AUGUST 2000
ISSUE #477
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THE NEW!

73® Amateur Radio Today

10m Amplifier: More Heat for a Hot Band

PIC Keyer Update

Big Signal/Small Car

APRS? Whazzat?

More *Vaya Con Ra(Dios)*

DR-135TP. Two Meters. Features Not Seen Before.

INTERNAL TNC FOR PACKET AND APRS®

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- Choose black (DR-135TP) or pewter (DR-135TPG) front panel color
- DR-135T can be purchased without TNC; EJ-41U TNC board can be added later
- 50 watts, H/M/L power settings
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- TNC board operates 1200 and 9600 bps
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- Theft alarm feature
- AM airband receive
- Backlit microphone
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- Ten autodial memories
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AUGUST 2000
ISSUE #477

THE NEW! 73® Amateur Radio Today

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73 Amateur Radio Today Magazine
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REVIEW

DEPARTMENTS

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Manuscripts: Contributions for possible publication are most welcome. We'll do the best we can to return anything you request, but we assume no responsibility for loss or damage. Payment for submitted articles will be made after publication. Please submit both a disk and a hard copy of your article [IBM (ok) or Mac (preferred) formats], carefully checked drawings and schematics, and the clearest, best focused and lighted photos you can manage. "How to write for 73" guidelines are available on request. US citizens, please include your Social Security number with submitted manuscripts so we can submit it to you know who.

QRX . . .

Microsoft: The FINAL Final Judgment

Bill Gates dies.

St. Peter meets him at the Pearly Gates (no relation) and says, "Well, Bill, you've led an interesting life. To be perfectly honest about it, we're not sure where to send you. Very innovative, very creative, but then all these government problems. So I tell you what: We'll let you decide."

Gates swallows nervously. "Okay."

St. Peter snaps his fingers. Instantly they are at a sunny beach. There's beer, rock music, and topless women playing volleyball. Gates says, "Hey, this must be Heaven. It's great!"

"No," says St. Peter. "Actually, it's Hell. I'll show you Heaven next." He snaps his fingers again, and instantly they're in a serene city park. There's a soft, warm breeze, and birds chirp in

Continued on page 6

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OUTPUT VOLTAGE: 13.8VDC

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

MODEL SS-18

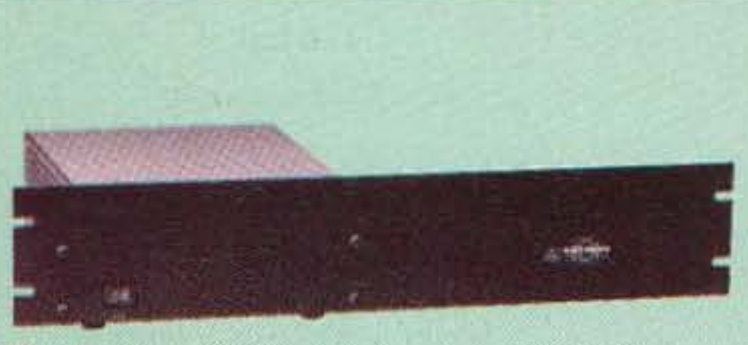
DESKTOP SWITCHING POWER SUPPLIES

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 9⅝	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 9¾	4.2
SS-30M*	25	30	3¼ x 7 x 9⅝	5.0



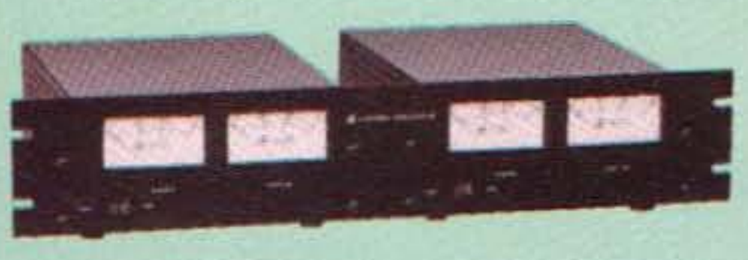
MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9¾	6.5
SRM-30	25	30	3½ x 19 x 9¾	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9¾	6.5
SRM-30M	25	30	3½ x 19 x 9¾	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 9¾	10.5
SRM-30-2	25	30	3½ x 19 x 9¾	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9¾	10.5
SRM-30M-2	25	30	3½ x 19 x 9¾	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

RAMSEY

Doppler Direction Finder

Track down jammers and hidden transmitters with ease! This is the famous WA2EBY DF'er featured in April 99 QST. Shows direct bearing to transmitter on compass style LED display, easy to hook up to any FM receiver. The transmitter - the object of your DF'ing - need not be FM, it can be AM, FM or CW. Easily connects to receiver's speaker jack and antenna, unit runs on 12 VDC. We even include 4 handy home-brew "mag mount" antennas and cable for quick set up and operation! Whips can be cut and optimized for any frequency from 130-1000 MHz. Track down that jammer, win that fox hunt, zero in on that downed Cessna - this is an easy to build, reliable kit that compares most favorably to commercial units costing upwards of $1000.00! This is a neat kit!!

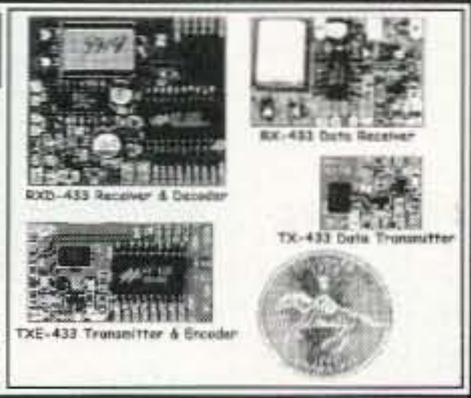
DDF-1, Doppler Direction Finder Kit $149.95

1 GHz RF Signal Generator

A super price on a full featured RF signal generator! Covers 100 KHz to 999.99999 MHz in 10 Hz steps. Tons of features; calibrated AM and FM modulation, 90 front panel memories, built-in RS-232 interface, +10 to -130 dBm output and more! Fast and easy to use, its big bright vacuum florescent display can be read from anywhere on the bench and the handy 'smart-knob' has great analog feel and is intelligently enabled when entering or changing parameters in any field – a real time saver! All functions can be continuously varied without the need for a shift or second function key. In short, this is the generator you'll want on your bench, you won't find a harder working RF signal generator - and you'll save almost $3,000 over competitive units!

RSG-1000B RF Signal Generator $1995.00

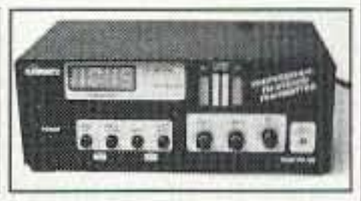
Wireless RF Data Link Modules



RF link boards are perfect for any wireless control application; alarms, data transmission, electronic monitoring...you name it. Very stable SAW resonator transmitter, crystal controlled receiver - no frequency drift! Range up to 600 feet, license free 433 MHz band. Encoder/decoder units have 12 bit Holtek HT-12 series chips allowing multiple units all individually addressable, see web site for full details. Super small size - that's a quarter in the picture! Run on 3-12 VDC. Fully wired and tested, ready to go and easy to use!

RX-433 Data Receiver..... $16.95 TX-433 Data Transmitter..... $14.95
RXD-433 Receiver/Decoder..... $21.95 TXE-433 Transmitter/Encoder..... $19.95

Super Pro FM Stereo Transmitter



Professional synthesized FM Stereo station in easy to use, handsome cabinet. Most radio stations require a whole equipment rack to hold all the features we've packed into the FM-100. Set freq with Up/Down buttons, big LED display. Input low pass filter gives great sound (no more squeals or swishing from cheap CD inputs!) Limiters for max 'punch' in audio - without over mod, LED meters to easily set audio levels, built-in mixer with mike, line level inputs. Churches, drive-ins, schools, colleges find the FM-100 the answer to their transmitting needs, you will too. Great features, great price! Kit includes cabinet, whip antenna, 120 VAC supply. *We also offer a high power export version of the FM-100 fully assembled with one watt of RF power, for miles of program coverage. The export version can only be shipped if accompanied by a signed statement that the unit will be exported.*

FM-100, Pro FM Stereo Transmitter Kit $249.95
FM-100WT, Fully Wired High Power FM-100..... $399.95

World's Smallest TV Transmitters

We call them the 'Cubes'.... Perfect video transmission from a transmitter you can hide under a quarter and only as thick as a stack of four pennies - that's a nickel in the picture! Transmits color or B&W with fantastic quality - almost like a direct wired connection to any TV tuned to cable channel 59. Crystal controlled for no frequency drift with performance that equals models that cost hundreds more! Basic 20 mW model transmits up to 300' while the high power 100 mW unit goes up to 1/4 mile. Their very light weight and size make them ideal for balloon and rocket launches, R/C models, robots - you name it! Units run on 9 volts and hook-up to most any CCD camera or standard video source. In fact, all of our cameras have been tested to mate perfectly with our Cubes and work great. Fully assembled - just hook-up power and you're on the air! One customer even put one on his dog!

C-2000, Basic Video Transmitter.....$89.95 **C-2001, High Power Video Transmitter...$179.95**

CCD Video Cameras

Top quality Japanese Class 'A' CCD array, over 440 line line resolution, not the off-spec arrays that are found on many other cameras. Don't be fooled by the cheap CMOS single chip cameras which have 1/2 the resolution, 1/4 the light sensitivity and draw over twice the current! The black & white models are also super IR (Infra-Red) sensitive. Add our invisible to the eye, IR-1 illuminator kit to see in the dark! Color camera has Auto gain, white balance, Back Light Compensation and DSP! Available with Wide-angle (80º) or super slim Pin-hole style lens. Run on 9 VDC, standard 1 volt p-p video. Use our transmitters for wireless transmission to TV set, or add our IB-1 Interface board kit for super easy direct wire hook-up to any Video monitor, VCR or TV with A/V input. Fully assembled, with pre-wired connector.

CCDWA-2, B&W CCD Camera, wide-angle lens $69.95
CCDPH-2, B&W CCD Camera, slim fit pin-hole lens.. $69.95
CCDCC-1, Color CCD Camera, wide-angle lens $129.95
IR-1, IR Illuminator Kit for B&W cameras $24.95
IB-1, Interface Board Kit $14.95

AM Radio Transmitter

Operates in standard AM broadcast band. Pro version, AM-25, is synthesized for stable, no-drift frequency and is setable for high power output where regulations allow, typical range of 1-2 miles. Entry-level AM-1 is tunable, runs FCC maximum 100 mW, range 1/4 mile. Both accept line-level inputs from tape decks, CD players or mike mixers, run on 12 volts DC. Pro AM-25 includes AC power adapter, matching case and bottom loaded wire antenna. Entry-level AM-1 has an available matching case and knob set that dresses up the unit. Great sound, easy to build - you can be on the air in an evening!

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

FM Stereo Radio Transmitters

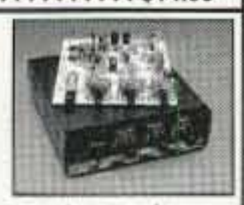
No drift, microprocessor synthesized! Great audio quality, connect to CD player, tape deck or mike mixer and you're on-the-air. Strapable for high or low power! Runs on 12 VDC or 120 VAC. Kit includes snazzy case, whip antenna, 120 VAC power adapter - easy one evening assembly.

FM-25, Synthesized Stereo Transmitter Kit $129.95

Lower cost alternative to our high performance transmitters. Great value, easily tunable, fun to build. Manual goes into great detail about antennas, range and FCC rules. Handy for sending music thru house and yard, ideal for school projects too - you'll be amazed at the exceptional audio quality! Runs on 9V battery or 5 to 15 VDC. Add matching case and whip antenna set for nice 'pro' look.

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

Mini Radio Receivers



Imagine the fun of tuning into aircraft a hundred miles away, the local police/fire department, ham operators, or how about Radio Moscow or the BBC in London? Now imagine doing this on a little radio you built yourself - in just an evening! These popular little receivers are the nuts for catching all the action on the local ham, aircraft, standard FM broadcast radio, shortwave or WWV National Time Standard radio bands. Pick the receiver of your choice, each easy to build, sensitive receiver has plenty of crystal clear audio to drive any speaker or earphone. Easy one evening assembly, run on 9 volt battery, all have squelch except for shortwave and FM broadcast receiver which has subcarrier output for hook-up to our SCA adapter. The SCA-1 will tune in commercial-free music and other 'hidden' special services when connected to FM receiver. Add our snazzy matching case and knob set for that smart finished look!

AR-1, Airband 108-136 MHz Kit..... $29.95
HFRC-1, WWV 10 MHz (crystal controlled) Kit..... $34.95
FR-1, FM Broadcast Band 88-108 MHz Kit..... $24.95
SR-1, Shortwave 4-11 MHz Band Kit $29.95
SCA-1 SCA Subcarrier Adapter kit for FM radio.... $27.95
FR-6, 6 Meter FM Ham Band Kit $34.95
FR-10, 10 Meter FM Ham Band Kit..... $34.95
FR-146, 2 Meter FM Ham Band Kit..... $34.95
FR-220, 220 MHz FM Ham Band Kit..... $34.95
Matching Case Set (specify for which kit) $14.95

RF Power Booster

Add muscle to your signal, boost power up to 1 watt over a freq range of 100 KHz to over 1000 MHz! Use as a lab amp for signal generators, plus many foreign users employ the LPA-1 to boost the power of their FM transmitters, providing radio service through an entire town. Runs on 12 VDC. For a neat finished look, add the nice matching case set. Outdoor unit attaches right at the antenna for best signal - receiving or transmitting, weatherproof, too!

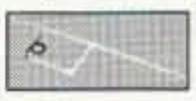
LPA-1, Power Booster Amplifier Kit $39.95
CLPA, Matching Case Set for LPA-1 Kit $14.95
LPA-1WT, Fully Wired LPA-1 with Case $99.95
FMBA-1, Outdoor Mast Mount Version of LPA-1 ..... $59.95

PIC-Pro Pic Chip Programmer

Easy to use programmer for the PIC16C84, 16F84, 16F83 microcontrollers by Microchip. All software - editor, assembler, run and program - as well as free updates available on Ramsey download site! This is the popular unit designed by Michael Covington and featured in Electronics Now, September 1998. Connects to your parallel port and includes the great looking matching case, knob set and AC power supply. Start programming those really neat microcontrollers now...order your PICPRO today!

PIC-1, PICPRO PIC Chip Programmer Kit $59.95

FM Station Antennas



For maximum performance, a good antenna is needed. Choose our very popular dipole kit or the Comet, a factory made 5/8 wave colinear model with 3.4 dB gain. Both work great with any FM receiver or transmitter.

TM-100, FM Antenna Kit $39.95
FMA-200, Vertical Antenna $114.95

Order Toll-free: 800-446-2295

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For Technical Info, Order Status
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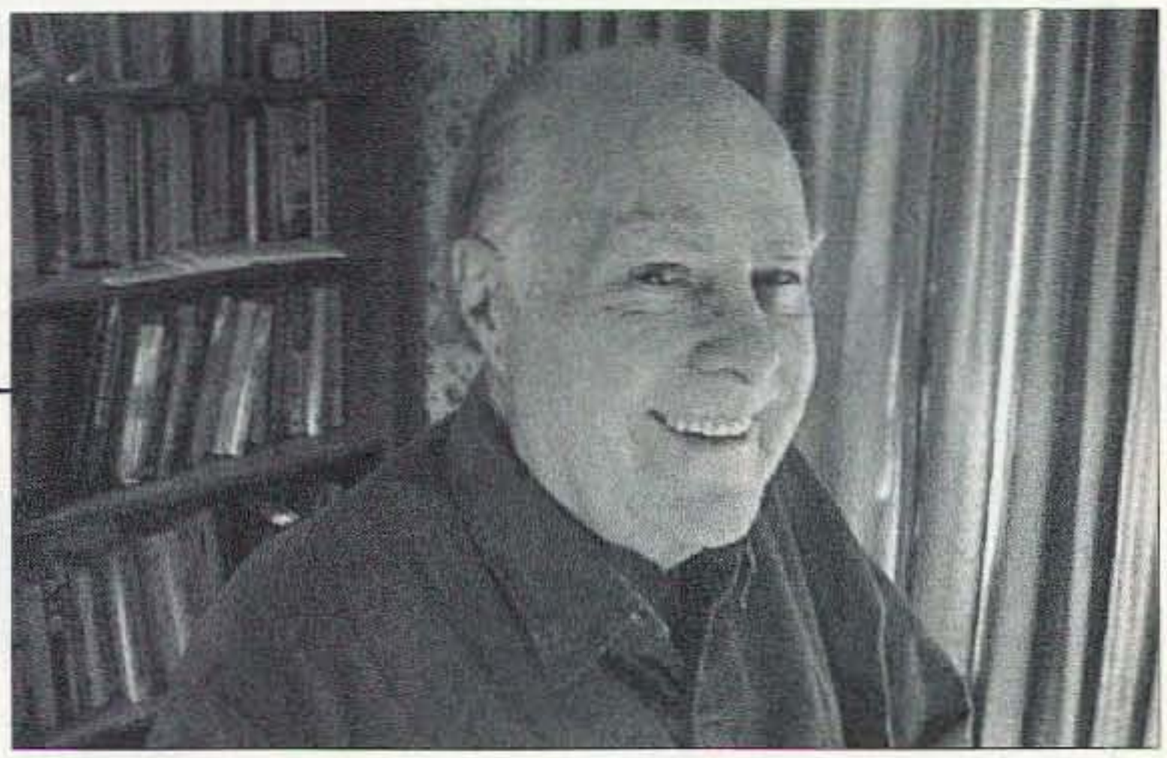

Bashing?

Tom Sowell, in a recent column, wrote, "It is amazing how many people consider it an *answer* to criticism to call it bashing."

Yes, I've often been critical of the ARRL, our *only* national ham organization. And, yes, the response I've gotten from many ARRL true believers is that I'm "bashing" the League. So, how can I answer to such a stupid nonresponse?

I think you'll be hard put to find any time I've been critical of the ARRL when I haven't offered creative suggestions on what they could have done or be doing. I try to always be positive in my criticism.

For instance, recently I've been critical of the League and its directors for not mounting a national amateur radio promotion campaign aimed at reaching teenagers with the message that ham radio is fun, can provide them with a lifetime of adventure, and is a wonderful stepping-stone into a high-tech career — and that's where the money is now and is going to be for a long time to come.

Sitting at home surfing the Internet, playing computer games, or spending hours in chat rooms isn't likely to lead to adventure or anything positive careerwise. Hacking might, if you could tap the Bank of England without getting caught. Good luck.

How many articles have you seen in the national magazines about the fun of using our two dozen ham satellites? Or about being able to talk with our astronauts while they're in orbit? Or about our thousands of repeater systems, which today are almost everywhere? Yes, there's even a Swaziland repeater.

Please join me in "bashing the Lea- gue" until we start seeing them making the public aware that ham radio is not only still around, but is alive and well. I want to see TV programs with hams. I want my readers to be sending me envelopes of clippings about ham activities from their local papers. I want to see articles in *Reader's Digest* and other national magazines.

Girls, would you like to be smothered in testosterone? Get on your local repeater and attend a few local ham club meetings.

Please invite your division director to your next club meeting and let him know in a way he won't forget it that it's time for him to get the HQ gang off the Newington golf courses and doing the promotion of the hobby that is their responsibility. "Bash" him for letting you, the members, down. Send him to the next board meeting with a big bottle of castor oil to get things unstuck at HQ. How about an air horn to wake 'em up? Boy, I'd love to be there for that meeting! Hell, I'd hand out enema bags with the *73* logo on 'em.

The Russian Meltdown

Have you noticed all the fuss about our trading with China, yet nothing at all is being said about our trading with Russia? Maybe you've noticed that we're wearing shoes, socks, pants, and shirts made in China. We're using telephones and flashlights made in China, but nothing we buy has a Made In Russia sticker on it. Hmm, how come?

Well, as we know, the Cold War ended with Russia's socialist economy collapsing. What we haven't read much about is the replacement of the ruthless Communist bosses by even more ruthless gangsters, pretending to be capitalists, and funded by Western opportunist financiers.

The gangsters grabbed the Russian state-owned industries such as telecommunications, gas, oil, steel, paper, and the gold, silver, and diamond mines; sold shares to Western investors at fire-sale prices; pocketed the cash; became millionaires; and kept control of the industries.

Then, led by the Clinton Administration, the IMF, World Bank, US AID, and other lending agencies poured money and officials (to help spend it) with huge salaries into Russia, driving up the prices for vacation homes, rents, and goods. This was made infinitely worse for the Russian people by an almost 3,000 percent inflation, which wiped out their savings. The inflation was mainly caused by our Treasury Department demanding that price controls be removed. Since the government had spent most of its money on the military, thus not providing consumer goods for their people to buy, the people had accrued huge savings. Suddenly, these were gone and the people were poor.

When word leaked out of the economic disaster, the Russian stock market collapsed.

Now the IMF and other "lenders" have lost their (our) money, Russian gangsters own and run the country, and the people are suffering the worst poverty in the history of the country. There are no goods to export, nor any money to buy imports. And the Russian people can thank our politicians and bankers for what's happened — and for our media being silent about the catastrophe.

How We're Doing

Not well, that's how.

I was just looking at the results of international tests of our eighth graders. In math, our kids came in last in comparison with the kids in 13 developed countries. Our kids scored 500. The kids in Singapore scored 643, the Koreans 607, and the Japanese 605. In science, the Singapore kids again were number one with 607. Korean kids were 565, and Japanese 571. Our American kids were 534.

Well, our teachers' unions tell us, all we have to do is spend more money. Sure. The 1994 per student expenditure for secondary schools was an average of $6,680. Korea left us in the dust educationwise for $2,170 per student.

The teachers' unions also keep saying that we need smaller classes (and thus more teachers). In 1996, our secondary schools had 16.1 students per teacher. Korea had 24.3 students per teacher. Our primary schools had 16.9 students per teacher vs. 31.2 for Korea.

Maybe we should send

Continued on page 59

Big Savings on Radio Scanners

COMMUNICATIONS ELECTRONICS INC.

Order on-line and get big savings

Take advantage of Communications Electronics special savings when you enter your order directly on the internet. Visit CEI at http://www.usascan.com, and click on "CEI News" to get your big CEI E-Value savings. Resellers, get extra special pricing when you fax your sales tax license to CEI at +1-734-663-8888.

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SAVE $30 on MPV32 or RH256N

Save $30 when you purchase your RELM MPV32 or RH256N transceiver directly from Communications Electronics Inc., PO Box 1045, Ann Arbor MI 48106 USA. Telephone orders accepted. Call 1-800-USA-SCAN. Mention offer CEIM. TERMS: Good only in USA & Canada. Only one coupon is redeemable per purchase and only on specified product.

NEW! RELM® MPV32-A Transceiver

Mfg. suggested list price $515.00/**Special $299.95**

Looking for a great hand-held two-way transceiver? Fire departments depend on the RELM MPV32 transceiver for direct two-way communications with their fire or police department, civil defense agency or ham radio repeater. The MPV32 is our most popular programmable frequency agile five watt, 32 channel handheld transceiver that has built-in CTCSS. This feature may be programmed for any 50 standard EIA tones. Frequency range 136.000 to 174.000 MHz. The full function, DTMF compatible keypad also allows for DTMF Encode/Decode and programmable ANI. Weighing only 15.5 oz., it features programmable synthesized frequencies either simplex or half duplex in 2.5 KHz. increments. Other features include PC programming and cloning capabilities, scan list, priority channel, selectable scan delay, selectable 5 watt/1 watt power levels, liquid crystal display, time-out timer and much more. When you order the MPV32 from CEI, you'll get a complete package deal including antenna, 700 ma battery (add $20.00 to substitute a 1000 ma battery), battery charger, belt clip and user operating instructions. Other useful accessories are available. A heavy duty leather carrying case with swivel belt loop part **#LCMP** is $49.95; rapid charge battery charger, part **#BCMP** is $69.95; speaker/microphone, part **#SMMP** is $54.95; extra high capacity 1000 ma. ni-cad battery pack, part **#BPMP1** is $79.95; extra 700 ma. ni-cad battery pack, part **#BPMP7** is $59.95; cloning cable part **#CCMP** is $34.95; PC programming kit, part **#PCKIT030** is $224.95. A UHF version with a frequency range of 450-480 MHz. part **#MPU32** is on special for $299.95. Your RELM radio transceiver is ideal for many different applications since it can be programmed with just a screwdriver and programming instructions in less than 10 minutes. Programming is even faster with the optional PC kit. The programming instructions part **#PIMPV** is $19.00. Call 1-800-USA-SCAN to order for RELM radios.

Bearcat® 895XLT-A1 Radio Scanner

Mfg. suggested list price $729.95/**Special $194.95**

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 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*** – This feature lets you record channel activity from the scanner onto a tape recorder. ***CTCSS Tone Board*** (**C**ontinuous **T**one **C**ontrol **S**quelch **S**ystem) which allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning enjoyment, order the following optional accessories: **PS001** Cigarette lighter power cord $14.95; **PS002** DC power cord - enables permanent operation from your vehicle's fuse box $14.95; **MB001** Mobile mounting bracket $14.95; **EX711** External speaker with mounting bracket & ten feet of cable with plug attached $19.95. The BC895XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden factory warranty. Not compatible with AGEIS, ASTRO, EDACS, ESAS or LTR systems. Call 1-800-USA-SCAN.

TrunkTracking Radio

DISTRIBUTOR'S COUPON | EXPIRES 10/30/00 | #000772

SAVE $75 on one BC245XLT

Save $75 when you purchase your Bearcat 245XLT handheld scanner directly from Communications Electronics Inc., PO Box 1045, Ann Arbor MI 48106 USA. Telephone orders accepted. Call 1-800-USA-SCAN. Mention offer CEI2. TERMS: Good only in USA & Canada. Only one coupon is redeemable per purchase and only on specified product.

Bearcat® 245XLT-A TrunkTracker

Mfg. suggested list price $429.95/**CEI price $269.95**

300 Channels • 10 banks • Trunk Scan and Scan Lists

Trunk Lockout • Trunk Delay • Cloning Capability

10 Priority Channels • Programmed Service Search

Size: 2-1/2" Wide x 1-3/4" Deep x 6" High

Frequency Coverage:

29.000-54.000 MHz., 108-174 MHz., 406-512 MHz., 806-823.995 MHz., 849.0125–868.995 MHz., 894.0125-956.000 MHz.

Our new Bearcat TrunkTracker BC245XLT, is the world's first scanner designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS and EDACS® analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. Our scanner offers many new benefits such as **Multi-Track** – Track more than one trunking system at a time and scan conventional and trunked systems at the same time. **300 Channels** – Program one frequency into each channel. **12 Bands, 10 Banks** – Includes 12 bands, with Aircraft and 800 MHz. 10 banks with 30 channels each are useful for storing similar frequencies to maintain faster scanning cycles or for storing all the frequencies of a trunked system. **Smart Scanner** – Automatically program your BC245XLT with all the frequencies and trunking talk groups for your local area by accessing the Bearcat national database with your PC. If you do not have a PC simply use an external modem. **Turbo Search** – Increases the search speed to 300 steps per second when monitoring frequency bands with 5 KHz. steps. **10 Priority Channels** – You can assign one priority channel in each bank. Assigning a priority channel allows you to keep track of activity on your most important channels while monitoring other channels for transmissions. **Preprogrammed Service (SVC) Search** – Allows you to toggle through preprogrammed police, fire/emergency, railroad, aircraft, marine, and weather frequencies. **Unique Data Skip** – Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. **Memory Backup** – If the battery completely discharges or if power is disconnected, the frequencies programmed in your scanner are retained in memory. **Manual Channel Access** – Go directly to any channel. **LCD Back Light** – An LCD light remains on for 15 seconds when the back light key is pressed. **Autolight** – Automatically turns the backlight on when your scanner stops on a transmission. **Battery Save** – In manual mode, the BC245XLT automatically reduces its power requirements to extend the battery's charge. **Attenuator** – Reduces the signal strength to help prevent signal overload. The BC245XLT also works as a conventional scanner. Now it's easy to continuously monitor many radio conversations even though the message is switching frequencies. The BC245XLT comes with AC adapter, one rechargeable long life ni-cad battery pack, belt clip, flexible rubber antenna, earphone, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, ESAS or LTR systems. Hear more action on your radio scanner today. Call CEI today at 1-800-USA-SCAN to order your BC245XLT radio scanner.

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Have fun and use our CB, shortwave and commercial radios to keep in touch with the world, friends and family.

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Davis 7440CS-A Complete weather station	$419.95
RELM SMV4099W-A 40 watt VHF mobile transceiver	$349.95
Uniden GRANTXL-A SSB CB Mobile	$124.95
Sangean ATS909-A shortwave receiver	$229.95
Sangean ATS818CS-A shortwave receiver	$199.95
Sangean ATS404-A shortwave receiver	$79.95

Radio Scanners

AOR8200B-A wideband handheld scanner/SPECIAL	$519.95
AOR5000B+3-A wideband communications receiver	$2,089.95
AOR3000A-A wideband base/mobile scanner/SPECIAL	$1,049.95
AOR AR16BQ wideband handheld scanner w/ quick charge	$209.95
Bearcat 895XLT-A1 300 ch.TrunkTracker base scanner	$194.95
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Bearcat 278CLT-A 100 ch base AM/FM/SAME WX alert	$169.95
Bearcat 248CLT-A 50 ch.base AM/FM/weather alert scanner	$99.95
Bearcat 245XLT-A 300 channel TrunkTracker II scanner	$269.95
Bearcat Sportcat 200 alpha handheld sports scanner	$174.95
Bearcat Sportcat 180B handheld sports scanner	$149.95
Bearcat 80XLT-A3 50 channel handheld scanner	$104.95
Bearcat 60XLT1-A 30 channel handheld scanner	$79.95
Bearcat BCT7-A information mobile scanner	$149.95
ICOM ICR8500-A2 wideband communications receiver	$1,479.95
ICOM PCR1000-A2 computer communications scanner	$329.95
ICOM ICR75-A2 communications receiver	$664.95
ICOM R10-A2 handheld wideband communications receiver	$289.95

RELM® RH256N-A Transceiver/SPECIAL

Mfg. suggested list price $460.00/Special **$284.95**

Size: 6-1/2" Wide x 10-3/4" Deep x 2-3/4" High

Frequency Coverage: **144.000-174.000 MHz.**

Now...everyone can have their own RELM two-way transceiver and stay in touch with their department. The RELM RH256N is a powerful 25 Watt scanning transceiver that is perfect for law enforcement, fire and urban search and rescue agencies. The RH256N is programmable for up to sixteen different frequencies with selectable CTCSS tones on each channel. Also includes simplex and repeater capability, scan delay and time-out timer. Built-in priority scanner is selectable from the slope-front panel. When you order the RH256N from CEI, you'll get a complete package deal including microphone, vehicle mounting bracket, DC power cords and RELM's two year limited warranty. You can also use the RH256N as a base station if you order our 22 amp 12 Volt DC power supply part **#PS26KX** for $94.95 and $25.00 shipping. VHF transmitting antenna with PL259 connector part **#ANTK** is $29.95. Programming instructions part **#PI256** is $19.00.

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QRX . . .

Continued from page 1

the trees. Old folks sit on benches, feeding pigeons and playing chess.

"What do you think?" St. Peter asks.

"Well ... this is nice ... but given a choice, I'll take Hell," Gates says.

"Very well," St. Peter says. "You've got it." He snaps his fingers, and Gates instantly finds himself awash in molten lava. In unspeakable agony, he hears demonic laughter amidst the screams of the damned.

"HEY!" Gates screams. "It wasn't like this! Where's the beach? Where's the babes?"

St. Peter turns from his laptop and says: "Sorry, Bill, that was the demo. To review your other options, please try to hold on for six hours until the next available placement saint can speak with you, and have your credit card ready for the nonrefundable $375 upgrade fee."

With alterations, and thanks to unknown Internet author, via the Bluegrass ARS Qua/Ham News, *January 1996, Bill De Vore N4DIT, editor, via the ARNS* Bulletin, *November 1996.*

Industry Ready to Work with ARRL?

The ham radio business community appears to be poised to work hand in hand with the American Radio Relay League to increase the numbers of new hams. Representatives for the two met in Dallas to lay further groundwork for what may be the next step in revitalizing the United States Amateur Radio Service, and, according to manufacturers' representative and *73* Ad Sales Director Evelyn Garrison WS7A, getting the word out to the nonham public will be a key issue at the gathering.

Until now, the relationship between the ham radio business community and the ARRL has been tenuous at best, and there has never been a truly close relationship. In fact, at times it's been quite adversarial. That appears to be changing, and Evelyn Garrison gives credit to one man, the newly elected president of the ARRL, Jim Haynie W5JBP. Congratulations also go out to Bob Heil of Heil Sound for being the first to step forward with a ($1,000) contribution.

Among other topics under discussion was Haynie's concept of putting ham radio into middle schools across America. Dubbed the Big Project, it is a cooperative venture among the League, the education community, and major industry.

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

Hurricanes on the Horizon

Hurricane season is here and the outlook isn't pretty. Federal storm specialists predict an above-average storm season — one that calls for stronger, longer-lasting storms, and more of them.

The outlook is for at least 11 tropical storms, seven of which will be hurricanes, of which three will be major. And this puts US coastal areas and the Caribbean islands at a much higher risk of experiencing a tropical storm or hurricane, according to James Baker.

Baker is head of the National Oceanic and Atmospheric Administration. He says the 2000 season forecast is similar to last year's. That one included a series of serious storms. One of these was Hurricane Floyd, which caused massive evacuations along the southeastern coast and then inundated North Carolina.

Baker says that it could all repeat itself this year. For ham radio operators involved in severe weather watch and post-storm relief, that means getting ready right now. Not just with weekly on-air practice drills, but also in getting supplies and equipment ready for what forecasters say is in store. With more and more storm-related communications taking to VHF and UHF FM, hams will want to have extra battery packs for their handhelds along with some way to charge them if main power is disrupted. The same holds true for repeaters. This is the time to install that battery backup and maybe even a solar power backup system.

James Lee Witt, who is the director of the Federal Emergency Management Agency, stresses the importance to all who live in possible target areas of having a plan and being prepared for the storms. He commends community efforts, including one called Project Impact, which help people strengthen their homes against nature's rampage.

Thanks to Bill Burnett KT4SB, via Newsline, *Bill Pasternak WA6ITF, editor.*

Ham Health

A noted researcher says that he will spend the next several years trying to determine if hams die for reasons that are different from those of the rest of mankind. And, the American Radio Relay League is helping in the project.

National Cancer Institute researcher Kenneth Cantor has embarked on an epidemiological study of radio amateurs. Cantor wants to evaluate whether causes of death among amateurs differ from those of the general population. If it turns out that they do differ, he then wants to find out whether the individual's "usual occupation" might explain the differences.

Cantor described his investigation as an "inexpensive kind of quick study" that would not yield fine detail. As a result, it would be "wrong" to ascribe deaths to any particular factor. He wants to learn about influences amateurs tend to be exposed to in addition to RF energy.

Some discussion has taken place focused on a similar study done 15 years ago by Samuel Milham. Wording in that study's conclusions led many to believe that the Milham study had presented evidence that RF energy caused "an excess of leukemia."

Cantor emphasizes that his investigation is a preliminary study, based on a statistical comparison of FCC licensing records and State of California death records. Additional death records might be included as needed. The initial "cohort group" for Cantor's study includes more than 100,000 men and women — seven times larger than the earlier Milham study.

"This type of study can be performed at minimal cost, but it has the potential for misleading results," says ARRL RF Safety Committee Chairman Greg Lapin N9GL — himself a research professional. Lapin explained that in the event of "apparent associations" in the results of Cantor's study, a follow-up study would be conducted. The followup would involve individual questionnaires and contact with the families of Silent Keys — something the Milham study did not attempt to do.

No exact date for completion of the Cantor study has been announced.

Thanks to the ARRL and Rick Lindquist N1RL, via Newsline, *Bill Pasternak WA6ITF, editor.*

All-Time Headlines

- Include Your Children When Baking Cookies
- Something Went Wrong in Jet Crash
- Expert Says Police Begin Campaign to Run Down Jaywalkers
- Drunk Gets Nine Months in Violin Case
- Iraqi Head Seeks Arms
- Panda Mating Fails; Veterinarian Takes Over
- British Left Waffles on Falkland Islands
- Teacher Strikes Idle Kids
- Clinton Wins on Budget, But More Lies Ahead
- Plane Too Close to Ground, Crash Probe Told
- Miners Refuse to Work After Death
- Juvenile Court to Try Shooting Defendant
- Stolen Painting Found by Tree
- Two Sisters Reunited After 18 Years at Checkout Counter
- Never Withhold Herpes Infection from Loved One
- War Dims Hope for Peace
- If Strike Isn't Settled Quickly, It May Last a While
- Cold Wave Linked to Temperatures
- Couple Slain; Police Suspect Homicide
- Red Tape Holds Up New Bridges
- Typhoon Rips through Cemetery; Hundreds Dead
- Man Struck by Lightning Faces Battery Charge
- New Study on Obesity Looks for Larger Test Group
- Astronaut Takes Blame for Gas in Spacecraft
- Kids Make Nutritious Snacks
- Chef Throws His Heart into Helping Feed Needy
- Local High School Dropouts Cut in Half

Thanks to the May 1998 issue of SMARC SPARKS, *newsletter of the Southern Maryland ARC, Al Abercrombe W2GJS, editor, via the ARNS* Bulletin, *July 1998.* 73

MFJ TUNERS

MFJ-989C *Legal Limit* Antenna Tuner

MFJ uses super heavy duty components to make the world's finest legal limit tuner

MFJ uses super heavy duty components -- roller inductor, variable capacitors, antenna switch and balun -- to build the world's most popular high power antenna tuner.

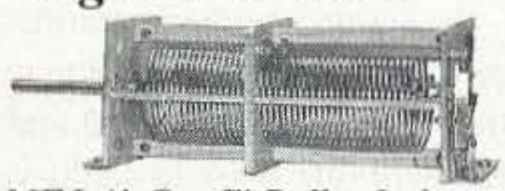
The rugged world famous MFJ-989C handles 3 KW PEP SSB amplifier input power (1500 Watts PEP SSB output power). Covers 1.8 to 30 MHz, including MARS and WARC bands.

MFJ's *AirCore*™ roller inductor, new *gear-driven* turns counter and weighted spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

MFJ-989C
$359.95

You get everything you've ever wanted in a high power, full featured antenna tuner -- widest matching range, lighted Cross-Needle SWR/Wattmeter, massive transmitting variable capacitors, ceramic antenna switch, built-in dummy load, *TrueCurrent*™ Balun, *scratch-proof* Lexan front panel -- all in a sleek compact cabinet (10¾Wx4½Hx15D in).



MFJ AirCore*™ *Roller Inductor gives high-Q, low loss, high efficiency and high power handling.

MFJ's exclusive *Self-Resonance Killer*™ keeps damaging self-resonances away from your operating frequency.

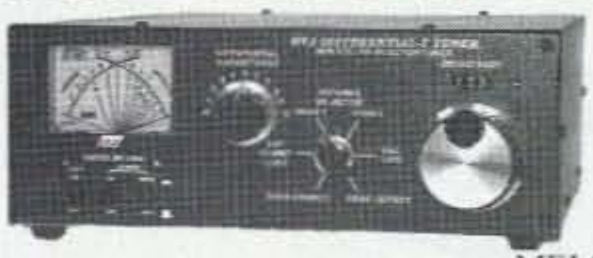
Large, self-cleaning wiping contact gives good low-resistance connection. Solid 1/4 inch brass shaft, self-align bearings give smooth non-binding rotation.

MFJ *No Matter What*™ Warranty

MFJ will repair or replace your MFJ-989C (at our option) *no matter what* for one year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T*™



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$329.95

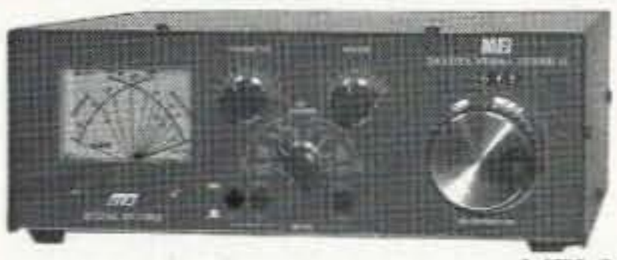
Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. 10¾Wx4½Hx15 in.

MFJ-962D *compact* Tuner for Amps

MFJ-962D
$269.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. 10¾x4½x10⅞ in.

MFJ-969 300W *Roller Inductor* Tuner



MFJ-969
$199.95

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. 3½Hx10½Wx9½D inches.

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E
$149.95

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, 48 position *Precision48*™ inductor, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. 3½Hx10⅝Wx7D inches. **MFJ-948, $129.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

MFJ-941E
$129.95

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek 10½Wx2½Hx7D in.

MFJ-945E HF+6 Meter *mobile* Tuner

MFJ-945E
$119.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $4.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971
$99.95

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x6½x2½ inches.

MFJ-901B *smallest* Versa Tuner

MFJ-901B
$79.95

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-16010 *random* wire Tuner

MFJ-16010
$49.95

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906
$79.95

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $49.95,** Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921 or MFJ-924
$69.95

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 inches. Simple 2-knob tuning for mobile or base.

MFJ-922 *144/440 MHz* Tuner

MFJ-922
$79.95

Ultra tiny 4x2½x1¼ inch tuner covers VHF 136-175 MHz and UHF 420-460 MHz. SWR/Wattmeter reads 60/150 Watts.

MFJ-931 *artificial* RF Ground

MFJ-931
$89.95

Creates artificial RF ground. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire. Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. **MFJ-934, $169.95,** Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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LETTERS

From the Ham Shack

Bernard Weinstein KB2PMH. Hey, Wayne! I am an Art Bell junky. On the first interview I heard, I went into "miscreance mode" the moment you mentioned Moondoggle, and shut Mr. Radio down. On this last interview, I got interested and ordered your *Moondoggle* book to see if you could be taken seriously. Now, I must admit NASA "done" an excellent job!! I expect to be taking much of the advice you give in your *Secret Guides*. You see, I am about your age, only I am on the other end of the success curve. Forgive me if I can't eat raw chicken! Chicken livers, maybe. Thank you! I love your stuff!

I didn't know I liked raw chicken until I had it at a Tokyo restaurant. If you enjoy raw fish (sushimi), try chicken with tare sauce and see. — Wayne.

Bob Metcalf WB9SLQ, Auburn IN. Burt Syverson K5CW's article in the June publication was very interesting. Burt mentioned one of the greatest inventors, not only of the past century, but of all time. Philo Farnsworth, at the age of 13, had a vision of the process he could use to invent the television system. He not only invented the entire television system, when GE and RCA with all their resources could not do so, but also the electron microscope, incubators for babies, the inertial guidance system used in space exploration, and many other far-reaching inventions.

I called my friend, Mrs. Philo Farnsworth, the 92-year-old widow, and told her of the article, and she was thrilled. She enjoyed the article very much and asked that I thank *73* and Burt for her. For those of you interested in a piece of history, Mrs. Farnsworth has written an excellent book about her husband, their life together, and his inventions and battles with the corporate giants who tried to steal his inventions. If you would like a personalized, autographed copy of this great book, *Distant Vision*, by Elma G. Farnsworth, send a check for $27 ($25 plus $2 for shipping) to: Mrs. Philo Farnsworth, c/o Bob Metcalf WB9SLQ, 111 E. 9th Street, Auburn, IN 46706.

Edward A. Butorajac KM4QQ. I was not sure how to take the "On the Cover" article on page 26 of the April issue. Was this meant as an April Fool joke or was it a test? Anyone who has been around the Morse code and CW arena for any amount of time can identify the bug on the cover as a Vibroplex Golden Presentation semi-automatic key. Over the years I have owned two of them. One like that pictured on the April cover and one very similar, except that it was of earlier manufacture and had two speed adjusting weights instead of the single weight as pictured (and as on the one I now own). This is a really fine code machine and was the mainstay of high speed ops before the advent of the keyer. Your write-up on page 26 identifies this key as an iambic hand key made by Bencher. Nothing could be further from the truth! In fact, the Vibroplex name can be seen if you look closely at the picture on the cover.

Glad to see someone is paying attention around here. — Wayne.

Neil Cline KB8KVH. I enjoyed the several articles on code and CW in the April 2000 issue. However, I am a little surprised that there was no mention of using a surplus, computer clock oscillator instead of a buzzer in the basic code practice unit. Hook a 9 volt battery up on 2 of the 3 active pins, with the key interrupting the 9 volt power, and you have a realistically sounding CW signal at the frequency stamped on the clock oscillator.

When placed near your receiver, the signal can be tuned in just like a real CW signal. Adding about 4" of wire antenna to the clock output pin increases the transmitting range to about 10 feet. They are readily available at any electronic surplus mail order house for between $2 and $5, and come in a variety of frequencies, including the "color burst" frequency in the lower 80 meter band. I use them as a signal generator/frequency standard to calibrate my home-rolled, toy receivers.

Also, they are small enough to install inside an old 9 volt battery case using its terminal connectors to snap onto the 9 volt supply battery.

Update

Jeff Seligman, subject of our interview in the July issue ("The Rocky Road to a Great Radio Club") has a new call: K2VNT/7. He can be reached via E-mail at [seligman@ecc.arizona.edu]. Tnx WA6ITF.

Vincent L. O'Lear WR8U, Newton Falls OH. Regarding the April issue of *73*, and the QRX article about the Universal Licensing System (ULS):

I used the Internet access our local Library provides to do something different today. I accessed the FCC Web page and used the address provided in QRX to attempt to register under the ULS.

Filling out that form was easy until I tried to enter my telephone number. I no longer have a telephone, so I tried entering NONE. I got a little box that said "NONE" was invalid. Then I tried my old area code, with seven zeros ... and it accepted that! But after clicking to register

Continued on page 41

Carol N. Hutkin K2BL, Voorhees NJ. *This photo is of my friend KC2AZU in action. She combines her rollerblading hobby with hamming it up. She is frequently found on the local repeater talking as she gets regular exercise. Often she will check in on the nets "portable on roller blades." Mary is an example of determination in action. Through hard work, Mary went from nonham to Extra in under a year. Now, if only we could get her to wear a helmet!*

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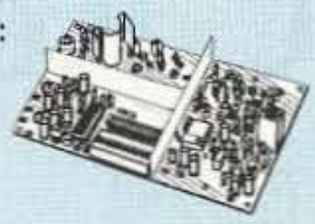

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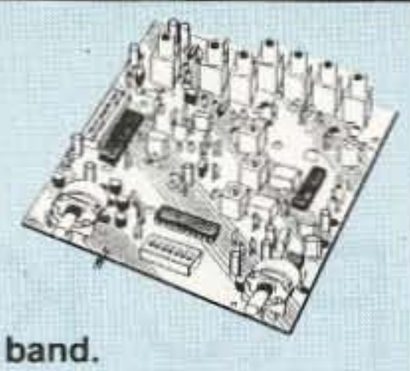

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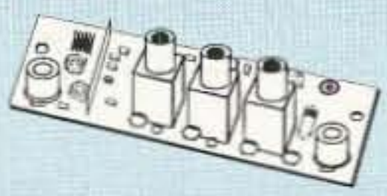

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Really PIC Key, PIC Key

Add memory functions to your PIC keyer project.

Amateur radio experimenting is a fascinating and ongoing process, and we amateurs are driven by the sheer delight of learning by doing. And it is a long-standing convention that most amateur radio projects are in a state of continuous modification — the more we learn, the more we desire to incorporate into our projects.

I've prepared this follow-up article in accordance with this tradition. My original PIC keyer project appeared in the September 1999 issue of *73 Amateur Radio Today*, and now that you've built the original circuit, it's time to enhance its performance! Let's begin by teaching the little hummer to automatically send frequently used CW messages.

Table 1 lists some sample messages, but of course you will use your own personal data. Consider how great it will be to send the entire message with the single press of a button (and send perfect, machine-formed characters in the process!). Push the button, lean back, and wait for an answer. Ol' Morse and Marconi are probably looking down and smiling.

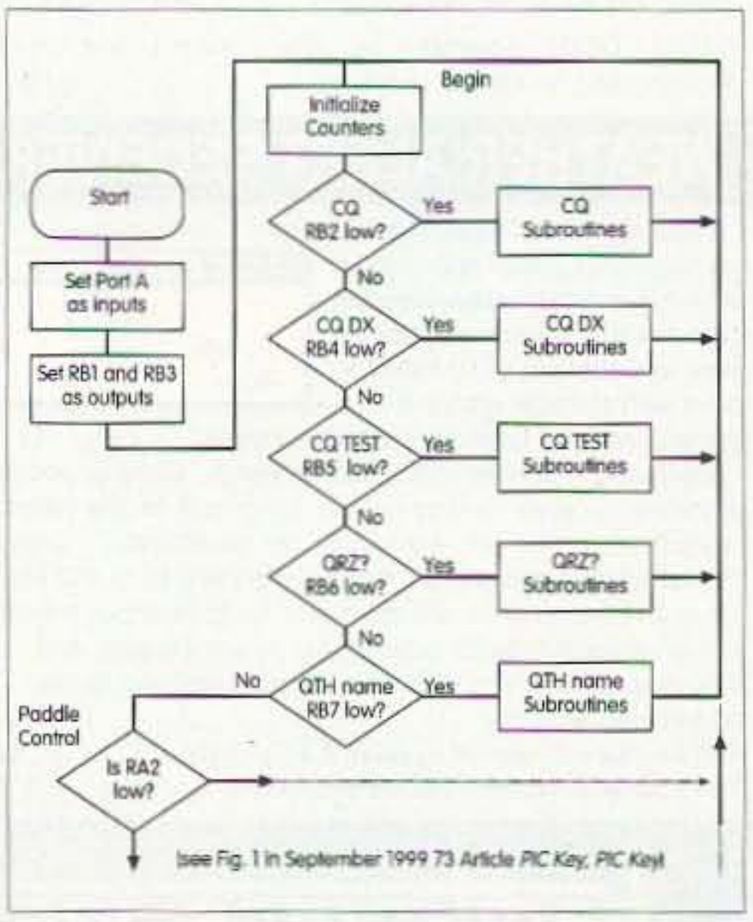

Fig. 1. *Operation algorithm for the upgraded PIC-controlled keyer.*

Operational algorithm

The new operational algorithm is more complicated than the original one, but it takes a little patience and coaxing with code to entice the little PIC to perform new tricks.

Let's begin with **Fig. 1.** Notice the left bottom corner, the portion entitled "Is RA2 low?" After the words "Paddle control" and down to the end is the same algorithm as the previous article (refer to Fig. 1 in *PIC Key, PIC Key).* We will only be discussing the new section of the algorithm — from "Start" to "Is RA2 low?" Let us make an excursion through the chart.

As usual, the program runs from the point labeled "Start". If you remember, the microcontroller PIC16F84 has 5 input/output lines at port A and 8 at port B. In previous programs, we programmed port A as input and all of port B as output. But actually we used only two lines as outputs — one for keying the transmitter and the other for audio control.

In this version of the program, it seems wiser to set all lines of port A, as well as almost all at port B, as inputs.

Message number	Message text
1	CQ CQ CQ de **UY5DJ UY5DJ UY5DJ** PSE K
2	CQ DX CQ DX CQ DX de **UY5DJ UY5DJ UY5DJ** PSE K
3	CQ TEST CQ TEST de **UY5DJ UY5DJ** TEST K
4	QRZ? QRZ? de **UY5DJ UY5DJ** PSE K
5	My QTH is **Kharkiv Kharkiv** es name is **Vlad Vlad** PSE K

Table 1. *Frequently used CW messages.*

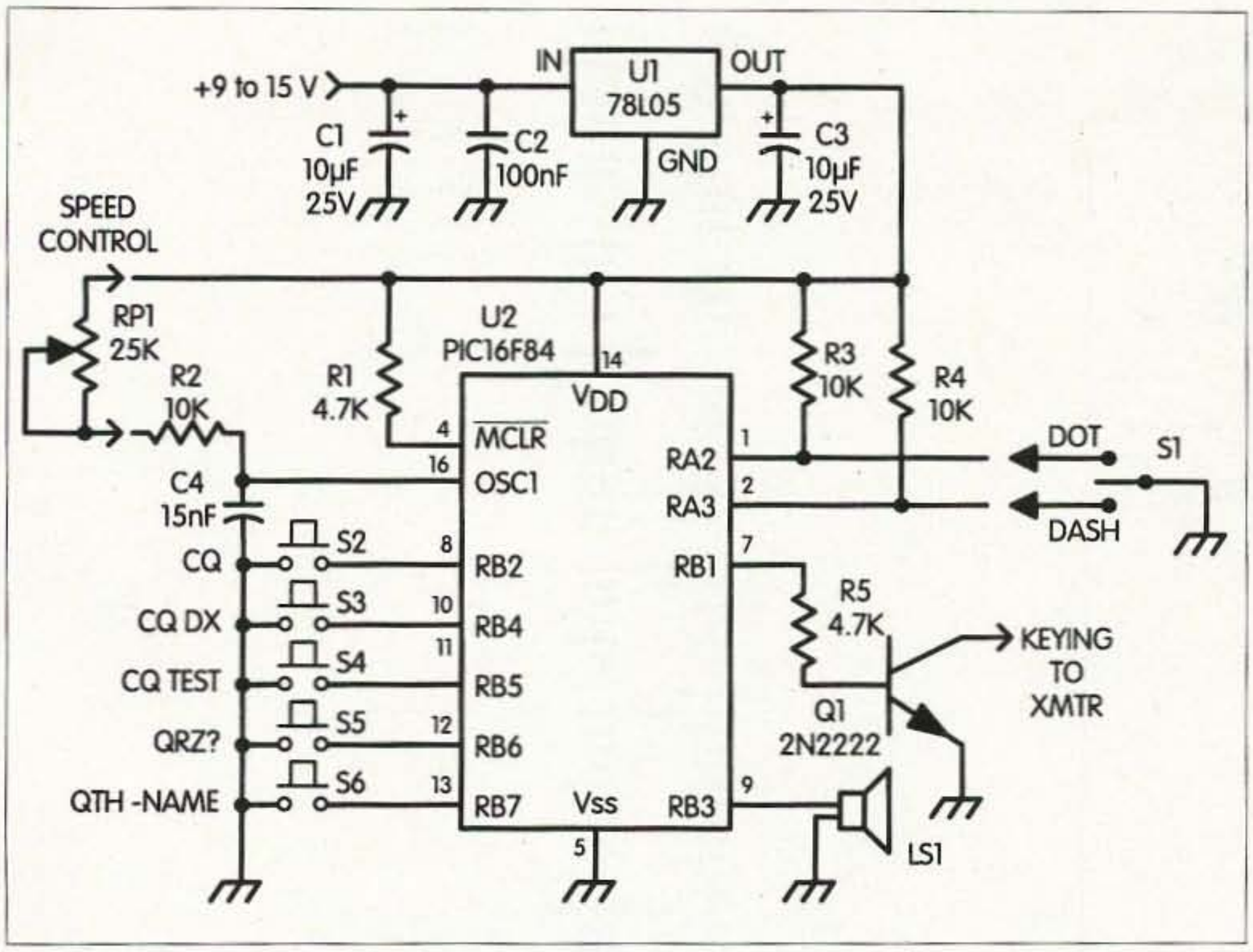

Fig. 2. Schematic of the improved keyer.

There are two exceptions — RB1 and RB3 are left as outputs. The next step is to initialize all counters in the program. This point is rather important, and marked by the label "Begin". Many times during operation, the program will come here and begin its run down to the end.

As you sensed while reading above, this keyer has several new input pushbuttons connected to the appropriate inputs of the microcontroller. By pressing one button we make that input low, which creates the desired message.

After initialization, the program checks to see if a pressed button is connected to the RB2 line. If it was pressed, the CQ message (number 1 in **Table 1**) is requested. The program will go to the "yes" direction to run the set of CQ subroutines. It causes transfer of the Morse code signals to the output. When the message is completed, the program goes back to the "Begin" label and everything will repeat.

When RB2 isn't low, the program will check to see if the "CQDX" button was pressed. It can find RB4 either high or low. If it is low, the program sends message number 2 from the table. In the opposite case, the program checks for low condition and consequently port lines RB5, RB6, and RB7. If it finds any low, the program sends the appropriate message and returns to the re-initialization of the counters. If no buttons were pressed, the program, after the last examination of RB7, continues

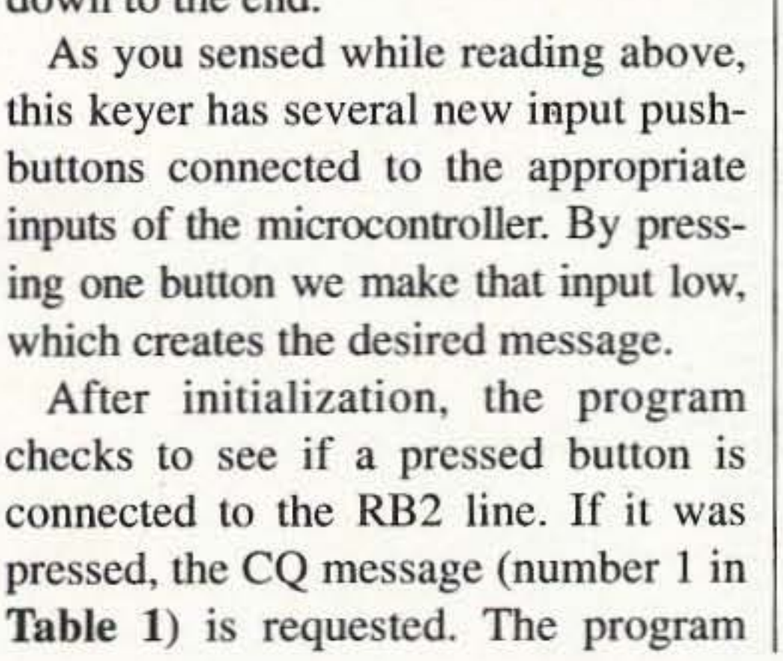

Fig. 3(a). PIC keyer PC board, component side.

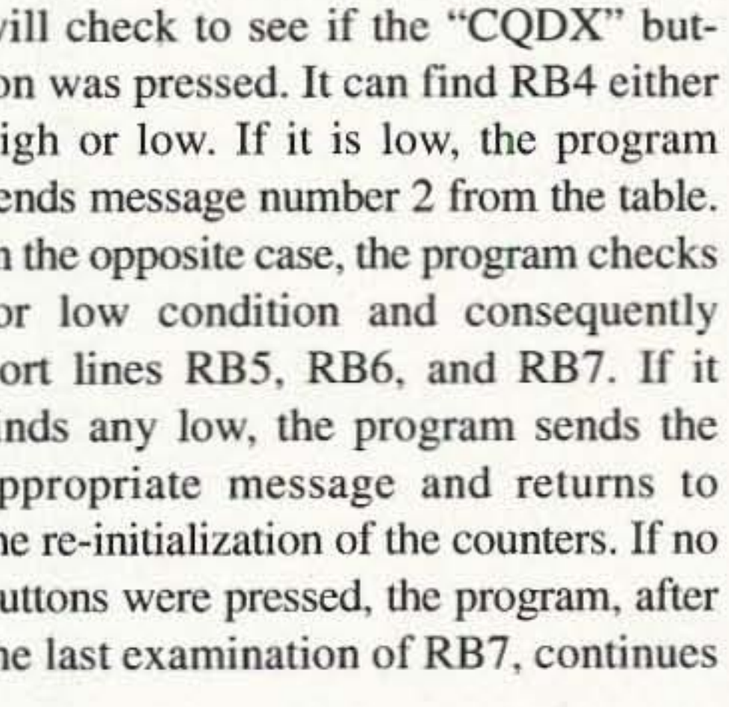

Fig. 3(b). PIC keyer PC board, foil side.

```
;********************** May 1999 ***************************
;                      CW keyer
;                      ver. 1.1
;
;Vlad Skrypnik, UY5DJ              E-mail:  uy5dj@yahoo.com
;-----------------------------------------------------------
            list        p=16f84
            __config    0x3ff3      ; RC clock oscillator
;-----------------------------------------------------------
;              CPU equates (memory map)
porta       equ         0x05
portb       equ         0x06
count1      equ         0x0c        ;for DOT delay constant
count2      equ         0x0d        ;for PAUSE delay constant
count3      equ         0x0e        ;for DASH delay constant
count4      equ         0x0f        ;for 2xPAUSE delay constant
count5      equ         0x10        ;for 8xPAUSE delay constant
;-----------------------------------------------------------
            org         0x000
start       movlw       0xff
            tris        porta       ; teach port A as inputs
            movlw       0xf5
            tris        portb       ; teach port RB1 and RB3 as outputs
            bcf         portb,1     ; set RB1 low
            bcf         portb,3     ; set RB3 low
            movlw       0x7f        ;\ set internal pullup resistors
            option                  ;/ on port B inputs enabled
;
begin       clrf        count1      ; initialize counters
            clrf        count2
            clrf        count3
            clrf        count4
            clrf        count5
;--------------- Calling CQ -----------------------------
MainCQ      btfsc       portb,2     ; is RB2 low? (pin 8)
            Goto        CQDX
            call        CQ
            call        CQ
            call        CQ
            call        from
            call        MyCall
            call        MyCall
            call        MyCall
            call        PSE
            call        K
            goto        begin
;--------------- Calling CQ DX --------------------------
CQDX        btfsc       portb,4     ; is RB4 low? (pin 10)
            goto        CQTEST
            call        CQ
            call        DX
            call        CQ
            call        DX
            call        CQ
            call        DX
            call        from
            call        MyCall
            call        MyCall
            call        MyCall
            call        PSE
            call        DX
            call        K
            goto        begin
;--------------- Calling CQ TEST ------------------------
CQTEST      btfsc       portb,5     ; is RB5 low? (pin 11)
            goto        QRZ
            call        CQ
            call        TEST
            call        CQ
            call        TEST
            call        from
            call        MyCall
            call        MyCall
            call        TEST
            call        K
            goto        begin
;--------------- Calling QRZ? ---------------------------
QRZ         btfsc       portb,6     ; is RB6 low? (pin 12)
            Goto        QTHname
            call        QRZ?
            Call        QRZ?
            Call        from
            call        MyCall
            call        MyCall
            call        PSE
            call        K
            goto        begin
;--------------- Send QTH and name ----------------------
QTHname     btfsc       portb,7     ; is RB7 low? (pin 13)
            goto        paddle
            call        dash        ; letter "n"
            call        dash
            call        pause2
            call        dash        ; letter "y"
            call        dot
            call        dash
            call        dash
            call        LP
            call        dash        ; letter "Q"
            call        dash
            call        dot
            call        dash
            call        pause2
            call        dash        ; letter "T"
            call        pause2
            call        dot         ; letter "H"
            call        dot
            call        dot
            call        dot
            call        LP
            call        is          ; "is"
            call        MyQTH
            call        MyQTH
            call        dot         ; letter "e"
            call        pause2
            call        dot         ; letter "s"
            call        dot
            call        dot
            call        LP
            call        dash        ; letter "n"
            call        dot
            call        pause2
            call        dot         ; letter "a"
            call        dash
            call        pause2
            call        dash        ; letter "m"
            call        dash
            call        pause2
            call        dot         ; letter "e"
            call        LP
            call        is          ; "is"
            call        MyName
            call        MyName
            call        PSE
            call        K
            goto        begin
;
;---------------  Subroutine  "CQ"    ------------------
CQ          call        dash
            call        dot
            call        dash
            call        dot
            call        pause2
            call        dash
            call        dash
            call        pause2
            call        dash
            call        dash
            call        dot
            call        dash
            call        LP
            return
;---------------  Subroutine "DE"    --------------------
from        call        dash
            call        dot
            call        dot
            call        pause2
            call        dot
            call        LP
            return
;---------------  Subroutine   "DX"   --------------------
DX          call        dash
            call        dot
            call        dot
            call        pause2
            call        dash
            call        dot
            call        dot
            call        dash
            call        LP
            return
;---------------  Subroutine "TEST"  ----------------------
TEST        call        dash
            call        pause2
            call        dot
            call        pause2
            call        dot
            call        dot
            call        dot
            call        pause2
            call        dash
            call         LP
            return
;---------------  Subroutine "IS"  ------------------------
is          call        dot         ; letter "i"
            call        dot
            call        pause2
            call        dot         ; letter "s"
            call        dot
            call        dot
            call        LP
            return
;---------------  Subroutine "CALL  SIGN "  ---------------
MyCall      call        dot         ; letter "u"
            call        dot
            call        dash
            call        pause2
            call        dash        ; letter "y"
            call        dot
            call        dash
            call        dash
            call        pause2
            call        dot         ; figure "5"
            call        dot
            call        dot
            call        dot
            call        dot
            call        pause2
            call        dash        ; letter "d"
            call        dot
            call        dot
            call        pause2
            call        dot         ; letter "j"
            call        dash
            call        dash
            call        dash
            call        LP
            return
;---------------  Subroutine "My QTH"  -------------------
MyQTH       call        dash        ; letter "k"
            call        dot
            call        dash
            call        pause2
            call        dot         ; letter "h"
            call        dot
            call        dot
            call        dot
            call        pause2
            call        dot         ; letter "a"
            call        dash
            call        pause2
            call        dot         ; letter "r"
            call        dash
            call        dot
            call        pause2
            call        dash        ; letter "k"
            call        dot
            call        dash
            call        pause2
            call        dot         ; letter "i"
            call        dot
            call        pause2
            call        dot         ; letter "v"
            call        dot
```

to the paddle control. You can manually manipulate the paddle to send either a dash or dot to the output. To recall how it works, please refer to the algorithm chart in the previous article. If no dash or dot inputs were low, the program comes back to "Begin".

Assembly language program

The structure of this assembly program was detailed in the previous article. **Table 2** shows that there are some differences even at the CPU equates. There are two more counters added. Counter 4 will keep a delay constant for pauses between letters in the message. Counter 5 will store the delay constant to separate words. In the Morse code structure, pauses between letters are three times longer than pauses between dots and dashes

```
            call        dot
            call        dash
            call        LP
            return
;--------------- Subroutine "My name"  --------------------
MyName      call        dot         ; letter "y"
            call        dot
            call        dot
            call        dash
            call        pause2
            call        dot         ; letter "l"
            call        dash
            call        dot
            call        dot
            call        pause2
            call        dot         ; letter "e"
            call        dash
            call        pause2
            call        dash        ; letter "d"
            call        dot
            call        dot
            call        LP
            return
;---------------   Subroutine  "QRZ?"   -------------------
QRZ?        call        dash
            Call        dash
            call        dot
            call        dash
            call        pause2
            call        dot
            call        dash
            call        dot
            call        pause2
            call        dash
            call        dash
            call        dot
            call        dot
            call        pause2
            call        dot
            call        dot
            call        dash
            call        dash
            call        dot
            call        dot
            call        LP
            return
;---------------   Subroutine "PSE"   ----------------------
PSE         call        dot
            call        dash
            call        dash
            call        dot
            call        pause2
            call        dot
            call        dot
            call        dot
            call        pause2
            call        dot
            call        LP
            return
;---------------   Subroutine  "K"    -------------------
K           call        dash
            call        dot
            call        dash
            return
;--------   Subroutine of pauses between letters  --------
pause2      movlw       d'24'       ; delay constant
            movwf       count4      ; load counter with delay const
rptpau2     decfsz      count4,f    ; decrement counter
            goto        rptpau2     ; not 0
            return                  ; counter 0, end pause
;--------   Subroutine of pauses between words    --------
LP          movlw       d'152'      ; delay constant
            movwf       count5      ; load counter with delay const
rptpau9     decfsz      count5,f    ; decrement counter
            goto        rptpau9     ; not 0
            return                  ; counter 0, end pause
;
;----------        Manipulating by paddle        ----------
;---------------   Select dot   -------------------------
paddle      btfsc       porta,2     ; is RA2 low (dot pressed)?
            goto        dash?
            call        dot         ; calling subroutine DOT
            goto        begin
;---------------   Select dash   ------------------------
dash?       btfsc       porta,3     ; is RA3 low (dash pressed)?
            goto        begin
            call        dash        ; calling subroutine DASH
            goto        begin
;----------   Subroutine for generating dots   ----------
dot         bsf         portb,1     ; RB1=1, dot begans
            movlw       d'12'       ; delay constant
            movwf       count1      ; load const to counter
rptdot      bsf         portb,3     ; sound on
            bcf         portb,3     ; sound off
            decfsz      count1,f    ; decrement counter
            goto        rptdot      ; not 0
            bcf         portb,1     ; RB1=0, end dot
            call        pause       ; start PAUSE subroutine
            return
;----------   Subroutine for generating dashes   --------
dash        bsf         portb,1     ; RB1=1, dash begans
            movlw       d'37'       ; delay constant
            movwf       count3      ; load const to counter
rptdah      bsf         portb,3     ; sound on
            bcf         portb,3     ; sound off
            decfsz      count3,f    ; decrement counter
            goto        rptdah      ; not 0
            bcf         portb,1     ; RB1=0, end dash
            call        pause       ; start PAUSE subroutine
            return
;--- Subroutine for generating pauses between elements  ---
pause       movlw       d'9'        ; delay constant
            movwf       count2      ; load counter with delay const
rptpau      decfsz      count2,f    ; decrement counter
            goto        rptpau      ; not 0
            return                  ; counter 0, end pause
;----------------------  END of progrss --------------------
            end
```

in the letter. It is equal to the length of a single dash. The duration of the pause between words is equal to three dashes or nine dots.

After you are familiar with assembly programming, you can easily understand what has happened in the lines preceded by labels "Start" and "Begin". After initialization of counters (merely clearing their memory cells), the program

Table 2. An assembly language program for a modified PIC keyer.

Name	Description
C1, C3	10 µF 25 V electrolytic or tantalum (DK P5148-ND)
C2	100 nF ceramic (DK P4924-ND)
C4	15 nF ceramic (DK P4905-ND)
LS1	Piezo buzzer element (DK P9924-ND)
Q1	2N2222 or any general purpose NPN silicon transistor (DK PN2222ADICT-ND)
RP1	25k potentiometer (DK CT2266-ND)
S1	Any type CW keyer paddle
S2–S6	Any type push-button switches (e.g., DK P8006S-ND)
U1	78L05 small 5 V positive regulator (DK NJM78L05A-ND)
U2	PIC16F84 microcontroller (DK PIC16F84-04/P-ND)

Table 3. Parts list.

starts to examine five port B inputs. The first step is labeled "MainCQ". If RB2 is still high (button unpressed) the next line instruction, "Goto CQDX", skips over the CQ message and examines input RB4.

If RB2 was really low, the program will ignore the second line and continue from the third one. Actually, there are numerous subroutines being called one by one while forming the message. At first, subroutine CQ was called three times. Next is called subroutine "from", which in fact generates the word "de" in the radio message. (It is impossible to name this subroutine as "de", because this combination of letters is reserved for the PIC microcontroller and is forbidden for use as the label or subroutine name.)

Then subroutine "MyCall" was called three times, "PSE" once, and "K". The first CW message is completed, and the instruction "Goto" returns the program to "Begin."

I hope this gives you the idea of how any message is formed. You may examine how it is organized in the "CQDX", "CQTEST", "QRZ," and "QTHname" portions of this program. It is really very easy. Subroutines included here also invoke other subroutines for dots, dashes, and pauses.

Please pay careful attention to subroutines "MyCall," "MyQTH", and "Name." You must understand how to change the sets of dots, dashes, and pauses to make your callsign, QTH, and name available. Remember that you have to call each time the subroutine produces one dot, dash, or pause. These subroutines are only what you need to change for correct operation of this keyer at your station. First, merely write your callsign, QTH, and name in Morse code, using dots and dashes. Then substitute them by instruction "Call" and appropriate subroutine name. Please keep in mind that pauses between dots or dashes are included into both subroutines generating dots and dashes (at their end). This means that you do not add any pause after Morse code elements.

Subroutines "Pause2" and "LP" provide pauses between letters and words in the messages. The required duration of these pauses was achieved by appropriate selection of the delay constant's values.

The part of the program labeled "paddle" is almost the same as what was in the original keyer program. One difference is in subroutine "Pause." The delay constant was changed from 14 to 9. Why? Because when the keyer is operating from the paddle any time the program is checking five microcontrollers' inputs and uses 5 processor cycles more each time. This, of course, will increase the pause duration between dots and dashes. To compensate for this, the delay constant was decreased.

Schematic diagram and construction

Fig. 2 shows the schematic diagram of the improved PIC keyer. The only differences from the original keyer are push-buttons S2–S6. They are normally open, and are intended to pull the PIC's inputs to ground. This will activate one of the previously determined messages.

The new keyer is assembled on a small 35 x 35 mm single-sided printed circuit board (**Fig. 3**). Please note that pads are provided for connecting the push-buttons. It will give you a variety of choices in your selection of push-buttons, paddle, and cabinet for final construction.

Summary

Building this simple keyer will help you gain knowledge and skills through study, experimentation, and construction — and you will end up with a very useful station accessory as well! Like most amateur radio projects, this project is ripe for further improvements and modifications. Keep in mind that the program described in this article utilizes only a very small part of the PIC16F84's capabilities.

I want to express my gratitude to my friend Dave Evison W7DE for his patience in reading and doing some preliminary editing of this article. 73

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10m Junk Box Amp

More tube-type fun!

A few months ago, I was trying to communicate with my son Mike KC4DQR on 10 meters. While he could hear my 100 watt rig, I could never hear his 25 watt Realistic HTX-100. We live about 50 miles apart, and that was just a little too far away for his 25 watt ground wave and dipole antenna to get through. I figured there must be a solution to this problem, and started to dig into the ol' junk box. Since Radio Shack sold the HTX-100 to lots of hams, I decided to share with you my solution, the 10m Junk Box Amp.

I wanted the amplifier to be easy to work with, simple to build, and rugged. With this in mind, I chose a tube-type circuit. Since the old 807 tubes are still quite popular as drivers in many AM broadcast transmitters, they are easy to come by and fairly inexpensive. If you use two of them in a parallel configuration, they also will produce about 100 watts, the power I was looking for. Another plus was that my junk box contained two of them!

Construction

The hardest part of the construction was building a suitable chassis out of a piece of aluminum which I also happened to have on hand. After much beating, hammering, drilling, and a few pop rivets, I had a 17- x 5- x 12-inch box that looked a lot like a chassis. Instead of building on the outside like most of the older tube-type projects, I built the amplifier inside the box.

The box of junk produced a suitable power transformer with a secondary of 550 volts @ 450 mA, which was rectified through a bridge circuit consisting of eight 2.5 amp, 1000 PIV diodes. I wanted it to last!

The most expensive part of the project turned out to be the filters. I used three 100 µF @ 450 VDC in series. Such capacitors are not easy to find now, since most projects are solid state and use low voltage capacitors. These little jewels cost $7.50 each.

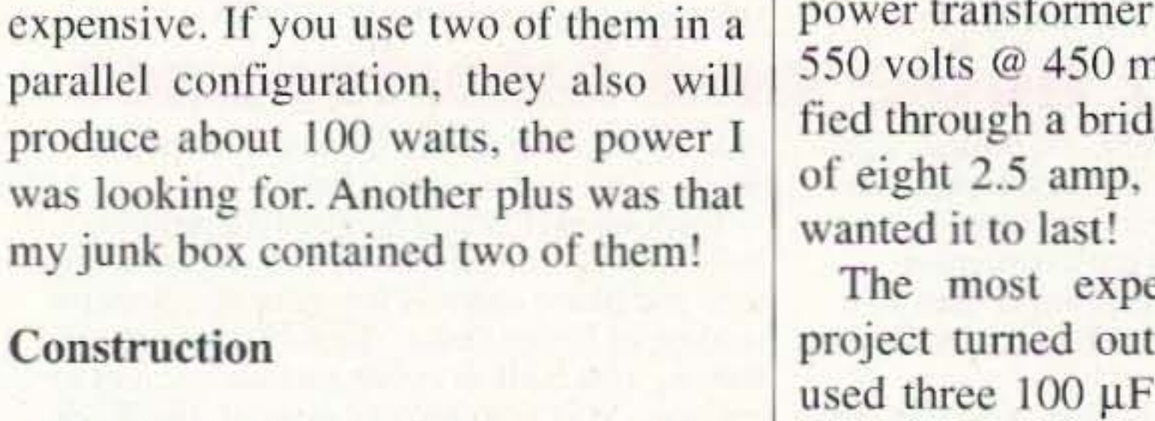

Photo A. *Front view.*

The three resistors, R3–R5, serve to equalize the voltage across the capacitors, and also as bleeder resistors to discharge the capacitors when the unit is turned off. The high voltage circuit produced a no-load voltage of 590 volts, and about 560 volts under load.

A word of caution: *Keep your fingers clear of this when the unit is on.* These voltages, producing nearly half an amp, can be dangerous. Practice safety at all times.

In order to make the unit as efficient as possible, I used a tuned circuit to drive the tube's grids. This consists of L1, L2, and C7. Since tubes like to see negative voltage on the grids, C6 was used to block the negative DC from the tuned circuit. To generate the negative grid bias voltage, I used a 6.3 volt filament transformer connected in reverse to the 5.0 volt rectifier filament winding, and used what was the primary winding as the supply. This was rectified by another bridge connected with the positive side to ground, and filtering the output with C2's positive lead to ground. The voltage produced here was exactly what was needed, biasing the tubes to cut off when no signal was applied. This prevented the need for any kind of switching to turn the amplifier off and on, since the plate current remained at zero when no signal was applied to drive the circuit.

The resistor R2 provides a small load to keep the voltage stable, and C1

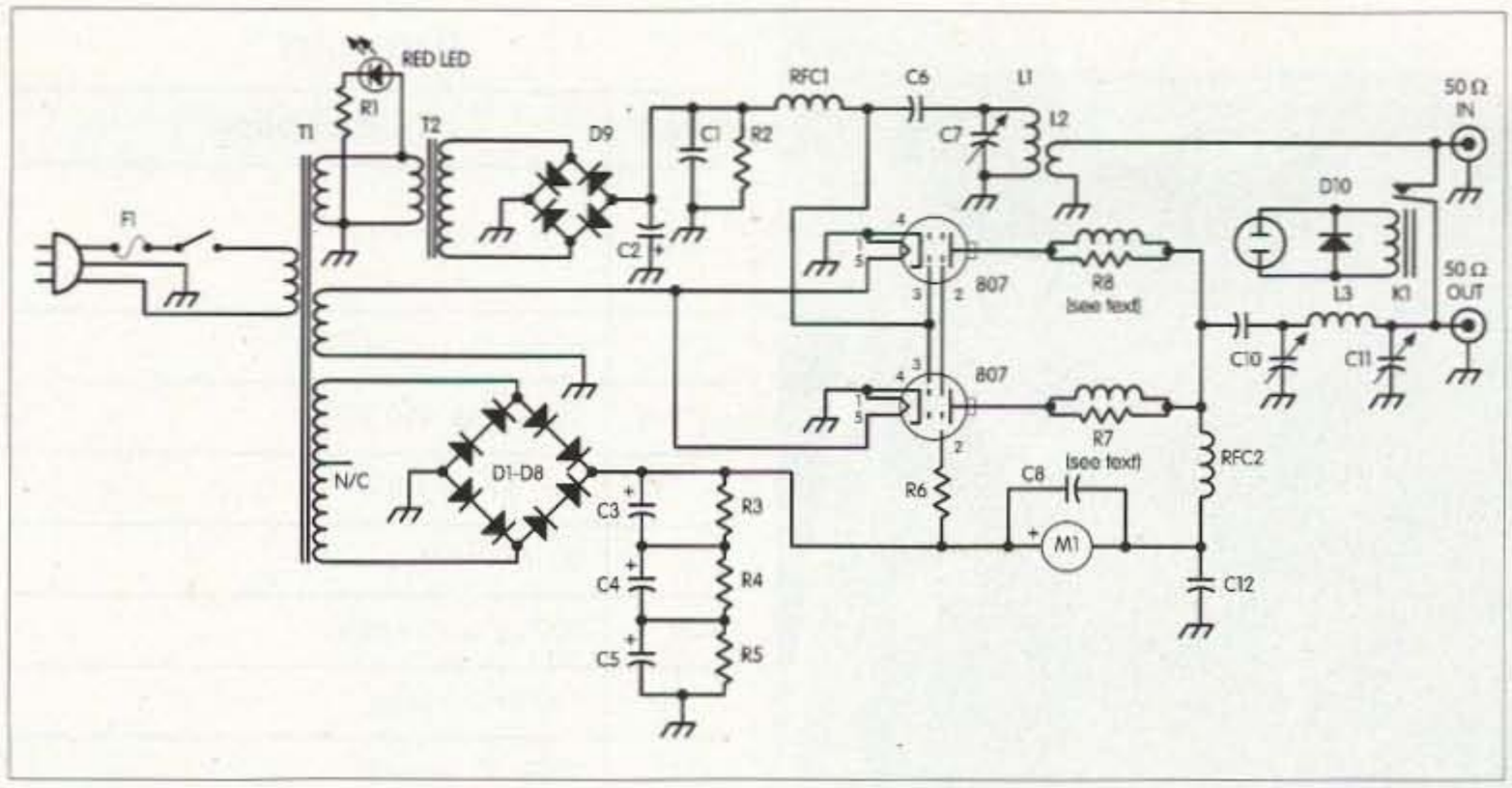

Fig. 1. Schematic.

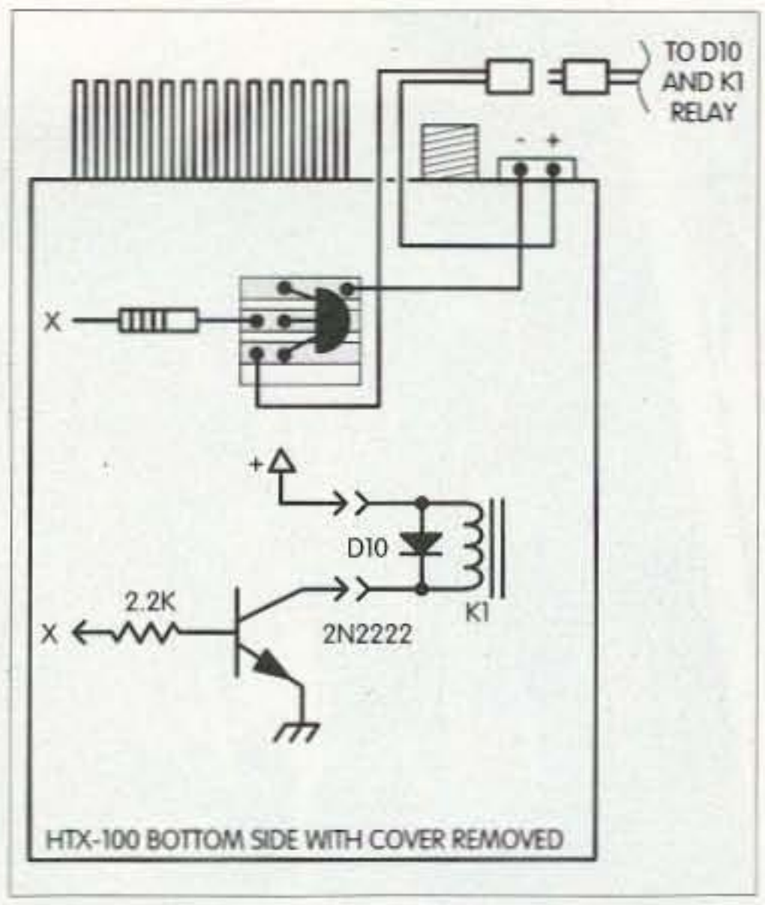

Fig. 2. Keying circuit modification for the Realistic HTX-100.

shorts any RF to ground that may have sneaked through RFC1. The screen grids were supplied through R6, which gave a little higher voltage than the specs on the tube called for, but since you can run the plate voltage at up to 750 volts, this did not seem to be a problem.

The parasitic suppressors in the plate circuit consist of 56 ohm, 2 watt carbon resistors, with three turns of #16 wire wound around them. I used the TLAR method to figure these values. What's the TLAR method? That Looks About Right! The output is a standard pi network consisting of C10, C11, and L3. I used a door knob capacitor, C9, to block the high voltage off the pi network, and antenna. The RF choke, RFC2 and C12, block the RF from the power supply. The plate current meter is a 300 mA unit, shunted by C8 for RF suppression.

HTX-100 Mod

Since it is not practical to design a simple RF sensing circuit that will respond to an SSB signal, I decided to modify the HTX-100 with a keying circuit for the 10m JB Amp. With the bottom cover removed, I looked for a place on the PC board that would go high when the mike was keyed, and remain high. Several places were found. I used a triangular land in the left-hand corner at the "x", which went to a positive 12 VDC when the mike was keyed.

In order not to place any significant load on the HTX-100 circuit, I coupled that point through a 2.2k 1/2 watt resistor to a simple relay driver using a 2N2222 NPN transistor. The transistor was mounted on a small PC board etched with only three strips, as shown. From the collector a wire was routed through an existing hole in the rear of the HTX-100, and a second wire from the (+) side of the power plug on the radio was routed through

Continued on page 18

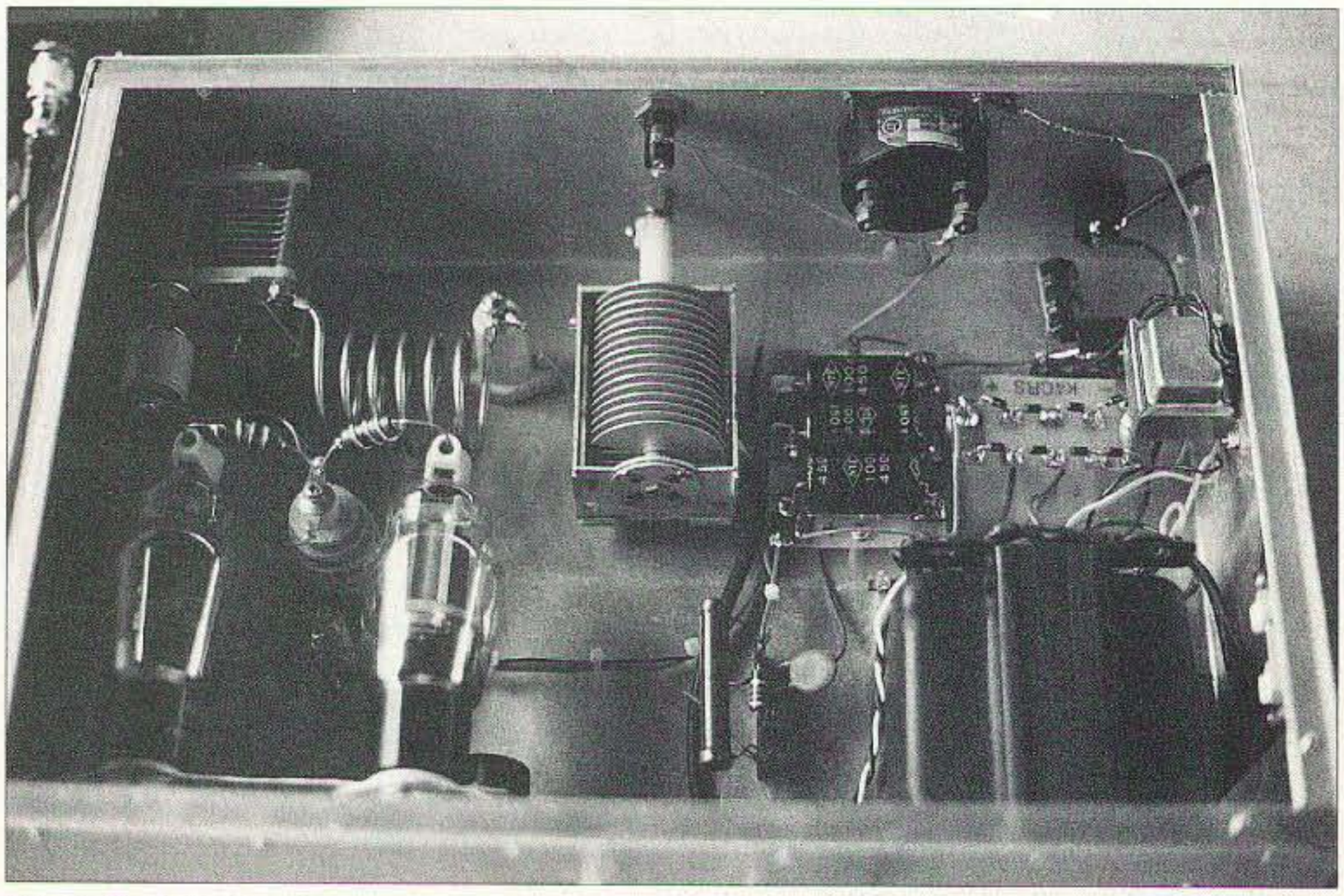

Photo B. Interior view.

10m Junk Box Amp

continued from page 17

the same hole and attached to a plug for quick disconnect.

The mating plug from the amplifier feeds the relay K1. A 1N914 diode was connected across the relay to act as a shorting device to protect the 2N2222 from voltage generated by the K1 coil when the relay is turned off.

Keying the radio turns on the 2N2222 and closes the relay in the amplifier. Since the radio's speaker is mounted on the bottom cover, care must be exercised to mount the transistor's circuit board so that it doesn't short against the back of the speaker.

Tuneup

Tuneup was straightforward, first tuning the pi network for maximum power into a Bird wattmeter and dummy load, then tuning C7 in the grid circuit, and retouching the pi network. When properly tuned, the amplifier produced about 95 watts output, with the plate running about 250 mA. Of course, this was done with the radio in the CW mode. All amateur transmitting equipment must be able to send CW — ARRL rule number 1!

During the 1999 Field Day contest, I used this system to make many 10 meter contacts that ranged from Florida to

Continued on page 40

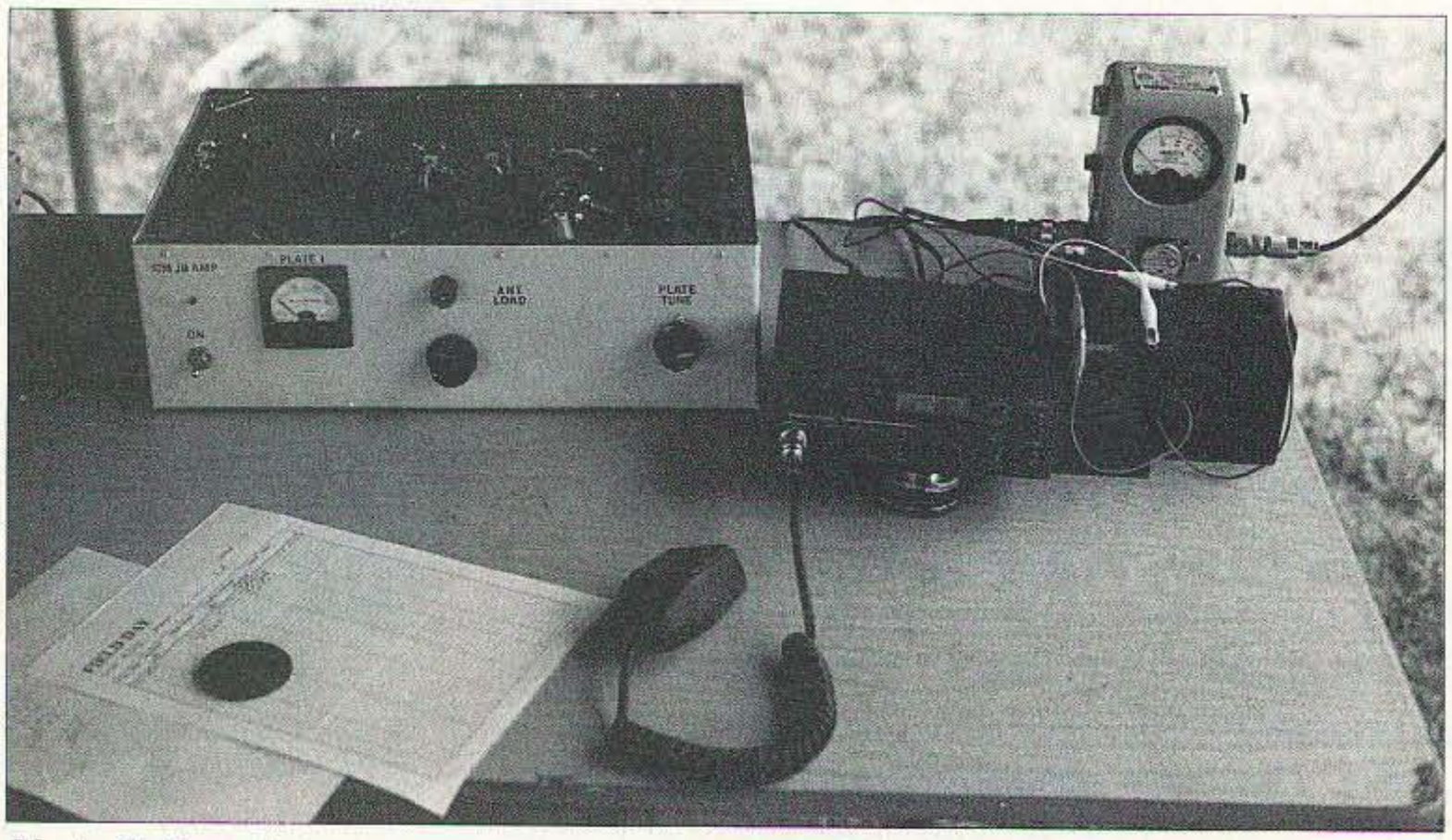

Photo C. Complete setup.

Parts List	
Part	**Description**
C1, 6, 8, 12	0.01 µF @ 1 kV
C2	50 µF @ 150 VDC
C3–5	100 µF @ 450 VDC
C6	0.01 µF @ 1 kV
C7	50 µF variable
C9	500 pF door knob
C10	150 pF variable
C11	1000 pF variable
D1–8	1 kV PIV @ 2.5 A
D9	200 V PIV @ 1A
D10	1N914
K1	SPDT relay 12 VDC coil
L1	6T #18 wire 1/2-in. diam. spaced 1 turn width
L2	3T #18 wire 1/2-in. diam. spaced 1 turn width on cold end of L1
L3	5.5T #10 wire 1-5/8-in. diam. 2 in. long
M1	0–300 mA meter
R1	200 Ω 1/2 W carbon
R2	47 k, 2 W carbon
R3–5	100 k 1/2 W carbon
R6	2 k 5 W wirewound
R7–8	56 Ω 2 W carbon
RFC1	2.5 mH RF choke
RFC2	2.5 mH 600 mA RF choke
T1	117 VAC primary, secondary 550 VAC CT @ 300 mA, 6.3 VAC @ 2A, 5.0 VAC @ 2 A
T2	117 VAC primary, 6.3 VAC secondary, hooked up in reverse with 6.3 side connected to 5.0 output of T1
Miscellaneous	
SPST toggle switch	
2 x SO-239 connectors	
Red LED	
2 x 807 tubes	
Line cord and plug	
Any kind of insulated 2-conductor plugs (keying circuit)	
5 x 5-terminal solder lugs	
Porcelain standoff	
2 x PCB for D1–D8 and capacitor bank	
17- x 5- x 12-inch chassis	

***Table 1.** Parts list.*

George Pataki WB2AQC
84-47 Kendrick Place
Jamaica NY 11432

Vaya Con (Ra)Dios

The radio amateurs of Spain — part 2:
Mallorca and a side trip to the Principality of Andorra.

During my tour of Spain, I took a side trip to visit the amateurs of the island of Mallorca in the Balearic group. Xavier EA3ALV, editor of the Spanish CQ Radio Amateur *magazine, who had translated and published several of my travelogues, called up Guillem EA6YG* ***(Photo A)*** *and set up a meeting for me.*

From Barcelona, I took a ferryboat of the Buquebus company, and in about three hours I arrived to Palma de Mallorca. The round trip tickets were 16,300 pesetas, about $110 at the rate of exchange of 148 pesetas for a US dollar. There is another company, the Transmediterranea, which is cheaper, but the journey takes twice as long. There were several monitors on board to show the itinerary but none of them worked properly. You could buy some food on board but it was expensive.

A worried woman asked the captain: "Ferryboats like this do sink often?" "No Madame, just once!" was the reply.

Many hams go to Balearic Islands to work in contests or just operate during their vacation.

I heard of one wife who told her DXpeditioner husband: "My dear, I am always worried when you leave on a trip."

"Don't worry, sweetheart, I'll be home before you know it."

"That's exactly why I'm worried!" said the wife.

I had wanted to see as many hams as possible and return the next evening, but I could get return tickets only after three days because it was during Semana Santa, a weeklong religious holiday, and vacationers were returning home by the thousands.

As soon as I got off the boat, I spotted Guillem with his cap showing his callsign EA6YG, and his friend José-Maria EA6DO. Guillem took me to his house in Inca, northeast of Palma, where I stayed three days while he was driving me around to various cities to meet the local hams. Guillem was licensed in 1983, and nowadays is not as active as he used to be. He has several jobs, such as hotel receptionist six months a year during the tourist season. He looks like the captain of a pirate ship, so he may indeed have something else

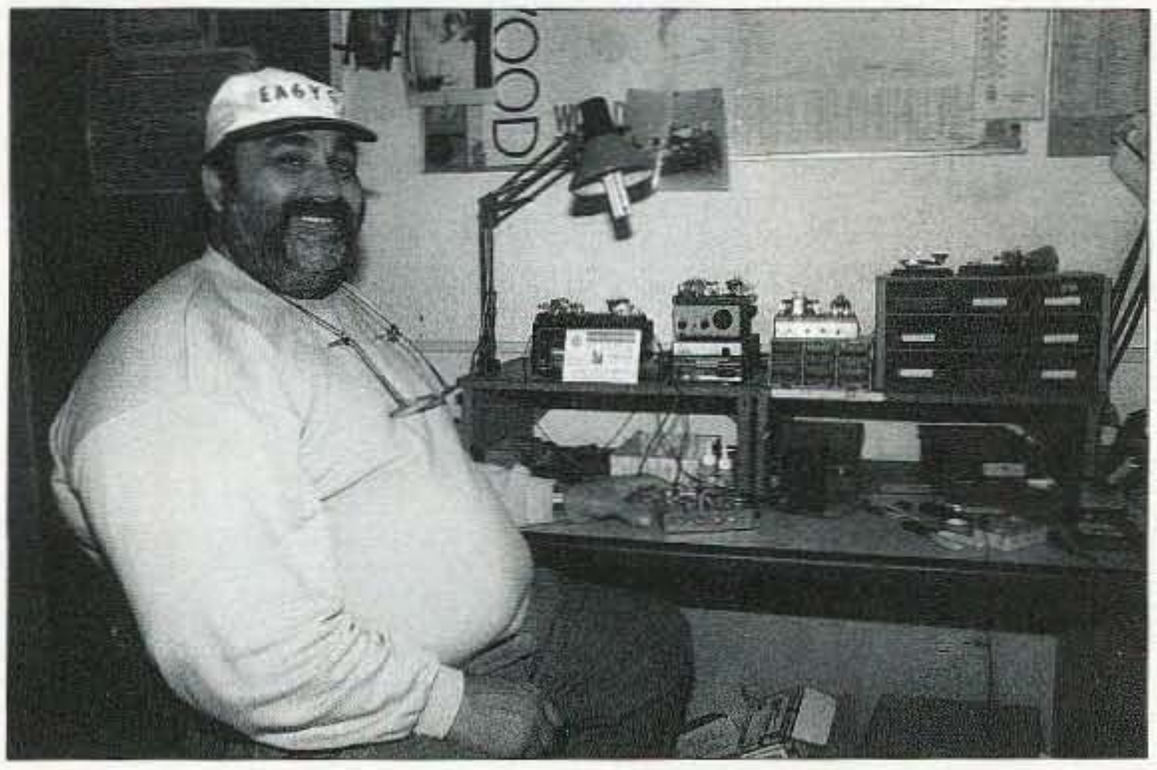

Photo A. *Guillem EA6YG was my guide in Mallorca.*

Photo B. *José-Maria EA6DO is a retired air force communications major.*

Photo C. *Genis EB6WS and Gabriel EA6JT operate Inca club station EA6URI.*

Photo E. *Gigi EA6HL, Palma de Mallorca.*

to do when the hotel is closed. His most important work is in manufacturing telegraphic keys. During the years, he had made about 40 different types: straight keys, iambic, semiautomatic, iambic with electronic memories, etc., under the name of Llaves Telegraficas Artesanas.

Guillem has a vertical for 10-15-20 meters, a multiband dipole for 10 to 80 meters, and a discone for 30 to 1,300 MHz, used for 2 meters. On the low bands, he works only CW. He is not connected to the city's power line; he is using solar panels and a generator. Also, instead of using the city's water supply, he has wells on his property. Guillem EA6YG has QSL cards and his E-mail is: [llatelar@arrakis.es].

We all went to Palma to see the station of José-Maria EA6DO, a retired air force communications major (**Photo B**). He started in amateur radio in 1949, the year when, after World War II, hamming was again authorized in Spain. He has a vertical for 10 to 40 meters from Butternut, a TH3-MK3–type 3-element yagi for 10-15-20 meters, and a dual-band vertical for 2 meters and 70 cm. His rig is a Drake TR-7, running 150 W, mostly on CW. The walls of his shack are covered with awards; I also noticed some military medals from his previous occupation, a framed photograph of His Majesty Juan Carlos, King of Spain, EAØJC, and his QSL card. As do virtually all the hams I visited, José-Maria also has QSLs.

In Mallorca, I saw many windmills. The mills were all in ruins; just the wind was still good.

Guillem took us to his radio club in Inca with a station EA6URI (**Photo C**). There we met Gabriel EA6JT, the club's president, and Genis EB6WS, the secretary. They run 100 W, use a computer, and have QSL cards. Needless to say, the CW operators use keys made by Guillem EA6YG. The club has 28 members; some of them come to meetings on Thursdays from 8 p.m. to sometimes midnight.

Gabriel EA6JT, licensed in 1981, has a photo studio close to the club. He works RTTY and color SSTV, and is on packet radio. His brother Juan EA6JS lives in Inca, while his other brother Oswaldo EA6AUL is in Palma.

Genis EB6WS, licensed in 1989, is a teacher of the Catalan language. Having a "B" license, he can operate only on VHF and UHF, meaning from 2 meters up.

Guillem organized a common dinner in a restaurant and a bunch of hams showed up: Mari-Carmen EA6ADY from Porto Colom (**Photo D**); Gigi EA6HL (**Photo E**) and her husband Bernardo EA6HI from Palma; Miguel EA6SK, a chief electrician from Inca; Mateo EA6BH (**Photos F** and **G**) from Palma and Bahia Azul (has

Photo D. *Mari-Carmen EA6ADY, Porto Colom.*

Photo F. *Mateo EA6BH, Bahia Azul and Palma.*

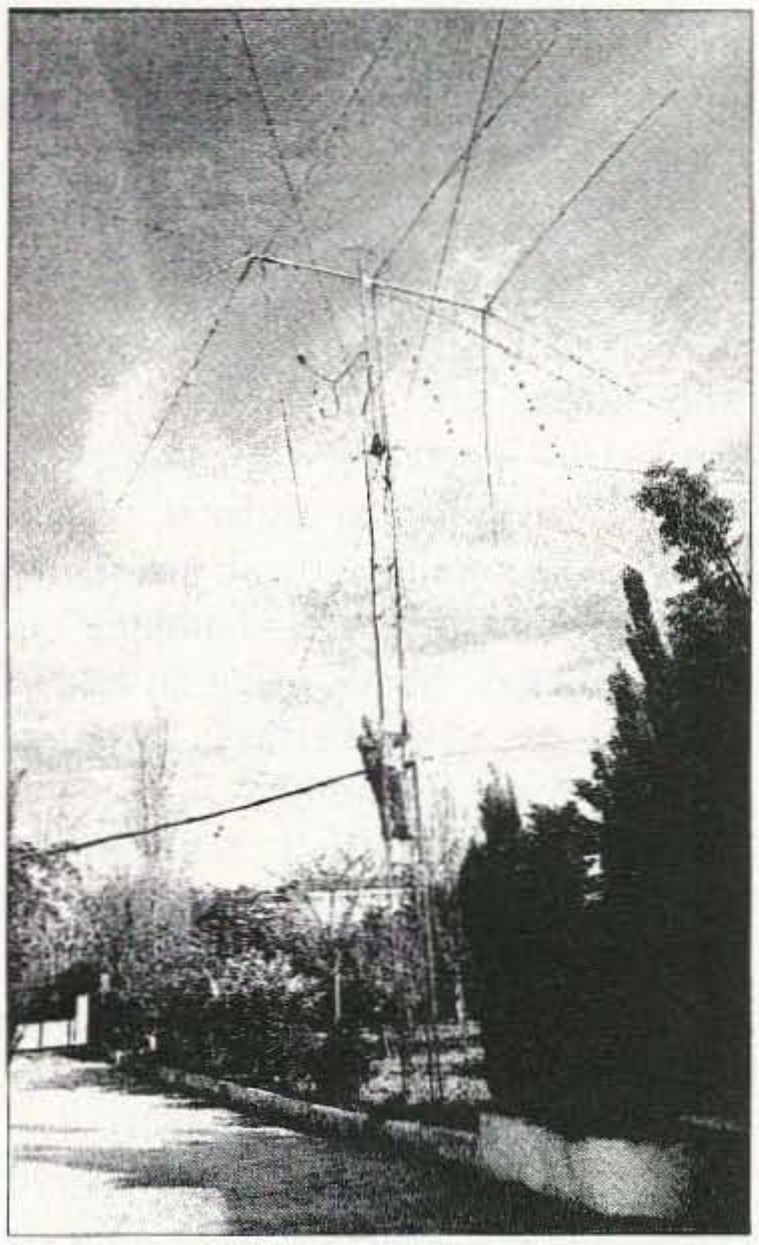

***Photo G.** EA6BH is hands-on when it comes to tower climbing.*

two residences); Gabriel EA6JT and Genis EB6WS, both from Inca; and others. I was advised to order "Lomo con Col" (pork loin with cabbage) — boy, I did, and I regretted it. I did not like it at all. I even wrote the name in my notebook, to remember not to ever order it again in my life. Using a moment of animated discussion and lack of general attention, I slipped my plate to a nearby table.

After dinner, we continued with the visits. We went northeast from Inca to La Puebla, or Sa Pobla in local spelling. There we saw Gabriel EA6HY, a teacher of electrical sciences, licensed in 1978 (**Photo H**). Gabriel has a Hy-Gain yagi for 10-15-20 meters, and a dipole for 40 and 80 meters. He uses a TS-520S with a remote VFO and antenna tuner, has various test instruments, and shows off homemade accessories like his power supply. He works on SSB, running 120 W; for RTTY, he is using an old Lorenz electromechanical teleprinter. Gabriel EA6HY has a nice, colorful QSL card.

On our way to see another ham, in Manacor on the eastern part of the island, we met Roberto EA6ABI (**Photo I**), a sergeant in the Guardia Civil traffic department who's usually roaming the highways on his motorcycle. Here I have to mention that the roads in Spain are in excellent condition. Roberto was licensed in 1964; he came from Madrid, where he had an EA4 callsign. He works SSB on 15 and 40 meters, and on 2 meters with his local friends.

I could not enter the Guardia Civil building where he has his station, so I photographed him in front of it, showing his antenna in the background. I also took his picture near his car having his callsign on the back window: EA6ABI. In Spain, the hams are not allowed to have license plates with radio amateur calls; some hams, proud of the service they provide, place their callsigns on their cars, anyplace they can. In case of Roberto, any place he wants — who will start an argument with a sergeant in the Guardia Civil? Roberto has QSL cards with the emblem of the Guardia Civil: a sword and the fasces, which is a bundle of rods bound together about an ax with the blade projecting, suggesting their roughness.

We stopped for a soft drink, and Tony EB6HZ, who happened to walk by, joined us.

A traffic cop stops a speeding car and starts to write a ticket. The woman driver says:

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***Photo H.** Gabriel EA6HY is an electrical sciences teacher.*

Photo I. *Roberto EA6ABI sports his callsign in his rear window — no ham plates in Spain!*

Photo J. *Guillermo "Billy" EA6ABN is a plumber who makes good connections all around the globe.*

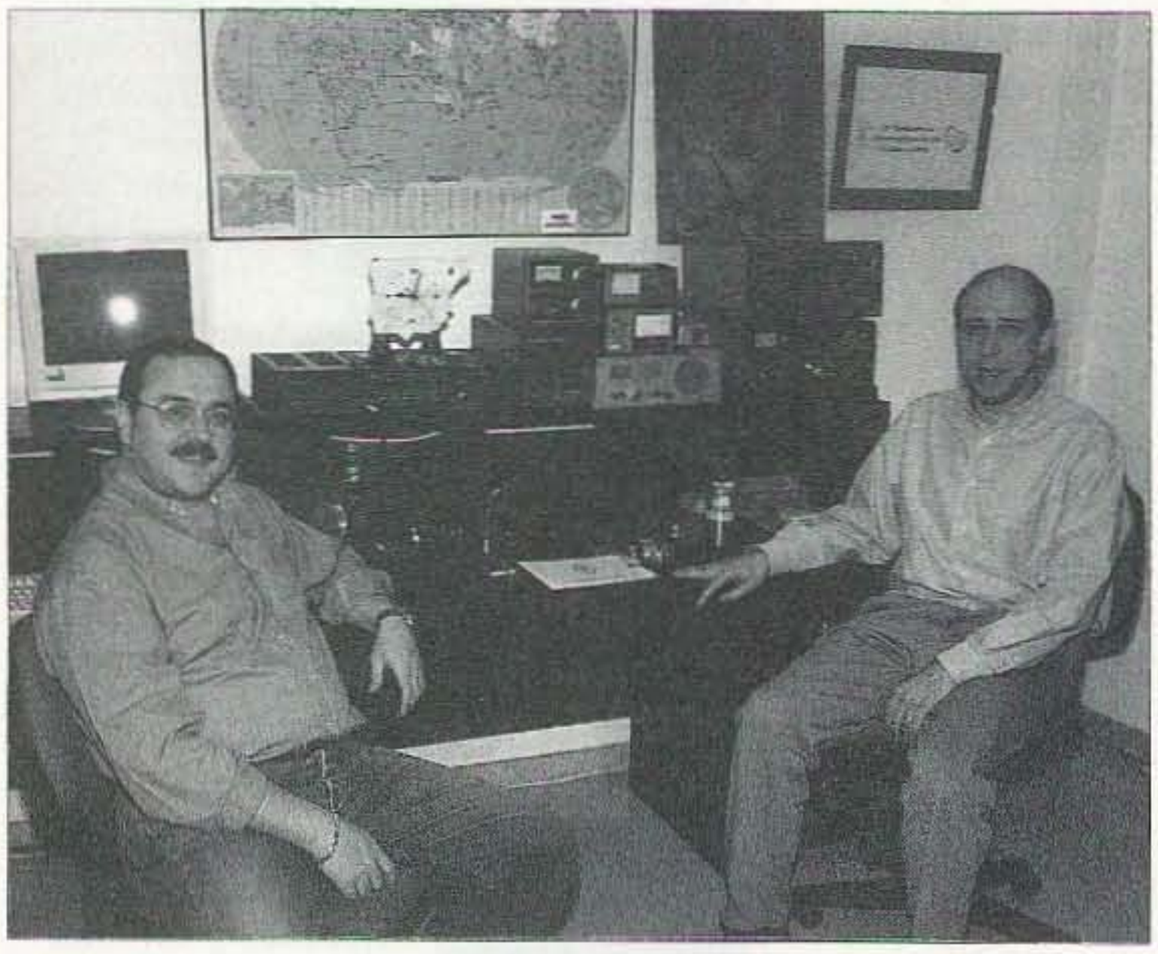

Photo K. *Michel C31MO is an accountant in Andorra; Joan C31US, co-owner with wife Josefina C32MV of a toy store, is president of the Radio Amateur Union of Andorra.*

Vaya Con (Ra) Dios

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"I am the wife of the richest man in town and I am in a very big hurry!"

"I am very impressed Madame," says the cop. "And I am writing as fast as I can!"

Have you heard this?

In one big European country, one million people drive their cars while they are intoxicated. Fortunately, this number is getting smaller every day.

Finally, we arrived at our destination in Porto Cristo and visited Guillermo, or Billy EA6ABN (**Photo J**). Licensed in 1984, Billy is a plumber who likes to make friends all over the world using ham radio. He has a 3-element yagi for 10-15-20-40 meters from Walmar of Argentina, and a double wire dipole for 12 and 17 meters. Billy's rig is a TS-520S; he is running 100 W on SSB and CW. He has worked 232 DX entities and has QSL cards. I saw on the wall of his shack maps, charts, and a framed QSL card from EAØJC.

In Porto Colom, in the southeast corner of the island of Mallorca, we saw Mari-Carmen EA6ADY, whom we had met earlier at the common dinner. She is handicapped and confined to a wheelchair, but is quite active as a radio amateur. She was licensed in 1996 after she saw her cousin Paco EA3AUL operating in Barcelona. Mari-Carmen has an all-band, 6 to 80 meters, Diamond vertical antenna, a dipole for 40 meters, and another one for 80 meters. She is using an IC-735 with an AL-811 Ameritron amplifier, works only SSB, and likes to talk with friends but speaks only Spanish. She has received more than 30 awards and has QSL cards.

In Palma we visited Gigi EA6HL, a secretary in a commercial company, and her husband Bernard EA6HI, a radio broadcaster, both licensed in 1979. They operate mostly on 20 meter SSB. Gigi has worked 100 entities; Bernard is doing better with 150. They use a computer and have a common QSL card.

Oh, the ladies of Spain! I used to dream about them when I was younger. Now I forgot what I was dreaming about. I met several lady operators during my travels; some were attached to man operators, others were independent.

A doctor calls up one of his patients with the results of a test.

"Senora Virginia, I have very good news for you!"

"Please doctor, don't call me Senora, I am a Senorita ..."

"In that case, Senorita Virginia, I have some bad news!"

In Bahia Azul, we saw the second home of Mateo, or Teo, EA6BH. His main residence is in Palma. Mateo, licensed in 1966, is a DXer; he needs only five entities to have them all. In Palma, he has a TH3-MK3 Yagi for 10-15-20 meters, and a dipole for 40 and 80 meters. Rigs he has plenty: TS-850S, TR7, TL-922, IC-229, and TS-440S. In Bahia Azul, he has more room, so on a tall tower Mateo installed a 4-element quad antenna for 10-12-15-17-20 meters, and on another tower installed on top of his building he has a 5-element monobander for 20 meters from KLM. He

also has a 4-element Hy-Gain yagi for 6 meters, a dipole for 40 and 80 meters, and a vertical for 160 meters. He uses a Kenwood transceiver and an AL-1200 amplifier.

Mateo EA6BH operated several times from Equatorial Guinea as 3C1DX. He also had a license and the assigned callsign of 3CØDX for Annobon, but first he could not go because of transportation problems, and later because the government canceled the license. Mateo has two types of nice QSL cards.

I heard of a DXer who, all excited, calls up his friend and asks:

"Did you hear the station from North Korea?"

"I certainly did!" assures the friend.

The DXer checks all the bands on all the modes on all the receivers he has, and turns his 11-element log periodical in every which way, but he cannot find the station from North Korea. He calls his friend again:

"When did you hear the station from North Korea?"

"Oh, it could be a week ago!"

In Manacor, Guillem took me to the Majorica "pearl factory" which is nothing more than a huge showroom where busloads of tourists go to spend their money. Without any doubt, the guides bringing them there get a percentage of the sale. While the buyers never see the factory, they have to be sure that there is one because the pearls are man and machine made, and they never came even close to an oyster. I knew all that, but my wife did not, and she gave me strict instructions to bring home some pearls. As I was not willing to go to the South Pacific and dive for them, the only alternative was to get them in a "pearl factory." The only bright side for me was that when I left Barcelona returning home, at the airport I claimed and received the sale tax, called IVA, I was charged. I got much less than I thought I would, but I had enough to pay a taxi in New York. Otherwise I would have taken the bus.

Everything you buy in Spain is subject to the 16% IVA tax — sometimes it's included in the sale price, while other times it's added to it. Many

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Photo L. *Carlos C31UA owns the Hotel Festa Brava in Andorra la Vella.*

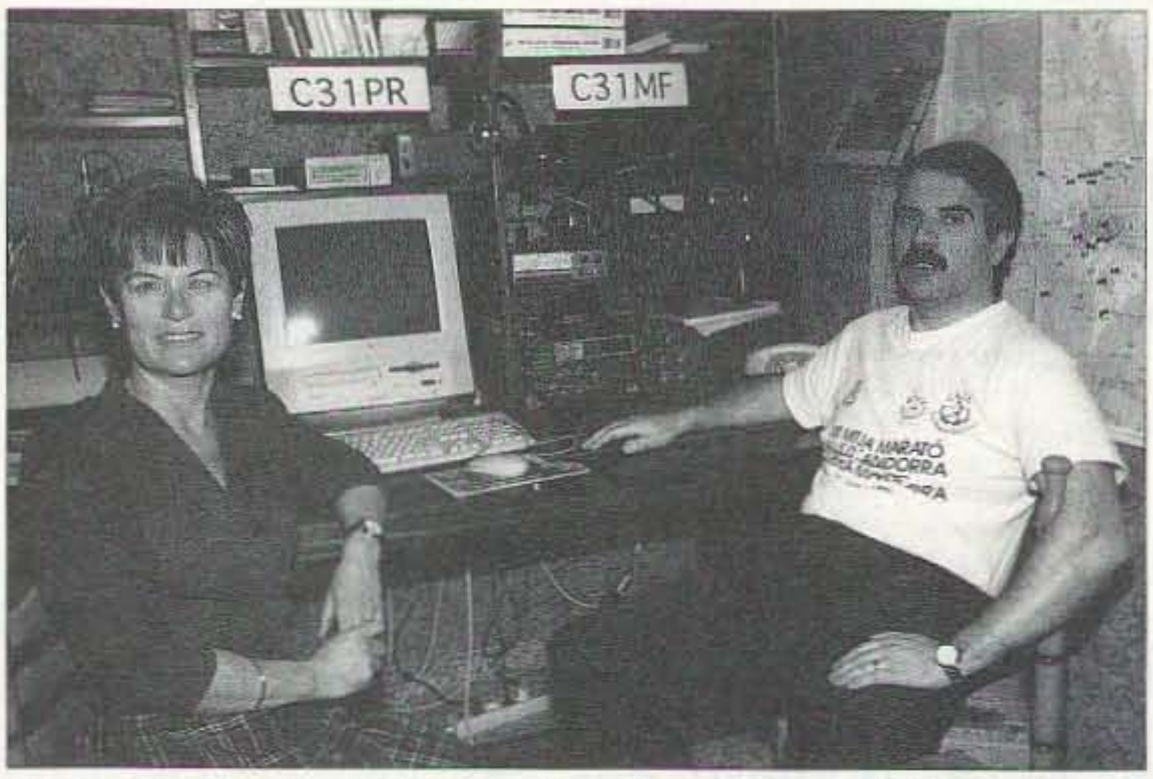

Photo M. *Paquita C31PR and husband Manel C31MF share a common QSL card.*

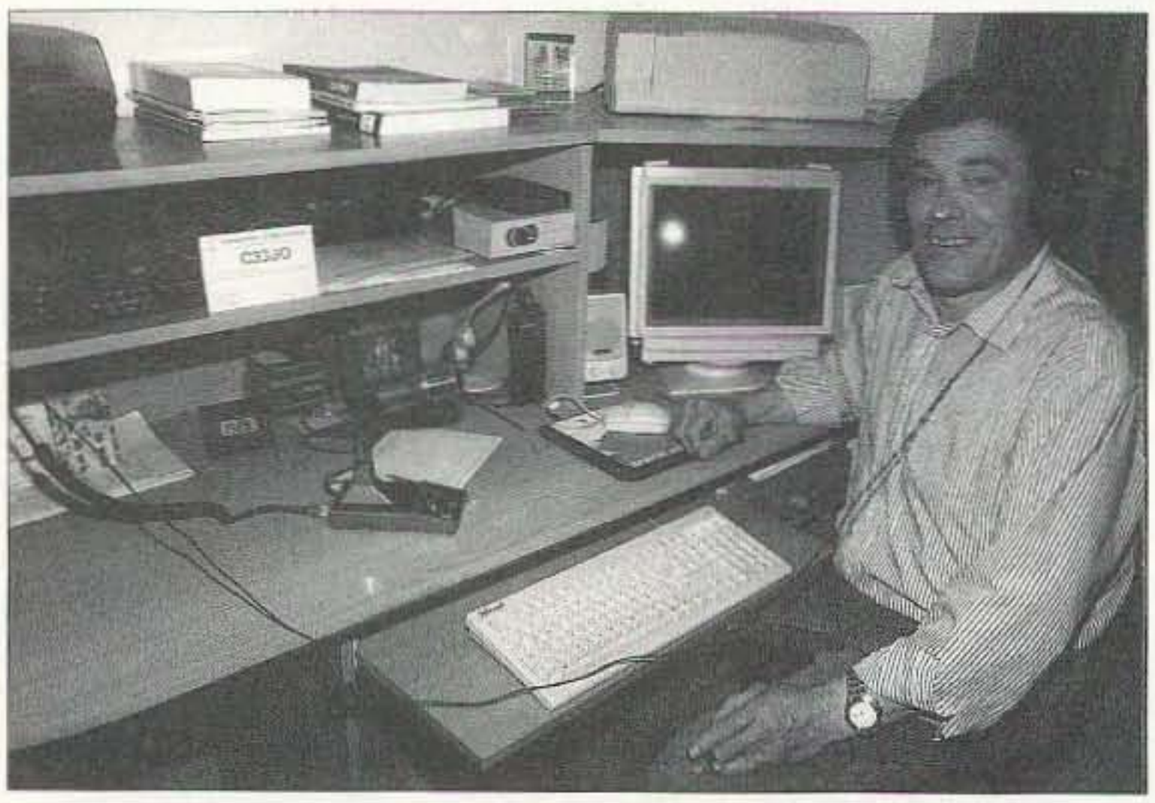

Photo N. *José C33JO is a manager for a building construction company.*

Vaya Con (Ra) Dios

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prices are quoted both in pesetas and in "Euros."

Visiting the amateurs of the island of Mallorca was fun and easy. There was one single instance when we were not successful. Guillem called up a ham in Manacor to arrange a visit. The ham knew that we would be in his town on a Saturday, when it would be easy for us to see him, but he insisted we come on Sunday at 12 noon. We took the long ride, and at the agreed-upon day and time we arrived at his place. Guillem rang the bell for about 10 minutes, but there was no answer. We waited around another 20 minutes, and then Guillem called him on his mobile phone. The ham answered by saying that he had just woken up, and would open the door in 10 minutes. We waited another half an hour, but still the door was not opened, so we left. On our way back to Inca, Guillem called the guy again. He said that he had seen us from his terrace, and if we wanted to come back, he would open the door. We declined the invitation.

Talking about smart hams: One of them wanted to measure the height of his tower, but could not figure out how to do it.

Another ham said: "Let's lay it on the ground and measure it!"

"That is no good," said the first. "I want its height, not its length!"

On my last day in Mallorca, Guillem EA6YG took me to the harbor in Palma. I again boarded the Buquebus ferryboat, and in about three and a half hours, I was back in my home port of Barcelona.

Speaking of ferryboats again: A tourist arrives at the pier when the boat is just leaving. A man tells him to jump aboard. The tourist hesitates, the man gives him a big push, and the tourist lands on the deck, hits himself, and passes out.

A couple of minutes later, he is revived, looks at the far away pier, and exclaims: "Gee, that was a pretty good jump, if I do say so myself!"

An editor once told me that to write a good story, you have to do three things: write a good beginning, write a good ending, and make sure that the two are fairly close together. As I recheck my Mallorca article, I realize that I have failed in all three. Well, there is always a next time …

Andorra

When I planned my voyage to Spain, I thought that, being already in the neighborhood, I could also visit Andorra. This tiny little country, with its seven districts, has a population of over 60,000. The official language is Catalan. It has a parliament whose its only female member is a radio amateur: Rosa C31MN. Not bad for a country that gave its women the right to vote only in 1970.

The country itself, a member of the United Nations and the Council of Europe, is called the Principality or the Princedom of Andorra, but it does not have a "prince." It has two sovereigns: the bishop of Seu d'Urgell and the president of France, none of them being "princes" as we would think of it.

While preparing the trip, I wrote to a couple of amateurs asking their cooperation in meeting local hams. I received an enthusiastic answer from Michel C31MO, member of the executive board of U.B.A., the Radio Amateur Union of Andorra, saying that he would arrange the visits.

From Barcelona I took an early morning bus, paid 2,435 pesetas (about $16.50), and, after going through the over-3-mile-long Cadi Tunnel, arrived in three hours at Andorra la Vella, the capital city.

A man is asking a bus driver: "Can a bus like this go on a winding mountain road at 100 miles an hour?"

"Of course it can, Sir," says the driver. "Once."

Another one:

A man is desperately running after a bus going downhill. A bystander yells at him: "Why are you running? Another bus is coming soon!"

"Yes, but I'm the driver for this one!" yells back the runner.

I was ready to call up Michel C31MO (**Photo K**) when he showed up and recognized me by my cap having my name and callsign. First we went to his house in Santa Coloma, built on a hillside with his 58-foot tower installed 32 feet higher than his building. Michel C31MO is an accountant, and his wife Rosa C31MN works in an attorney's office; both were licensed in 1979. At the time of my visit, Rosa, member of the parliament, was in Brussels at a meeting of the European Interparliamentary Union.

Their antennas are an 8-element yagi for 10-12-15-17-20-40 meters from Force 12; a 9-element vertically polarized yagi for 2 meters; and a separately installed vertical for 2 meters and 70 cm. They use (mostly him rather than her, because Rosa is not very active) an IC-738, a 3 kW PEP Tremendus II amplifier made in Spain by Ulvin, and an MFJ Versa Tuner V capable of loading that high power.

Michel C31MO has worked over 200 DX entities, works SSB and RTTY, has packet cluster, and for logging is using Swisslog.

Michel's favorite words are "no problem," meaning "it can be done." It happened that the same words were my least favorite ones, because I heard too many times "QSL no problem" and never received any cards from the frequent users.

Talk about problems …

A clerk entered his big boss's office, stuck out his tongue at him, threw on the floor all the papers from his desk, ripped out the telephone cord, and pulled the waste basket over the boss's head.

Then his fellow workers stopped him, saying: "José, we were just kidding — you did not win the national lottery!"

In Andorra, there are three classes of personal licenses and one club license. Class 1 has the C31 prefix, class 2 has the C32 prefix, and class 3 for Novices has the C33 prefix and entitles the holder to work on VHF and UHF bands. Club stations, and there is only one that I know of, are using C37 as the prefix. There is no power limit for the class 1 licenses, which makes sense in the Andorra's particular situation, where most of the stations are surrounded by 1,000– 2,000-foot-high mountains. While 2–3 kW are helping push the signal over the mountains, they don't do any good for the incoming ones.

We went to Andorra la Vella to see the radio club of the Radio Amateur Union of Andorra, which has a couple of rooms: one for the radio station using the C37RC and C37URA calls and for the QSL bureau, and another one for meetings and courses. The club awards the 5 W 5 diploma for working five Andorran stations, each on a different band. There are 128 licensed hams in Andorra, and they run three open repeaters on 145.700(-), 145.625(-), and 438.750(-) MHz. The club has several transceivers and two computers, and is nicely decorated with several awards. The Union has a Web page at [http://www.sta.ad/ura], and its E-mail address is [ura@andorra.ad].

Next we saw the station of Joan

Photo O. *Jordi C31JI manages an electronics store and works only on SSB.*

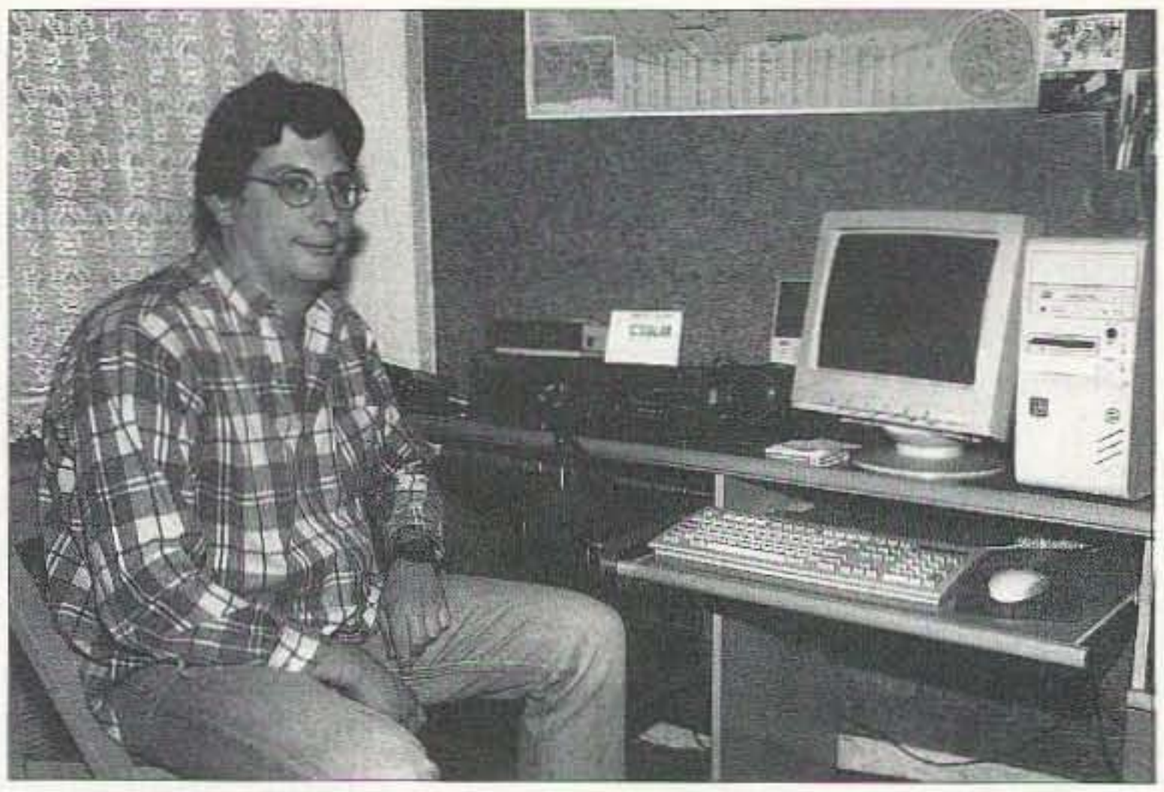

Photo Q. *Luis C33LM, Andorra la Vella.*

C31US, the president of the Radio Amateur Union of Andorra. Joan was licensed in 1984. He and his wife Josefina C32MV, own a toy store called "Tic Toc" right in the business center of Andorra la Vella. Joan C31US has worked over 150 countries only in SSB. He has an FT-1000, is running 200 W, and uses a computer. His amplifier is ... what else but a Spanish-made Ulvin, which produces several kWs. His antennas are: an 8-element yagi for 10-12-15-17-20-40 meters from Force 12, a dipole for the 40 and 80 meter bands, and a vertical for 2 meters and 70 cm.

I heard a story:

Two heavyset men are walking up the street.

A young rascal is yelling at them: "You are fat, you are fat!"

One of the fat men gives the rascal 100 pesetas, and the other one, surprised, asks the giver: "He called us fat, why did you give him 100 pesetas?"

"Because now he thinks he can get some money if he calls somebody fat," the first replies, "and one of these days somebody will beat the hell out of him!"

Michel took me to Carlos C31UA (**Photo L**), to his second house, way up on the mountain, at 6,400 feet above the sea level. There he has a TS-430S and a TS-690S, followed by an Ulvin 3 kW amplifier for the lower bands, and a TS-790E for 2 meters and 70 cm. Carlos has several antennas on three towers: The first tower, a 48-footer, has two 5-element monobanders, one for 10, the other for 20 meters. His second tower, a 32-footer, has a 5-element monobander for 15 meters, and a 2-element monoband yagi for 40 meters. His third tower, again a 48-footer, has a 6-element quad for 2 meters to connect him with his main house down in the valley. A delta loop for 80 meters and a 15-element yagi for 2 meters complete his antenna farm.

Carlos C31UA is a senator in the municipality of Andorra la Vella; I think that is equivalent to our city councilman. He owns and runs Hotel Festa Brava, where he has a 4-element yagi for 10-15-20 meters from KLM, a 5-element yagi for 6 meters, and an inverted V for 40 meters. Down there he uses a TS-690S. Carlos does computer logging and he made over 300 DX entities.

In Anyos, we saw Manel C31MF (**Photo M**), a bank employee licensed

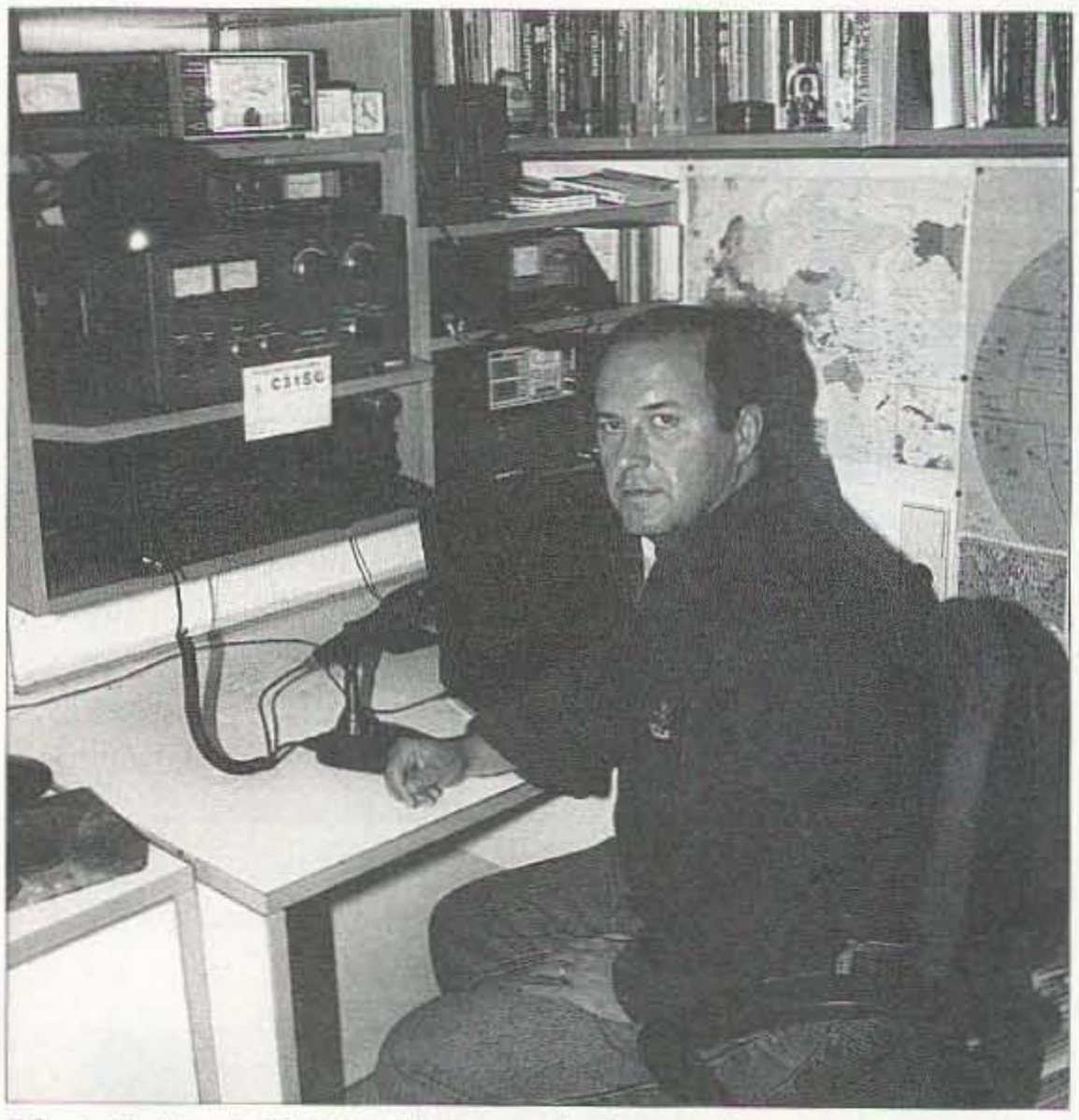

Photo P. *Santi C31SG, like many Andorran hams, uses Swisslog.*

Photo R. *Carles C31SD is a retired banker.*

in 1982. With a TS-930S and a TL-922 amplifier, he is running 500 W and works only on SSB. He has a vertical Hustler antenna for 10-15-20-40-80 meters and a log periodic installed vertically. His wife, Paquita C31PR, was licensed in 1983. They do computer logging with a home-made program. They have a common QSL card for both of them.

In Les Escaldes, near the radio club, lives Jose C33JO (**Photo N**), a manager for a building construction company, licensed in 1996. His antenna is a Cushcraft R7000 for 10-15-20-40-80 meters, his rig is a TS-570D, and he works only on SSB. He uses a computer with Windows 98, and logs with Swisslog, a program which seems to be widely preferred by Andorran hams. He has QSLs, as all C3 amateurs I visited have.

Also in Les Escaldes we saw Jordi C31JI (**Photo O**), licensed in 1996, after he saw his friend C31MF operating his radio. Jordi is an administrator of an electronic store — I think we would call that a manager. He has a Cushcraft R7, and for a rig he uses an FT-840 with 100 W. Works only on SSB, has over 140 DX entities, and for logging he is using — guess what? — yes, the Swisslog.

A ham sold his friend an old transceiver, but he did not receive payment for a long time. After a while, the ham tells his friend: "I see you are not going to pay for the transceiver, so I'll make a gift of it to you."

"No way," says the other ham. "Sooner or later I'll pay you, but if you feel like making a present, please give me a power supply to go with it!"

Continuing the visits, Michel took me to Andorra la Vella to see Xavier C31PM, a computer and office equipment salesman. Xavier has a neat little station with a computer using Windows 95. He started as a CBer, but in 1996 he got his ham license. He has a vertical 5-band Hustler antenna, works DX with an FT-890 using 100 W, but only on SSB. Xavier also has QSL cards.

Tony C31AL is the brother-in-law of Xavier C31PM. Licensed in 1996, Tony is a heavy machine operator. He has an IC-707 feeding 100 W into a Spanish-made 3-element yagi for 10-15-20 meters or a wire dipole for the 40 and 80 meter bands. Tony has packet and DX cluster, uses Swisslog for logging, operates only SSB, has over 70 DX entities, and has QSL cards.

Also in Andorra la Vella, we visited another Tony, this one is C31OF. Licensed in 1981, he installs and maintains heating systems. Tony has a rotatable dipole for 10-15-20-40 meters, and a TS-940S transceiver followed by a TL-922 amplifier capable of supplying 2 kW PEP. He works SSB, SSTV, and CW on keyboard, is a DXer with over 300 entities, and has the 5BDXCC and scores of other awards. He worked EAØJC, probably one of the second operators, José or Isaias; few ever had the chance to work with the first operator, HM Juan Carlos, the King of Spain. Tony's wife Ermitas C32VA was licensed in 1987. Tony has QSL cards; I had a QSO with him and we exchanged cards. Ermitas doesn't have any.

Also in the capital city, we went to see Santi C31SG (**Photo P**). He was licensed in 1987 and is working in banking. He has an FT-1000 — what else would a banker use? For an amplifier, Santi uses a TL-922, feeding 2 kW PEP into a 2-element yagi for 10-15-20 meters. He has over 180 DX entities worked, only on SSB. Santi is using the Swisslog, which it seems comes with the Andorran citizenship. I had QSOs with Santi and received his card. His brother Joaquin is EA3BQR.

Luis C33LM (**Photo Q**), in Andorra la Vella, is an auto mechanic. He got his Novice license in 1996. With a TS-570D he is feeding 100 W into a Cushcraft R7000 vertical antenna. He has DX cluster, has worked over 60 DX entities, has QSL cards, and is logging with ... Swisslog.

In Aixirivall, high up on a mountaintop at 3,200 feet above the sea level, is, the house of Carles, or Carlos in Castilian, C31SD (**Photo R**). His house may be way up but the surrounding mountains are ever higher. He retired from banking and was licensed in 1960. His antennas are a 6-element yagi for 10-15-20 meters, and separate wire dipoles for 40 and 80 meters. He has an FT-980, an FT-901DM, and an FL-2100B 500 W amplifier. With a second Sommerkamp SL-7000 amplifier, he can push 700 W. Carlos works SSB, SSTV, RTTY, and CW with the keyboard.

I worked Carlos, sent a card to his manager CT1AMK, but did not receive anything back. I did not leave until he filled out a QSL for me. I did not go up the mountain for sightseeing!

Even higher up the mountain than the house of Carlos lives Fred C31HK,

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I.M. Gottlieb W6HDM
1827 Madison Avenue
Redwood City CA 94061

Cold Fusion, Hot Speculation

OK, experimenters, get ready to do this on your kitchen table.

My considerable involvement as an electronics consultant to physicists and chemists investigating cold fusion naturally left me with my own interpretation of this elusive phenomenon. My opinion will be found a bit off the beaten path, but in any event it should provide food for thought.

The usefulness of an energy source for human needs decrees that it should be available, economic, convenient, and safe. These attributes are, of course, inter-related. Appraised from any viewpoint, the promise of abundant energy from a simple apparatus via "cold fusion" appeared almost too good to be true. This, alas, apparently turned out to be so! Nonetheless, a minority of creditable investigators feel more might have been involved than "smoke and mirrors" or bad science.

Yet, any researcher continuing to claim demonstration of this elusive phenomenon risks both reputation and paycheck. Professionals and the public are both fed up with repetitive reports of nonrepetitive performance. The whole bizarre scenario evokes questions and speculations. Are we to assume that all of the scientists and technologists purposely or inadvertently made fraudulent interpretations? Or, were they such inept experimentalists that they became victims of their own negligence? Attempts to provide a soul-satisfying answer seem only to deepen the dilemma. In any event, a basic setup for (allegedly) demonstrating cold fusion on your kitchen table is shown in **Fig. 1**.

An interesting speculation can be made without recourse to formidable mathematics or esoteric physics. (This, indeed, is the general prelude to more rigorous analysis.) Let's suppose that the reports of inordinately high energy generation were valid observations, but that the responsible reaction was *not* necessarily nuclear, but rather an enhanced *chemical* type hitherto unrecognized. A couple of examples in nature may hopefully lend credence to such an idea.

Consider that noble beast of burden, the horse. After imbibing a small portion of a bale of hay, he is able to transport his several-hundred-pound payload for a few hours over rough and even hilly terrain. A little "horse sense" disposes of the need for extensive thermodynamic calculations — there is no way oxidation or combustion of the meager quantity of dried grass can fuel the work output by familiar chemistry. Surely, there resides a mystery of energy conversion in this beast's digestive metabolism, or in its muscular system. How, indeed, does he get so *much* bang for the buck?

In a similar vein, you think of the several-hundred-kilometer flights of migratory birds, sometimes buffeted by sustained headwinds. The energy conversion for this athletic feat apparently derives from a handful of bugs, seeds, or berries, but how? Here again, an accounting based upon the data and rules of physics and chemistry falls far short of satisfaction. A model airplane laden with sufficient fuel for such a flight would never take off. And, this would remain true even if its motor operated with an idealized Carnot-cycle and had frictionless bearings, or if its propeller screwed through the air with 100% efficiency. It clearly behooves us to speculate about the possibility of greater energy extraction from matter than we have been accustomed to deal with, i.e., a conversion process somewhere *between* nuclear and "ordinary" chemical reactions.

Interestingly, the discipline of chemistry can be viewed as an arbitrary (but academically convenient) classification of *electronics*. This is because most chemical reactions result from displacements or exchanges of electrons in the outer orbits of atoms. Energy invested in these electrons thereby

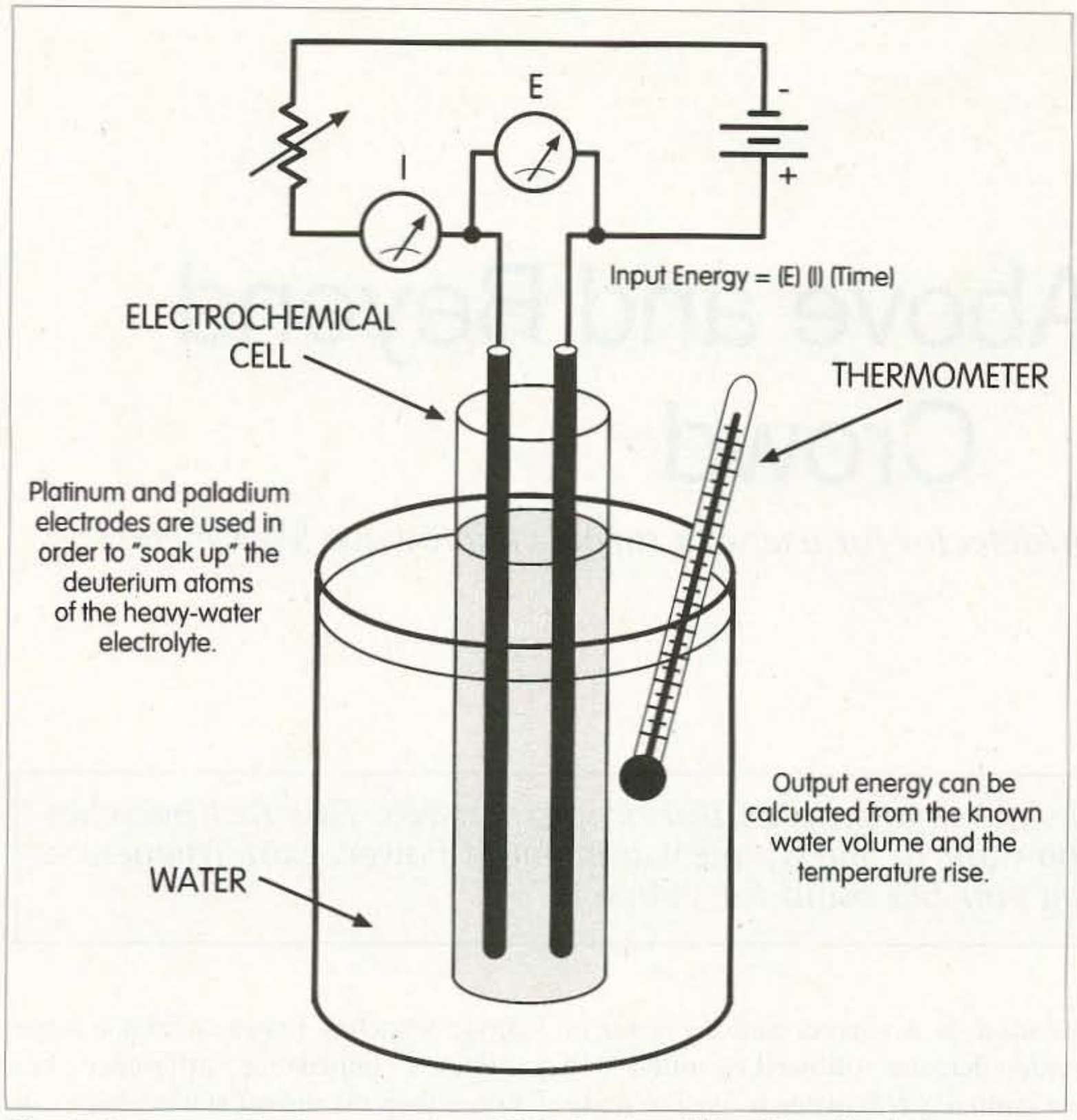

Fig. 1. *Basic setup for demonstrating cold fusion, hopefully. Allegedly, the heat energy represented by the temperature rise in the surrounding water can* exceed *the energy input to the electrochemical cell. The elusive phenomenon is supposed to occur only when the electrolyte of the cell is heavy water (deuterium oxide, where deuterium is an isotope of "ordinary" hydrogen). It is claimed, moreover, that nuclear fusion reveals itself by liberation of neutrons from the cell. (Trace amounts of substance can be added to the cell to improve its electrical conductivity.)*

becomes available to us, usually in the form of heat or electricity. Although these facts of life must be "old-hat" to most readers, certain ramifications derived therefrom should prove worthy of consideration in our search for higher energy yields.

The "universal technological device" can lend insight to our efforts; as shown in **Fig. 2,** it is a sandwich of three sections. Depending upon the conductivities and junction characteristics of these sections, a wide variety of practical devices can be realized. All stem from manipulation of the *energy levels of electrons.* Included are the capacitor, the electrochemical cell, the fuel cell, the thermoelectric cooler, the transistor, the solar cell, and, with mirrored inner-surfaces of the outer sections, even the laser.

The device most like the cold fusion apparatus is probably the electrochemical cell. This is interesting in the light of the vigorous development now underway to squeeze more energy-per-pound from batteries for electric vehicles. Progress has been made by the use of exotic materials, but here, too, the solution could conceivably assume the form of an *enhanced* chemical action thus far guarded in secrecy by Mother Nature.

Allusions to "enhanced chemistry" need not suggest far-out science fiction; we are *already* acquainted with phenomena akin to ordinary chemical reactions, but with inordinately unique yields. A good example is that of photosynthesis. In this everyday process, plants convert carbon dioxide and light energy into the carbohydrates which

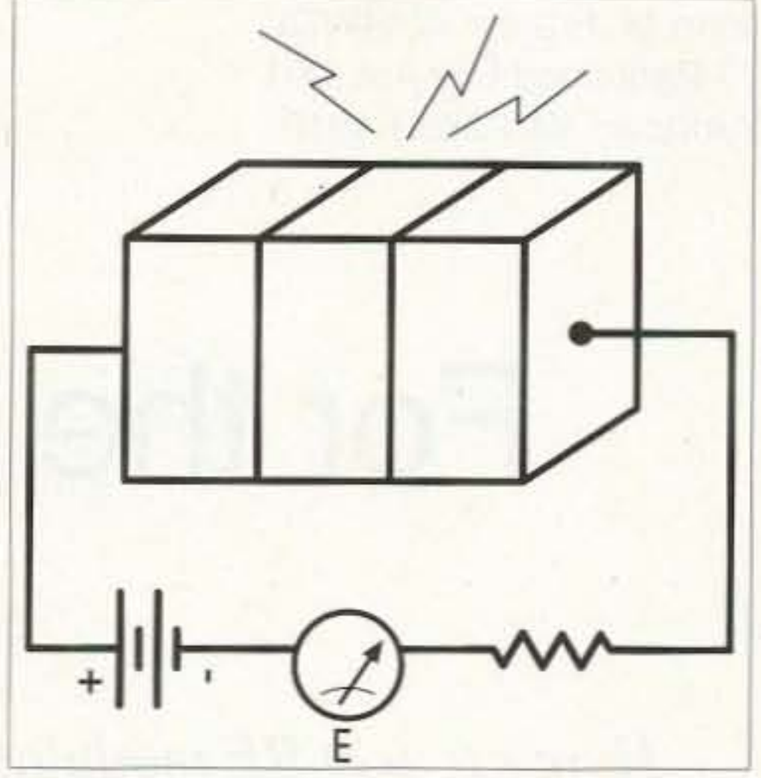

Fig. 2. *The universal technological device. The* electronic *behavior of this system is governed by appropriate selection of conductivity and surface characteristics of the three sections. You can thereby produce a capacitor, an electrochemical cell, a fuel cell, an electroplater, a transistor, a solar cell, a thermoelectric cooler, and interestingly, a* cold fusion *apparatus. The operating principle of the latter device remains a tantalizing mystery.*

feed and fuel their metabolism. Texts freely concede we have not yet attained a firm grasp of the complex chain of reactions underlying this remarkable conversion.

Another process qualifying as "enhanced chemistry" is the environmentally destructive depletion of millions of ozone atoms by a single chlorine atom. Such a transformation is in a league by itself compared to more ordinary chemical reactions, where the exchange of atoms occurs on a tit-for-tat basis.

Finally, consider the principle of the laser. Here, too, a unique output comes about via appropriate manipulation of the *energy levels* of electrons surrounding the atomic nucleus — certainly suggestive in part to behavior in garden-variety chemistry.

The diversity of results from such differing changes in the energy levels of orbiting electrons should induce open-mindedness with regard to the tantalizingly erratic phenomenon of "cold fusion." (We can let the academics argue the appropriateness of the terminology — nuclear fusion may *not* be involved.)

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For the Above and Beyond Crowd

Here's a neat RF modulator/detector for use with surplus microwave SWR meters.

Microwave test equipment has never been plentiful or inexpensive. This fact becomes readily apparent as soon as you want to make a measurement of power, gain, frequency, and so forth. Here's something you can build for yourself.

The earliest microwave experimenters found value in modulating their sources with a 1 kHz tone and using a simple crystal detector followed by a tuned audio amplifier and voltmeter as a measurement tool. The technique was quickly adapted for use with slotted lines for making impedance and SWR measurements.

Even today, the technique is used for amateur radio VHF/UHF/Microwave antenna gain measurement contests. A tone-modulated oscillator or signal generator with a broad beamwidth antenna is used as a source, and a crystal or video detector followed by an HP 415 or similar SWR meter is used to make power measurements relative to an antenna with known gain.

This idea works well if your source can be easily amplitude-modulated (AM). However, most microwave brick oscillators, klystrons, and Gunn diodes do not lend themselves to direct AM modulation. Most can easily be frequency modulated (FM), but AM must be done with an external modulator such as a PIN-diode. The only PIN-diode switches I own exhibit a large reflected impedance difference between their on and off states which can upset the stability of some sources.

I wanted to be able to test with a variety of microwave sources without having to build a unique dedicated modulator for each source, so I decided to modulate the receiver instead of the transmitter. This idea is not that much different than what is done with a Dicke radiometer or even the earliest automotive radar detectors. The idea is to chop the input line to the detector. With no RF present, there is no output. When RF is present, the output is an AC signal at the chopping frequency, proportional to the amplitude of the incoming RF. The only difference between the two approaches is that with this system, the meter will respond to all RF present, whereas with the modulated source, the meter only responds to the modulated RF. While a simple RF bandpass filter should cure any interference problems if they occur, I have yet to need one.

Years past, at a hamfest, I had purchased several Hewlett-Packard (HP) PIN-diode SPDT switch modules as an investment that now seemed ideal for the task. All I would have to do would

Photo A. *Front view of modulator/detector.*

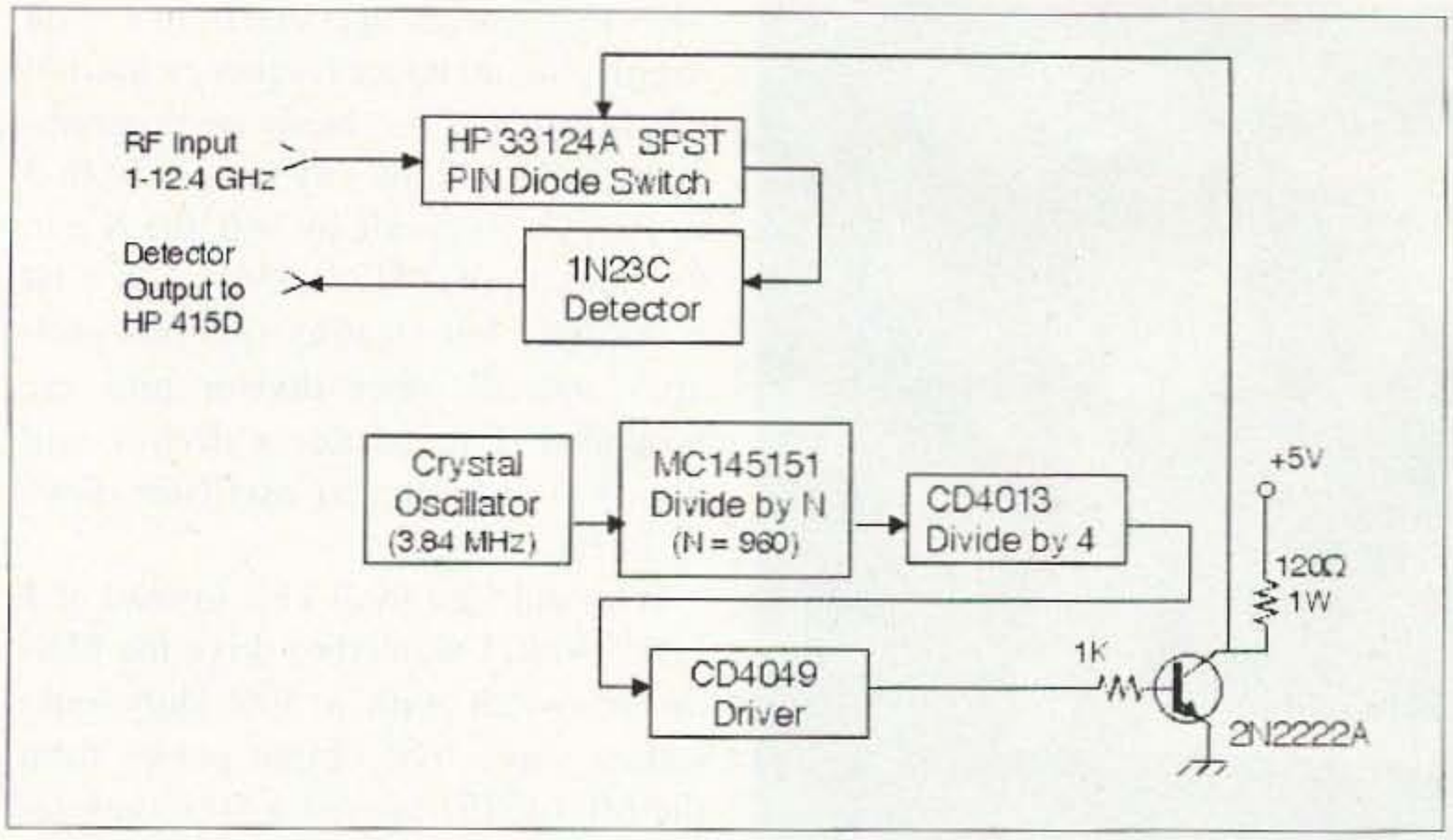

Fig. 1. Block diagram of HP 415D modulator/detector.

be to feed the received RF to one of the switches, turn the switch on and off at a 1 kHz rate, and follow the switch with a broadband RF detector. The result would be a universal adapter to allow me to use my HP 415D SWR meter with any source within the frequency range of the PIN-diode switch and detector. The PIN-diode switch I used, a Hewlett-Packard model 33124A, has a bandwidth of 0.1 to 12.4 GHz, and the detector I used, a Sage 1021H, has a bandwidth of 1 to 12.4 GHz. The net result is a system bandwidth of 1 to 12.4 GHz.

A block diagram of the system is shown in **Fig. 1**. A complete schematic diagram of the PIN-diode switch driver is presented as **Fig. 2.** I have several HP PIN-diode switches, but the 33124A was the only one I could use in a negative ground system.

I could have used a simple, free-running, NE555 1 kHz oscillator to drive the PIN-diode switch, but decided instead to use a crystal-controlled driver for several reasons. First, the cost of a crystal oscillator and divider chain is not that much more than a free-running oscillator. Second, a very stable source would be needed to take full advantage of the fact that the HP 415 bandwidth can be narrowed down from 100 to 15 Hertz. And, third, I like the idea of no

Continued on page 32

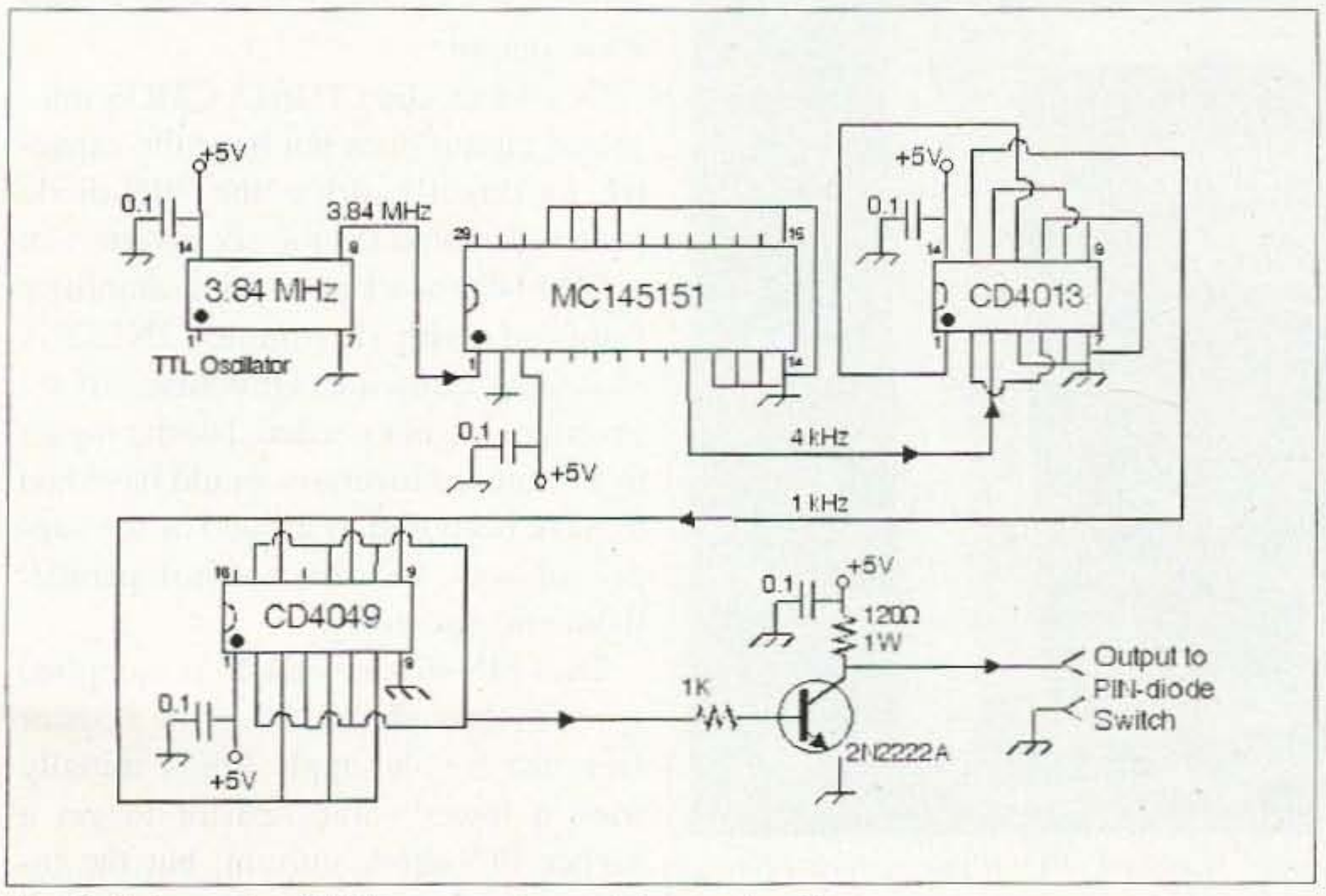

Fig. 2. Schematic of 1 kHz generator and driver circuit.

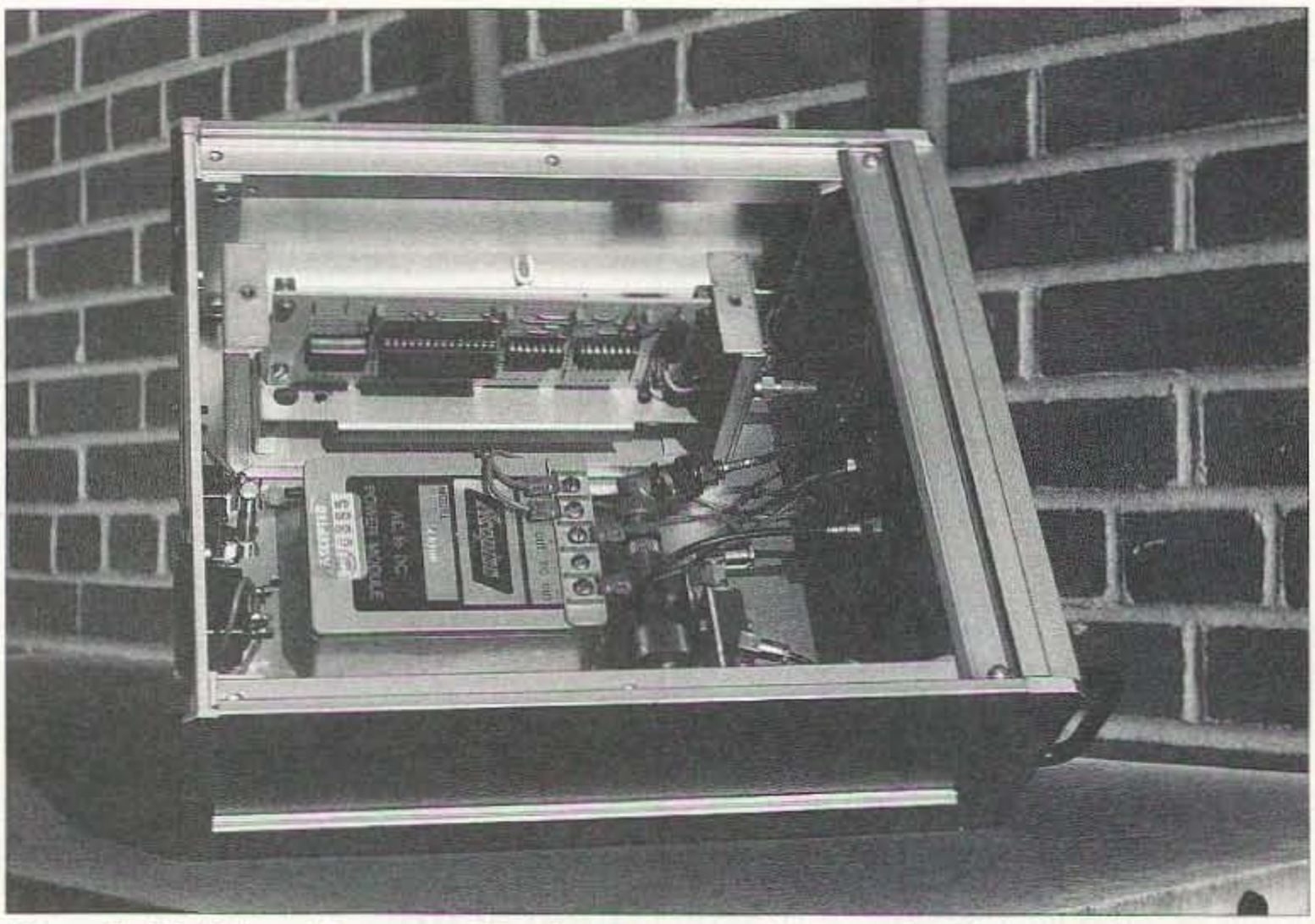

***Photo B.** Modulator/detector with cabinet cover and driver shield removed.*

For the Above and Beyond Crowd

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adjustments or calibration required — too many knobs spoil the measurement.

Having decided to start with a crystal oscillator, why didn't I use a common 1 MHz TTL oscillator? Well, a quick check of my junk box revealed several TTL unit oscillators. I hated to use one of my 1.000 MHz units when I had some other units with seemingly odd-ball frequencies. I selected a 3.84 MHz unit because it will probably otherwise never be used. Use whatever oscillator you have, as long as the output frequency is an even integer multiple of 1 kHz.

Following the oscillator, I used an MC145151 integrated circuit to divide the 3.84 MHz by 960 to get 4 kHz. The MC145151 was designed to be part of a phase locked loop and has many internal functions which are not needed for this application. However, the divide-by-N portion can be used independently of the other functions. The MC145151, when operated from a 5 volt supply, has an upper frequency limit of 15 MHz and is hardwire-programmable to divide by any integer from 3 to 16,383. To divide by 960, the N = 9, 8, 7 and 6 pins (512 + 256 + 128 + 64 = 960) are left floating (internal pull-ups) and all other divisor pins are grounded. Use whatever divisor will divide your particular oscillator down to 4 kHz.

Why did I go for 4 kHz instead of 1 kHz? Well, I wanted to drive the PIN-diode switch with a 50% duty ratio square wave. The output pulses from the MC145151 are not a 50% duty ratio square wave, but have a pulse duration equal to the period of one cycle of the input signal, 0.26 microseconds in this case. Therefore, I knew I would need to add at least one binary flip-flop following the MC145151 to achieve the 50% duty ratio. Since most integrated circuit flip-flops have at least two stages per package, the output of the MC145151 could be either 2 or 4 kHz. I chose 4 kHz. The divider I selected to follow the MC145151 is a CD4013, a common two-stage type D flip-flop. A type D flip-flop will toggle or divide by two if the set and reset pins are grounded and the not-Q (complementary) output is connected to the D input. The flip-flop input is the C or clock pin, and output is taken from the Q pin. As I mentioned, I used both stages to divide by four and achieve a 50% duty ratio 1 kHz square wave output.

Of course, the CD4013 CMOS integrated circuit does not have the capacity to directly drive the PIN-diode switch. I paralleled the six inverters in a CD4049 to act as a drive amplifier followed with a simple 2N2222A switching transistor. Of course, all six inverters are not needed, but the inputs to the unused inverters would have had to have been tied to ground or the supply anyway, so why not just parallel them and not worry.

The PIN-diode switch is supplied current through a 120 ohm resistor from the 5 volt supply line. I initially tried a lower value resistor to get a higher PIN-diode current, but the increase in signal output was marginal,

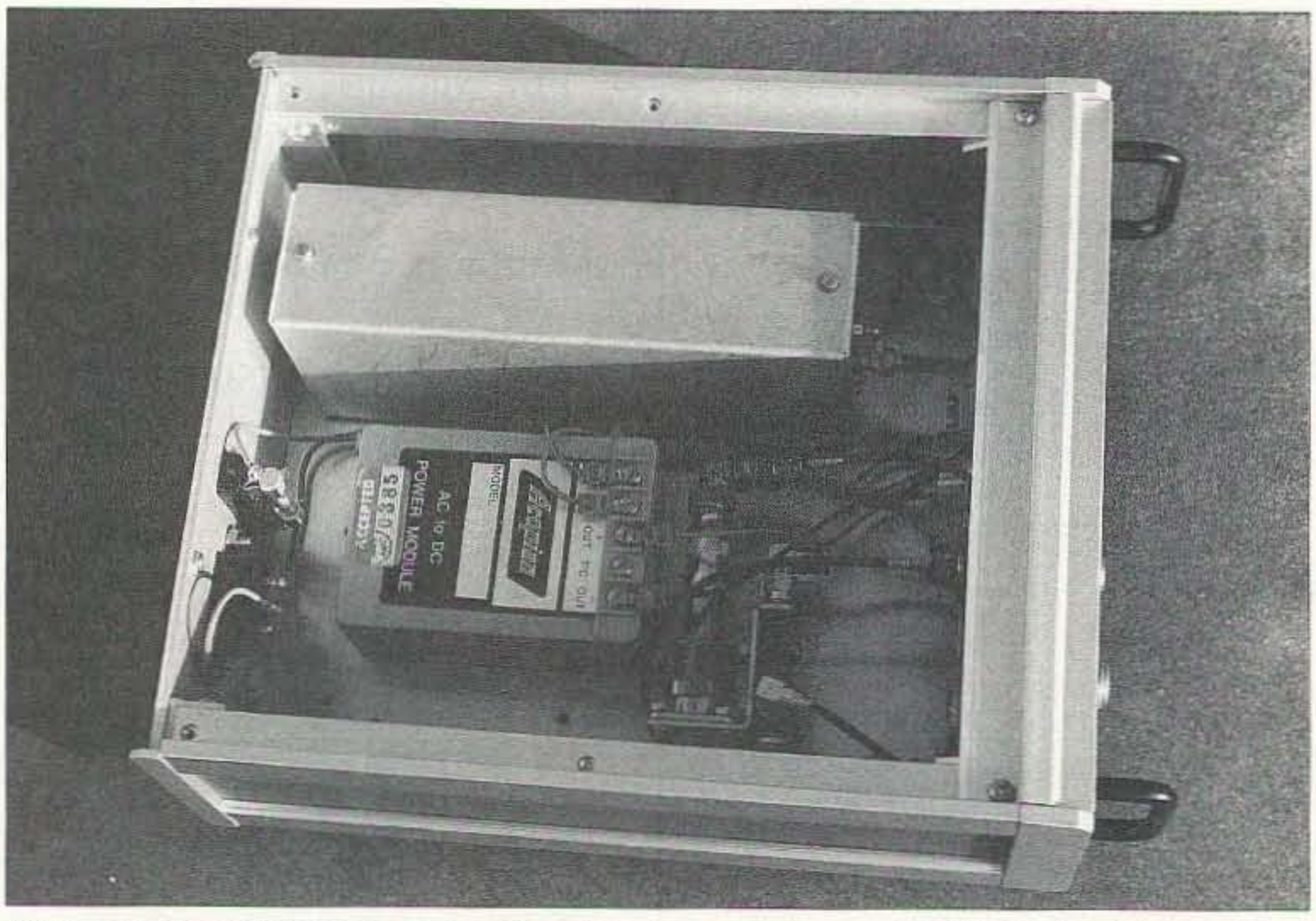

***Photo C.** Modulator/detector with cabinet cover removed. PIN-diode driver at top, power supply in the middle, and PIN-diode switch with detector in lower right.*

and the power consumption and radiated noise level were much higher. The difference in detected output between using a switch that switches from 0 to 10 dB versus one that switches from 0 to 100 dB is less than 10%.

The 2N2222A transistor, when switched off, has no influence on the PIN-diode current. When switched on, the 2N2222A shunts all the current through the 120 ohm resistor to ground, thereby reducing the PIN-diode current to zero. The PIN-diode switch is on when the transistor is on and vice versa. By using a shunt switching configuration, the current through the 120 ohm resistor is relatively constant. This way, no large switching currents are generated that can radiate and be picked up by the HP 415D SWR meter. After all, the HP 415D has a useful sensitivity approaching 0.1 microvolt, and the final system noise floor will determine the ultimate sensitivity of the complete instrument.

The voltage across the PIN-diode switch is 0.1 V when the transistor is on and 0.9 V when the transistor is off and all of the current is passing through the PIN-diode. The 120 ohm current limiting resistor is dissipating 0.2 W when the transistor is on and 0.14 W when the transistor is off. The average power dissipated by the resistor is 0.17 W. For reliability, I used a resistor with a 1 W rating. The current drain on the 5 V regulated power supply, not including the LED power indicator, is approximately 60 mA. The LED power indicator draws an additional 12 mA.

To further reduce radiated noise, the driver circuit board is mounted inside a shielded enclosure and the TTL oscillator module and each integrated circuit is bypassed with a 0.1 µF capacitor. The circuit board, mounted in its shielded enclosure, is shown in the photographs both with the shield removed and in place.

The shielded driver is mounted in a larger aluminum cabinet along with the regulated 5 volt power supply, PIN-diode switch, and crystal detector. The cabinet volume is less than the HP 415D and is easily stacked under or over the HP 415D as seen in the photographs. Coax cables are used internal to the cabinet between the front panel feedthrough connectors and the PIN-diode switch input and the detector output. A short SMA jumper cable connects the PIN-diode switch and the detector as seen in the photographs. An SMA to SMC cable is used to route the 1 kHz drive to the PIN-diode switch. I mounted the PIN-diode switch and the detector on a common bracket for ease of assembly and to minimize the length of the interconnect cable. The usual paint trim, handles, and label decals were applied to the front panel.

In operation, the HP 415D "INPUT SELECTOR" switch is set to "XTAL," either 200 ohm or 200k depending on which position gives the strongest reading with your detector. I usually use the 200k position. Do not use the "BOLO" or bolometer position, as it is designed to supply a current bias to the detector and can destroy the crystal diode. If you use a Hewlett-Packard detector with its own, matched, square-law optimized load resistor, use the 200k setting.

Because a diode detector, when used with low level signals, is a square-law device, the dB scales are reasonably accurate relative power indicators. For example, a change in meter reading, up or down, of 3 dB, represents a factor of two power change. The unit can be used for antenna gain measurements, relative to a known antenna, attenuation measurements, and small signal amplifier gain measurements, as well as slotted line impedance measurements as explained in the HP 415D manual. While the unit was designed and built with the HP 415D in mind, it should work equally well with other 1 kHz tuned SWR meters having a crystal detector input.

How well does it work? I continue to be pleased with the performance and use it regularly. Using a mid-value gain setting on the HP 415D, the noise floor is mid-scale on the 50 switch position. At 1 GHz, a signal of –42 dBm is 3 dB (full scale deflection) above the noise floor. At 2 GHz, a signal of –47 dBm is also 3 dB above the noise floor. The only regret I have is that I did not build it sooner. 73

73 Review

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A Good Look at WinAPRS

Mark Sproul's shareware program brings a new dimension to cutting-edge fun.

In 1992, Bob Bruninga WB4APR came up with a new approach using packet radio technology. This new mode, which he titled Automatic Position Reporting System (APRS), included the position of the transmitting station as an integral part of the message, which allowed for the tracking of objects using a computer program Bob had written. What makes this so useful is that the location is not merely reported, but instead is accurately displayed on a map. At a time when the first wave of interest in packet radio had faded, APRS appeared with just the right features to take over.

Coincidentally, the early '90s also marked the explosion of personal computers. This ground swell was due in a large part to the development of Graphical User Interfaces (also known as GUIs). The Apple computer had introduced their GUI, and because of the Apple's popularity, a short while later Microsoft offered the Windows operating system for IBM-compatible personal computers.

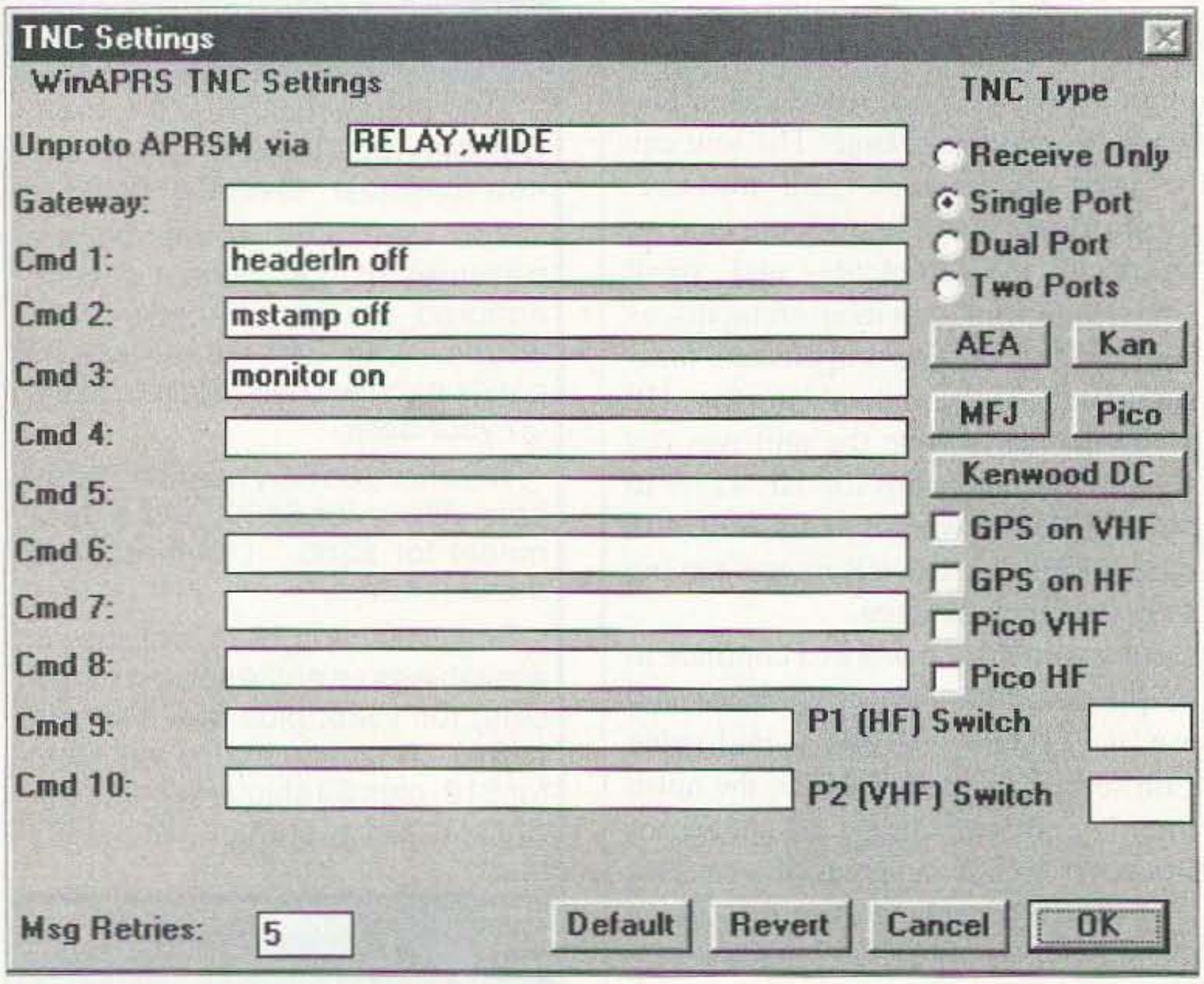

Fig. 1. Click on "Settings", then "TNC". Using this screen, you can choose the commands which make your computer and TNC communicate. My TNC is an MFJ-1278, so I merely click on the MFJ button to establish the commands.

Bob Bruninga's APRS program was written in DOS, but when brothers Mark and Keith Sproul heard Bob introduce APRS, they realized that it would be ideal to run it in a GUI environment. Keith wrote an APRS program for the Apple Macintosh and named it MacAPRS. Even though Mark had never written anything for Windows before, he succeeded in porting the program from the Macintosh operating system to Windows.

There are some differences between the MacAPRS and WinAPRS versions of the program, but they are relatively insignificant. But as we all know, it is important to have just a few differences if for no other reason than to keep the discussions between Mac fans and PC fans lively. If you think you might be interested in APRS, I recommend WinAPRS or MacAPRS as the way to enter this new and exciting aspect of ham radio. I'll focus on WinAPRS for this review, but most comments will be true about either version.

Equipment needs

The equipment list for the most common type of operation is relatively short

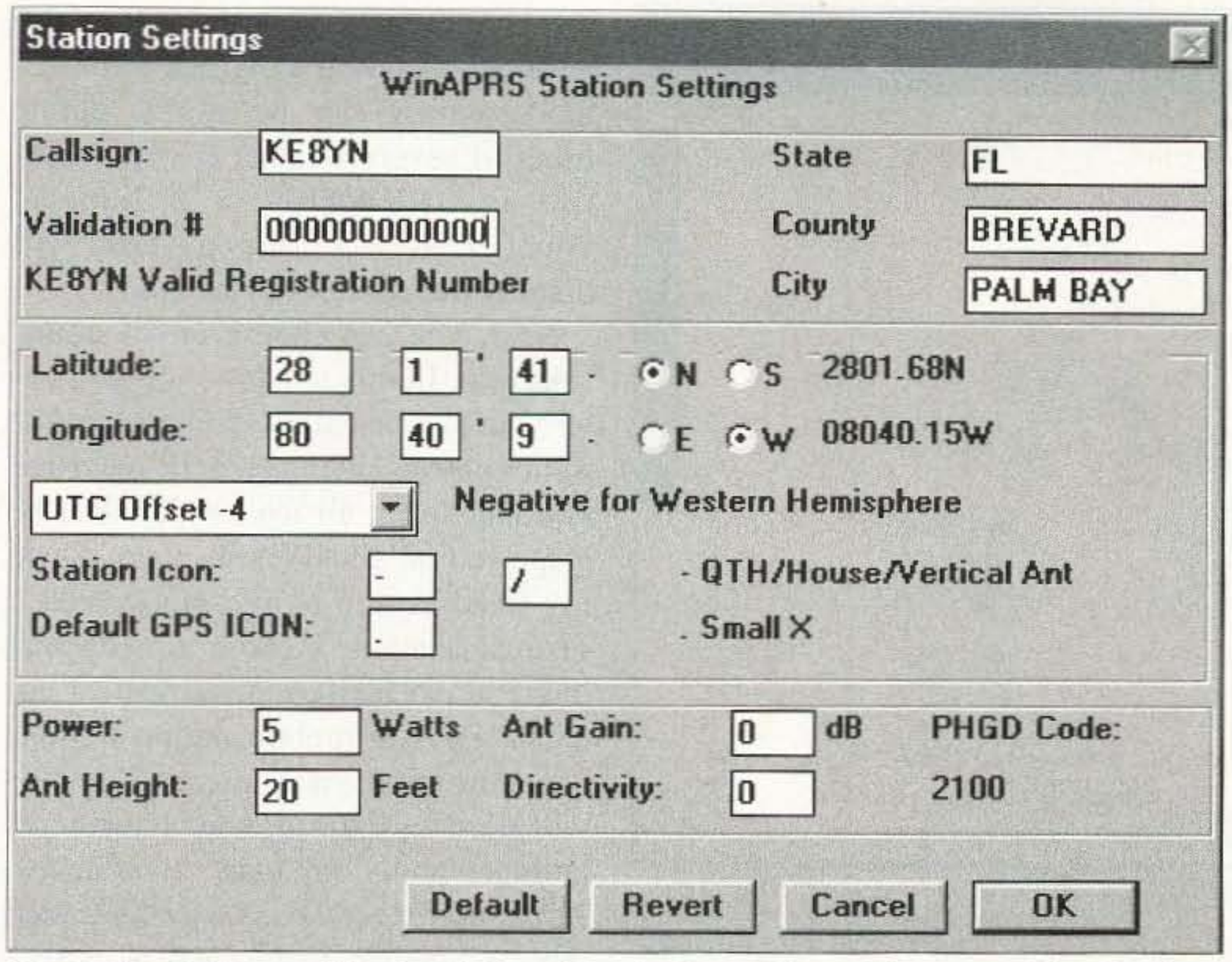

Fig. 2. By clicking on "Settings", then "Station", you'll see this screen. Here is where you enter the information about your station, including location. This is also the screen where you can select the icon which will be displayed on everyone else's computer screen.

— a 2 meter transceiver, power supply, antenna, terminal node controller (TNC), and connecting cables. If you have the components of your old packet station, you're in business. WinAPRS supports all standard packet radio TNCs, so the radio piece of the equipment puzzle should present no major problems. Obviously, you will also need a computer. WinAPRS runs under Windows, of course, and most users will be using either Windows 95 or Windows 98.

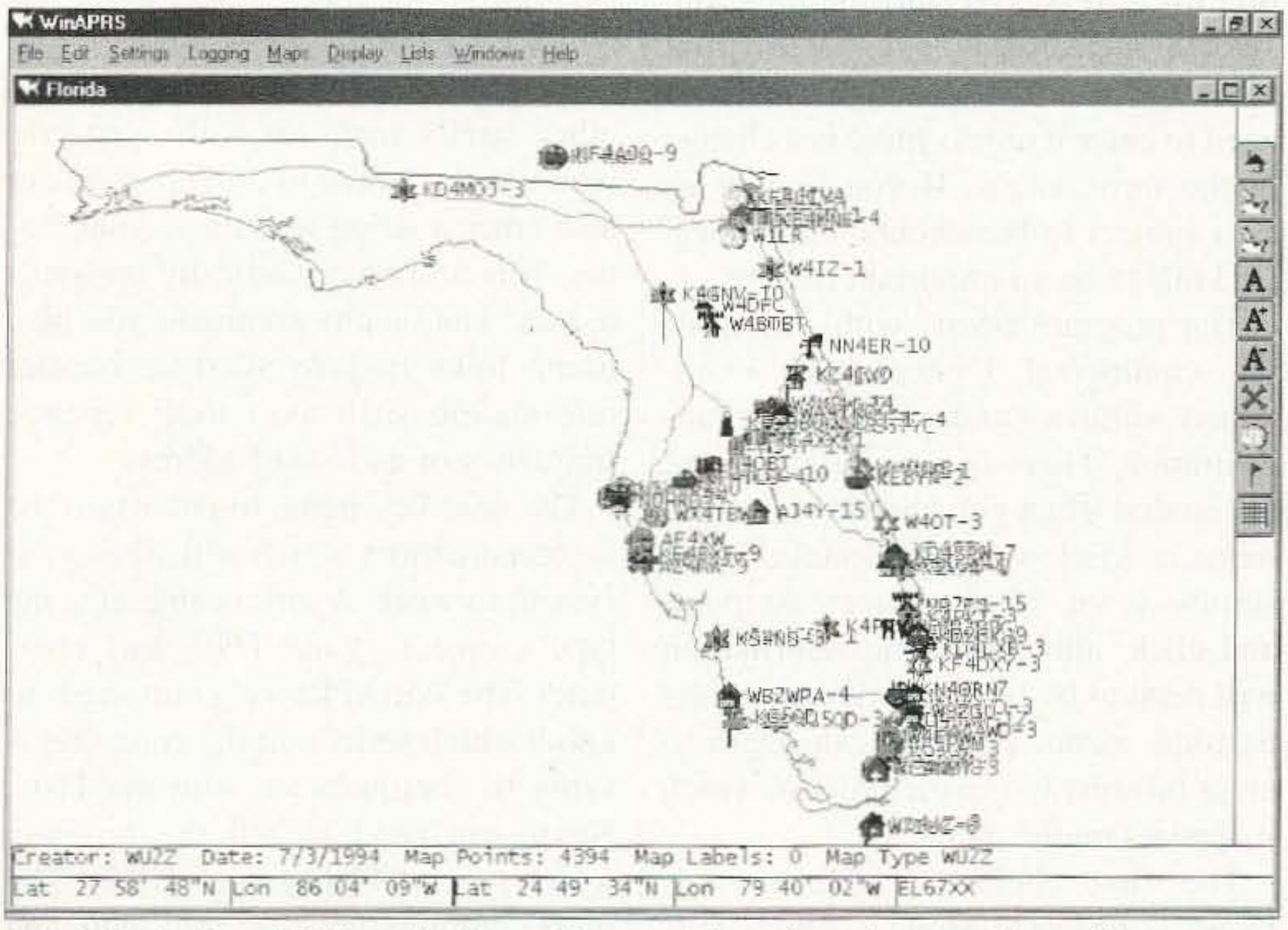

Fig. 3. Notice how APRS activity is so widespread throughout the state. Many of the open areas are areas such as the Everglades which are not populated. While the screen appears busy, WinAPRS will allow you to separate stations by zooming in on a particular area or choosing which types of stations you wish to display.

If, on the other hand, you are running Windows 3.1, you will need to download and run another program called Win32S before you run your WinAPRS program. If you attempt to run WinAPRS without Win32S, the program will immediately terminate when you try to run it. As an aside, if you are running Windows 3.1 because of memory constraints and you are not using that computer for any other purposes, you may find it beneficial to at least think about running the DOS version of APRS.

How to get WinAPRS

WinAPRS is as close as your connection to the World Wide Web. You can download the latest version of WinAPRS (Version 2.4.5) from one of several sites. The Tucson Amateur Packet Radio Web site [http://www.tapr.org] offers a link the various versions of the programs for most currently available operating systems, as well as a forum for APRS users, etc. From the home page, go to the APRS and GPS section, and from there choose WinAPRS. You will see a list of all the available files for various versions of WinAPRS. You can also go directly to one of the two download sites:

[ftp://aprs.rutgers.edu/pub/hamradio/APRS/WinAPRS/]

[ftp://ftp.tapr.org/aprssig/winstuff/WinAPRS/]

First time APRS users will need to download the entire program, so look for the latest version and date. As of this writing, version 2.4.5 is the latest. To download the entire program, look for waprs245.zip. Once you have a version of the program running, you will be able to download updates that will add newer features or fix problems. Updates will have a title such as w245updt.zip. In any case, just choose the program that interests you, and double click on it. In a few minutes (or more, depending upon your modem speed), you'll have the program on your hard disk. The ".zip" indicates that these programs are stored in a compressed format that allows for easier storage and faster transfers.

In order to decompress the program

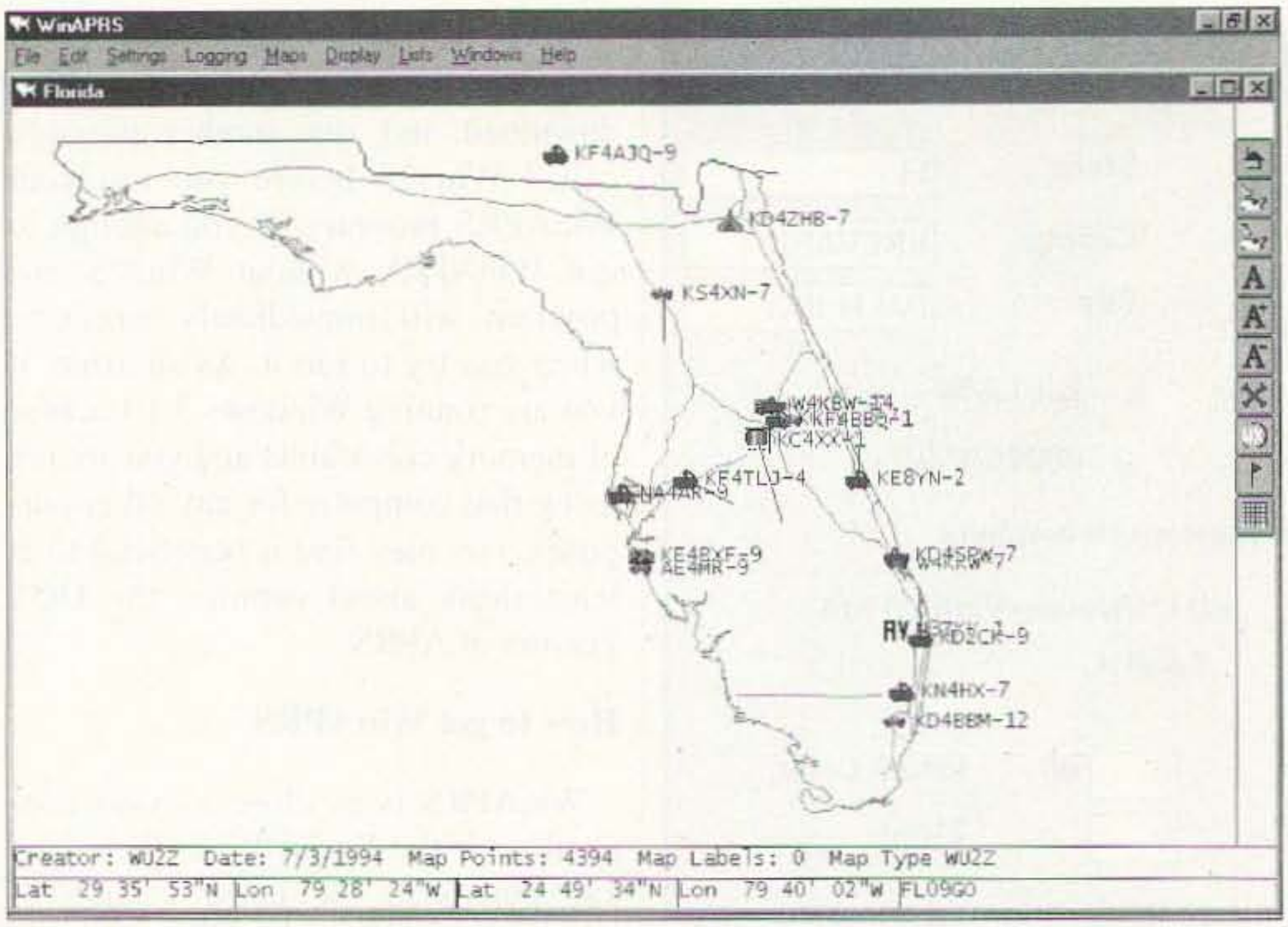

Fig. 4. *Here I've selected to display only tracked stations — that is, stations which have been in motion. It is just as easy to select only stations you have heard direct, only weather stations, or only stations that you have "flagged."*

file, you will need a copy of PKUNZIP, WinZip, or a similar program to convert the compressed file you downloaded to a workable program. If you use PKUNZIP, you will need to type Pkunzip -d waprs245.zip. The "-d" tells the program that there are directories (also known as folders) which it needs to create. If you have WinZip on your computer, it should start running automatically as soon as the download is complete, and should create the folders without any action on your part.

When the program decompresses the .zip file, you will have the main folder with certain subfolders. The recommended folders include DATA, DOCS, MAPS, LABELS, LOGS, OVERLAYS, and SOUNDS. You shouldn't have to do anything to create these. The decompression program creates all of these folders and the installs certain required programs without any effort on your part. Once expanded, the program is ready to run.

Starting WinAPRS

The first time you run WinAPRS, you'll have to enter certain information that I'll describe in a minute. Before I do that, though, I need to point out that this program is shareware. That means that you can run the program with all its features and benefits as soon as you install it. However, a lot of time and effort went into this program, so it seems only appropriate that you register your program with the author. This is the right thing to do. In addition, with an unregistered copy you will need to re-enter a lot of information every time you start the program. With a registered copy, the program saves the information and you will not need to enter it unless there is a change in the information. If you live in an area subject to brownouts, etc., you'll find this to be an important feature.

The program opens with a map of the continental United States contained within a standard Windows configuration. There is a menu bar at the top so that when you choose one of the items, a window of additional choices scrolls down. Most choices are point and click, although some information will need to be typed in. Start with the Settings menu, and you can begin to enter information in the order in which it appears on the menu.

The first choice on the Settings menu is "Master Mode", which tells the program how you want it to run. In most cases, you will select "Normal Ham Operations". This allows you to display all types of stations. It is also possible to choose a "Weather ONLY" mode which can be useful during times of severe weather if you are active in SKYWARN or a National Weather Service station. This will display only weather stations.

Next, you can choose the "Station" selection. In this window, you will enter your station call, station type, transmitter power, antenna height, etc. Here you can select an icon which will be displayed on all APRS displays. Since my fixed station is in a house with a vertical antenna, I chose an icon that looks like a house with a vertical antenna. For my mobile station I chose — never mind (okay, a car). You also will need to indicate your location in latitude and longitude coordinates. There are several ways to determine this. A detailed map, such as a sectional chart used for flying, will give you these coordinates.

You can also use an online service such as [http://www.qrz.com]. Look up your own callsign, and when you request more information, it will indicate your latitude, longitude, and grid square. Of course, you can also locate your position on the map displayed on the screen. The program will indicate the information for the current cursor position on the map. In any case, you will need to enter your location, or else your station will not appear on any other ham's map since the program won't know where to draw it. You can also enter a string of data as your status. This will be periodically transmitted and can be any comment you like. Some folks include alternate contact information such as a local repeater frequency or an E-mail address.

The next key items to enter into the system are those which will allow your system to work. A serial cable of some type connects your TNC and computer. The WinAPRS program needs to know which serial port the computer is using to communicate with the TNC. Next, you need to tell the program which type of TNC you are using. The most common types are indicated, and by selecting yours the system knows which commands the program must send to start the TNC's various functions. If

your TNC needs some additional codes entered, you can enter these at this time and they will become part of the start-up sequence. Most of the time this is not necessary, but it's good to file this information away for future use.

You can run APRS on both HF and VHF, but many people operate on 2 meters only. Part of the configuration of the TNC is to identify it as a single port or a dual-port TNC. A dual port can control both HF and VHF radios from the same computer. Select the correct configuration for your TNC and your preferred band.

Incidentally, there may be some confusion about frequencies, so now is as good a time as any to address the frequency issue. Most VHF APRS in the United States is now on 144.390 MHz simplex. Older references mention at least one other frequency that caused interference with satellite operations. Ignore the old frequency and stay with 144.390. In addition, as more APRS stations appear in most areas, remember to keep the power down. If you wish to operate HF APRS, the conventional frequency is 10.151.51 lower sideband (LSB). This may appear to be outside the ham bands, but since the carrier is 2125 kHz down, it actually is within the band.

Most of the other settings are fairly straightforward. If you need additional information, you can access or print out a very thorough set of documentation at: [http://aprs.rutgers.edu/WAPRSdoc.htm]. This may prove very useful as you get to know the basics about this program and want to work with more advanced features. One, the KISS mode, hands a lot of the tasks traditionally managed by the TNC to the computer. Although the computer stays busy, there are many more capabilities available under this mode.

Once you have everything configured, you should see your TNC indicate that it is in contact with the computer. On my MFJ, this means that all but one LED stop glowing. Make sure that if you can adjust the sensitivity of the TNC, that it is properly set. On my system, it is just below the halfway point. The decode (DCD) LED should illuminate every time it detects and decodes a packet. As the start-up sequence completes, the computer sends a query looking for other APRS stations, and you should see the push-to-talk (PTT) light on your TNC or the transmit indicator on your radio. This is a pretty good sign that everything is working. Next, you'll begin to see nearby stations appear on your map as they respond to your query. As time goes on, you'll see stations from hundreds of miles away appear.

Much of this program operates in a very intuitive fashion. If you have used Windows before (and who hasn't?), you'll have few surprises. Check each of the menu choices at the top of the window. I usually switch from the continental United States map to my state map for greater clarity. As you get familiar with WinAPRS, you'll realize that you can display on multiple maps, and there are many types of maps available. You can use some atlas programs, and it is even possible to display stations on satellite images rather than line drawn maps. Many of these maps are available on line, although the most detailed are commercially produced on CD-ROM. It is very easy with a commercial atlas to identify a station by street!

Besides the map window, you can display various lists. The station list shows all stations that you've received. By clicking on the column heading, you can sort by station call, by date, etc., so that you can locate a particular station. From there, you can have the program identify the station's location on the map. The program draws a shrinking halo around the station so that you can easily locate it. You can also send a message to the station.

You can display a list of messages and display all, or just bulletins, or even limit it to those messages either addressed to you or sent by you. An interesting feature of this program is the ability to set it up to automatically reply to a message. In this way, the sender knows your station received it and you can scroll through your messages next time you sit down at the computer. My system runs all the time (except when my local electrical company fails), so I frequently have message traffic waiting for me. To

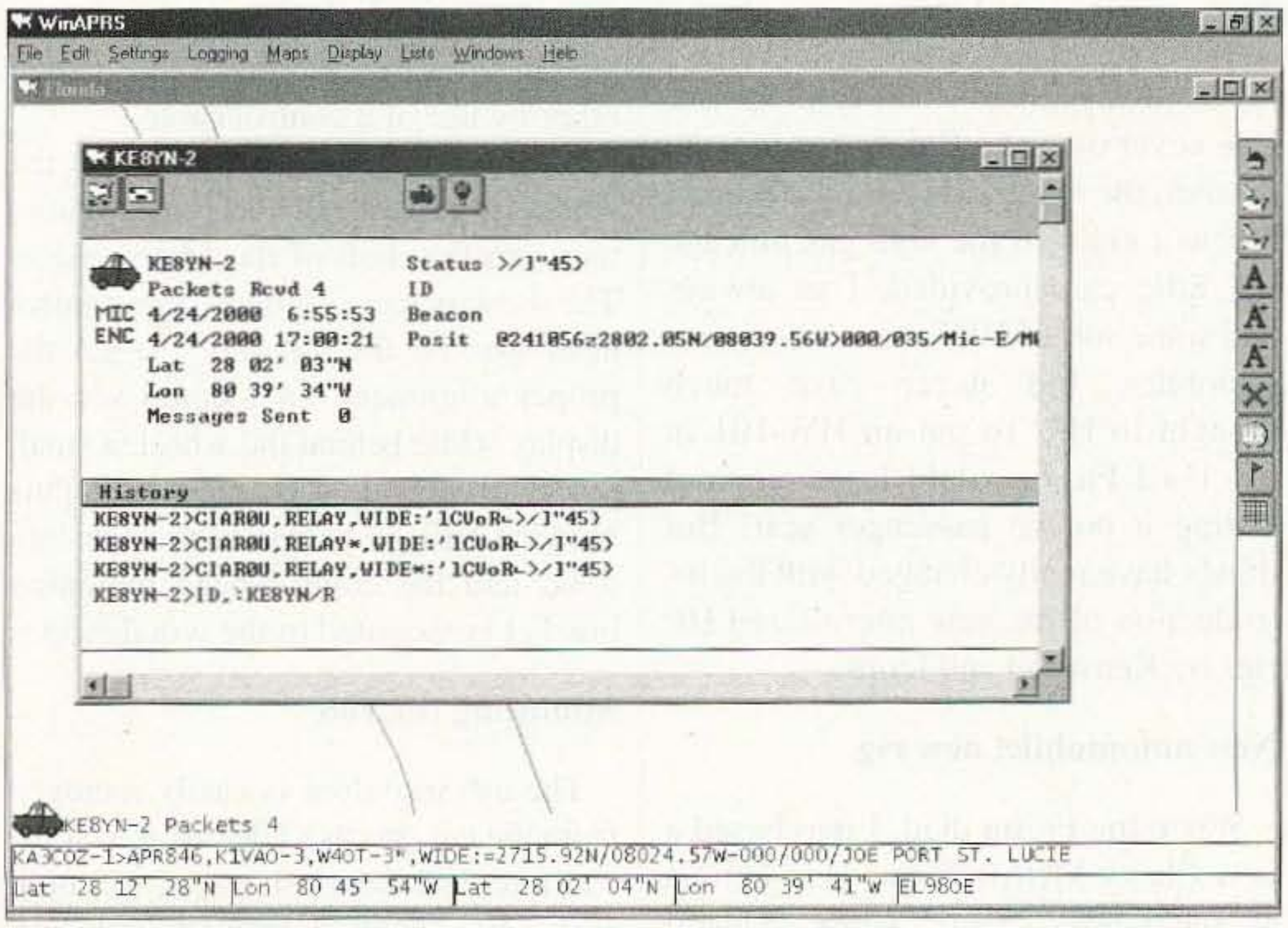

Fig. 5. *If I select a particular station from the station list, the program will give me details about that station. If I click on the map button, it will highlight that station on the map. The envelope takes me directly to the message window so that I can send a message to the station. The automobile button displays the track information while the balloon provides altitude information as well.*

Continued on page 41

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A QRO Rig in a QRP Car

IC-706, meet Chevy Metro.

My first exposure to HF mobile operation came right after I got my ticket in 1975. One of the locals had a Heathkit HW-101 mounted in the family Buick. Now, you have to remember, in those days, the American-made family auto was huge. Even with the HW-101, there was plenty of room for three adults in the front seat.

The rig was mounted on the floor, and the DC-to-DC converter was mounted under the hood. You had to keep the engine running to supply enough power to operate the rig!

The antenna system was a mismatched home-brew whip using the classic bumper antenna mount. Remember real steel bumpers? Those chrome and steel mammoths that you could easily mount a full wave 40-meter vertical to? It was an impressive sight for a new Novice.

***Photo A.** This is the first version of the mobile antenna installation. Notice how short the loading coil is compared to the car's body.*

That was then, this is now

I've always liked small cars. In fact, I've never owned a Buick. For me, the smaller, the better. Must be the ham in me, as I enjoyed the high gas mileage the little cars provided. I've always had some sort of VHF rig in all my automobiles, but never gave much thought to HF. To put an HW-101 in my Ford Fiesta would have required setting it on the passenger seat! But things have really changed with the introduction of the new micro-sized HF rigs by Kenwood and Icom.

New automobile, new rig

When the Fiesta died, I purchased a new Chevy Metro! These were known as the Chevy "Geo" when General Motors was into the "Geo" nameplate. The allure of three cylinders and 50+ miles per gallon impressed me to no end. Along with the new car, I decided to purchase an Icom 706. Installing the Icom in such a small car would prove an exercise in engineering.

I quickly decided that the Icom would not fit under the dash on the Metro. One of the great features that the Icom 706 has is the ability to separate the control head from the rest of the rig. The two sections talk to each other by use of a control cable.

Usually, I keep my cars until the wheels go square. But I did not want to tear into the dash of the Metro either. The best place to mount the control head was on the ash tray. To get the proper alignment, so I could see the display while behind the wheel, a small piece of wood was installed. This wooded strip is bolted to the ash tray door, and the control head mounting bracket is mounted to the wood strip.

Mounting the 706

The ash tray door is easily removed from the car. In case I decide to sell the car, a replacement ash tray door could easily be obtained from a junkyard. The business end of the Icom is located under the passenger seat. A piece of 3/8" plywood cut to fit under the seat holds the rig by using the mobile

mounting hardware. The plywood is kept from sliding around by placing Velcro on the plywood. I used the "hook" half of the Velcro. This stuff sticks to the carpet and prevents the plywood from moving around. It's easy enough to pull the plywood up and out from under the seat if I need to access the rig.

Getting power to the Icom

At full power, the Icom requires over 20 amps at 12 volts. A direct connection to the battery is a must. The power cable is routed through the firewall of the Metro. I was lucky enough to get the cable through the firewall via a rubber grommet. I don't know what the grommet was used for, but it worked super for me. The power cable was then routed under the plastic trim and carpet to the rig under the seat.

The power cable that comes with the Icom is long enough to reach from the battery to the rig under the front seat. Icom has installed two inline fuse holders. But the Icom fuses are mounted close to the rig. The wires from the battery to the rig needed fuses, too. So I installed one more inline fuse holder right next to the battery.

Antenna system

A mobile antenna is always going to be a compromise antenna. This is especially true when dealing with 80 and 40 meters. The hardest part, I found, in assembling a mobile setup was trying to mount the antenna on one of today's cars. Gone are those steel bumpers. Today, they're made out of fiberglass and covered with plastic. So, forget about using one of the old bumper mounts.

The antenna I had chosen was a multiband unit from Texas Antennas. It looks like one of the classic bug catchers, but is a bit smaller. Nevertheless, it's a monster of an antenna when placed next to a car like I drive. Mounting this antenna would prove interesting.

Mobile antenna mounting

I looked at the problem of getting such a large antenna mounted to such a small car. This was not going to be easy. The usual method of mounting would not work; the antenna was way too heavy. Bumper mounting it was out of the question, too. Of course, getting the antenna placed on the car was one thing, but keeping it on the car at 65 mph was an entirely different problem!

I already had two Comet trunk/hatch mounts placed on each corner of the hatch. These were for the two-meter and 440 MHz antennas. The mounts would hold the HF antenna just fine, but not while mobile. Crawling under the car, I found two tapped holes in the underchassis. I have no idea what they are for, but they looked like a good place to attach a metal support. Lucky for me, I work in a steel mill. A quick trip to the weld shop produced a hunk of flat steel stock about four inches wide and several feet long. The stock is 3/8" thick.

A piece of cardboard was used to get all the angles and bends ironed out before torch touched metal. A few minutes with the torch, and the flat stock was formed into the desired shape. Two holes sized to fit the ones in the car's frame were drilled in the metal. On the other end of the flange, a large hole had to be drilled to allow the ball mount to fit. The ball mount is held to the metal flange with four stainless steel bolts. I fastened the coax to the mount and then applied a large glob of coax sealer. This bottom piece would be exposed to all kinds of weather, and had to be sealed. The entire shebang was then bolted into place with two metric bolts. With the antenna screwed into place, it was a sight to behold! Now, would it work?

Getting a mobile antenna resonant

In a nutshell, my super mobile antenna was not even close to being resonant anyplace near the ham bands. Good thing that Jim WA8GXM has one of the MFJ antenna analyzers. That tool really came in handy when working on the mobile antenna. Nothing I seemed to do would bring the antenna even close to being resonant. I even tried using an external antenna tuner between the antenna and the radio. All that did was arc the tuner. After much discussion with Jim, we came to the conclusion that the antenna was too low. Lucky for me, I had purchased the extension section. Adding that to the antenna helped quite a bit. Now we could at least get the antenna resonant, and, by using the tuner, could move from CW to phone without stopping the car and changing tap locations on the coil.

On the downside, with the added height, the antenna became too unstable. Even the thick metal bracket holding the antenna would flex. The solution was an old one. I added some guy strings to hold the antenna in place while tooling down the road. Most of the time, you would use nylon fishing line. This guy was way too heavy for that stuff. In my case I use 1/4-inch nylon clothesline. Two pieces were used. They were tied off to the Comet hatch mounts. The guys would permit highway speeds without tearing the antenna off of the mount. The downside was a reduction in gas mileage. It's an extra effort for those three cylinders to move that much antenna down the road. With the big antenna on and a six-meter whip and two-meter 5/8 wave on the other mounts, I stopped traffic! As a matter of fact, when I was stopped in traffic on Interstate 4 in Florida, some guy yelled out, "Hey

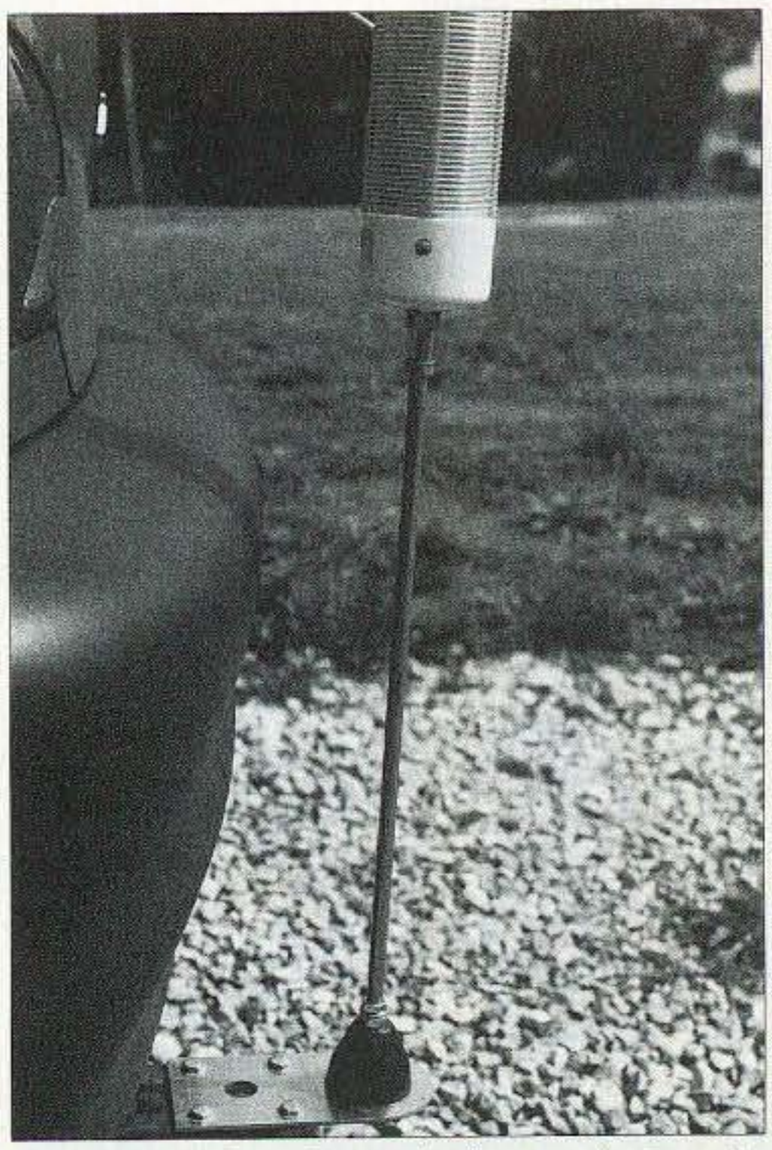

Photo B. *This short shaft was eventually replaced to increase the height of the loading coil. Notice the metal mounting bracket from under the car's body.*

buddy! Can you get ESPN with that setup?"

How does it work?

Well after all the work Jim and I put into finding the resonant points of the antenna, I can say that the entire system works. Not great, but it does work. With those guylines, it's almost impossible to open the hatch. Stopping and changing taps to change bands is not my idea of fun either.

In order to operate without changing bands all the time, I would start out using the lowest band that would be open. I'd start out on 40 meters, hit up MIDCARS and then drive until 20 meters opened. I'd change taps and continue this scheme so that by the end of the day I was working 10 meter phone.

Problems

For a car with only three cylinders, they sure make a lot of electrical noise. As soon as you start moving, the noise level goes up to S-7. Any signal less than that, and I can't hear.

The Metro has your basic 2-55 air conditioning. You know, two windows down going 55 miles an hour. Trying to talk with that much wind noise proved interesting.

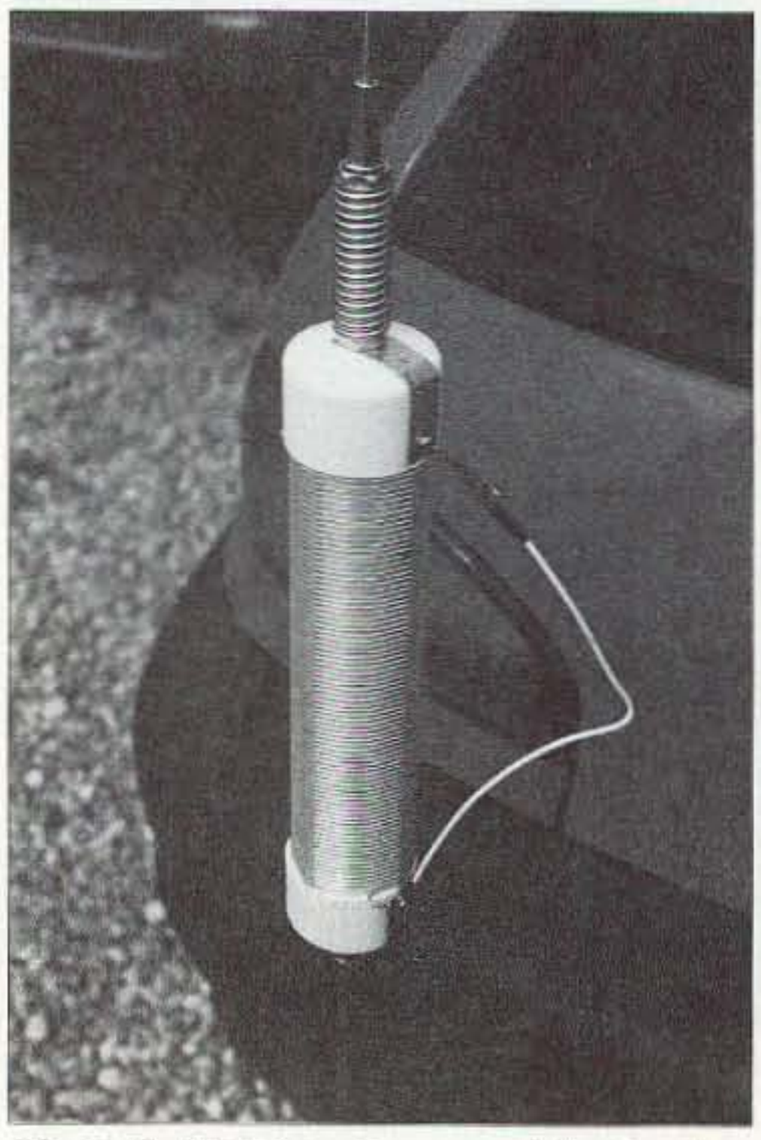

***Photo C.** Here's a close-up of the loading coil.*

With this monster antenna, it took an hour or two to get everything hooked up and bolted down. The system I used was not something I could throw on the car in a minute's notice. Something else was needed for quick HF setup.

For those quick mobile QSOs while heading to a far-off hamfest, I put on one of the helical-wound whips. I have one for just about all the bands I operate on. I usually use 40, 10, and 75 for SSB. For CW, there's 30 and 40 meters.

The whips are easy to set up and usually give good performance. They are not as good as that huge Texas antenna, but setup only takes a few minutes.

I did find one problem with the whips. For some reason, I could not get the antennas (any band) to resonate. The trouble was tracked down to the hatchback mounts. They really don't supply a good RF ground for the antenna.

Designed not to dig into the paint, the mount did not work as it should. I had a good DC ground provided by the shield in the coax from the radio to the antenna mount, but not a good RF ground. The solution was simple. I took a hunk of RG-8U, stripped off the shield (threw away the inside wire) and soldered a large ring to each end of the shield. One of the bolts holding the hatch in place was removed; the ring went over the bolt. The bolt was then screwed back into the car's frame. The other end of the shield went to the ground side of the Comet mount. When the shield was connected, there was a day and night difference in the way the whip antennas worked.

So, there you have it. A QRO rig in a QRP car. It took several tries, but overall, HF mobile is fun! It's slick being able to take HF ham radio with you as you travel down the interstates. Next stop: ESPN. 73

10m Junk Box Amp

continued from page 18

Canada, and as far west as Nebraska, using a simple halfwave dipole antenna. It has also served the purpose for which it was designed: To be able to communicate with KC4DQR, my son, Mike.

In this day of amateur radio equipment being mostly plug-in appliances, I found a great sense of joy and pride in being able to make those Field Day contacts on a rig that I, at least in part, designed and built. After all, isn't that what amateur radio is all about? 73

Vaya Con (Ra) Dios

continued from page 27

ex-C31LHK. He is at 4,400 feet above the sea level. In the early 1950s, Fred was PK1AF in Java and PK4AF in Sumatra. He used to have a yagi and is planning to reinstall it again, but for now he has a vertical antenna for 10-15-20 meters. Fred has an FT-1000D and a TS-830S. For a mobile rig, he is using an IC-725.

In the evening, I was the guest of the Radio Amateur Union of Andorra, and was taken to a fancy restaurant where they served "nouveau cuisine." The meals were indeed beautifully and ceremoniously served, but the portions were kind of small. We were four at the table; first the waiters brought two plates covered with some hemispheric metal lids. Then they brought another two with similarly covered plates. Then the four waiters lifted simultaneously the four covers and I think we were supposed to say: "Aaaaah!" But I was too hungry for any acting. The meals were good indeed, but as I said, on big plates they served tiny masterpieces. When you go to a fancy restaurant, it is better to have something to eat before leaving the house.

The hotel where I spent the night was very nice, and a complimentary breakfast was included in the price. It was the only meal during my 22-day trip that did not leave me hungry.

Between the visits, I had a chance to stroll around the streets of Andorra la Vella, window-shopping. I had heard that the prices in Andorra were lower than in Spain, but I found that Kodak film was more expensive. Cigarettes and gasoline are indeed cheaper in Andorra, and there is a lot of smuggling going on with these commodities.

No passports or luggage was checked at the border, neither coming, nor going.

I started to miss my home; every day I was thinking of my dog Bella, and every second day of my wife Eva. However, it was a trip worth taking thanks to Michel C31MO and the hams of Andorra, who let me in their shacks. 73

Cold Fusion, Hot Speculation

continued from page 29

Think of some of the surprising breakthroughs within quite recent times. You recall electrically conductive plastics, high temperature superconductivity, solid state batteries, ultra-capacitors, laser-induced chemistry, and so forth. It is only natural to anticipate more light to be cast on the phenomenon of "cold fusion." You suspect it is only a question whether such new revelations spring forth from megabuck research laboratories, or from the kitchen table of an experimentally inclined hobbyist! 73

A Good Look at WinAPRS

continued from page 37

expedite this, I have my computer set up so that WinAPRS is loaded when the computer is started. As a station in automatic operation, this is fairly typical, although remember that this only works with a registered copy.

It's kind of hard writing about a product that has so many features. WinAPRS is a program that you should be able to run with no problem, on the first day you use it, and you'll keep finding new features to keep you interested. APRS is really growing, and this program is growing with it. Everything from hot air balloons to the International Space Station is impacting APRS, and this program is the easiest way to get started in this fascinating area of ham radio.

As I mentioned earlier, the program is available free on the Internet, but a registered copy makes life significantly easier and is well worth the investment. Try out the shareware version for a couple of weeks. If you agree with me, you'll find that the sixty dollars to register WinAPRS is money well spent. The registration fee covers everything and even includes updates. I've never found a deal like this with any other software. Registration instructions are included in the program and documentation.

In any case, I think you'll enjoy APRS, and WinAPRS makes it easy to get started. I've had a ball with this, and run APRS at home and in my car. It's fascinating, cutting edge, and a heck of a lot of fun! 73

Letters

continued from page 8

the data I provided, it seems I could not. I had made two errors.

First, they said that I had an invalid name. My last name has two capital letters separated by an apostrophe. Second, they told me that my telephone number was also in error.

Aren't computers wonderful? My Commodore C-64 that I'm using now can spell my name properly, but the BILLIONS of dollars spent on computers in use by our governments and in some businesses today don't seem able to spell all our names correctly!

The press and TV really made a great big thing about the Y2K problem, concerning difficulties at the end of the 20th century. Yet, for many of us, there is no discussion or relief from a Y1.9K similar event. It was during Y1.9K that computers decided that punctuation and capitalization were not necessary to "keep track of us." So, gradually millions of proud family names have been changed to something our Billion Dollar Computers have been taught to understand. I wonder how many generations will pass before "computers" and the people who manage them will eliminate our names completely, and instead know us ONLY by our "number." 73

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

AUGUST 5

ALFARATA, PA The Juniata Valley ARC, and the Decatur Township Fire Co. will host a Hamfest 8 a.m. till ?, in Alfarata PA, 8 miles east of Lewistown, on U.S. 522 North, at the Decatur Township Fire Co. grounds. $2 donation. XYL and kids free. Tailgating, $5 donation. Food will be available. Talk-in on 146.91 MHz. For more info, call *Richard Yingling at (717) 242-1882.*

ITHACA, NY The Tompkins County ARC will hold the Finger Lakes HAM-IN (hamfest and fly-in) at Tompkins County Airport (KITH), 3 miles NE of Ithaca. Large hangar for indoor vendors and displays. Drive-in setup. Paved outdoor flea market and parking. Airplane rides and aviation displays. Pancake breakfast and BBQ lunch served by Boy Scout Troop 80. Admission $5, under 18 free. Indoor tables $10. Outdoor space $2 each. VE exams, walk-ins welcome. Talk-in on 146.97. Contact *Richard Spingarn (607) 387-5251.*

AUGUST 6

CROOKED LAKE, ANGOLA, IN The Annual Land of Lakes ARC Hamfest will take place at Steuben County 4-H Fairgrounds, corner of 200 W and 200 N, Exit 150 off of I-69. Talk-in on 147.180 and 444.350. Packet 145.510. Tickets $3 in advance, $4 at the gate. Indoor tables $8; trunk sales $2. Vendor setup Sat. August 5th, 3–10 p.m., Sun., August 6th, 4–7 a.m. Free parking. Camping, swimming, amusement park and outlet shopping malls nearby. Contact *Bill Brown, 905 W. Parkway Dr., Pleasant Lake IN 46779. Tel. (219) 475-5897. E-mail [sharon.l.brown@gte.net].*

MARSHFIELD, WI The Marshfield Area ARS will hold their 10th Annual Picnic "HAMNIC" on Sun., August 6th, starting around 11 a.m. Potluck, swapfest. The location is Wildwood Park in Marshfield WI. Talk-in on 147.180. All are welcome. Contact *Guy Boucher KF9XX, 107 West Third Street, Marshfield WI 54449. Tel. (715) 384-4323. Packet: KF9XX @ W9IHW.E5.AI.WI.USA.NA. E-mail [guyboucher @tznet.com].*

AUGUST 12

HUNTINGTON, WV Amateur "ham" radio and computer hobbyists from all over the mid-west will be in Huntington WV on Saturday, August 12th, for a giant "Hamfest" and Computer Show. The event will be held at the Veterans Memorial Field House, 2590 Fifth Avenue, 8:30 a.m. until 2 p.m. This event is being sponsored by the Tri-State ARA. Vendor's tables $8 in advance, $10 at the door (if still available). They may be reserved by calling *Hamfest Chairman Dwight Smith WB8JPJ at (304) 522-7865.* VE exams will be held at the Field House. Registration begins at 10 a.m. All examination elements, written and Morse code where applicable, will be offered for all classes of amateur radio licenses. A fee of $6.65 will be charged per test. Pre-registration is not necessary but applicants must present two forms of acceptable identification, including one picture ID. Bring the original of any currently held ham license, and of any Certificate of Successful Completion of Examination (CSCE) which you claim for credit from a previous exam. For further test info, contact *Garry Ritchie W8OI at (304) 733-1300.*

AUGUST 13

GREENTOWN, IN The Greentown Hamfest Committee will hold the Greentown Indiana Hamfest at the Greentown Lions Club Fairgrounds, beginning at 8 a.m. Talk-in on 146.91. Vendor setup Saturday, August 12th, 6 p.m.–8 p.m.; and Sunday August 13th, 6 a.m.–8 a.m. Inside tables $8 each. Tailgate setup $3. Admission tickets are $4 in advance, $5 the day of the event. 12 and under free. Handicapped parking. If you want to take the VE exams, sign up by 8:30. Anyone who obtains a No-Code Tech license at this test session will be admitted free. Contact *L.B. Nickerson K9NQW, tel. (765) 668-4814; E-mail [ka6nqwnick @ netusa1.net].* The Web site is at *[www.netusa1.net/~ka6nqwnick/greentown.htm].*

PEOTONE, IL The Hamfesters Radio Club, Inc., will hold their 66th Annual Hamfest, Sunday, August 13th, at the Will County Fairgrounds (I-57 Exit 327 East) in Peotone. Setup is Saturday, August 12th, from 3 p.m. to 11 p.m. Convenient unloading and parking areas. Free overnight parking. Building secured. Exhibits open at 8 a.m. Amateur equipment and computers. Flea market runs 6 a.m. to 3 p.m. No additional charge for flea market space. Saturday setup from 1 p.m. until 11 p.m. Tickets $4 in advance w/double stub, $5 at the gate, w/single stub. Children under 12 admitted free. For advance tickets and info, contact *Christine Mack, PO Box 2161, Oak Park IL 60303; tel. (708) 358-1786. E-mail [christine1@mediaone.net].* Talk-in on 146.52 simplex, 146.64 (-107.2) STARS rptr.

SHREWSBURY, PA A Ham and Computer Swap Fest will be held beginning at 7 a.m., just off of 183 Exit 1 (Shrewsbury PA). Take Rt. 851 West 1 mile to the firehouse on the right. An old fashioned auction will be held mid-morning. Mark all items to be auctioned with your call or name. A 10% fee will be charged. For further info, contact *Cecil K3DCU, Fax (717) 927-9282; phone (717) 927-6662.* VE exams will be held Friday, August 12th. Please call *Carol at (717) 235-2738* for testing info.

AUGUST 19

LONGVIEW, WA The Lower Columbia Amateur Radio Assn., W7DG, will sponsor its 9th Annual Ham Radio, Computer, and Electronic Equipment Swap Meet from 9 a.m.–1 p.m. at the Cowlitz County Expo Center in Longview. Admission is $4, tables are $16, tailgate spaces are $6. Food concessions, free parking. Overnight RV parking on the fairgrounds for $12, electrical hookup available. Vendor setup Friday, August 11th, 5 p.m.–9 p.m., Saturday 6 a.m.–8:45 a.m. Talk-in on 147.26(+) PL 114.8. Take Exit 36 or 39 off Interstate 5 and follow the signs west for the Expo Center (fairgrounds). Mt. St. Helens and the Oregon Coast are nearby. For more info, write to LCARA Swap Meet, PO Box 906, Longview WA 98632; or call Bob KB7ADO in the evening at (360) 425-6076. E-mail to [KB7ADO@aol.com]. Internet link to flyer at [www.qsl.net/nc7p/].

AUGUST 20

LEXINGTON, KY The Central Kentucky ARRL Hamfest and Computer Show will be held at National Guard Armory, adjacent to the Lexington KY airport. From I-75 Exit 115, follow signs to the airport (KY 922 south 1.5 miles, New Circle Rd. west and south 4.6 miles, to Exit 5, Rte 60 West 1.5 mile, turn south at the traffic light. Take Man O' War south 1.3 miles, Parkers Mill west 1.2 miles, right onto Airport Rd., left onto Armory grounds). Talk-in on 146.760(-). VE exams *(contact Bob Cooper AF4OI by August 9th, at (606) 272-6460);* or E-mail *[AF4OI@cs.com].* Other features include an ARRL Forum, technical forums, commercial vendors, indoor flea market, air-conditioned building. Outdoor flea market, powerline-safety demo, aeronautical mobile

demo, and special event station outside. Kentucky Horse Park, museums, and other family activities nearby. Handicapped accessible. Free parking. Free overnight self-contained camping. Admission $5 in advance, $6 at the gate. Vendor setup Sat., 6 p.m.–8 p.m., and Sun. 6 a.m.–8 a.m. Tables $15 if payment received before August 9th; $25 afterwards. E-mail/phone reservations confirmed upon receipt of payment. Tailgating free with admission. For further info, or to preregister, contact *John Barnes KS4GL at [KS4GL@juno.com], (606) 253-1178 evenings; or SASE John Barnes KS4GL, 216 Hillsboro Ave., Lexington KY 40511-2105.*

AUGUST 26–27

ALBUQUERQUE, NM The Duke City Hamfest will be held at the Rio Rancho National Guard Armory, 4001 Northwest Loop. Take I-25 to Bernalillo, W on NM 44/US 550 approx. 5 miles to the Armory (watch for signs). Doors open Saturday 8 a.m. until 5 p.m., and Sunday 8 a.m. until 1 p.m. Flea market, tailgating, $5. VE exams, and forums will also be featured. Free admission. Talk-in on 145.33(-) 100 Hz, and 444.00(+) 100 Hz. RV parking, no hookups. Tables $12 without power, $17 with power. Contact *Marcus Lieberman KM5EH, 2300 Hurley Drive NW, Albuquerque NM 87120. Tel. (505) 836-1724, Fax (505) 352-6154. E-mail [km5eh@arrl.net].* The Web site is at *[www.qsl.net/dchf].*

AUGUST 27

LA PORTE, IN The LPARC Summer Hamfest will be held Sunday, August 27th, at La Porte County Fairgrounds, SR2 west of La Porte, 7 a.m.–1 p.m. Admission $5, Tables $10, outdoor tailgating $2. Talk-in on 146.52, 146.61(-) PL 131.8. For more details, contact *Neil Straub WZ9N, PO Box 30, La Porte IN 46352. Tel. (219) 324-7525; E-mail [nstraub@niia.net].* The URL is *[www.geocities.com/siliconvalley/byte/1653].*

ST CHARLES, MO The St. Charles ARC "Hamfest 2000" will be held 6:30 a.m.–1 p.m. at Blanchette Park in St. Charles MO. Talk-in on 146.670. Free parking. No admission charge. The parking lot flea market will be limited to amateur radio and electronic items. Spaces $8 each. Vendors, inside the air conditioned Memorial Hall, $15 per 8 ft. table, if available. Contact *Ken Fieser at (314) 428-4383; E-mail [kfieser@aol.com].*

YONKERS, NY The Yonkers ARC will host an indoor, no tailgating, Hamfest and Computerfest at Saunders High School, 145 Palmer Rd., Yonkers NY. Talk-in on 146.265/.865, no PL. Sellers 7 a.m., buyers 8:30 a.m.–2 p.m. Sellers, pre-registration is $15 per table (includes one admittance, AC power available). At the door, $20 for first table (includes one admittance). Additional tables $10. For pre-registration, make check payable to YARC and mail to Y.A.R.C., PO Box 378, Centuck Station, Yonkers NY 10710-0378. Buyers, admission $5, kids under 12 free. Plenty of free parking. VE exams 9 a.m.–11 a.m. Walk-ins okay. Bring original and copy of FCC license, original and copies of any valid CSCE. Fee is $6.65. For more info, call *John at (914) 963-1021; Paul at (914) 237-5589; or Dan at (914) 667-0587.* E-mail can be sent to *[w2yrc@hotmail.com].*

SEPT 10

SOUTH DARTMOUTH, MA The Southeastern Massachusetts ARA, Inc. will hold its annual fleamarket on the club's grounds at 54 Donald St., South Dartmouth MA. The event will run from 9 a.m. to 1 p.m. Talk-in on 147.00/.60. Admission $2, spouse and children free. Walk-in VE exams at 10 a.m. Free space for vendors. For further info contact *Bill Miller K1IBR at (508) 996-2969;* or by E-mail to *[billmiller@netzero.net].*

SPECIAL EVENTS, ETC.

AUGUST 19–20

ENGLEWOOD, NJ The Englewood (NJ) ARA, Inc., invites all amateurs the world over to take part in the 41st Annual New Jersey QSO Party. The time of the contest is from 2000 UTC Sat., August 19th–0700 UTC Sun., August 20th; and from 1300 UTC Sun., August 20th–0200 UTC Mon., August 21st. Phone and CW are considered the same contest. A station may be contacted once on each band — phone and CW are considered separate bands. CW contacts may not be made in phone band segments. New Jersey stations may work other New Jersey stations. The General call is "CQ New Jersey" or "CQ NJ". New Jersey stations are requested to identify themselves by signing "DE NJ" on CW and "New Jersey calling" on phone. Suggested frequencies are 1810, 3535, 3950, 7035, 7235, 14035, 21100, 21355, 28100, 28400, 50-50.5, and 144-146. Suggest phone activity on the even hours, 15/10 meters on the odd hours (1500 to 2100 UTC); 160 meters at 0500 UTC. For complete rules, please contact *Englewood Amateur Radio Assn., Inc., P.O. Box 528, Englewood NJ 07631-0528.*

FAIRBORN, OH The Upper Valley ARC will operate Special Event Station W8F to commemorate the 50th Anniversary of the merger of Fairfield OH and Osborn OH into the City of Fairborn OH. Fairborn is the site of Wright Patterson Air Force Base (and thus the site of the Bosnian Peace Talks). Wright Memorial marks the site of the experiments by the Wright brothers that led to flight. Fairborn is also the site of Wright State University. The station will be on the air 1700 UTC August 19th to 2100 UTC August 20th. Frequencies: 3.860, 7.260, 14.260, and 28.360. A certificate is offered for a QSL with a 9x12 SASE to *Upper Valley ARC, PO Box 2000, Fairborn OH 45324.* Contact *Lew Lewis W8OEL, PO Box 1871, Fairborn OH 45324. Tel. (937) 879-4469.* E-mail *[W8oel@arrl.net].* 73

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

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A Safe LED Optical Transceiver System — Part 3

Well, this month let's wrap up the LED transceiver and get on with the remaining photo optical receiver circuitry. By the way, the LED used in the transmitter circuit covered last month is a Radio Shack 260 nM 5000 Mcp high-output-power LED, part #276-086, costing just less than $3 apiece.

Basically, the receiver is a sensitive photo diode with a large cross-section area and 4-transistor amplifier that we obtained in surplus. Alternately, a diode can be obtained from commercial sources for under $5, and an alternate amplifier using an op amp could be used here to replace the 4-transistor circuit that we built from used surplus components.

The photo diode and amp assembly is placed in the exact center of the first forward facing pipe cap assembly and has light focused on its surface by the Fresnel lens in the splice union. Again, just like the LED transmitter, the assembly is quite identical for both receiver and transmitter circuitry. The rear cap (of the two caps cemented back-to-back) houses the local oscillator and mixer circuit that converts the 35 kHz (or 45 kHz) received FM from the photo diode amplifier to a frequency in the 2 meter ham band for reception only on my 2 meter HT.

We used a synthesizer at 145 MHz to accomplish this conversion. However, other frequencies are possible depending on what you have on hand to serve as a local oscillator as well as your choice of FM receivers for reception. A scanner will function just as well as the 2 meter HT I used. While an FM broadcast receiver would seem to function here, its FM bandwidth is too wide for narrowband FM reception, making this an unlikely choice. With the LED being switched at a rate above 50 or so kHz, efficiency drops off, making wider modulation schemes impossible with this design.

In our system, we used a synthesizer to produce an LO of 145 MHz for injection into the LO port, pin 8, and ground of a SBL-1 mixer to convert the 35 kHz IF to 145.035. The output of the converted photo diode detector amplifier assembly feeds the IF port, pins 3 and 4 tied together, and common ground of the SBL-1 mixer directly. The RF port of the mixer, pin 1 (blue pin), and ground is the coaxial connection to the HT's RF connector. The SBL-1 mixer has pins 2-5-6 and 7 all tied to common ground. Again, pin 8 is LO input, pin 1 is RF output, and pins 3 and 4 are the common IF input.

I have used many different other agile sources of RF for LO injection to the mixer, replacing the synth on a trial basis. Any good signal generator that is stable enough to be held on frequency for narrowband FM work would do for a bench test. It would seem that a simple crystal oscillator circuit that is used for a 2 meter converter could be duplicated here to replace the synthesizer circuit. The frequency of the circuit needs to be changed from the original circuit that appears in almost any *ARRL Handbook* on VHF 2 meter converters. Just the crystal oscillator circuit needs to be built with a suitable crystal for the frequency desired.

In another test, I tried a TTL oscillator at 78 MHz and coupled it to a MMIC amplifier. Not only did it amplify the 78 MHz, but it also proved to be a good 2nd harmonic generator at 156 MHz. Using 156 MHz unfiltered for other harmonics and 78 MHz I

Photo A. *Front view of entire system showing spotting scope on top, centered between the receiver and transmitter 4-inch assemblies. Visible just inside the front of each tube is the Fresnel lens in the splice union coupling.*

tried readjusting my wide coverage HT to the commercial FM band (150 to 174 MHz). I set it to 156.035 MHz and it worked as well as using the synthesizer and 2 meter portion of the HT frequency range. Harmonic output of this 78 MHz crystal oscillator was quite good, giving full scale S-meter reading in my back yard with just the crystal oscillator powered up on my workbench. Stability on my FM HT at 156 MHz was quite good.

The TTL oscillator is powered from +5 volts DC at a few mA, and puts out .8 volts p-p or just about zero dBm as measured on my 432 HP power meter. Duplicating pin pattern for a standard 14-pin IC, pin 1 is DC ground, pin 6 is signal RF ground (can be common ground connected). Pin 7 is +5 volts DC, and pin 14 is 78 MHz RF output.

Whatever circuit you use, be it the 2 meter converter crystal oscillator circuit or the TTL crystal and MMIC design, either one will work well for you. This simplification of the circuitry and component parts required will help to hold down parts count, eliminating the more complex synthesizer. The reason I tried the 78 MHz TTL crystal oscillator is that I came across a quantity of 78 MHz TTL oscillators and they seem to work well. If you have any TTL oscillators in the junk box, give them a whirl — it might work. Remember, this is just a suggestion, as there are many other frequency combinations that will work just as well. Put the junk box to use if at all possible.

The TTL oscillator is a quite simple 4-lead device looking much like a IC that fits into a standard IC socket. They are a complete oscillator circuit and crystal all enclosed in a miniature metal can. Mount the oscillator dead-bug upside down on a small piece of PC board next to the MMIC amp capacitor coupled to the MMIC input. A DC supply resistor and output coupling capacitor complete the LO TTL oscillator. A short section of miniature coax couples RF out of the MMIC amp harmonic generator to the LO port of a SBL-1 or similar mixer.

The photo detector we used was obtained from surplus and had a four-transistor amplifier as part of the assembly. The photo detector/amplifier was chosen because it had a large surface of active light detection area about 3/16 of a inch square. This assembly used a detector that was not obscured with a dark red infrared filter. If the detector you obtain is covered with a molded IR filter on the detector, a suitable replacement photo diode can be obtained from Newark Electronics (see **Photo C** caption).

The surplus photo detector/amplifier assembly we obtained was not filtered (for IR), making it very usable over the LED

Photo B. *Original photo detector obtained in surplus. Note the photo diode near bottom left. You can see active element for photo detect in visible light. If it were for IR use only, it would be obscured with a very deep-colored RED lens.*

visible frequency range. The units with a IR diode and IR filter (very dark red) are not usable as far as the photo diode is concerned. See **Fig. 1**. The photo diode should be clear in appearance, allowing you to see the dark photo sensitive element in the device. See **Fig. 2** for the reverse-engineered schematic of the photo detector amplifier and the conversion to the output transistor amplifier circuit. This converts

Continued on page 46

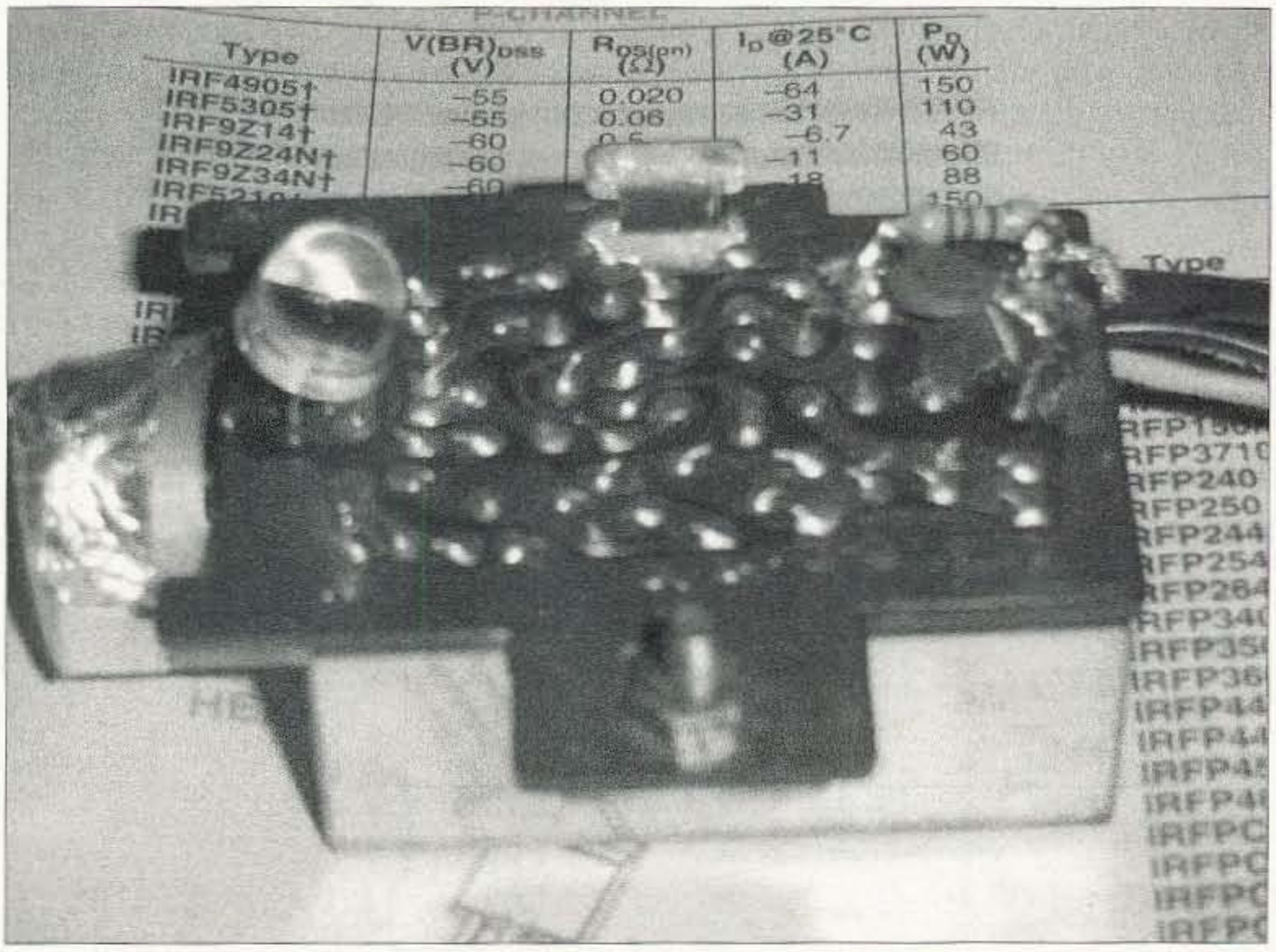

Photo C. *Standard IR detector (removed) and amplifier unit. This unit is modified to experiment with the Newark Electronics photo diode (#95F9029, p. 583, Newark Electronics cat. #117). As you can see, the Newark Electronics replacement photo diode has a clear white plastic lens. The Newark photo diode replaced the IR diode as received in surplus. Same 1k emitter mod on final transistor amplifier stage.*

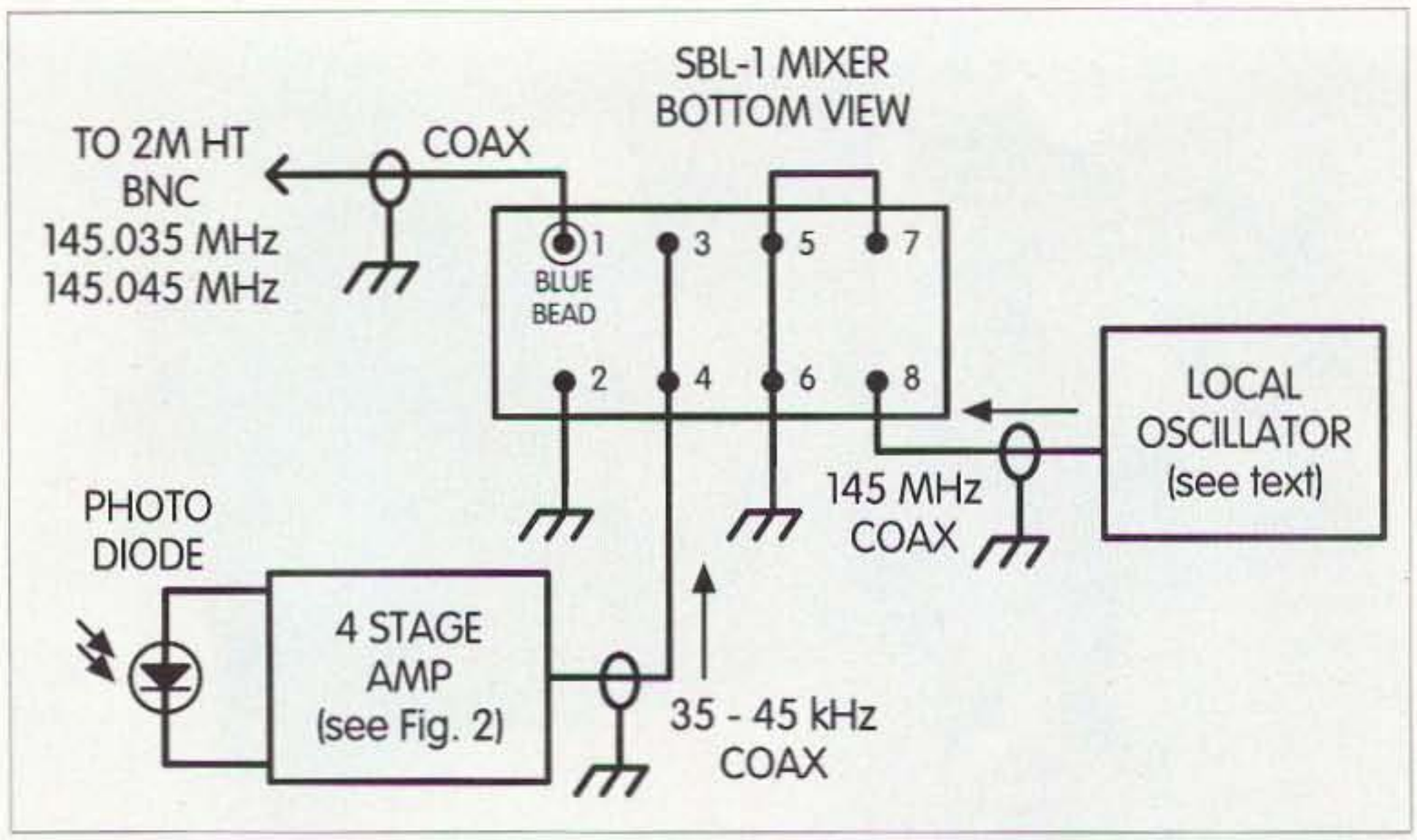

Fig. 1. Optical receiver/converter schematic.

Above & Beyond

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from digital to analog for use with our FM application.

The conversion is simple, as the original transistor emitter is grounded and needs to have ground broken to the emitter, to be replaced with a 1k resistor. Output is not the collector as in the original circuit, but converted to an emitter follower by coupling out of this last stage on top of the 1k emitter resistor coupled with a .001 µF capacitor.

Alternately, if you can't locate an IR detector assembly, an alternative could be a suitable photo diode and constructing an amplifier using a common op amp. While improved designs use high performance op amps, most of these amps are hard to locate. The op amp design is not critical — it's your choice. See what you can come up with from the junk box. A good junk box will cut costs.

With this design, I hope you don't follow exactly what I used, but rather use it as a guide. I used what I was able to find in my scrap metal and surplus dealers for low cost assembly. You're quite welcome to follow exactly but try where possible to use alternatives from locally available components to reduce your construction costs. In that way, you should use this as a guide not as an absolute to-follow-at-all-costs design.

The output .001 µF capacitor of the photo detector amplifier is coupled to the IF port of an SBL-1 mixer. Now, amplifying light might not seem proper using common RF components, but remember what we are actually amplifying is the LED's light output chopped at 35 kHz rate. That's the RF carrier with the FM modulation superimposed on this carrier frequency. That's why we had to modify the transistor amplifier output stage to analog to pass without distortion the carrier and its FM modulation.

The local oscillator, be it a signal generator, synthesizer, or TTL crystal oscillator MMIC amplifier, is injected to the local oscillator port (LO) of the same mixer. The HT antenna is connected to the RF port via miniature flexible coax cable.

Startup tests were performed inside a garage, focusing the LED transmitter on the inside of the garage door and setting the TX optics for best spot focus. Turn on the receiver and connect the HT tuned to your receive frequency (RF carrier + local oscillator injection frequency). The RF carrier is either 35 or 45 kHz and your LO is 145 MHz with the synthesizer or 156 MHz if you used the 78 MHz TTL crystal source. If all is functioning, you should have a full quieting signal of the HT receiving your RF being generated from the LED transmitter. For best return signal, you might have to target a plastic bag or some reflective surface to give a return reflection.

Further tests include peaking up the system using a remote reflector mounted quite a distance away, say, 200 or so feet distant. Auto rear backup light reflectors make a great target also. Aim the LED transmitter at the reflector, and when the transmitter is being reflected (very noticeable) by the remote reflector, signal strength on the HT should be nearly or completely full S-meter deflection. Align the spotting scope and target in the scope's crosshairs first for a coarse adjustment. Then peak up system performance using an attenuator in the HT path to reduce overloading. Use the S-meter to peak up on. At the same time, the final rifle spotting scope adjustment is done by slightly loosening the vertical and horizontal calibration screws on the scope mount. Then, move the scope and position the scope crosshairs, aligning the scope on target with the LED transmitter being reflected by the reflector target.

If all is well after this initial alignment, re-verify mount rigidity, as it will be subjected to some stress when the whole unit is moved to a remote location for further tests. I suggest moving out the distance attempted from a modest test at relative short ranges to greater and greater ranges as system sensitivity suggests. Try across a school or park open space first or up and down a city block first before trying a greater distance. If S-meter readings are still way up there, go for a greater distance. We tried 2 miles and made it on our first attempt. This,

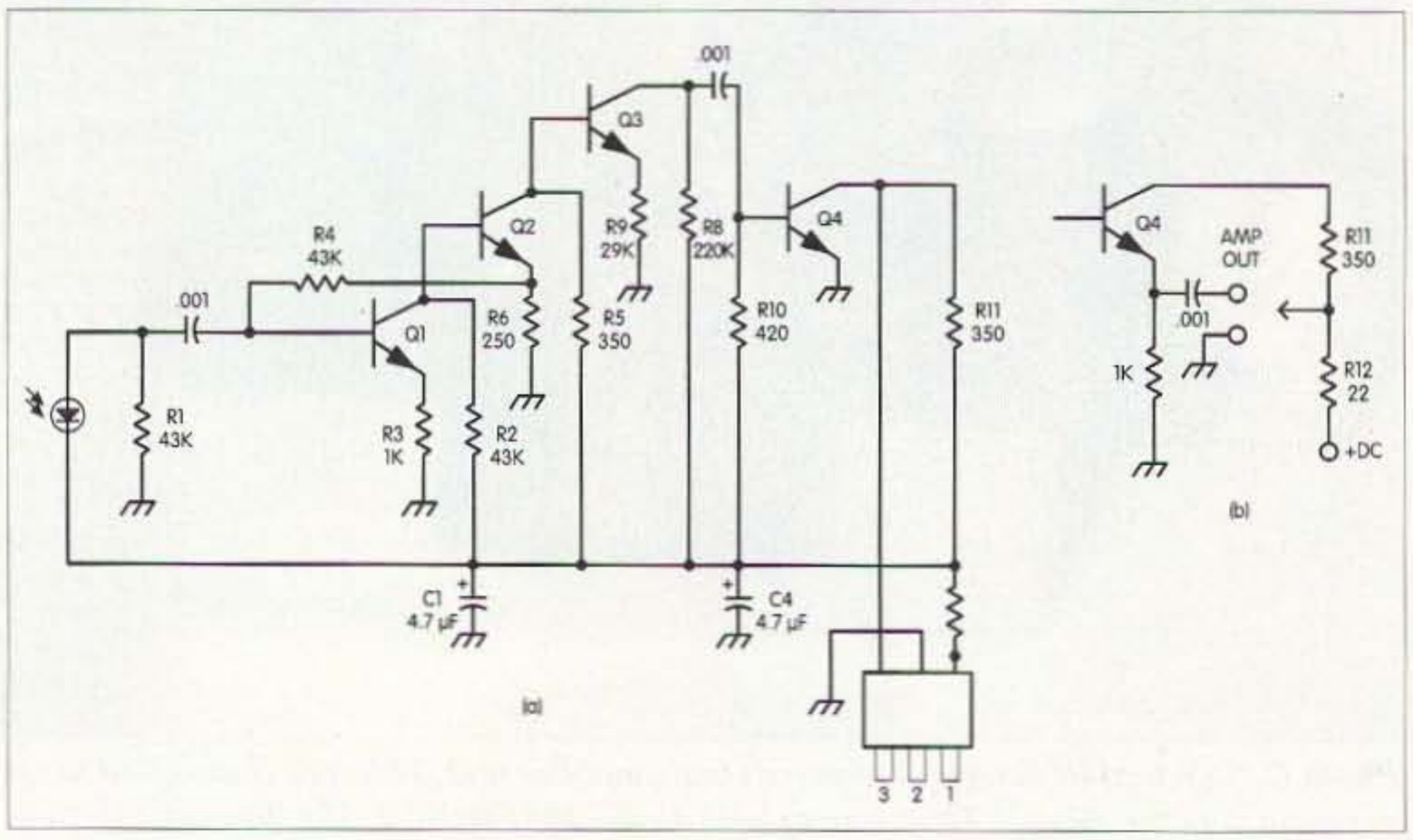

Fig. 2. (a) Reverse-engineered drawing of converted surplus IR diode detector and 4-transistor amplifier. (b) We converted the output stage by removing ground on the emitter and coupled out of the emitter with a .001 µF capacitor.

after great care was given to align the LED and detector diodes in the center of the respective housings and making a careful focus of the Fresnel lenses for best focus sensitivity.

These tests were made at night and from nearly black background areas. To locate each other, a very bright flashlight was blinked on and off. Just like using microwaves, if you are using a narrow or few-degrees dish antenna and you're not pointed at the correct heading, you won't make contact.

When you have contact, you can visually observe the LED transmitter at the remote location. The LED system looks like a bright porch light — colored red, of course. Not overly bright, as observed at a 2 mile distance. You immediately wonder if this thing will function at this distance at all, being as dim as you optically observe this light at this distance. In practice, these units can still have detection (noisy) when slightly off direct aiming. If you use an SSB HT for lineup, this allows you to detect a CW tone from the carrier and use this tone to peak up the pointing angle as compared to relative tone strength. This tone can be fed back to the transmitting location to facilitate alignment using the SSB receiver feeding back this tone over the communications liaison system. We use 450 MHz simplex frequencies to prevent having anything locally in the VHF 2 meter IF band used in this optical transceiver.

Did I forget to mention using a good tripod for the system? We use the same tripods for this system that we use for our microwave dish antenna mounts. Whatever tripod you use, we suggest a heavy one — much heavier than a standard camera unit. Camera tripods could be used; however, they are not as sturdy as a microwave tripod.

Also when setting up at night, be sure to bring a small flashlight for local use to check setup in the dark. A useful light is an old military signal flashlight with red colored filters over the flashlight bulb to retain some of your night vision, allowing you to look through the spotting scope. It's not a necessary item, but a thought. For a liaison radio, we used our 450 MHz FM HTs on a simplex channel for communications setup as they're much better than arm and hand signals.

A nice addition to this liaison communications setup is a Radio Shack VOX headset boom mic, part #19-312. The cost is $50 — much less than others on the market. Its use allows hands-free operation for work on the optical system and communications over the liaison channel while setting up. The VOX operation is very nice, and it seems to be able to be used on many different HTs that not only include a whole series of Icom radios, but also Alinco, Yaesu, and Standard models, according to Radio Shack catalog details.

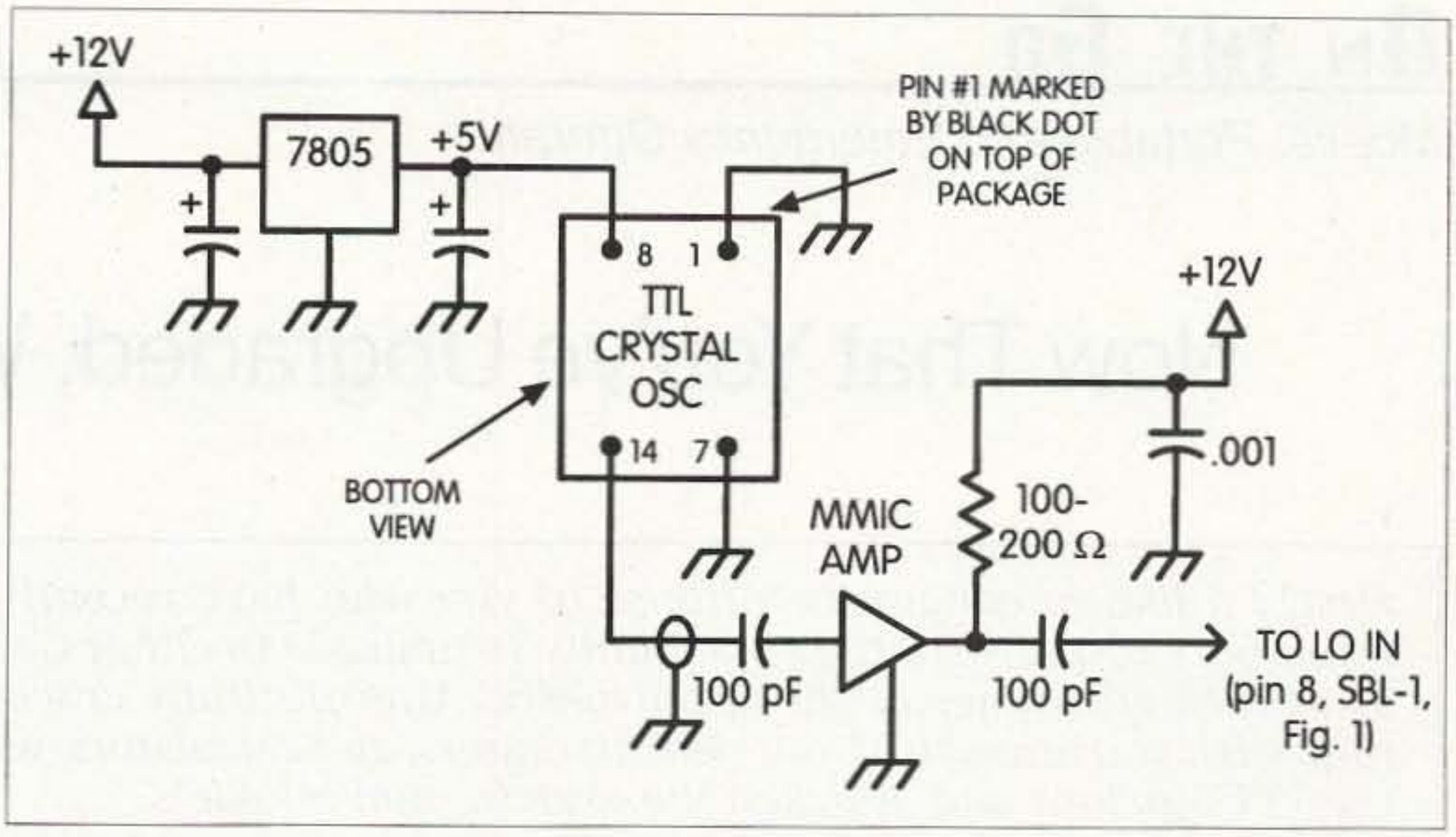

Fig. 3. LO constructed from 78 MHz TTL crystal oscillator and MMIC (driven hard to produce harmonics) used for LO injection at 2nd harmonic for 156 MHz reception of the LED transmitter, 35 or 45 kHz modulation.

Don't forget to bring along some of the creature comforts like a lawn chair. You might have a wait for total setup and there is nothing like being comfortable.

Well, there is the entire system that Kerry N6IZW and I constructed.

Of course, there are improvements that can be constructed and added on to this system. The tripod head we used had a return spring that somewhat argues with the manual positioning of the tripod in fine positioning settings. Just could not set on to a spot but near it. It was like there was backlash in the mechanism. I suppose in its original use this tripod that we used was in reality a TV camera tripod. The return spring was a great device with such a heavy camera. For our system it was removed, and we use the horizontal and vertical locking screws. This made life easier for finer pointing when using the rifle scope crosshairs to align scope and target together.

Well, that's it for the system. I hope you have as much enjoyment as Kerry and I have had in this project. It just goes to show you that some things that seem impossible are just not so. They might be, but until you give them a whirl, you will never know. I have located a quantity of 78 MHz TTL crystal oscillators and will make them available for $2 postpaid.

For laser topics and lots of information and suppliers check out Web address [http://www.qsl.net/k3pgp/opening.htm]. Our final plan is to use the system during the ARRL 10 GHz and up contest for fun, should my KNEES allow me to do so. Best 73 for now, Chuck WB6IGP. 73

Depression is merely anger without enthusiasm.

On the Go

Mobile, Portable and Emergency Operation

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Now That You've Upgraded, What's Next?

First, I'd like to congratulate those of you who have recently upgraded. With the standing-room-only response to the opportunity to upgrade to either General or Extra, tens of thousands of us took advantage of the opportunity. After dutifully cracking the books (or the computer tutorials), and armed with our pencils, erasers, and calculators, we dutifully presented ourselves at the VEC sessions and attacked the examination booklets.

Of course, in the process we managed to totally overload the system, so actually getting your new license has been an opportunity to learn patience. As I write this, it has been six weeks from the April fifteenth stampede, and the VECs are working diligently to get the backlog of upgrades submitted to the FCC. While you may not have your new grant as of the time I write this, I figure that by the time you read this we should all have our upgrades in hand.

I suspect that in addition to those who upgraded we also have a number of folks who have recently joined (or rejoined) the hobby. When the requirements changed, many who had not taken the plunge may now choose to do so. Predictions were that as new folks enter the hobby we might be seeing a shift in the reasons people have for joining the hobby. Ten years ago, there were many who became hams because amateur radio provided a cheap and effective means of communications. Now there are many alternatives to meet that particular need and people join the hobby for other reasons. With so many modes, modalities, and options available, we may begin to attract the experimenters who have become tired with the limits of surfing the Web. Others who have gotten into the habit of assembling their own computers may see ham radio as a natural outgrowth of the desire to build. In any case, congratulations or welcome, whichever the case may be.

Now that you have your new license, or your upgrade, what are you going to do with it? Don't forget that there is one thing that sets this hobby apart from most others. We routinely have the opportunity to provide real and meaningful support and assistance to others by using our hobby. We can give something back to the community that may fill a critical and emergent need. With this opportunity comes an obligation, not to mention a proud tradition, of public service. In the past I've written about a number of things that we can do for the community, whether communications during a disaster or during a bike ride. Maybe we're helping out with a food drive or even providing backup communications within a hospital when they experience telephone equipment problems. Then it hit me. We often think of our role as one where we provide communications for various agencies, but our role is actually quite a bit more important. As communicators we provide the data that people need in order to act during a particular situation. We understand that this data is the lifeblood of any operation, and we spend a lot of time planning and preparing to meet that need.

As hams we spend a lot of time practicing for events that might occur — or then again (and hopefully), they might not. We practice for disaster support and recovery communications through our Amateur Radio Emergency Service (ARES) and Radio Amateur Radio Civil Emergency (RACES) networks. Those affiliated with the Military Affiliated Radio System (MARS) practice the skills which might be needed to assist and support armed forces communications. We develop and maintain skills which are not required for the enjoyment of the hobby but which would be needed if called upon to serve in one of these capacities. It struck me recently that while many people want to help out in times of a serious problem or emergency, relatively few are geared toward investing time and effort in the anticipation of such an event. Many homeowners do not prepare their own home for an emergency, and therefore would not be inclined to prepare on behalf of their community.

Perhaps they feel that someone else will do it. Perhaps they feel that that's why we have a Civil Defense function. As it turns out, that someone else is us. When we register with a local or state agency and function as a RACES station, we are, by definition, a component of Civil Defense.

The key is that in an emergency the most effective hams are those who are also the planners. Some hams are ready willing and able to assist in a real emergency but cannot or may not choose to participate in the planning and preparation. While these folks are important, without the planners, it would be difficult or impossible to assimilate these folks into the event when it occurs. This is especially true since most disasters by definition occur with little or no warning. So how does that affect you as a ham, particularly if you have recently joined the hobby or upgraded?

1. Get involved to the degree that you can. Check out the local ham club and find out who is coordinating the public service communications. Get to know them. Let them get to know you and what you are interested in.

2. Be available when possible. You may have a demanding job, and it may take priority during an emergency. Police, fire, and hospital employees will have their hands full in a disaster, but there are many other events in which you can participate. The local fun run or marathon may be such an opportunity that allows you to participate but which doesn't conflict with your other duties in an emergency.

3. Get involved. Participate in planning for the types of events that may impact your area. Go through SkyWarn training. Register with the local public service agency as a

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QRP

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Electricity at the Speed of Light

At the 2000 Dayton Hamvention, I picked up a second Heathkit HW-8. This one is really nice looking with hardly a scratch on it. I really did not need another HW-8, but the price was reasonable and the condition of the radio made it a got-to-have.

The guy behind the table say it would only work on 20 meters. All the other bands were dead. There was no receive or transmit. So with an exchange of some dead presidents, the HW-8 was mine.

A look inside

After I got home from the Hamvention, the HW-8 got its time on the workbench. I powered up the HW-8 and sure enough the guy was correct. It only worked on 20 meters. There was no transmit at all on any of the other bands. The receiver was also quiet on 80, 40, and 15 meters. All I could hear was the audio hiss in the earphones.

As I looked around at the PC board, I found that out of twelve of the compression trimmers, only three had their adjustment screws. The rest were missing. Now, why on earth would anyone want to remove the adjusting screws from the trimmers? I've still not been able to figure that one out.

Also missing, or rather destroyed, is the slug in the L19/L18 coil. This is one of the heterodyne oscillator coils. If this coil is out of adjustment, the circuit it controls will not function. In this case, L19 controls the operation of the 20-meter oscillator. The other half of this coil controls the 40-meter oscillator. Since the slug for the 40-meter band was in crumbs, it told me that someone someplace was working on the heterodyne oscillator. It also told me that they could not find the problem by adjusting the slug in L18/L19.

Checking the heterodyne oscillator

Heath wants you to use an RF probe to check for the proper operation of the heterodyne oscillator. The test point is TP1 and is located on the diode side (as looking down onto the PC board) of R94. I have found in the past it is best to couple an oscilloscope to this test point and forgo the RF probe. The scope will not only show you the output level of the oscillator but also what the waveform looks like. Sometimes more is not better!

So, couple your scope probe to R94. As you select the different bands via the front push-buttons, you should see a nice waveform on the scope. There should be at least 50 mV p-p on the scope. On this radio, none of the crystals would fire except on 20 meters. Since Q7 and Q6 are the only active devices and they both work on 20 meters, there had to be another problem.

The HW-8 is full of switching diodes. They control the various tuned circuits. We've talked about these diodes in the past, and I won't go into great detail here again. Enough to say that if one or more of the switching diodes is kaput, then the section that is controlled by those diodes will not function.

On this radio, the switching diodes controlling the heterodyne oscillator were all working. This test is simple. Use your VOM and check to see if plus 12 volts is routed via the diode to the crystal.

The front panel push-buttons do much more than direct the 12-volt switching voltage to the various diodes. They do in fact route the antenna to the front-end amplifier. They also route the output of the PA to the various output filters. These push-buttons have wires on the top and connections via the PC board on the bottom. I mention this because I found while checking the switching diodes that I had 12 volts on the green wire leading from the 20-meter switch even though the 80-meter button was in! The color codes are from the Heathkit manual and allow you to trace the various switched circuits. The color code is: black for 80 meters; red for 40 meters; green for 20 meters; and white for 15 meters. This color-coding holds the same no matter if the wire goes to the front end or to the PA stage.

While we're at it, looking into the front of the radio, the leftmost push-button is: 80 meters SW1; 40 meters SW2; 20 meters SW3; and 15 meters SW4.

Each SECTION of any of the push-button PINS are numbers like this. The section closest to the front panel leftmost side, pins 10,11,13; right side, 1,2,3. Middle section, pins 13,14,15, right side, 4,5,6. End section, pins 16,17,18; right side, 7,8,9.

The sections are lettered. Again, for the front panel, RIGHTmost switch (the 15-meter button), the section closest to the front panel is section A. Middle section is B, and the last section is C. This sequence is repeated on all the switches. So, 80 meters can have section D, E, and F, with pins 1,2,3, and 10,11,12.

Now having said all of the above, a quick touch of the soldering iron detached the green wire from the 20-meter switch. With this wire no longer connected to the heterodyne oscillator, the other crystals fired right up.

No matter what switch was pressed, the wire going to the 20-meter band was always hot with 12 volts. The problem was finally traced to a shorted switching diode in the front end. As it turned out, diode D7 was at fault. Here's what happened. When any other band switch was pressed in, the switching voltage was applied to all stages. In this case, we'll select the 80-meter band. With the 80-meter button in, 12 volts is applied to select L5 via D5. C2 and L1 in the front-end circuit are now active thanks to diode D1. At the same time, D22 is turned on and places Y1, 12.395 MHz, in the heterodyne oscillator. And last but not least, diodes D31 and D35 are forward biased and

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Zakanaka

You may take it as a given that I have all the latest technology on my operating desk — especially when you read that I recently purchased one of the high-end transceivers. Surely, then, I must have all the latest whizbangs computer money can buy, non? Not even close. I seem to stay in touch with reality in a lot of areas, at least from my own perspective, but I must work within a budget.

Speaking of expensive, I have watched the $400 rebate campaigns to get everybody down to the store to purchase new computers and have firmly dug my heels in. Do the math. That rebate will commit you to something close to an additional $400 out-of-pocket by the time you are finished with your commitment.

Now that I have spouted off, I still haven't told the deepest secret about my shack's time-worn computer. It is a long way from cutting-edge at 120 MHz and 32 megs of RAM. A few years ago, that sounded pretty good. After all, this machine has been upgraded several times since it was purchased new with Windows 3.1 as the operating system!

Way back in those dark ages, the first configuration had a 486 processor and the attendant goodies. Seemed pretty high-end, then it went downhill — or perhaps the hill just got taller.

Where am I going with this? It just happened recently that one of the newest pieces of ham software won't run correctly on this machine. That started me to thinking about you guys. And I notice there are hams running computers similar to what this computer was when it was hatched six or seven years ago.

First, let me state that there are some programs that will do very exotic jobs on fairly "slow" machines such as a 486 33 MHz. For instance, if you wish to run PSK31, the original Peter Martinez G3PLX package will usually do the trick quite nicely if you are running an earlier configuration with Windows 3.1. The latest version, 1.08, is available via the URL listed on the 4th line in The Chart.

I use it on my laptop (Win95) with the WD5GNR front end and it is quite respectable. The laptop might handle one of the more "hungry" pieces of software, but I am satisfied with the performance. The tuning leaves a little to be desired, but it works for a lot of folks. Once it is on frequency, the rest works like most any other program.

There are other programs for other modes that will perform on these machines. Usually, if you are looking for such software, the best bet is to find DOS applications. Often, they are more stable and make a slow machine come to life. One of my favorites for SSTV is the Pasokon Lite package. It is a DOS program that really does the job on the laptop. Incidentally, the laptop is another "cripple" at 120 MHz and only 8 megs of RAM.

What brought all this thinking to a head

I have mentioned the new Zakanaka PSK31 software by Bob Furzer, the author of Logger. Bob decided to build a separate standalone PSK31 program that would work in conjunction with Logger so the latter could do as its name implies, log contacts. He found that the logging program with the PSK31 module had gained a lot of popularity due to the inclusion of a PSK31 module.

That was the very reason I first downloaded the Logger software. At the time, it was one of the most attractive programs for working the new mode, and the logging capability was built-in. I very likely wouldn't have given the software a second look if the PSK31 module were not offered.

Now you will find both programs at the revised listing in The Chart. I was made aware, a few months before this publication date, that the old URL I had listed for acquiring Logger, which was a very interesting site with many ham links, had gone by the wayside. So I am at present supplying the correct URL via E-mail and this new listing should relieve some of that traffic. I do enjoy hearing from all of you, but the error rate from this end becomes a bit embarrassing in cases like this.

As soon as the first version of Zakanaka was available, I downloaded it and it worked very well, especially considering it was a first release. Obviously, a lot of effort went into the program. Not only had Bob written a fine piece of software, but a dedicated crew of volunteers worked up a magnificent help file.

I managed to work a few stations with the software and figured I had the cat by the tail. Then I read about running Logger concurrently with the new software. At that time, there was a new version of Logger available (ver. 7.05), which I downloaded and installed. I did a little checking and that program appeared to work quite well as a standalone.

Then I got the two programs running side by side and the really big problem developed. Crash — reboot — crash — etc. Actually, the programs would run long enough to make me think there was just some little quirky bug floating about. My comment later was that I had enough crashes that day to fill a computer junkyard.

Another confession

I must apologize for misleading anyone on the ease of using some of these "hungry" programs. After the above incidents, I went to the Zakanaka reflector and described my woes in enough detail to expect a reply and, of course, I was hoping for a simple fix.

I did receive several replies. Most of the authors of the replies gave me some good-natured chastising for not reading the help

files which clearly state the programs require a minimum 150 MHz processor. Some of the chastising was not so good-natured, while other folks were downright sympathetic to my plight.

Throw money at the problem!

The end advice was to either use other software or buy a "real" computer. I tried to avoid being discouraged and mulled the options. Mulling, in case you have not done much of it, can hurt the head as much as regular old-fashioned thinking.

I had tried most, but not all, of the software available and decided I would make an investment that was more practical than the recommended "new computer" purchase. Though it would be nice to have something fast enough to run just about any job, in reality, this old machine does everything I ask of it and I can not only put off the purchase of hardware, I can avoid all the time-consuming configuration at least until sometime in the future. Such loyalty ... if computers talk to each other, can you imagine how jealous the others are?

Source for:	Web address (URL):
Soundcard program for PSK31, RTTY, more	http://tav.kiev.ua/~nick/my_ham_soft.htm
TrueTTY — Sound card RTTY w/ PSK31	www.dxsoft.com/mitrtty.htm
Pasokon SSTV programs & hardware	www.ultranet.com/~sstv/lite.html
PSK31 — Free — orig. PSK31 — also Logger	http://aintel.bi.ehu.es/psk31.html
Site with links to PSK31 and Logger 7. Also Zakanaka and scope program	www.chroniclenetworks.com/~dwm/Logger.htm
PSKGNR — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm
Digipan— PSK31 — easy to use — new version 1.1	http://members.home.com/hteller/digipan/
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TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/
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Timewave DSP & AEA products	www.timewave.com
Auto tuner and other kits	www.ldgelectronics.com
XPWare — TNC software with sample DL	www.goodnet.com/~gjohnson/
RCKRtty Windows program with free DL	http://home.t-online.de/home/dl4rck/ [use lowercase DL4RCK]
HF serial modem plans & RTTY & Pactor	http://home.att.net/~k7szl/
SV2AGW free Win95 programs	www.raag.org/index1.htm
Source for BayPac BP-2M & APRS	www.tigertronics.com/
BayCom — German site	www.baycom.de/
BayCom 1.5 and Manual.zip in English	www.cs.wvu.edu/~acm/gopher/Software/baycom/
N1RCT site — excellent RTTY ref.	http://www.megalink.net/~n1rct/
Int'l Visual Communication Assn. — nonprofit org. dedicated to SSTV	www.mindspring.com/~sstv/
Creative Services Software	www.cssincorp.com
Hellschreiber & MT63	www.freeweb.org/varie/ninopo/iz8bly/index.htm

Table 1. *The chart from Hell(er) — your guide to good things on the Web.*

The software of choice is the MixW package that I reviewed last month. I wrote the article for last month using the demo version of the program, and it seemed to do well. The demo version installed easily and, once I got past the series of operator errors, the performance was excellent.

This should mean the installation of the "real" software should be a snap, right? Well, there was a difference and it did give me a few fits for a time. I learned a partial lesson about a resident file labeled Wininet.dll. I didn't really want to learn about this, but this is what I found, and I doubt it will happen to you.

The MixW program comes with a regular Windows95™ Install mechanism and the installation goes like clockwork ... except ... I messed with it. I have a partitioned hard drive and I changed the installation address to the "G" drive rather than the default "C." My C partition is a bit overfilled.

Education — no extra charge

This shouldn't make a difference ... or so I thought. Well, a hitch developed in the get-along. The program would display an error message on boot-up. The message was based on the .DLL file I mentioned. I did a little checking and at the Microsoft Web site there are listed about 100 incidences of complaint on the little-wonder file.

Apparently nobody had reported such a problem to Jim WA2VOS, who handles the paperwork for this software. He seemed to feel I should not have messed with the installation process.

I wasn't desperate yet. I decided the problem could simply be that the file was the wrong version to work with the software. I copied a different version of the file from the laptop, but soon found I was in trouble when I went to rename the file in the desktop. Access denied. I thought of one method I hadn't tried for access after I posted the details of the problem on the MixW reflector.

Hams to the rescue

Shortly after the posting, I checked back and there was a message from Nick UT2UZ, the author of the MixW software. I still don't know all there is to know about that file, but Nick sent me a fix to install that cured the problem in just a few minutes. This was a day when I lacked the time to work steadily for a solution.

So finally, at midnight, as I was configuring a few macros, I noticed a strong signal from out Tokyo way, gave it a call and bingo, I was in business. Excellent report, even with the beam in exactly the wrong direction.

The point of this is there was an attitude of helpfulness with this problem. I appreciated the effort extended by Nick to supply a fix. I am sure he had a few other things going on in his life just as I had that day, but he came to the rescue in the true ham spirit.

So, you may wonder, why would I actually pay cash for a program to work PSK31 when there are so many freebies out there. I wasn't really retaliating to the admonition to get with it and get a modern computer (though that was an incentive). The MixW software also has a logging system and, of greater interest, it also does RTTY (very well), has two new modes, FSK31 and MTTY, and it will also send and receive packet on HF and VHF.

It appears there is more development on the way, because there is a "Pactor Listen" function so it will copy Pactor and, just for fun, it also copies Hellschreiber. I don't claim to have any inside dope on what is in the future for the program, but it looks like a very promising project.

New modes to experiment with

I haven't had the time and patience to try the FSK31 or the MTTY mode. I have observed others on the MixW reflector attempting skeds to experiment and just a few, at this writing, have managed to make contacts. The advantages of these modes will probably be better known as time marches to its tune. I will let you know.

And along came Zakanaka

The new Zakanaka is worth looking into. The download and installation goes well. And I have managed to run it successfully as long as I do not run Logger at the same time. That may seem to defeat some of the purpose of the package, but in the interest of seeing what's new, a little effort is justified. After all, if logging is important, a few pencil notes and a later entry is not all that bad.

I snapped a screen shot of Zakanaka in action (**Fig. 1**). One of the more impressive features is the full-width tuning display. The screen shot shows three signals in the display. There were probably more that were not displayed due to the limitations purposely placed by the radio's filter at the time.

Any of the signals can be instantly tuned by clicking with the mouse. The one currently tuned is the one on the left, as indicated by the two parallel lines just above it. The other tuning indicator in the upper right of the receive screen is reminiscent of the Logger PSK31 module's tuning system.

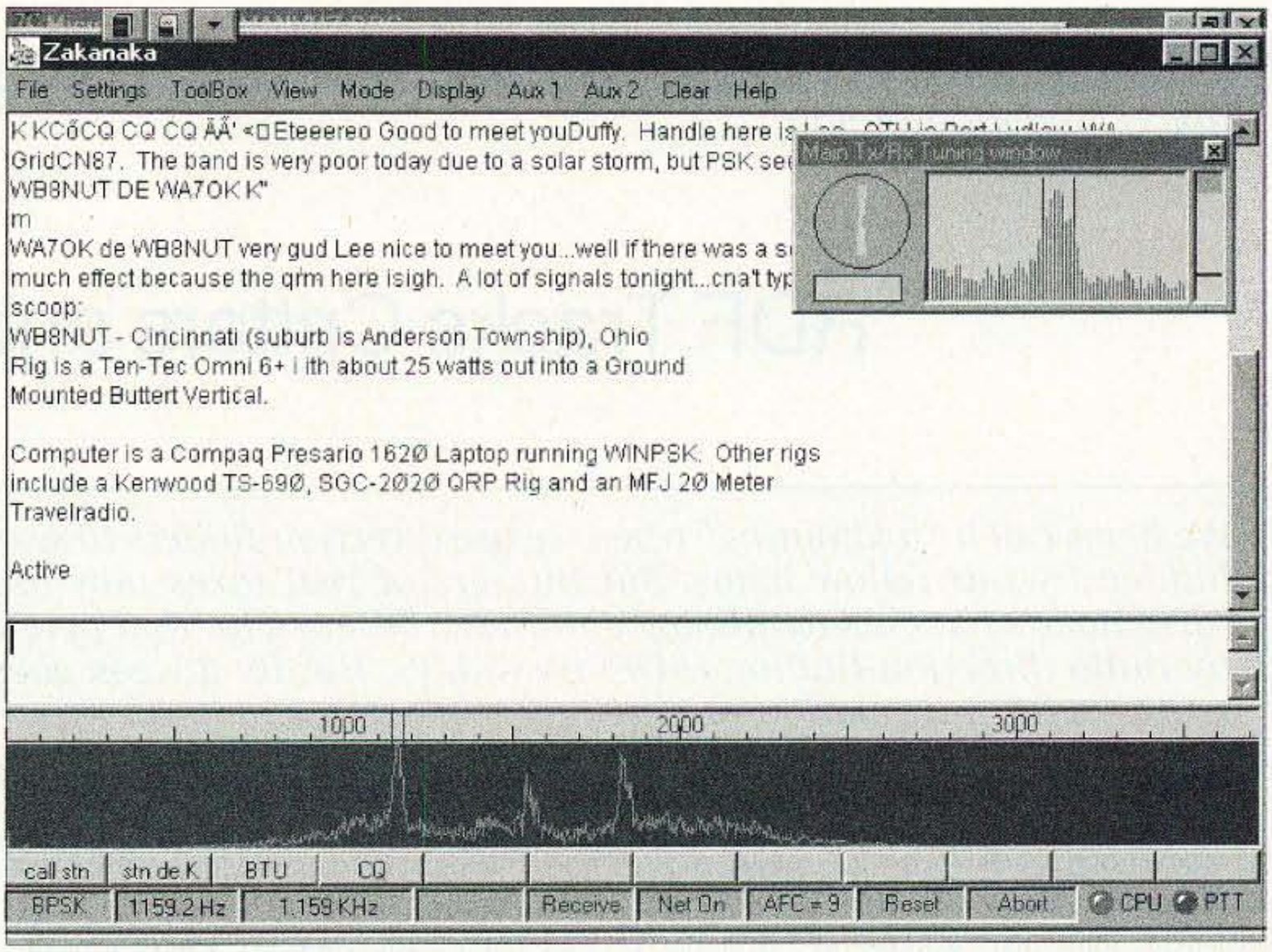

Fig. 1. *The first release of the Zakanaka PSK31 program. All the bells and whistles were not in place at this time, but there was enough there to use the program, and it works well. It is intended to be run with Logger in the background so the programs can interact. This setup requires at least a 150 MHz processor and "lots" of RAM. Since my computer doesn't qualify, I could only evaluate the one piece of software at a time. The full width tuning display at the bottom is as easy to use as any and the help file is well written. See text.*

This smaller indicator can be clicked and dragged elsewhere to suit your fancy.

The programmable buttons just below the main tuning display are to be programmed and named by the operator. In practice, three times as many buttons are available by choice of the setup. They are activated by mouse click. I feel the need for several basic macros to save typing callsigns that I forget in the course of a contact.

It had been several weeks since I made up the few macros seen here, and I have to tell a little story on myself. I couldn't recall which programs snag callsigns with a double-click in the receive window. I saw a station calling CQ, double-clicked on the callsign, and didn't see evidence of it being stored on-screen. (This was the first beta release.)

Next, I clicked the "call stn" button and found that not only was the calling stations callsign already in the macro, but I had also programmed the key to not only call the station but go automatically into transmit mode. I was just about to make a contact, I thought, and all the time I was just looking for material about the program. Conditions weren't too good and a station that was closer to the station calling CQ won that one. Well, I learned what that double-click would do. I imagine future releases will make the operator aware of what is going on "behind the scenes."

Anyway, even if I can't convince my little weakling computer to use the new system in its entirety, it is a good working piece of software. I have to admit that. One of the nonfunctioning areas of the program due to computer limitations is the transceiver frequency, which should be displaying in one of the boxes at the bottom left of the screen shot. That display works in conjunction with the Logger program which polls the transceiver — then the Zakanaka program takes the information and displays it. I did experience that before the series of crashes mentioned earlier.

More to come

Of particular interest, in the "Mode" pulldown menu, there is a RTTY choice listed. There is no RTTY module as yet, but it may give some idea where this piece of software is headed. Looks like an ambitious undertaking.

Also, the QSO information as gathered by Zakanaka is somehow stored in the Logger program when they are running concurrently. Gee guys, this sounds so good I am

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RDF Tracks Critters and Bugs

We hams call it "foxhunting" when we use direction-finders to search on foot for radio transmitters hidden by our fellow hams. But hunters of real foxes now use RDF, too. From stolen cars to Alzheimer's patients to missing children, there is a lot that people want to find and keep track of by radio direction finding (RDF) nowadays. Hardly a week goes by without my getting several requests for information on tracking systems for various uses. Today's mail brought two.

One inquiry was from the owner of a business, wanting an RDF solution for expensive tools that "wander off," to quote him. The other writer wanted "a homing device 3/4-inch long and 5/16-inch diameter." He didn't give any information about intended use, range, transmission duration, or anything else that might help me answer him.

From the beginning, I have tried to respond to every inquiry, no matter how vague or outlandish. I have learned a lot in the process.

Photo A. *"Finds hidden transmitters! Ensures privacy." That's what it says on the NCG RF Bug package.*

One of the most memorable letters came just after "Homing In" first appeared in 1988. Tracy from Kansas wrote: "I have a friend who needs help with tracking his coonhounds. He says when they get out of hearing distance, it sometimes takes all night to find them. Yeah, I used to laugh too, until I heard how much money, prizes, and stud fees a good coonhound can bring in. By the way, we like to build from used parts, to help hold down costs."

I suspected that someone was pulling my leg when I saw this postscript: "Dorothy and Toto send their love." Nevertheless, I answered as best as I could at the time, something about looking into the animal tracking tags used by university researchers.

As it turns out, Tracy was completely serious, and I soon learned that other dog owners have similar needs. Helping them has created a thriving business for at least one company. Gary Tripp of Grifton, North Carolina E-mailed a few months ago to say that *73 Magazine* and my RDF book helped inspire him. "I really enjoy your 'Homing In' articles," he wrote. "They have served as a valuable resource in my transmitter and receiver development. My copy of *Transmitter Hunting — Radio Direction Finding Simplified* [Moell and Curlee, TAB/McGraw-Hill, ISBN 007-1560068] is well worn." I had to find out more, so I called him.

Gary doesn't have his amateur radio license yet, but he has a strong interest in ham-related technologies. "North Carolina State did a telemetry study on the deer population in my state in the early '70s," he explained. "I was just a kid at the time, but the radio tracking was interesting to me."

Magnum Telemetry, the company that Gary started about six years ago, makes rugged miniature VHF transmitters and the equipment for tracking them. "We've done projects for fish and wildlife services in just about every state, and we've even had some international business," he says.

The majority of Gary's customers are individuals who own hounds for sport hunting. When the dogs are following the scent of an animal such as a fox or raccoon, they may run several miles away from their owners. Radio tracking allows the humans to catch up and to round up any hounds that stray from the pack.

Hounds in the Bible Belt

Although Magnum has customers from Canada to southern Mexico, most are in the Bible Belt, as he puts it, from Virginia to Louisiana. "That's where the foxhunters and coonhunting fraternity live," he told me. "Other customers are hunters of cats (mountain lions), bears, and the like. They also use hounds, and they're spread about in the parts of the country where those animal populations exist and it's still wild enough that they can pursue them.

"There's two disciplines," he continued. "One is exactly as existed in old England and was brought to the USA by Thomas Jefferson, George Washington, and other rogues of that era. Other than the fact that the land they use is dwindling due to the population increase, foxhunting is exactly the same as they've practiced it for hundreds of years. We don't have the same amount of game available nowadays, but it's done in the same way.

"We go out as a group. It's a social event. We're hunting in large tracts of timber, so it's rare to be seen by the general public. In some states it's illegal to pursue game with hounds, but here in the Bible Belt it's very popular, a tradition for years and years. My

great-great-grandfather hunted, and all of us since have.

"In Kentucky, some foxhunters ride $50,000 horses and have huge packs of hounds. They hire houndsmen that are paid year-round to keep up their hounds. On a horse, it's sort of a different story than RDFing out of a pickup. You can't mount an antenna on a horse. Typically, a mounted hunter uses a hand-held yagi with a fairly short coax and the receiver in his pocket. It's a folding yagi and we offer a little nylon case for it that will attach to a saddle. Almost all use the receiver's speaker — very few use an earphone.

"There's another foxhunting group that's totally different. They are actually there primarily for the hunt, though only in about one out of 200 trips would they actually kill a fox. They're in it for the chase, though, and that's the exciting part for them. I guess it's the same as it is for you hams pursuing a hidden transmitter. They use their pickups and CBs, but they hunt mostly on timber company lands, 10,000 to 20,000 acres or more. I've been on both sides and both are different, but both are good groups.

"We build our radio collars in-house. Most of them put out about 20 milliwatts in the 215–225 MHz range, giving 60-millisecond pulses every second or so. We typically cater to foxhunters who have about 15 to 20 hounds in their pickup. All those would have active transmitters on them. They would be trying to track or triangulate hounds that are out, say a mile or so from them. Our receiver allows them to space those transmitters out frequencywise. There's very little interference among them.

"For some customers, we add a 'tree switch' to the collar. Hounds that bear hunters use will bay the bear up into a tree. When the hound raises up on its front feet onto that tree and tilts his head back, a mercury switch kicks a resistor in parallel with another on the timing circuit and it makes the transmitter pulse at a faster rate. This lets the hunter know that the hound has trapped a bear and they need to get there quickly.

"Some hunters in Utah and Idaho use earphones because they're dealing with really weak signals and long distances in mountainous terrain. Most of the time they're in contact with their hounds, but occasionally one will get out and they won't be able to locate it. Then they'll use their radiolocation equipment to get in touch. Occasionally, a hound will slip out of its radio collar and you have to go find it.

"For them, especially, we do everything possible to get the sensitivity up. We use high-gain low-noise preamps on the receivers. Hunters in mountainous terrain use a 5-element beam to get the most signal. It's not unusual to get 12- to 15-mile range.

"Our product reliability is very important. Since hounds are a major investment, those guys want to keep them. For instance, bear hounds cost $5,000 to $10,000. It takes a few years to train one and you usually only get one really good one out of fifty or so."

To achieve the highest reliability, Magnum's collars are hermetically sealed to prevent corrosion. "It's not unusual for them to be under water for significant periods of time in the field," Gary says. Transmitter batteries are soldered in, not replaceable by the user. When they run down (which takes 3,000 to 16,000 hours, depending on the collar), Magnum refurbishes the unit. A magnetic switch inside each collar allows the user to turn it off by putting a bar magnet next to it.

"I think what really spurred on the use of radiolocation in hunting is that true wildlands are disappearing," adds Gary. "There's very few places where we can hunt 30,000 acres or so without encroaching. Radiolocation helps you control your hounds and it shows ownership and responsibility."

RDF is a boon to hunters because it helps them train their hounds, protect their investment and enjoy their hunts. It also has benefits for nonhunters. According to Gary, "A big reason these guys use RDF equipment is the responsibility side of it. They don't want to impose on people that aren't familiar with their sport. They are hunters, but they care about wildlife. I know they would help out your burrowing owl researchers in a heartbeat if they could. It's a great group of people, rooted in traditional values."

If they could see foxhunting nowadays, I wonder what George Washington and Thomas Jefferson would say.

"RF Bug" put to the test

At last year's Hamcon transmitter hunt (See "Homing In" for January/February 2000), one of the twenty hidden Ts was inside my conspicuous van, which was parked near the starting table. It should have been easy to track down, right? Not necessarily, because the hunters had to figure out which one of ten labeled antennas on the van was radiating the signal!

For some, this was a big problem. But as one hunter approached, he pulled out a small device, the size of a short stack of coins. It was the smallest RF "sniffer" that I had ever seen. I discovered later that it's also the least expensive.

Field strength meters (FSMs) have been around for decades. You can find construction plans for early versions in ARRL *Handbooks*

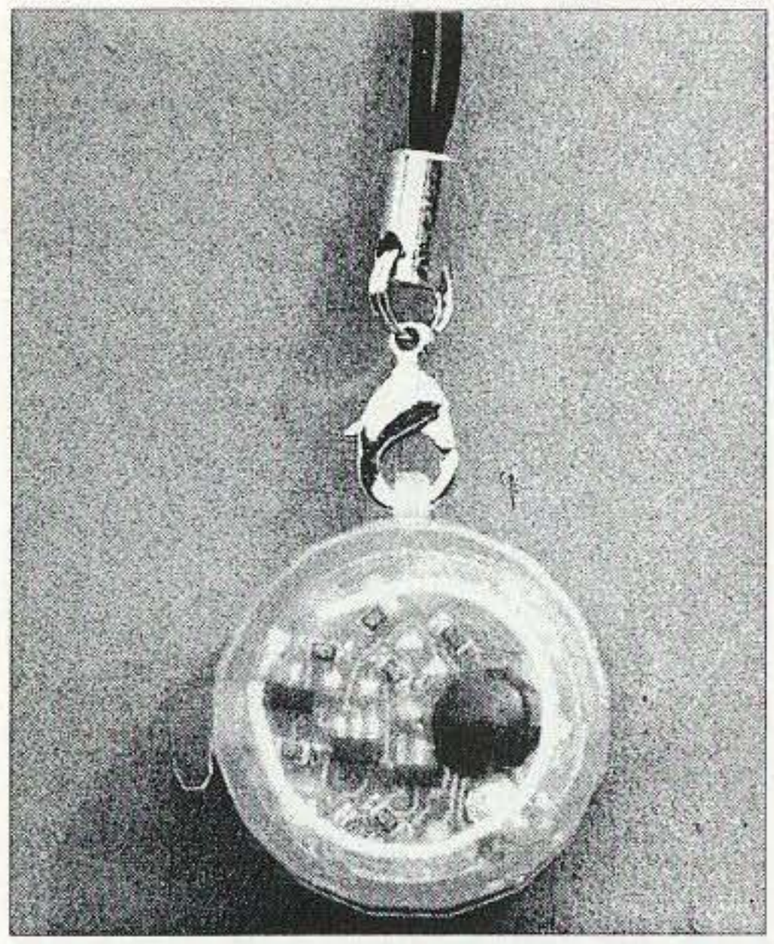

Photo B. *The KC1 is the size of a stack of six nickels, with a cord for attaching it if desired.*

of the 1950s. Hams used them to eke out the maximum amount of RF from their antenna systems. They placed them several wavelengths away and tuned their antenna coupling circuits for maximum meter indication. Sometimes FSMs with tube amplifiers

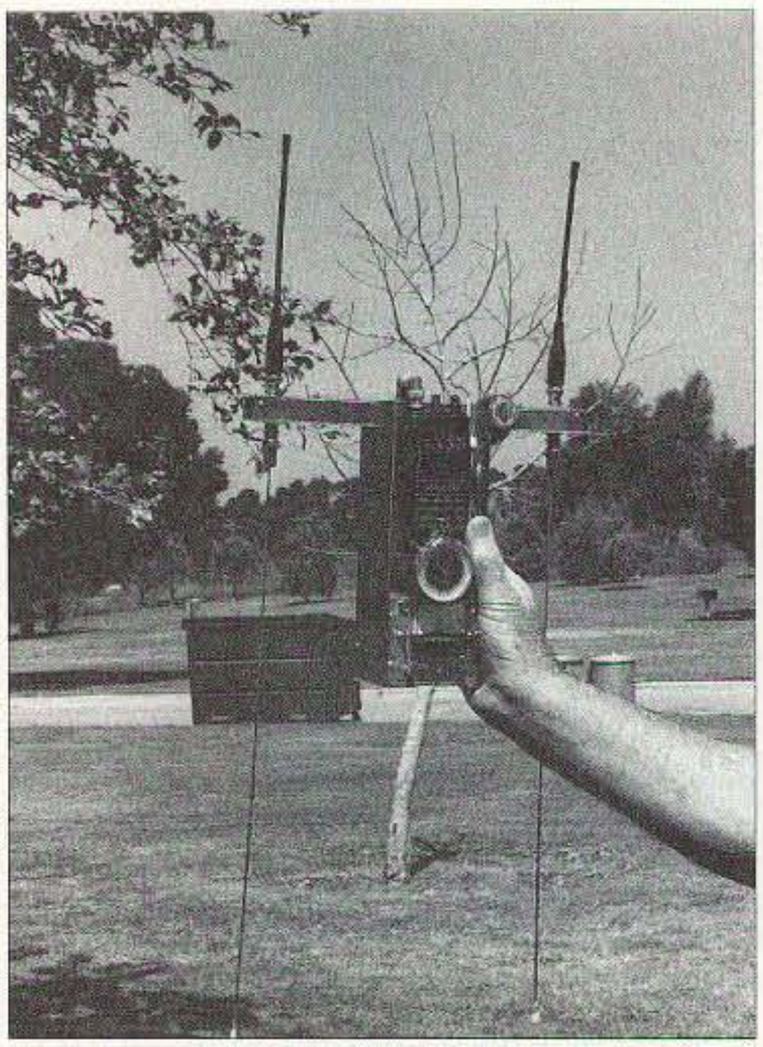

Photo C. *Dan Welch W6DFW mounted a KC1 to his dual-antenna sniffer for a recent transmitter hunt in Fountain Valley, CA. Look closely to see it on the horizontal boom.*

were included in vehicular installations, to help operators get the highest efficiency from their high-Q mobile antennas for the HF bands.

In recent years, FSMs have found a new market — bug sweeping. Believe it or not, there are plenty of people who think that there are tiny transmitting devices all over their homes and offices, ready to capture and send their most intimate conversations to earphone-wearing agents in trench coats sitting nearby in dark vans. Simple FSMs costing a few dollars to build are easy to sell to these folks, sometimes for hundreds of bucks each.

Was it this market that prompted NCG Company to introduce the KC1-R and KC1-B "RF Bugs?" (**See Photo A.**) Distributed in the USA by dealers of Comet antennas, these little devices "find hidden transmitters and ensure privacy," or so it says on the package.

The KC1-R and KC1-B (the only difference is color of the case) weigh only a quarter of an ounce each. Inside the almost-clear plastic case are a coin-cell battery and a circuit board with six light-emitting diodes (LEDs) and other surface-mount components. The two-inch antenna is curled inside the case (**Photo B**).

The obvious question from prospective purchasers of the KC1 is: "What's the range at which it activates?" The answer isn't simple. The antenna is curled up in almost a full circle and there is no counterpoise except for the tiny circuit board. So sensitivity depends on orientation and where it is (hand, pocket, etc.). It also is a function of the transmitter's power, frequency, and modulation. In my tests, I usually held it in my hand at arm's length from my body.

NCG claims that the KC1 activates within 12 inches of PCS phones and 40 inches of 800 MHz cell phones. In my tests, it didn't light until I got to 15 inches from a 800 MHz 1.2-watt analog mobile phone. Hand-held 800 MHz phones run only 600 milliwatts, so detection distance with them should be even less.

Other portable phones gave less detection range: Two inches from 900 MHz spread-spectrum handset or its base, one inch from a 49 MHz cordless handset, and a quarter-inch from its base whip. On the other hand, the first two microwave ovens that I tested set off the KC1 at one foot from the door.

What about two meters?

No claims are made on the package about performance on ham bands. With its very short antenna, sensitivity on frequencies below 500 MHz ought to be much less than at UHF and microwaves. Detection distance for a typical 146.565 MHz ammunition-can half-watt hidden transmitter with quarter-wavelength whip antenna turned out to be 4 inches from base of the antenna and closer at the antenna tip. It was the same for a typical two-meter handie-talkie.

A 25-watt 146 or 225 MHz mobile rig on a 5/8-wavelength antenna would activate it at six to eight feet from the antenna. It should be possible to open the case and attach an external antenna to the board for greater sensitivity on HF and VHF, but I haven't tried that yet.

The KC1 has no sensitivity control. On most FSMs, you can dial back the sensitivity to readily determine which antenna in a closely spaced group is radiating. You can't do that on high-power transmitters with the KC1 unless you wrap it in foil.

What about finding those secret listening devices? They have very low RF power output to keep the battery size as small as possible. My guess is that you'll spend a lot of time sweeping with the KC1 before you find one. An Audio Technica wireless microphone on 170 MHz wouldn't activate it until I put it within one inch of the rear of the case.

One transmitter hunting task for which the KC1 is well suited is proximity warning. Many dual-antenna RDF add-on units such as the Vector-Finder by Radio Engineers and the Foxhound by Ramsey Electronics give left-right and front-rear indications only, with no attention paid to signal strength. Using these units, it's easy to walk over or past a buried or otherwise well-concealed transmitter. By including a KC1 in the system as the hunter in **Photo C** did, you'll know you're very close when the lights start flashing.

The KC1 really isn't an FSM, because there is no meter. The LEDs aren't a bar graph, they just flash in sequence. That makes it difficult to use as a tune-up aid. The LEDs continue to flash for ten seconds after the RF goes away. This improves detection of pulsed signals such as digital phones, but it detracts even more from its usefulness as a measurement tool. Hey NCG, how about a ham model with a bar graph and without the long delay?

There is no ON/OFF switch. When you remove the plastic strip to connect the CR2032 battery and activate the unit, it draws about 4 microamperes in standby. Don't worry too much about draining the battery, as it should last about 6 years that way. When the LEDs are flashing, it draws an average of about 13.5 milliamperes, so one battery should be good for over 5000 ten-second activations.

Bottom line: Despite its high "cuteness" factor, the KC1 is just a crude RF indicator, not a calibrated test instrument. For 15 bucks, it's worthwhile for doing quick checks of transmitters and antennas, and to verify if the antenna you just spotted is that of the hidden T or just a decoy. But serious foxhunters will also want to have a better FSM with sensitivity control and external antenna provisions in their RDF arsenals. 73

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Time on My Hands

And things to do with it — like write articles.

Having been retired at the tender age of 55 for medical reasons, I found myself with a considerable amount of time on my hands and looking for ways to occupy myself without driving the XYL totally berserk. As a long-time but inactive ham, I decided to get active on the air — not just VHF, but HF as well.

An issue of *73* suggested sources for used equipment and auctions, and I rapidly made contact with an interesting chap in Florida who just so happened to have an Icom 740 for sale at a price that fell into my budget. Not wanting to make a long story even longer, the equipment and my check changed hands, the addition of a GAP Titan antenna, some coax, and I found myself on the air and loving every moment — except for the fact that I wanted a watch that would indicate both local and GMT times *and* have separate calendar dates for each zone.

Looking back to my misspent youth, I recalled the lovely Rolex™ GMT Master which sat proudly on my wrist, throughout my tours of duty in SE Asia, while working for the US government. A quick Internet search revealed that a replacement for said watch would cost about $3,000 more or less, and the XYL was adamant about not spending that much on a watch. The same day, nursing my wounds (fry pan applied to side of head at close range), I happened upon a display for Timex™ watches, and noted that a considerable number of them featured dual and even three independent time zone displays. This seemed like something to look into further, so I examined several and discovered that the Expedition model watches had both dual time zones and independent calendar date displays, *and* they sold for less than $30 at my local mass merchandiser and discount store.

We acquired one and determined that we could set the basic or default time to read local EST with its applicable date, and the second time zone could not only be set for GMT, but with the corresponding date and 24 hour format as well. A press of the mode switch selected the second time zone, which remained displayed until you elected to switch to one of the other many features. This watch, costing a fraction of the amount I would have liked to spend on a Rolex, has served me well during periods of communications when I want to know the UTC, GMT, or Zulu time for logging, QSL cards, etc. The watch is rugged, accurate, and above all cheap, and has made my ham activities just a bit more fun — except that I do dearly miss that Rolex, it had real snob appeal. So if you are looking for a watch for Field Day, DXpeditions, or just to impress your JAG fans, you can't go wrong with any of the Timex Expedition series digital watches. Just make sure that the model you select has independent date function.

Power and the loss thereof

For perhaps only the second time in the past two hundred years or so, the South, and specifically the home QTH area of Smyrna (a suburb of Atlanta, Georgia) has had an incident referred to as the "recent unpleasantness." The first such reference, I am told, referred to the illegal occupation of the South by the North during what was called the Civil War. The week started out just fine — in fact, we had record high temperatures — and then it happened: A combination of severe cold weather and the grandpappy of all ice storms left some 400,000 of us without electricity, heat, and every creature comfort that comes with it.

The home QTH was a pleasantly balmy 40 degrees (inside) (outside with the wind chill it was around 10 degrees), and for the next four days it was more of the same. Trees which had graced our modest home, Tara,

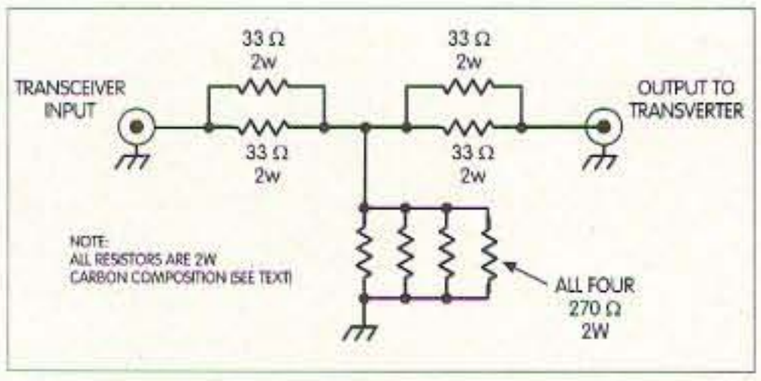

Fig. 1. *Attenuator circuit.*

were covered with ice, and the combined weight of the ice, plus high winds, caused them to come crashing down on the house, my daughter's car, and generally making life even more miserable. Lucky for us, we found a motel which would accept the family retainer, a well behaved Lhasa Apso, and we sweated out the balance of the storm in relative comfort considering the only open restaurants asked if you wanted it "super-sized."

Once things had returned to normal, and the family to Tara, I set out to ensure that the ham rig would at least be operational no matter what. Being physically challenged (that's politically correct for handicapped), I have the advantage of using an electric-powered chair to get around in. The chair obviously runs on batteries, and batteries have to be replaced on a periodic basis. In fact, they recommend replacing the two healthy-size sealed 12 volt gel cells on an annual basis, regardless of their condition. Having just replaced mine before the storm, I looked at the two "old" batteries and learned that they were capable of delivering 33 Ah (amp-hours) each. Hmmm, if I connected them in parallel, that would mean I'd have something in the neighborhood of 60 Ah to supply power to whatever rig I wanted to use. A quick bit of wiring, positive to positive, negative to negative, placed them in parallel (they were series connected for 24 volts in the chair) and overnight on the conventional automotive battery charger resulted in a ready-to-use, relatively high-capacity emergency source of DC power.

OK, so you aren't lucky enough to be physically challenged. You just might, on the other hand, be able to get your hands on two or more of these batteries by letting your fingers or keyboard (assuming computer literacy) do the walking in the local Yellow Pages directory under medical equipment. What you are looking for is a dealer who services and perhaps sells electric mobility aids, commonly referred to as "scooters," or powered chairs. A phone call, followed up by a visit, just might result in you carting away some of the old batteries or at worst paying a few dollars for them. These batteries, as I mentioned, are quite heavy-duty — the 33 Ah rating is not unusual — and quite frankly, the two I have, even after a full year's use and recharging, are still quite viable.

If, on the other hand, you don't like walking through the Yellow Pages, or for that matter calling people up, the same batteries are available, along with literally thousands of others, from a company called BATTERIES PLUS™, a national chain of stores selling every type of battery you can imagine, and probably a dozen or so more that you've never even considered. They have a Web site: [www.Batteriesplus.com], and a toll-free number, 1 (800) 67START, if you need more information. By the way, the batteries for my chair sell new for about $45 each, so even if you can't get a used pair, the new ones aren't all that expensive.

How to peacefully coexist with your transverter

As I was setting up my station, I'd heard that six meters was getting quite hot, and rather than buying a single rig for six-FM, one of my friends at the repeater association suggested the Ten-Tec 6 Meter Transverter. Naturally, I ordered one, but I did take advantage of their used and demo listing to buy a factory-wired unit (demo) that was ready to go and carried a warranty same as new. There was one catch: The input from the transceiver could not be more than 5 W, and as far as I could tell, the Icom 740, even with the RF cranked all the way down, could put out more than was safe to use.

Obviously, some sort of attenuator circuit was necessary. The transverter specifications showed that the input at 5 W would result in about 10 W out on six, which was exactly what I wanted, at least for now. I could have gone into the rig, and, using the chart supplied in the Ten-Tec manual, changed a single resistor value and been "good to go" just as long as my RF input did not exceed 10 W. The manual cautioned that you would not be able to operate in prolonged key-down situations such as FM. Well, considering the fact that I could not accurately verify the output, even with the RF turned all the way down, the circuit shown in **Fig. 1** was born.

There's nothing overly complex about it. You need a total of eight resistors, four 33 ohm and four 270 ohm 2 watt composition resistors. So, I lied: There is a bit of a problem. Last time I looked at my local Radio Shack, the resistor assortments stopped at 1 watt, and I had to search high and low, without success, for a local source of what used to be a fairly common value and wattage. Nothing stops a reader of *73,* and a small ad from RF Parts Company and a minimum order (I think it was $25) brought these now nearly extinct components to my door. RF Parts has a Web site [www.rfparts.com], and a toll-free number 1 (800) RF-PARTS [or, for the alphabetically challenged, 1 (800) 737-2787]. We mounted the resistors on a couple of terminal strips (you do know what a terminal strip is?) and used two SO-239 coax connectors for Transceiver RF in, and Output to Transverter. The circuit, mounted in a small minibox, provided us with a margin of safety and several happy days of contacts on six meters, all modes. Try one yourself — it's a natural if you aren't sure how low your rig can go. While you're at it, tell the folks at RF Parts you read about them in *73.*

Computers: Every article has to mention them

There seems to be an unwritten rule that every, or almost every, ham or technical article has to mention or refer to computers. Not willing to break the rule, we will mention computers. Hams and computers go together like white on rice, unless, you are health conscious, and then it's brown on rice. We are bombarded with ads for them on TV, in the newspapers and magazines, and everyone wants one. So as a ham, you are no exception, except that you

are a bit smarter. You know that last year's technology or, for that matter, technology that's two or even three years old is more than adequate for logging, rig controlling, PSK31, and packet operations. You are the last person who will spend too much for a computer — or are you?

Hamfests are great places to meet people, buy a boat anchor or two, even pick up some small parts or antenna cable, but they are the last place I'd go to buy a computer. Granted you might see a bargain, but can you really evaluate this bargain, will it work when you get it home, does it even work now? Think about it, and let me tell you about another source, not unlike the gel cell batteries, that can save you some real money while getting a good value for whatever money you do have available.

Given that technology changes at a rate almost equal to the current increases in gasoline prices, and that companies big and small are afraid to be left behind the "technology curve," whatever that is, there are hundreds of computers being declared excess and or surplus by these companies rushing to buy the very newest, fastest, and "best." Then, you might ask, where do these old computers go? Excellent question. Large and small companies contract with other companies such as Technology Renaissance [www.ovinet.com] to purchase their old systems, refurbish them, and resell them to others. The technology can be as "young" as last year's laptop, or as old as a two- or three-year-old desktop. Regardless of the age, the seller considers them old hat, obsolete, not enough bells and whistles to meet today's needs, and you can benefit.

I first came across these resellers when I wanted a laptop for use when I spent a prolonged stay in the hospital. What I wanted was something to surf the Web, and not a great deal more. It had to be small, and relatively powerful, and it had to be CHEAP! My first laptop was an AT&T 486 DX-100, with 40 MB RAM, 750 MB hard drive, Active Matrix Color Display, and 28.8 modem, and came with a carrying case and the business card of the previous owner, an AT&T salesperson. As I recall, the whole package cost me less than $450 with a one-year warranty. It did the job for me — perhaps the salesperson needed something faster, a Pentium or better, but for my purposes, it was a great deal. I used it for over a year, and then made the mistake of lending it to Number One Daughter to use at college. Within a month, a computer that probably had bounced around in a car trunk for a few years, spent more than a few days in hospital, was dead — beyond resuscitation. Imagine how I'd have felt if it was a new $2000+ system. I cried a bit and called their local number and found I could now get a Pentium, Compaq 5400 Lite with CD-ROM, 2.3 GB hard drive, 32 MB RAM, color display, 56K modem, and a year's warranty (but no case) for less than $600. I jumped at it, bought my own case, and am presently wiring up the interface for PSK31 and looking for a good logging program (any suggestions, please E-mail). When I picked my system up, H-P Vectra desktops (Pentium) were selling for as little as $125 (less the monitor).

Your best bet in finding a company like I did would be to call around. They might be listed in your phone book as Computer Resellers, or you might call the IS (Information Systems) people at any large company in your area. They should be able to steer you in the direction of whoever buys their old systems.

It's a wrap

One thing's for sure: You can have time on your hands and make the most of it, or you can just watch it go by [or "go buy," as the author Freudianly had it originally — ed.].

Remember, if you contact any of the companies listed in this article, be sure to tell them you read about them in *73 Amateur Radio Today!* 73

NEVER SAY DIE

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someone to Korea to find out how they're able to run circles around us with schools that cost one third of ours to run.

We don't have to do that. There are several books I've reviewed in my editorials and are also reviewed in my *Secret Guide to Wisdom*, which tell about American schools which are graduating outstanding kids at a fraction of our public school costs. But as long as you keep reelecting your crook to Congress, the NEA's millions of dollars in reelection campaign donations are going to cost you and your children billions and put American businesses at a competitive disadvantage with other countries.

Some Nerve!

Now that I understand that serendipity is often more than just chance, I enjoy it all the more when it happens. Like today.

It started this morning with a phone call from a reader in Last Vegas who wondered if I'd heard about using an automotive circuit tracer buzzer on warts and stings. Well, no, but I did know that Amazonian Indians used a wire from the spark plug of their boat motor to neutralize snake bites, and that some people in Australia cured a deadly virus by getting zapped with an electric fence. The Jungle Flying Doctors take along a little hand generator for snake and other poisonous bites. The serendipity came in when I was filing things that had piled up around my office and I came to a booklet on the ElectrIcare nerve stimulating unit from Nikken, the magnet company. It seems to be similar to those little crystal-powered gadgets, but run by batteries.

Today's doctor's concentration on pills and shots, and the blind eye medical research has turned on alternatives such as acupuncture, magnets, electricity, and even the psychological component of illnesses, is a shame on the medical establishment, and one whale of an opportunity for independent researchers to show them up.

Atomic Physics?

There's a lot of wool pulling going on, what with the zoo of particles physicists have discovered once they blew atoms apart. But, for all the billions of dollars put into scientist welfare (called research), current theory doesn't explain such basic stuff as gravitational, magnetic, or electric fields. Or why we have inertia. Or how photons and radio waves travel through space and act like both particles and waves. Quantum theory? We see it in the lab, but scientists have no good explanation for it. Current theory doesn't tell us about the structure of electrons, protons, or neutrons. It doesn't tell us what energy or electricity is. Or how matter can be turned into energy and vice versa.

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PROPAGATION

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The Doldrums

The BEST days for propagation are likely to be August 7–10 and 27–31, while the POOREST days are expected to be August 15–24. The remaining days should be Fair (F) or trending between propagation conditions as shown on the calendar.

The usual summertime doldrums will also prevail on the HF bands this month, accompanied by signal fading and generally weak strengths between about 10 a.m. and 2 p.m. local time in your area. Morning and afternoon short skip and DX signal strengths will be generally better than at other times during the day, and on the BEST days, the 15, 17, and 20 meter bands may be open long after local dark.

So far, Sunspot Cycle 23 has produced disappointingly low solar flux values (200–250) well below the peaks of previous cycles (300–350). During May, the solar flux dropped to 135 or so for several days. The number of magnetic field disturbances caused by solar disk events appear to be reaching a maximum as this is being written, an indication that cycle 23 may be close to its peak. If correct, we can expect a slow decline in HF propagation beginning about 2001 and lasting over the next five years to a low during 2005 or 2006.

One interesting phenomenon I have noticed during the past year or so is that the actual band "conditions" frequently DO NOT seem to correlate with the solar flux values or the Boulder A and Boulder K indices broadcast by WWV at 18 minutes after each hour.

EASTERN UNITED STATES TO:												
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							17/20	15/17	15/17			
AUSTRALIA	12/15	12/15			12/15	20/40	12/15	20				
CENTRAL AM.	15/17	15/17	15/17	40	40		20	20			10/12	10/12
EUROPE		30/40	30/40					12/15	12/15	20/15	12/15	12/15
FAR EAST						20	15/17	20				
HAWAII	12/15	12/15	20/17	20/17	20/17		20					
INDIA	20				20	20						15/20
MID-EAST	20	20/40	20/40							12/15	12/15	12/15
RUSSIA/C.I.S.	17/20	17/20	17/20									17/20
S.E. ASIA	15/17	17/20										
SOUTH AFRICA		40/30		17/20				12/15	12/15			
SOUTH AM.	15	15	20	20							10/12	10/12
WEST COAST	15/17	20	20	30/40	30/40	30/40	30/40		10/12	10/12		15/17
CENTRAL UNITED STATES TO:												
ALASKA	15/17	17/20	17/20			30/40	17/20	17/20				
AUSTRALIA	15/17	15/17	17/20	17/20	20		20	20				
CENTRAL AM.	15/17	17/20	17/20	17/20	17/20		17/20	17/20	15/17	10/12	10/12	10/12
EUROPE	17/20	17/20	17/20									17/20
FAR EAST	15/17	17/20	17/20			30/40	17/20	17/20				
HAWAII	15/17	15/17	15/17	20	20/30	30/40		17/20				
INDIA	15/17	20					20					15/17
MID-EAST	17/20	17/20	20									
RUSSIA/C.I.S.	17/20	17/20	17/20	17/20						12/15	12/15	
S.E. ASIA	15/17		20	20				20				15/17
SOUTH AFRICA				20					15/17	20	20	
SOUTH AM.	10/12	15/17	30/40	30/40							10/12	10/12
WESTERN UNITED STATES TO:												
ALASKA	10/12	15/17		20	20	30/40		20				15/17
AUSTRALIA	10/12	15/17	15/17	20	20	20/30	30/40					
CENTRAL AM.	15/17	15/17	20/30	20/30	20/30	30/40				10/12	15/17	10/12
EUROPE	20						20		15/17	15/17	20	20
FAR EAST	10/12	15/17		20	20	30/40		20				15/17
HAWAII	10/12	17/20	20	30/40	30/40	30/40	20	20		15/17	15/17	15/17
INDIA	15/17							20	15/17			
MID-EAST	20	20							15/17		20	
RUSSIA/C.I.S.	20	20	20	20								20
S.E. ASIA	10/12							20	15/17	15/17		
SOUTH AFRICA			20	20					15/17			
SOUTH AM.	15/17	15/17	15/17	20	20	20/30						10/12
EAST COAST	10/12	10/12	15/17	20/30	30/40			20	10/12	10/12	20	20

Band-by-band summary

10 and 12 meters

Good daytime DX on transequatorial paths to North and South America, Africa, and the Pacific, is expected on (G)ood days, with signals peaking in strength during the local afternoon. Plenty of short skip to 1,500 miles or more should occur on (G)ood days.

15 and 17 meters

Good daytime DX to many parts of the world, with maximum signal strength occurring during the late afternoon hours. These bands usually close after dark. Daytime short skip is expected to 2,300 miles and beyond on (G)ood days.

20 meters

Good DX conditions both day and night, with best signal strengths occurring after sunrise and again in the late afternoon and evening hours. You can also expect to hear strong signals in the west, northwest, and Pacific areas during hours of darkness. Daytime short skip beyond 2,000 miles is anticipated on most days.

30 and 40 meters

Good DX to most parts of the world from our location is likely during night-time hours, beginning at sunset and extending

August 2000

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

after sunrise. High static levels due to occasional thunderstorms along the path of propagation may be expected. Short skip between 500 and 1,000 miles can be expected on most days.

80 and 160 meters

Some weak DX openings may occur during darkness hours and around sunrise, but will often be masked by high noise levels due to thunderstorm static. Night-time skip between 200 and 2,000 miles may be expected, but daytime skip will be limited to about 200 miles. 73, W1XU/7. 73

On the Go

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communicator. There are a hundred things that cannot be done at the last minute. The time to get these done is when they are the farthest things from your mind.

4. Participate in local network activities. There are many opportunities — weekly training nets, traffic nets, and SkyWarn. There is a discipline that is required for a net to operate efficiently and effectively. If you are a regular participant, this discipline becomes almost a rhythm in your operating technique. During a real emergency it is evident who is used to operating in a directed net and who isn't. As the punch line to the old joke goes, "... practice, practice, practice!"

5. Involve others. In the event of a real emergency you'll need every operator you can get. Invite others to participate. If you hear a new callsign on the local repeater, invite them to a club meeting or a net.

6. Be open to suggestions. Every one of us can do things just a little better. Ham radio by its very nature is a dynamic hobby so it is always changing. Listen to other's ideas and be willing to try them. Keeping people interested and involved is easier when they feel they are being listened to.

7. Be a mentor. When you hear that freshly minted call or an interim upgrade call, lend a helping hand. Compliment good operating practices. Offer advice — not criticism. Make people feel like they're glad they moved into your neighborhood. And, please, PLEASE don't assume the title of frequency police. Be there to help not dictate.

8. Stay involved. With a hobby as diverse as ours, it sometimes takes a turn in an unexpected direction and some people vote with their feet. If you're as good as you think, we need you to stay active in the hobby.

So before the ink dries on that new license or upgrade, take a look at what you can do to help out. This is a very special hobby, with special requirements and special responsibilities. But that's okay, because it attracts a pretty special group of people. 73

QRP

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select the L27/C77-C78 combination for the final transistor.

What happened is kind of simple once you look at it. With D7 shorted, no matter what band you selected you always had several other stages turned on as well. That's way the heterodyne oscillator did not work. When 80 meters was selected, the 20-meter crystal was still selected as well. That's why the heterodyne oscillator did not run. Two crystals were in parallel!

The fix is simple. Replace D7. After the new diode was in place, the 12 volt switching voltage was only present when 20 meters was selected by the push-button.

The only other fixes were to the L18/L19 coil and the trimmer capacitors. The trimmers were kind of easy to fix. The screw size is 5-56 by 1/4-inch-long. Radio Shack sells a pack for about two bucks. But, the heads of these screws are too small to hold the top half of the trimmer together. The fix? I used nylon shoulder washers. These are the same kind you would find in a TO-220 mounting kit. The shoulder part of the nylon goes the trimmer first. Then the screw is dropped down in the trimmer. The trimmer has the same thread size, so all you need to do is tighten the screw! Don't over do it, as you can easily run the screw head through the nylon washer.

The L18/L19 slug was a bit trickier. Before recycling became fashionable, Heathkit was already into it. Many of the same components are used in a variety of Heath products. Case in point is the heterodyne crystals used in the HW-8. They are the same as in the Heathkit HW-101! So, to replace the broken slug in the L18/L19 coil, a slug was removed from the heterodyne oscillator coil from a dead HW-101. Worked like a champ!

Setting the VFO

There's one scheme that Heathkit used in almost all of their analog VFO designs: You had to balance the ends of the VFO to calibrate it. Here's how Heath wanted you do to it:

You used a receiver to listen to the output of the VFO. You then turned the receiver to the low end of the VFO. You adjusted the VFO trimmer so you could hear its signal. Then you reset the receiver to the high end of the VFO's output and adjusted the VFO's coil so you could hear the signal. You did this over and over again until the two ends were balanced. What you ended up with is a VFO that tracked from the high end to the low end. Now, if you have ever tried this using the method described above, you'll go batty!

Here's an easier and quicker method. You'll need a good frequency counter. Allow both the HW-8 and your counter to warm up for at least 30 minutes.

Couple your counter to test point two. This is resistor R49. Go to the end of the resistor that is closest to L9, the large VFO coil. The VFO in the HW-8 runs from 8.895 MHz to 8.645 MHz. The idea is to set the VFO so it will track from one end to the other between the two frequencies of 8.8895 and 8.645 MHz. You adjust the trimmer located on the VFO tuning capacitor (C302B) and the slug in L9. Again, the idea is to set the trimmer and slug so the VFO will run from 8.8895 to 8.645 MHz. It's not easy to set, so do the best you can. I find that the trimmer on the VFO tuning capacitor is very touchy!

After a few hours, my Hamvention 2000 HW-8 was working like new.

Some closing thoughts about the HW-8. Although the manual calls for 3.5 watts of RF into a 50-ohm load, I've found these values to be much closer to real life:

Transmit power @ 13.8 volts into 50-ohm load: 80 meters 1.5 watts, 40 meters 1.5 watts, 20 meters 1.5 watts, 15 meters 1.2 watts.

Of course, I've seen more power in some HW-8s on 80 meters than 1.5 watts, but the values shown are very typical.

On receive: 80 meters 0.5 µV, 40 meters 0.6 µV, 20 meters 0.7 µV, 15 meters 0.7 µV.

Of course, your HW-8 may have a much hotter front end, but again, these values are typical. In other words, your mileage may vary!

If you happen upon an HW-8 this summer at a hamfest, be sure you pick it up. Even though they are nearing 30 years old, they're still a very incredible radio. 73

The Digital Port

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almost convinced to go out and buy a new Colossa-Hz computer. Later …

More ways to skin a cat

I read a message on one of the PSK-related reflectors recently that sparked a memory about a piece of equipment that works very well and doesn't often get its due. A ham was telling about the excellent luck he had with less than a watt on a DX RTTY contact with a ham who was running a kilowatt station.

As I read through this, I realized the DX station was using a superb receiving system for RTTY that will virtually drag signals out of the mud and decode them. The secret weapon was the Timewave DSP 599zx. For those of you who are not aware, Timewave built a modem into the 599zx that works along the order of the HamComm serial modem. The advantage lies in the superb DSP available from the 599zx that filters RTTY perfectly. I have one of these along with Timewave's DSP-RTTY software and it does work very well.

This made me stop and think what advantages we all have now with the soundcard software for digital modes including RTTY. One of the major advantages of using the soundcard is the built-in DSP. It takes some clever programming, but we have a number of clever programmers who have written software not only for RTTY but also for other modes.

That is one of the reasons PSK31 has caught on so well. It gives us near-perfect copy, digs signals out of the mud and affords relatively high-speed throughput. I don't know if Timewave was first at all this, but they certainly made a contribution.

Antenna noise canceled

Now I see Timewave has something new that may be of interest to a lot of us. When Japan Radio Corp. pulled out of the ham radio field, Timewave acquired the rights to build their line noise suppressing equipment. It looks like a good thing for any ham station experiencing RF noise associated with power lines, electrical equipment, etc. It intercepts the noise before it gets to the RF stage of the receiver. I took a look and it is on their Web site as listed in The Chart.

Another URL update

I received a message that George SV2AGW's Web site no longer responded. After a bit of searching, I found the same free software that George has written, with many updates is at the new URL listed in The Chart. You will find free packet software for just about everything you could ask that works with Windows95, on TNCs, and on modems of the various speeds and he claims compatibility with all soundcards now. Another outstanding contributor to the ham fraternity.

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

Never say die

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In space, physicists need an ether medium for photons/electromagnetic waves to travel in, but they also say there is no ether. All particle/waves have to have a vector, but when they try to measure it, the particle/wave disappears.

A basic problem facing scientists is that the atomic world is so entirely different from the one we are familiar with that they keep trying to understand it in the wrong frame of reference. As Nobel Laureate Richard Feynman said, "The mechanical rules of 'inertia' and 'forces' are wrong — Newton's laws are wrong — in the world of atoms … here things behave like nothing we know of, so that it is impossible to describe this behavior in any other than analytical ways."

A hundred years ago Bessant and Leadbeater, two Theosophists, using meditation as their microscope, outperformed any microscope we have yet invented with their description of atoms and their movement. They described all of the known elements, plus elements and isotopes which were still unknown at that time, right on down to quarks, subquarks and strings. You can read the details in the Stephen Phillips book reviewed on page 10 of my *Secret Guide to Wisdom*.

I suspect that, if scientists could get past their disbelief in the power of the mind, that they might be able to come to grips with quantum mechanics and start being able to understand more about physics fundamentals.

Heck, much of the physics establishment is still in denial over the transmutation of elements, needing bigger and bigger brooms to sweep the mounting evidence under their already bulging carpet.

Now What?

Since the ARRL has not announced any plans to do anything as a result of the FCC's restructuring move to help kick-start the hobby, and the ham industry seems too disorganized and too near bankruptcy to do much, that leaves only the ham clubs.

Yes, I have a plan. I think you'll like it.

Step one will be to get a CD-ROM of the *Callbook* so you can get a list of all the hams within easy driving distance of your club's meeting place and print it out.

Step two will be to split the list among your club members so they can call everyone. You want to find out if they're interested in upgrading under the new rules, and they can be offered a personal invitation to the next club meeting.

Step three: Add the names to your club newsletter mailing list of any hams who haven't slammed down the phone.

Step four: Organize license test groups to discuss the Q&As after each club meeting, and have your VECs there to give the tests.

Step five: Make darned sure your club meeting is fun. Have an interesting speaker — a ham dealer or manufacturer, or perhaps a local ham who's involved with ham satellites, packet, SSTV, or something else exciting, like showing off QRP rigs and the cards garnered with 'em. Have a report on how DX is doing on each of the ham bands. What's doing on 6m, and so on. A club meeting is show biz, so keep it lively and fun. Be sure to introduce any new faces, and publicly congratulate anyone who's upgraded.

Step six: After the meeting, you have a choice of helping to shorten your members' lives with coffee and doughnuts, or maybe having a big plate of veggies and dip. Yes, I know which you'll choose.

We've got close to 400,000 hams out there who need to be encouraged to upgrade to at least General. So we need to make sure they know about the DX that is rolling in night and day, and the fun we're having on the HF bands. It doesn't take a kW and a beam on 10m to work the world, just a dipole and 100 watts.

Let's get the DX warning nets going on 2m again so DXers won't miss contacting DXpeditions, and helping to make sure hams in rare countries wish they'd never heard of amateur radio.

Let's drive the ham industry crazy trying to keep up with the demand for new gear and antennas.

Oh, yes: By the way, I've been extremely disappointed that you haven't been sending letters to the editor to tell me how much fun you've been having with that new rig you bought — and what you've been able to do with it.

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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 Bioelectrifier Handbook: This explains how to build or buy ($155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (#01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (#02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (#03)

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 difficult 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. $5 (#04)

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)

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)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: $10 (#22).

Julian Schwinger: A Nobel laureate's talk about cold fusion—confirming its validity. $2 (#24)

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 be gotten to cut it's 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 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 videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (#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 youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. $3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

One Hour CW: Using this sneaky booklet even *you* can learn the Morse Code in one hour and pass that dumb 5wpm HF entry test. $5 (#40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. $5 (#41)

Code Tape (T13): Once you know the code for the letters (#41) you can go immediately to copying 13 wpm (using my system). This should only take a couple of days. $5 (#42)

Code Tape (T20): Or, you can start right out at 20 wpm and master it in a weekend. $5 (#43)

Wayne Un-Dayton Talk: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (#50)

Wayne Tampa Talk: This is the talk I gave at the Tampa Global Sciences conference—where I cover amateur radio, cold fusion, health, books you should read, and so on. $5 (#51)

$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. $40 (#52)

Reprints of My Editorials from *73*. Very few things in this world are as we've been taught, and as they appear. 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.

1996 Editorials: 120 pages, 100 choice editorials. $10 (#72)

1997 Editorials: 148 fun-packed pages. 216 editorials. $10 (#74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. $10 (#75)

1999 Editorials: 132 pages of ideas, book reviews, health, education, and anything else I think you ought to know about. $10 (#76)

2000 Editorials: In the works.

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink, Read some books on the uses of silver colloid, it's like magic. $15 (#80)

Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. $5 (#83)

NH Reform Party Keynote Speech. It wow'd 'em when I laid out plans for NH in 2020, with much better, yet lower cost schools, zero state taxes, far better health care, a more responsive state government, etc. $1 (#85)

Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (#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, and etc. $25 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. $35 (#92)

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

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

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

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the November 2000 classified ad section is September 10, 2000.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. Check it out at **[www.ohio.net/~rtormet/index.htm]**—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. $12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

Great New Reference Manual with over 100 pgs of P/S, transistor, radio, op-amp, antenna designs, coil winding tables, etc. See details at [www.ohio. net/~rtormet/index.htm] or send check or M.O. for $19.95 + $2.00 P&H to RMT Engineering, 6863 Buffham Rd., Seville OH 44273. BNB202

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NEVER SAY DIE

continued from page 62

If you've got an interesting ham shack or antenna system, get a decent camera and maybe you'll make the cover!

If you're having a ball with QRP, get your word processor going and let's see if we can get a few thousand more addicts involved.

QRPers have been working some remarkable DX these days. Heck, when I've operated from rare spots around the world I've always worked the frequency right down to the weakest signals I could hear before starting a new pileup, so I've helped a lot of QRPers get rare cards. And one of my first contacts with China, W7IMW/C7, was using a tenth-watt signal generator for a rig and a long wire on 20m.

Step 5A: If all else fails for an entertainer at a meeting you can always hook up a telephone to an amplifier and call me to give a talk. 73

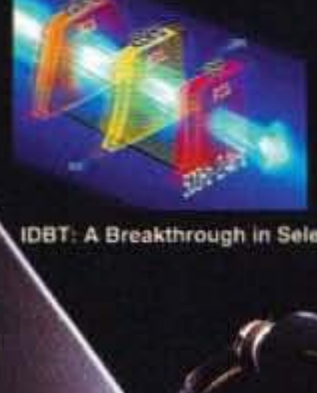
To steal ideas from one person is plagiarism — to steal from many is research.

"Brick-Wall" Selectivity

Today's elite-class operators demand the best RF weaponry available. Yaesu's exciting new MARK-V FT-1000MP answers the call, with an expanded array of receiver filtering, 200 Watts of power output, and Class-A SSB operation capability for the cleanest signal on the band. Enhanced front-panel ergonomics save you seconds in a pile-up or a contest "run," and Yaesu's HF design and manufacturing know-how ensures that no short-cuts have been taken in our effort to bring you the best HF transceiver money can buy. For more QSOs in your log, and more awards on your wall, there is only one choice: the MARK-V FT-1000MP from Yaesu!

I. IDBT: Interlocked Digital Bandwidth Tracking System

The IDBT feature greatly simplifies operation by matching the bandwidth of the DSP (Digital Signal Processing) system to the net bandwidth of the 8.2 MHz and 455 kHz IF stages. The IDBT system accounts for the settings of the IF WIDTH and SHIFT controls, and automatically sets a DSP bandwidth which matches the analog IF bandwidth.



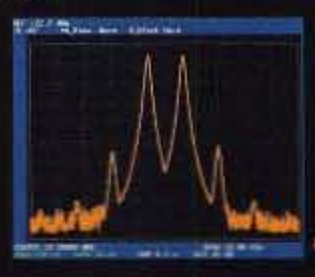
IDBT: A Breakthrough in Selectivity!

II. VRF: Variable RF Front-End Filter

Protecting the MARK-V's receiver components from strong out-of-band signals, the VRF system acts as a high-Q "Preselector," located between the antenna and the main bandpass filter networks, providing additional RF selectivity on the 160-20 meter Amateur bands for multi-operator contest teams, DX-peditions, or for operation near MW/SW broadcast stations.

III. 200 Watts of Transmitter Power Output

Utilizing two Philips® BLF147 Power MOSFETs in a 30-Volt, push-pull configuration, the MARK-V's transmitter puts out up to 200 Watts of clean output power, thanks to the conservative design of the PA section.



Class A 75 W PEP IMD

IV. Class-A SSB Operation

Exclusively available on the MARK-V FT-1000MP , a press of a front-panel button engages Class-A SSB operation of the transmitter, at a power output level of 75 Watts. Class-A operation produces incredibly clean signal quality, with 3rd- order IMD suppressed 50 dB or more, and 5th- and higher-order products typically down 80 dB or more!

V. Multi-Function Shuttle Jog Tuning/ Control Ring

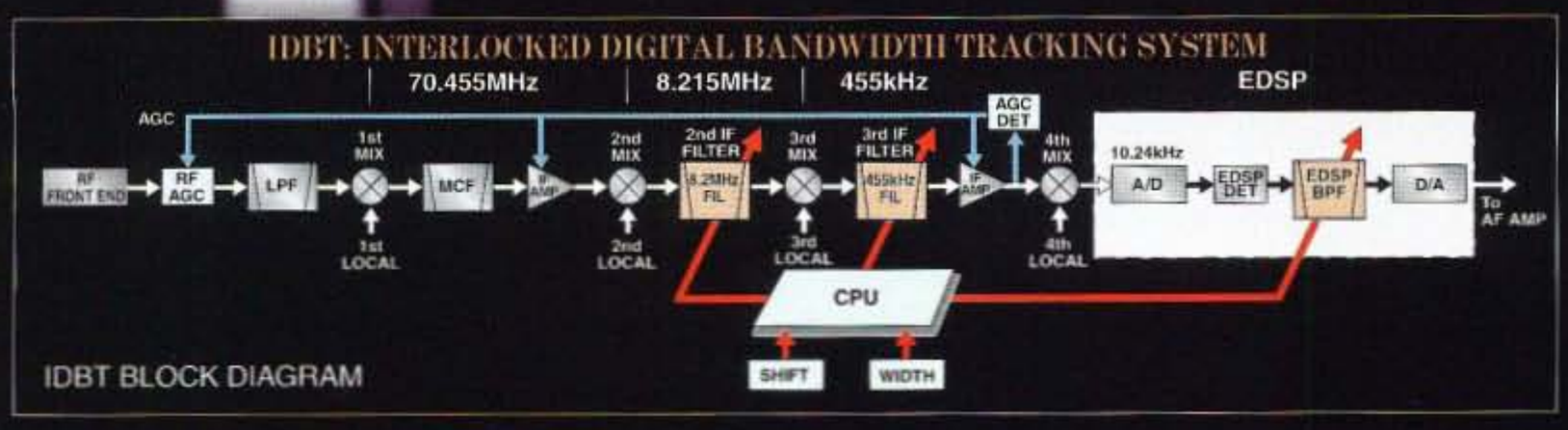
The immensely-popular Shuttle Jog tuning ring, which is concentric with the Main Tuning Knob, has a new look in the MARK-V: it now includes the activation switches for the VRF (left side) and IDBT (right side) features, so you don't have to move your hand position to activate these important circuits during contest or pile-up situations!

DC 30 V / 13.8 V Power Supply FP-29

Photo shows optional MD-100A8X Deluxe Desk Microphone

HF 200 W All-Mode Transceiver

MARK-V FT-1000MP



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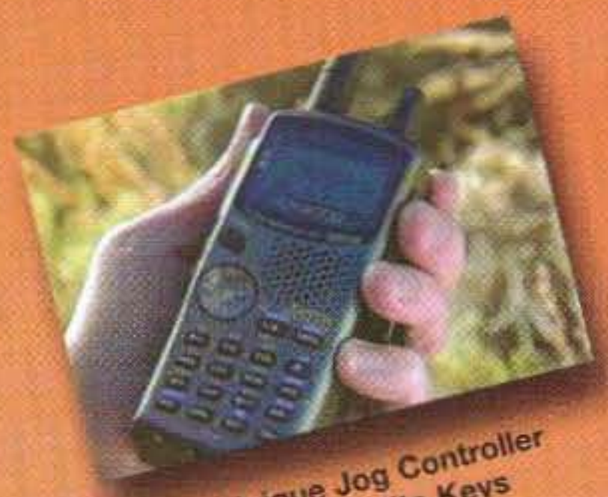
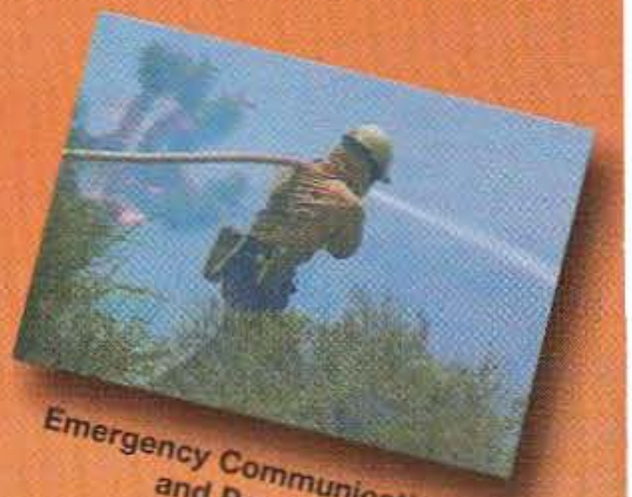


Unique Jog Controller w/Backlite Keys



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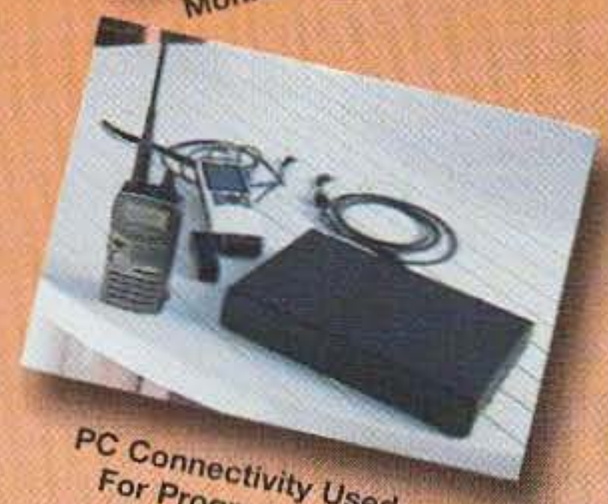

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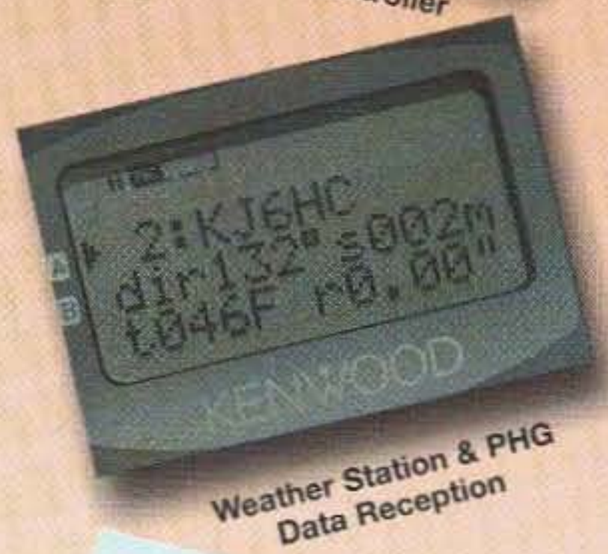

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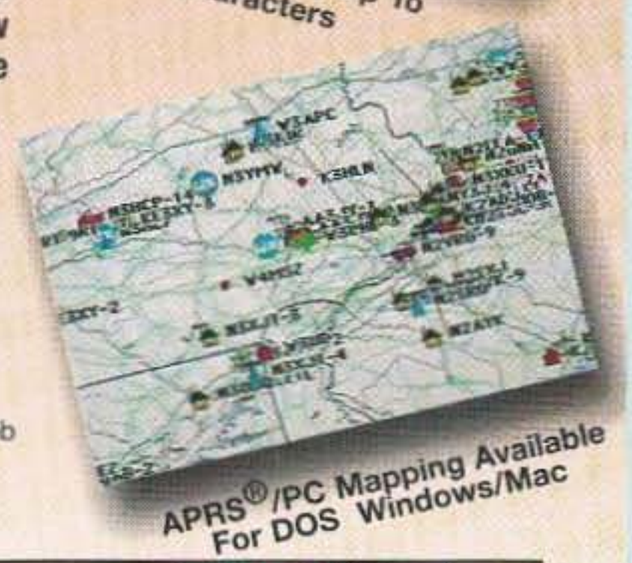

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