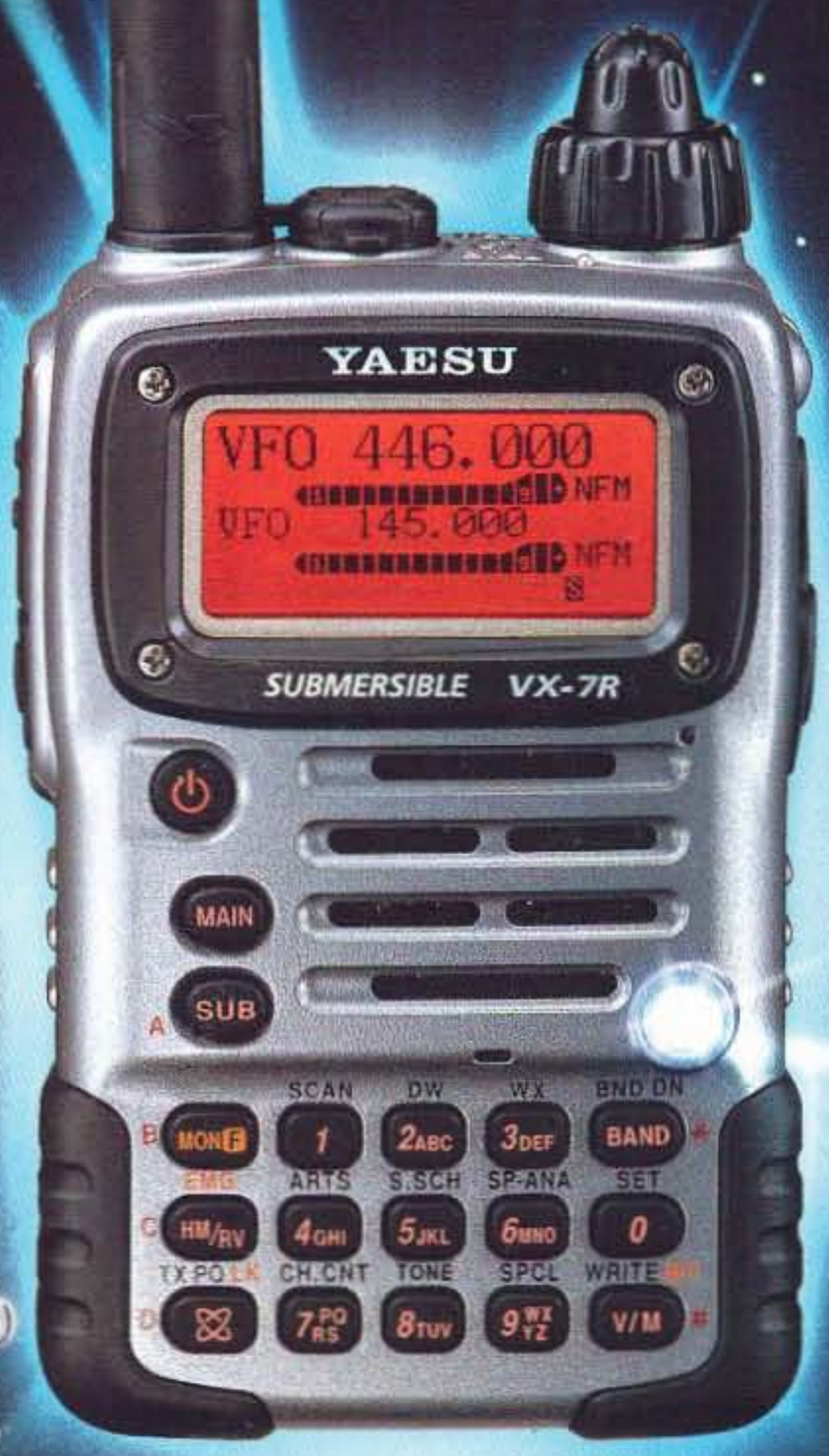

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