DECEMBER 2000
ISSUE #481
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THE NEW!

73 Amateur Radio Today®

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- "D" - Cell QRP Xcvr
- Modem Monitor
- Lightning Protectors
- Ultimate Milliammeter

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YOU deserve a new
rig for Christmas!

DECEMBER 2000
ISSUE #481

THE NEW! 73 Amateur Radio Today

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73 Amateur Radio Today Magazine
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FEATURES

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QRX . . .

Hams and Affirmative Action

Several predicted it would happen. Now a call for more minorities to be ushered into ham radio is growing on the Internet and on the air in some Eastern localities. This, as a growing number of ham radio activists are demanding that the government enact an affirmative action policy geared at bringing more minorities, females, and people of color to the ham radio bands.

Those promoting the idea say that you need only attend any ham club meeting to see that all minority groups are grossly under-represented in the hobby. They cite the growing electronic divide in the percentage of white versus black households who have Internet access. They say that this same chasm exists in amateur radio but only more so. And they also say that the only way to bring racial and gender equality to ham radio is to actively recruit minority peoples and, if necessary, waive the examination process.

Those who oppose such an Affirmative Action program cite the fact that proponents would first have to prove persistent and pervasive past discrimination in order to justify special requirements. They point out that there is a finite legal definition of discrimination and that a group being under-represented in an activity of its own accord is not necessarily suffering discrimination. They also point out that discrimination means being excluded on the basis of race, creed, color, gender, or national origin

Continued on page 8

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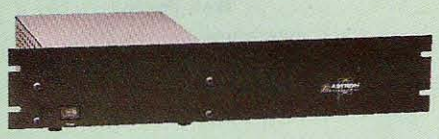
SS-18	15	18	1⅜ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅝	4.2
SS-30	25	30	3¾ x 7 x 9⅝	5.0

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 9⅝	4.2
SS-30M*	25	30	3¾ x 7 x 9⅝	5.0



MODEL SRM-30

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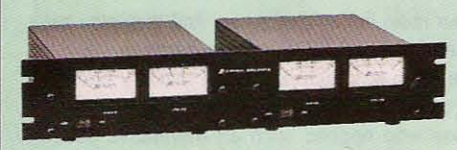
MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅝	6.5
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

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



MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

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

WITH SEPARATE VOLT & AMP METERS

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

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

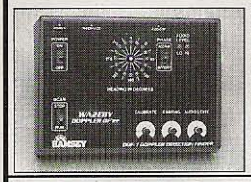
NEW SWITCHING MODELS

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

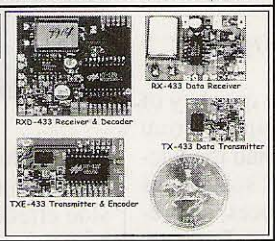
Doppler Direction Finder



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

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!

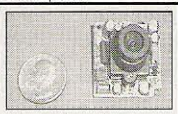
RX-433 Data Receiver..... $16.95 **TX-433 Data Transmitter..... $14.95**
RXD-433 Receiver/Decoder..... $21.95 **TXE-433 Transmitter/Encoder..... $19.95**

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

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

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!

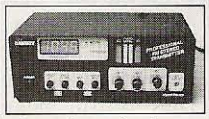
PIC-1, PICPRO PIC Chip Programmer Kit $59.95

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

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

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

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

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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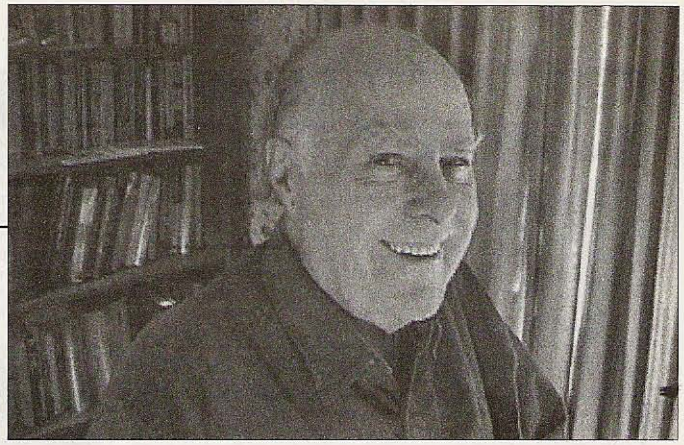

Traffic Tickets

How would you like to know a way to avoid getting any points on your license the next time you get a traffic ticket? Here's how you can take advantage of the computerized traffic ticket systems they are using in every state. This information supposedly comes from someone who works for the computer company that sets up the database for the motor vehicle departments.

Here's how you work it. When you get your fine, send a check to pay for it. But (love those buts), instead of paying the actual fine, send the check for a few dollars more than the fine. The system will then have to send you a check for the difference. Do not, heh-heh, cash that refund check. Shred it, or have it framed, but do *not* cash it.

Since points are not assessed on your license until all financial transactions are complete, you'll beat the system, which has gotten its money, so it won't bother you anymore.

There, has that paid for your subscription to *73* for next year?

Executive Order

I understand that Clinton signed an Executive Order on 9/30/00 to the effect that the military now has the right to give any member of the armed forces any inoculation, any time, and at any place. This has the force of law.

This, I suspect, has to do with several of our military refusing to be inoculated with the anthrax vaccine. *60 Minutes* had a segment about an officer who refused the vaccine and was discharged as a result.

Considering the quantity of medical complaints from people who have had the vaccine and suffered sometimes drastic consequences, as reported on the *Coast-To-Coast* show by Joyce Riley, with a growing number of their babies being seriously deformed, there has to be a lot going on here that we aren't hearing about.

On my last interview on the show, I suggested that some sort of mass immunization program for anthrax was the only logical explanation I could think of to explain this smothering of our whole country with those mysterious chem trails. Or have you looked up lately?

I cited *Bioterrorism*, a book I've reviewed in my *Secret Guide to Wisdom* which makes a very good case for Iraqi groups all around America brewing anthrax to be sprayed in our major cities and from cropdusting planes in rural areas. The book says that leaks from some CIA-infiltrated Iraqi cells claim that their aim is to kill around 200 million Americans within a few days in retaliation for their defeat in the Gulf War.

Is this just another conspiracy theory? Well, it's a practical and relatively inexpensive way to attack us, so it makes a lot of sense from that viewpoint.

The CIA, NSA, FBI, DIA, and the eight other federal secret agencies, undoubtedly know about this, but don't have any way to be sure of stopping all terrorist cells. If they announced a confirmation of the situation, there could be one heck of a panic as the public demanded anthrax vaccine shots, which are in relatively short supply. Plus, the serious side effects of the shots could then trigger millions of malpractice suits. A more gentle spraying of an immunizing agent over the country might help protect us from being killed by an anthrax attack, merely making us awfully sick instead of dead.

I discussed this idea on the *Coast-To-Coast* program in early June and got quite a few letters agreeing with my assessment. No one challenged it.

By the way, *Bioterrorism* lists places where you can get protective clothing and masks. Y'know, if something like this is launched at the next Ramadan holy holiday, it could gut every communications system except amateur radio. If they are able to kill or disable half of the people in the country, it sure would create a mess.

AIDS

On the subject of bioterrorism, a couple of the books I review in my *Secret Guide to Wisdom* make very good cases for the AIDS epidemic being spread intentionally to certain groups. Like Africans and homosexuals. I suppose those responsible might look on that as one way to stem the African population explosion.

I've corresponded with some of the authorities in South Africa about this, explaining that I'm convinced that AIDS can be cured, and without any expensive medications. The same simple, inexpensive approach that works for cancer and other serious illnesses, as covered in my *Secret Guide to Health*, should take care of AIDS, no matter how it is spread. This, apparently, wasn't what they wanted to hear. Well, there's no money in it if people don't need hospitalization and drugs.

Reversals

If you're not a *Coast-To-Coast* listener, you missed all those programs Art had with the guy who discovered that people tend to give themselves away when you play a tape of their talk in reverse.

The whole idea is ridiculous, of course. Except that he was able to come up with some surprisingly clear tape reversals which put a lie to what people were saying.

Anyway, I got an E-mail from Joe Egles K2UX, who has been reversing some of our astronauts and NASA. He has one of Buzz Aldrin saying, "Man was not here," and a mission controller saying, "Apollo a lie from its onset ... I'll tell about you ... I'll tell ... no mission at all." Joe's thinking in terms of a book with a CD of the reversals.

Or do you still prefer to think Wayne is crazy for doubting our going to the Moon? Only if you haven't bothered to do your homework. By the time you've finished the 568-page *Dark Moon* book, you'll be as convinced as I. Yes, I have some copies available. $40, including priority mail from Radio Bookshop. Hardbound copies

Continued on page 6

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.

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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

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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*** (Continuous Tone Control Squelch System) 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

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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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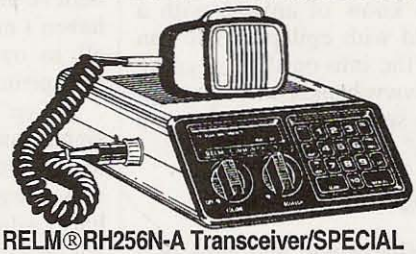
ICOM R10-A2 handheld wideband communications receiver	$289.95



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

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NEVER SAY DIE

continued from page 4

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Epilepsy

Some time ago, I mentioned that a TV exposé show had a segment explaining that many years ago doctors at the Johns Hopkins hospital discovered a special dietary cure for epilepsy—and buried it. Except for the persistence of one woman doctor, this cure might have been lost.

One of my readers, Diane Miller of Hilo HI, sent an update that you should note if you know of anyone with a child with epilepsy. You can get the info on this by going to [www.hopkinsmedicine.org] and searching for "ketogenic diet" in the Search Box.

Progress?

What would you think of a person who held up a medical book from the 1700s, claiming that its teachings are the whole truth? That all doctors today should follow its teachings?

Or the person who points to a math book written in 1536 as the last word in math? Or someone who claims that a book on physics published in 1858 is what we should all believe? Or an electronics text from 1928 as the end-all book on the subject?

Ridiculous, of course. Yet, when it comes to spiritual matters, the so-called experts in the field are asking us to take as fact books that were published 1,500 to 2,500 years ago as the latest words on the subject. How can we honestly believe that in 2,000 years we haven't made *any* progress at all in our understanding of our spiritual side?

We've gone from smoke signals and the Pony Express to the Internet. From dead reckoning navigation to global positioning satellites that tell us within a few feet where we are anywhere in the world. However, in spiritual matters the whole world seems unable to recognize or acknowledge anything we've learned in the last thousand years or so, much less the last hundred years, when every other field of knowledge has been accelerating, making the texts of just a few years ago obsolete.

The resistance to new information in the spiritual field is as strong (stronger, actually) as that in the other fields. Like Galileo and Copernicus in astronomy. Like Semmelwise and Pasteur in medicine. Like the reality of meteors and plate tectonics. Like the blind eye many of today's leading physicists have turned to the cold fusion phenomenon.

In spiritual matters, our "spiritual leaders" have ignored all developments not cited in their 2,000-year-old textbooks. Reincarnation? Heck, they edited that out of the Bible 1,500 years ago. Communicating with the spirits of the departed? Mere superstition. In the medical field, any uncomfortable new ideas are immediately called snake oil or quackery by the medical establishment.

Having regressed many people to their past lives, I don't have to depend entirely on the many very well documented books on the subject to accept the reality. In reading about the carefully documented scientific experiments with telepathy, precognition, psychokinesis, and so on by Dr. Rhine at Duke University 50 years ago, and the recent Princeton PEAR Labs, how can I reject this reality if I have an even partially open mind?

Anyone whose mind isn't clamped shut by religious beliefs will find that there have been a lot of interesting developments in the spiritual field.

Read some of the mind-expanding books by Boone, Crookall, Radin, Graff, Monroe, Moody, Bird, Bander, Alexandersson, Stone, Kubris, Lehto, Stephens, Jaegers,

Continued on page 59

MFJ 1.8-170 MHz SWR Analyzer™

Reads complex impedance . . . Super easy-to-use

***New** MFJ-259B reads antenna SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . covers 1.8-170 MHz . . . built-in frequency counter . . . side-by-side meters . . . Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . . and much more!*

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You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

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You can read SWR, return loss and reflection coefficient at any frequency simultaneously at a single glance.

You can also read inductance in uH and capacitance in pF at RF frequencies.

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It has built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

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Here's what you can do

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Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance over the entire spectrum 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and approximate Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and much more!

NEW

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MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1315, $14.95. Its rugged all metal cabinet is a compact 4x2x6¾ inches.

How good is the MFJ-259B?

MFJ *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

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MFJ-249B, $229.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

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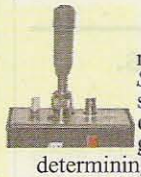
MFJ-219B, $99.95. UHF *SWR Analyzer*™ covers 420-450 MHz. Jack for external frequency counter. 7½x2½x2¼ inches. Use two 9 volt batteries or 110 VAC with MFJ-1312B, $12.95. *Free* "N" to SO-239 adapter.

SWR Analyzer Accessories

Dip Meter Adapter



MFJ-66, $19.95. Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Save time and take the guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your *SWR Analyzer*™.

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Made of special foam-filled fabric, the MFJ-29C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends.

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continued from page 1

and not because they cannot or do not want to pass a federally administered exam.

But those pushing such an Affirmative Action program counter by saying numerical goals for admission to Amateur Radio are for more important than maintaining what they call artificial barriers to the hobby that are created by the federally mandated entrance examinations. They say that it's far more meaningful to fully integrate the Amateur Radio hobby, which they claim is traditionally closed to minorities because of discrimination on the part of an elderly, male-dominated majority.

Thanks to Tuck Miller NZ6T, via Newsline, *Bill Pasternak WA6ITF, editor.*

Lambda vs. ARRL vs. BSA?

The Lambda Amateur Radio Club wants the American Radio Relay League to sever ties with the Boy Scouts of America. This, over what Lambda says is the Scouts' policy of discriminating against gays.

The Lambda Amateur Radio Club is an organization composed primarily of gay and lesbian radio amateurs. In an open letter from its president, Art Joly N1RPN, to League president Jim Haynie W5JBP, Lambda requested that the ARRL officially and publicly distance itself from the Boy Scouts of America because of the organization's policy to dismiss and exclude gay Scouts and Scoutmasters.

Haynie informed his counterpart in the Lambda Amateur Radio Club that the League will not drop its ties to the Boy Scouts of America, despite Lambda's claim of discrimination against the gay community by the scouting organization.

As expected, the ARRL did not issue a public response. Instead, Lambda chose to make Haynie's private response public, as quoted by Lambda spokesperson Jim Kelly KK3K. Said Haynie:

"I would suggest to you that it is unnecessary for the ARRL to take any position on subjects that do not pertain specifically to Amateur Radio. It would be beyond the scope of the League's charter to address political topics unrelated to its mission and purpose."

The letter came only days before this past fall's Scout Jamboree on the Air, or JOTA. The ARRL is a long-time, highly visible supporter of the United States Scouting movement, and has very close ties to the Boy Scouts in particular. As such, nobody expected it to give in to the Lambda call for it to sever its ties.

Thanks to the Lambda ARC (press release) and www.rainreport.com, via Newsline, *Bill Pasternak WA6ITF.*

MURS: Another CB-like Challenge?

With little fanfare, the FCC created the Multi-Use Radio Service on July 12th. Its birth went just about unnoticed by everyone except those in the telecommunications industry who had fought long and hard to see it become a reality. And its reality is that it is another hobbylike radio service that could be in competition with ham radio for users.

MURS is really a new kind of license-free Citizens Radio Service, but one not subject to the vagaries of high frequency propagation. This is because MURS operates in the 151 MHz spectrum — not far above the two-meter ham radio band. But unlike 2 meters, the MURS service is expected to be filled by everyone from hobbyists to commercial users, all vying for local communications access that is virtually regulation-free.

Unlike its predecessor, the micropower Family Radio Service in the 460 MHz band, MURS permits users to run up to 2 watts of effective radiated power. There is no restriction on connecting external antennas to a MURS radio, as long as the 2 watt effective radiated power restriction is observed. Also permitted will be phone patching, paging, telemetry, and remote control operation. In addition to voice, the FCC is permitting MURS users to transmit packet, data, and imaging.

Does MURS sound like a clone of the VHF and UHF Amateur Radio service? Well it takes it a step beyond because there is no restriction on the content of communications in the Multi-Use Radio Service. Also, repeaters will be permitted, extending the range of communications across an entire region.

But there are a couple of negatives. First, there are only five MURS channels. They are at 151.82, 151.88, 151.94, 154.57, and 154.60 MHz. The first three are listed as having an 11.25 kHz bandwidth, while the last two permit a 12.5 kHz-wide signal. Also, continuous transmissions are permitted on four of the five MURS channels, which is bound to cause havoc with those attempting to share with voice and other modes.

So what will the impact of MURS be on ham radio? First, it will interest kids who want to connect their computers to the Internet so that they can constantly be on-line. It will probably also siphon off those adults who have been considering becoming radio amateurs but do not want to take the time to learn the theory, rules, and regulations. (No formal license is required for MURS.) This is almost a parallel to those who fought to create a code-free amateur license because they did not want to learn the Morse. And as we saw from ham radio's experience with no-code licensing, those numbers can be staggering.

MURS was scheduled to have begun last November 13. We hope our readers will keep us updated on developments in their area ...

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

Airliner Ban Continues

If you have any thoughts of using your two-meter handheld or a cellular phone the next time you fly on a commercial airliner in the United States — forget it. A recent decision makes it look like the decade-old ban on the use of these devices and others will continue.

The decision lets airlines continue restricting in-flight use of electronic devices. It comes after telecommunications experts told Congress that — while there is no definitive proof that cellular phones pose safety risks on airplanes — the devices should stay banned as a precautionary measure.

The Federal Aviation Administration's Thomas McSweeny testified that restricting the use of these devices prevents a disaster with an extremely remote chance of happening from taking place.

McSweeny's testimony took place before the House of Representatives' Transportation Subcommittee. The hearing was held because lawmakers say the public is confused about airline rules governing use of devices including laptop computers, hand-held games, pagers, 2-way radios, and cellular phones.

Tennessee representative John Duncan says the ban against cellular phones in the air is one of the biggest causes of altercations between passengers and crew on board airplanes.

McSweeny says that the FAA remains concerned that radiation from electronic devices could cause errors in the aircraft instrument landing systems or global positioning readings. He notes that many hospitals prohibit using cellular phones and other transmitters because they can interfere with health monitoring devices.

But other witnesses testified that while there have been incidents in which portable electronic devices may have interfered with aircraft operations, they have never been able to repeat such episodes under controlled conditions.

The FCC's engineering and technology chief, Dale Hatfield WØIFO, also testified. Hatfield says that Commission rules also prohibit cellular transmissions aboard in-flight aircraft. That, he says, is because calls made from high altitudes keep phones on the ground from being able to use the same cellular telephone base station frequencies.

Representative James McGovern urged the FAA to promote technology which detects emissions from inside an aircraft cabin that could produce electromagnetic interference. That kind of technology, McGovern says, could lead to greater in-flight safety.

Meanwhile, the in-flight ban on the use of

Continued on page 59

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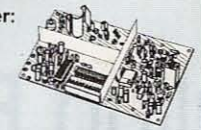

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- **Wired/tested** ...**$209** (includes TCXO)

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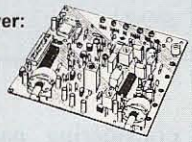

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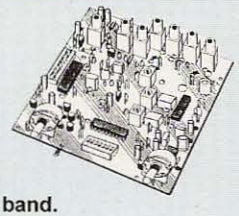

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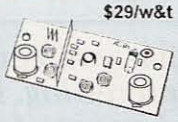

- Miniature MOSFET Preamp.
- Low noise figure.
- *Available* for various bands from 28 to 450 MHz.

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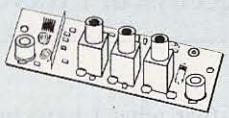

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- Available for bands from 137 to 170 MHz.

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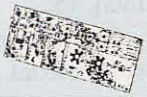

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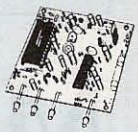
Hamtronics has the world's most complete line of modules for making repeaters. In addition to exciters, pa's, and receivers, we offer the following controllers.



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Announcing the Yingling ET-1

A new QRP classic.

Did you ever want to see what you could do with just a few parts? Well, here's one experiment you might find interesting. I decided to see what I could do toward making a small transceiver that would operate from the power of one "D"-cell flashlight battery. This article describes how successful I was in reaching that goal.

My approach started out with the following objectives: (1) Use one transistor and switch it between the receiver and transmitter sections of the transceiver. (2) Design both to operate from 9 volts DC. (3) Find a good switch and mount the transistor directly onto its common terminals. (4) Put the receiver components on one printed circuit card and the transmitter components on another printed circuit card. (5) Wire everything up with cables and connectors so that if you wanted to change either circuit, you could just plug in a new circuit card. (6) Since a transceiver is defined as a transmitter and a receiver that share common parts, I will claim that what I have built can be called a "transceiver," not a "trans-receiver." Hi. And (7) to *minimize* the parts count and complexity, design the ET-1 to be a one-band, 40 meter rig.

The overall approach is illustrated in **Fig. 1**.

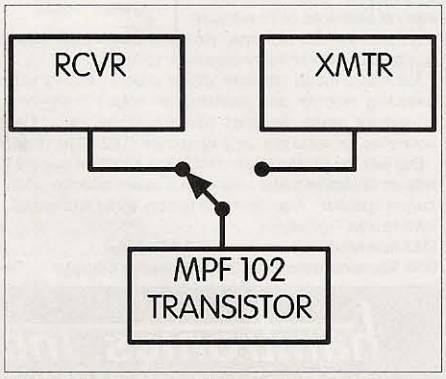

Fig. 1. *System configuration.*

Try it yourself

This project is easy to build. You don't need any special printed circuit cards, because for 40 meters the layout is not overly critical. You can use "ugly" construction if you desire. I chose to use pieces of the Radio Shack project card No. 276-150A because it makes everything a little neater. (A lot neater than my usual work!)

You can even build this project on a "pine board" if you like, and it will work fine on 40 meters.

Design source

The circuits described come from everywhere! Of course, as the project developed, I had to make my own engineering changes to make everything work to my satisfaction.

The receiver circuit is a regenerative detector (regen). The regen approach provides the best trade-off when considering parts count, sensitivity, and cost. It will receive both CW and SSB, and it will compete in sensitivity with your main rig. Sounds impossible, but it is true. I have heard weak signals on my main rig and have then verified that I can also hear them on the regen.

In fact, you can tune in a signal on both sides of "null" or "zero beat" on the regen, thereby getting two for the price of one! Of course, you should use high impedance earphones for this regen, since there is only one transistor in the circuit.

The transmitter circuit is essentially a Pierce oscillator. This circuit is made up of ideas given in the *ARRL Handbook,* the *QRP Notebook* (W1FB), and the *SPRAT* magazine No. 69 (GM3OXX).

The resulting circuit for the ET-1 has the following parts count: receiver, 8; transmitter, 6; common transistor, 1; total, 15.

The antenna connection for the ET-1 is a coaxial cable connecting directly to my normal 40 meter antenna system. My antenna is a centerfed Zepp with open wire feeders and a home-brew tuner.

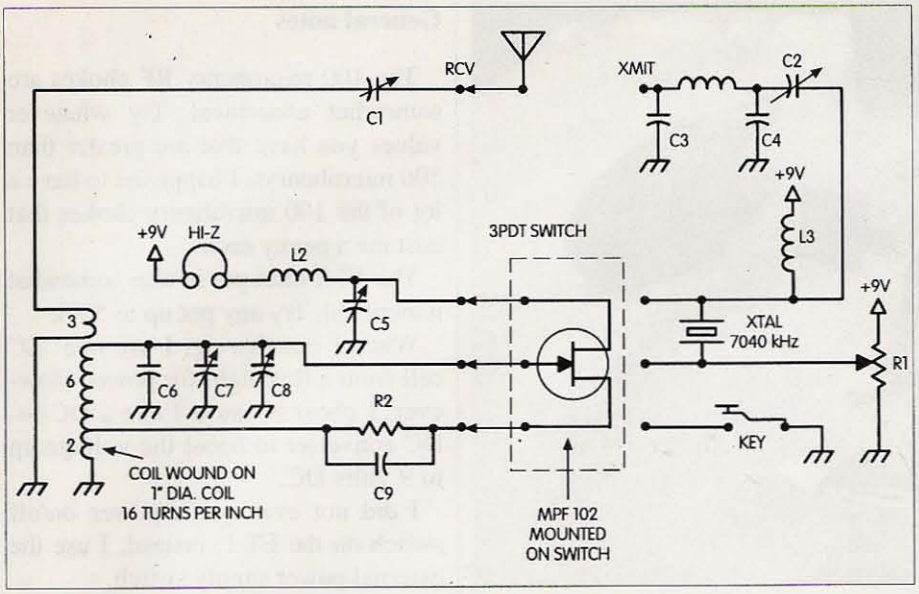

Fig. 2. The electrical schematic for the ET-1. Unlabeled coil is L1.

Detailed electrical circuit

Fig. 2 shows the electrical schematic of the ET-1. Please note that the MPF-102 transistor (Radio Shack, #276-2062) is mounted directly on the triple pole double throw (3PDT) common switch terminals. It is used for both the receiver and the transmitter sections. I selected the FET transistor because it works good in the regen. (See **Table 1** for the parts list of the **Fig. 2** schematic.)

Receiver notes

For the 40 meter band, tuning is set with the following: The 320 pF cap gets you to the 7.0 MHz range. The 6–70 pF cap lets you home in on the frequency of interest—in my case, 7040 kHz.

The small variable cap (one plate) lets you tune around 7040 kHz as a bandspread control.

The 5–50 pF variable cap provides feedback to the oscillator for sensitivity control. Adjust it until the regen is on the verge of oscillation. Any "squeal" indicates that you have gone too far!

This circuit works well and the layout for 40 meters is not critical, but try to keep your wires short.

You will hear a signal on both sides of "zero beat," allowing you to hear each signal "twice" on your dial, unlike your superheterodyne.

The 9-component (including the transistor) regen receiver will bring in signals comparable to those received by your expensive receiver. But, the selectivity will not be as good.

The downside of this story is that it is so sensitive that it can be easily overloaded by a strong signal or a nearby station. (I didn't care, so I did not try to put in any attenuation or volume control.) Also, at night with a contest on, the regen is pretty much unusable. (If you like, you can get some degree of attenuation by putting a variable resistor in series with the 9 volts supplied to the regen.)

With the limited frequency range that I wanted (7040 ± 15 kHz), once

Continued on page 12

C1, 2, 7	6–70 pF trimmer (Jim-Pak TC6-70)
C3	820 pF
C4	560 pF
C5	5–50 pF variable (regen control)
C6	320 pF (band select)
C8	Tiny one plate variable (band spread)
C9	0.1 µF
L1	T50-2 core with 14 turns
L2, 3	100 µH inductor
Q1	MPF102 FET (Radio Shack)
R1	50k pot
R2	22k

Table 1. Parts list.

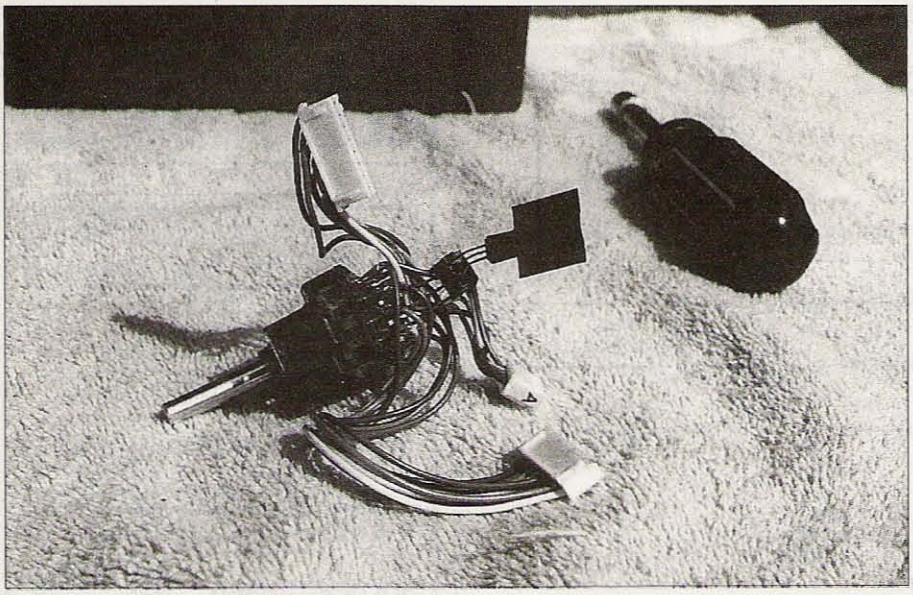

Photo A. *The switch after the transistor has been mounted, and the cables that are used to connect to the receiver and transmitter cards. A third cable is used to connect the switch to the external plugs and jacks, which include the antenna connector, the headphone jack, the key jack, and the power plug. When assembled, the switch is installed on the front panel so that all "switchover" is accomplished with one throw of the switch.*

Announcing the Yingling ET-1

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you set the regen control, you may not need to adjust it again.

Transmitter notes

Adjust the 50k pot and the 6–70 pF trimmer for maximum output of the transmitter into a 50 ohm resistor.

The transmitter puts out approximately 20 milliwatts. Power is calculated as follows:

1. (Peak to Peak volts)/2 x 0.707 = volts rms. For ET-1: 3 volts/2 x 0.707 = 1.06 Vrms.
2. (Vrms squared)/50 ohms = Power in watts. For ET-1: (1.06 x 1.06)/50 = 0.022 W = 22 mW.

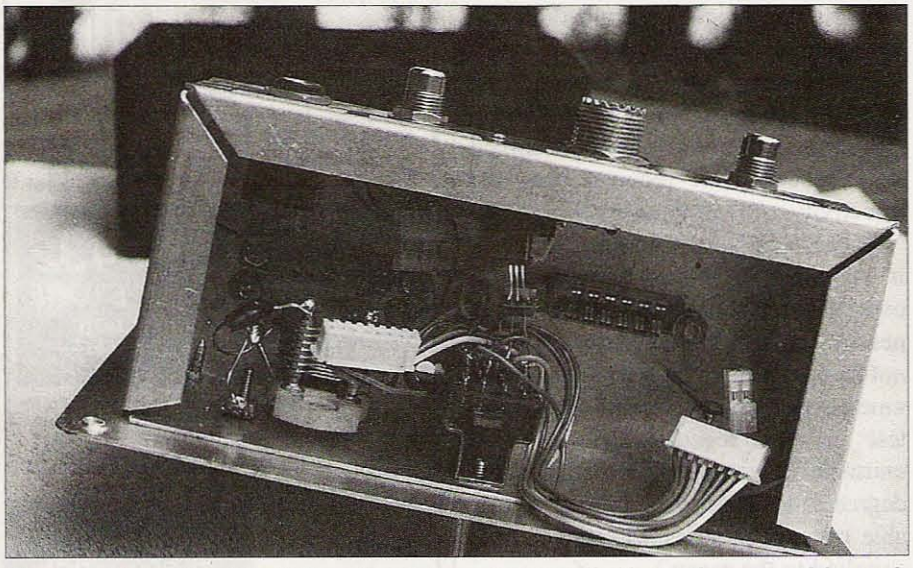

Photo B. *The inside of the ET-1 unit with the switch installed but without any of the cards installed. I used pieces of an old card connector to provide mounting for my cards. The connectors have pin connections on them, but they are not used for electrical connections. I used them because they provided a nice springlike pressure slot to hold the cards in position.*

General notes

The 100 microhenry RF chokes are somewhat noncritical. Try whatever values you have that are greater than 100 microhenrys. I happened to have a lot of the 100 microhenry chokes that cost me a penny each.

The 50 k-ohm pot is also somewhat noncritical. Try any pot up to 500k.

When I run this rig, I use one "D" cell from a flashlight for power. However, I cheat because I use a DC-to-DC converter to boost the voltage up to 9 volts DC.

I did not even put a power on/off switch on the ET-1; instead, I use the external power supply switch.

I did not put a sidetone monitor on the ET-1. I just use the sidetone from my keyer. There is plenty of space for later addition of a sidetone to the transmitter card if so desired in the future.

Detailed mechanical design

With the information already supplied, you should be able to construct your own ET-1 using your own mechanical design. However, you might be interested in what I ended up with when I started looking through my junk box for the various parts.

Almost immediately, I found "The SWITCH!!" I ran across a brand-new eight-pole double-throw switch that caused me to immediately go off on a tangent! I decided to switch everything at once instead of just the transistor.

I switched the transistor, the antenna, the 9 volt power, the headphones, the key, and I even switched the ground. However, I left the **Fig. 2** schematic with the 3PDT switch for simplicity. You can adjust according to your junk box.

Initial setup

The initial setup consists of connecting the ET-1 to a 50 ohm dummy load. Using an oscilloscope or an RF probe plus your multimeter, adjust the transmitter for maximum output. Adjust the 50 k-ohm pot first and then adjust the C2 trimmer cap. No adjustments to these controls will be needed again.

Set the receiver frequency to 7040 kHz, by adjusting the variable trimmer

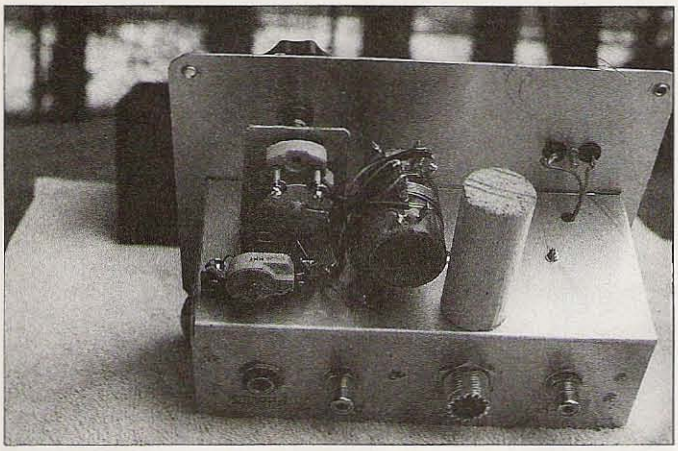

Photo C. *The top deck of the chassis, showing the tuning coil with its lumped capacitors and the one plate, variable bandspread, capacitor. The crystal socket cable plugs into the transmitter card when installed. If you look closely, you may see that I used parts from my junk box for the capacitors, but the parts that I show in the parts list, the JIM PAK TC6-70, etc., will work just as well.*

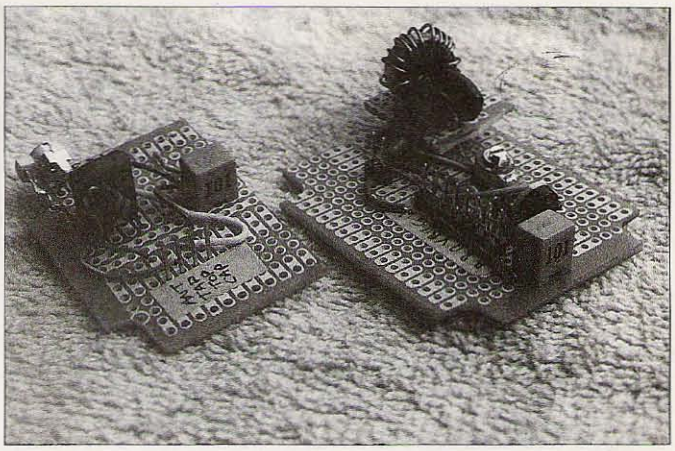

Photo D. *The two cards. The receiver card is on the left and the transmitter card is on the right. If you look carefully, you can see the pin headers soldered onto the cards for connection to the cable connectors. (If you consider the space that I used to mount these 15 components, this has got to be the world's least efficient packaging scheme!) Hi.*

on the top deck of the chassis. You can use a grid dip oscillator or a frequency meter, or you can even listen to the receiver oscillator on your main receiver. Next, adjust the "Regen control" on the receiver until just on the verge of a "squeal." Then adjust the antenna trimmer cap (C1) for best reception. One more tweak of the "Regen control" may be required. After that no further adjustments of these controls will be needed.

On-the-air performance

It is hard to believe how well the ET-1 performs on the air. I have had no reports of chirps or clicks, and the frequency is stable as a rock since it is crystal-controlled. My crystal is listed as 7040 kHz, but since I did nothing to "pull" it to that frequency, it ended up transmitting on 7040.7 kHz! Since I am "rockbound" I usually call a lot of CQs or wait around until someone calls on my frequency.

All of my contacts were made using a 1.5 VDC "D" cell connected to a DC-to-DC converter that I got from the Electronic Gold Mine (Part No. G6344), which boosts it up to 9 VDC. You may want to use a 9 volt battery instead.

Most of the contacts that I have made were the result of my calling CQ. This speaks well for a rig that only puts out 20 milliwatts. I estimate that 80% of the contacts were made by calling CQ.

All of the QSOs were made using the regen for reception. The regen is somewhat broad and other signals can always be heard, but it gives good performance. In fact, if there is

Continued on page 14

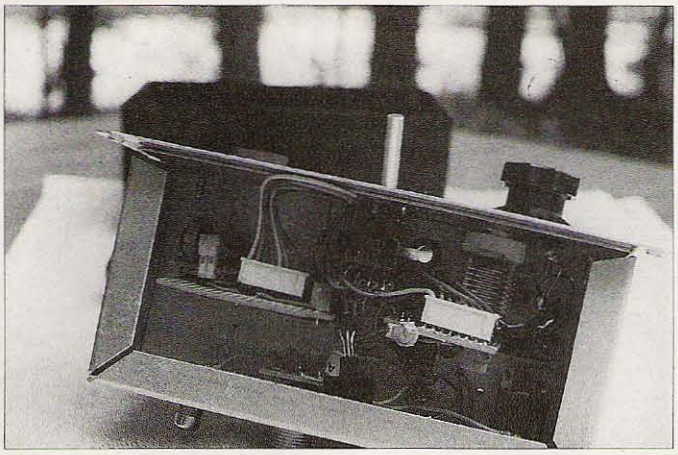

Photo E. *The underside of the chassis, with the switch and the cards installed. One receiver trimmer capacitor is available at the top, but all other trimmers and pots are adjusted by lifting the card up somewhat so that you can reach them without removing the cables. (Doing it over again, I would put all those adjustments at the top of the card.)*

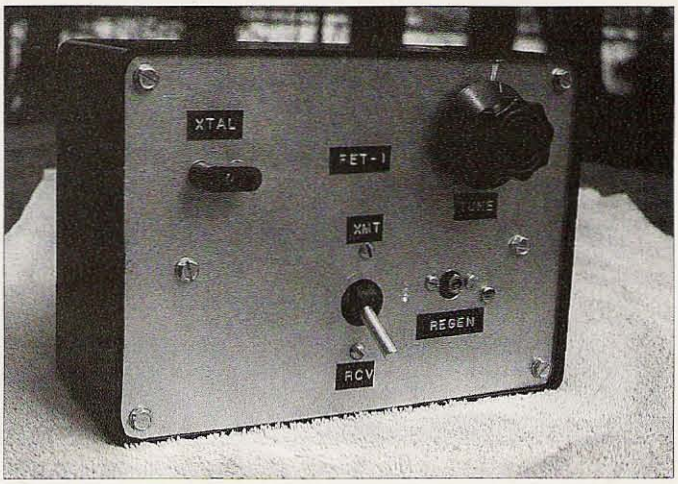

Photo F. *The front panel. I did not have a nice regen control capacitor, so I had to settle for one with a screwdriver slot. But, as I said in the text, once it is adjusted for the small bandspread of the ET-1, it requires little future adjustment.*

Announcing the Yingling ET-1

continued from page 13

interference, you can often tune to the other side of "zero beat" to get rid of it!

Using my centerfed Zepp antenna tuned to forty meters, I have worked 18 states and Canada. This was over a 60-day period and I averaged about 1 QSO a day. However, in my defense, I would give the following as a reason for the poor showing: After every QSO, I would sit back, pat myself on the back, and marvel for a long time, reveling in the glory of making a QSO with such a mini rig. However, the most credit should be given to those on the other end who were willing to put up with such a weak-signal station.

Most of the QSOs were 1/2 to 3/4 of an hour duration, with solid copy on both ends. Only once or twice was a QSO terminated for poor copy on the other end. My reports ranged from RST 339 to 569. In general, my best luck was making QSOs in the morning and afternoon hours, probably because of lower noise levels on forty meters during those times.

My best DX was with Art WA4HXS in Jonesboro TN, a distance of approximately 550 miles (as the crow flies), or 27,000 miles per watt!

States worked were: CT, DE, KY, ME, MA, MD, MI, NC, NH, NJ, NY, OH, PA, RI, TN, VA, VT, WI, plus ONT and QUE Canada.

During most of my QSOs, when I commented that my transceiver consisted of only 15 parts, that it was running only 20 mW, and that the power was coming from a "D" cell flashlight battery, I expected some statements of amazement. Instead, I mostly got a big "ho-hum"! So I guess that it may be true about ham radio operators being mostly "appliance operators." However, I would like to give a special thanks to Lenny W2BVH, who gave me a "Holy Cow!" and "Congrats!" Hi. 73

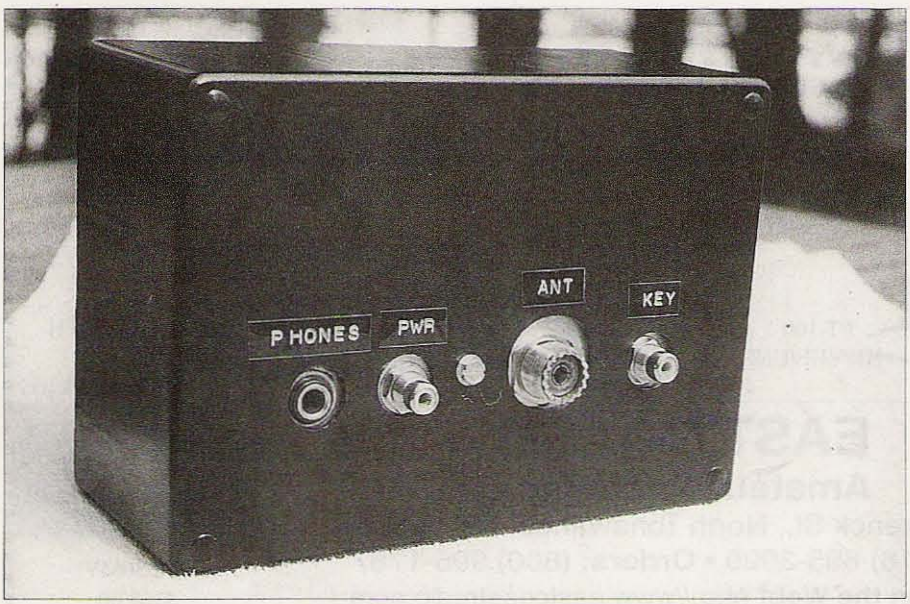

Photo G. *The rear panel. I should note that the phone jack shown is insulated so that it doesn't provide any connection to the chassis since the receiver 9 VDC power comes through this headphone jack.*

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Front-panel has easy access five-way binding posts for heavy duty use and cigarette lighter socket for mobile accessories. MFJ-4245MV has two sets of quick-connects on the rear for accessories.

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MFJ-1116, $49.95. Similar to MFJ-1118. No 30 amp posts. Has "ON" LED and 0-25 VDC voltmeter. 15 amps total.

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More than a Modem Monitor

Here's another great project from the Gizmo King.

"Status: Dialing ... waiting for the connect prompt ...
"Verifying user name and password ...
"Logging on to the network ..."

While many a happy "on-line" session has begun with those comments from the monitor, many an unhappy session with the computer has started with just the first statement. Sometimes after the installation of new equipment you may spend several anxious moments waiting for the "connect" prompt. After a few unhappy sessions, waiting for a connect prompt that never appeared, I decided to take some of the guesswork out of the game.

Did the modem "pick up" the phone line? Did the computer really send out dial tones? Did a computer on the other end of the phone line really respond? Was that the voice of the computerized "operator" saying that I had misdialed? I prefer to have my mysteries from another form of the media, commercials notwithstanding.

What's my line?

Knowing some of the characteristics of an ordinary, analog phone line looked like a good starting point. When the telephone is hung up, "on hook" as the telco people call it, an analog phone line has a nominal 48 volts DC across it. When someone, or something like a computer, picks up the phone, and takes it "off hook," the voltage drops to about nine volts. These are NOMINAL values. Do not calibrate your voltmeter by using these values. They are close to the real world and make good guidelines. It amounts to about a 5 to 1 change from an "on-hook" to an "off-hook" condition.

You may use an analog voltmeter, a digital voltmeter, or an LED indicator to let you know when the phone line is in use or when it is available. Additionally, hearing what kind of signal is on the line would be most useful. A simple, isolated audio amplifier could do that: no hi-fi system, just a cheap amplifier. Oddly enough, though, a cheap, solid-state amplifier gives better quality than is needed. Let's take a closer look at what we need and what we can get or make in order to take the guesswork out of our on-line modem connections.

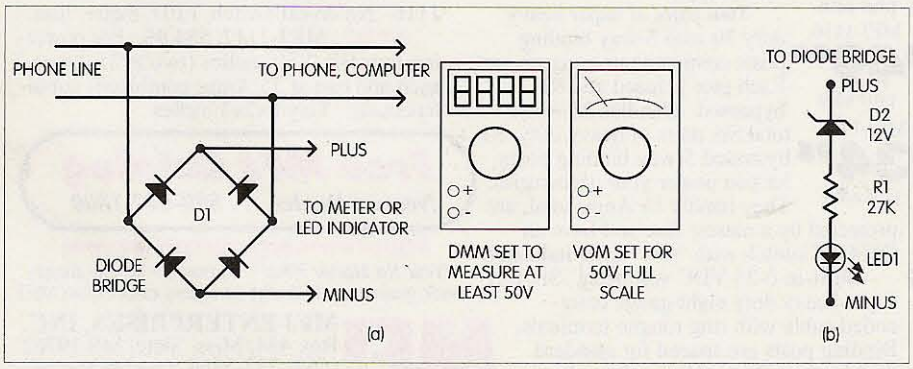

Fig. 1. Line monitor. Direct approach, two methods. (a) Voltmeter across the line. (b) LED indicator.

Voltage indicators

The phone line supplies enough current to drive most analog meters and any digital voltmeter that I have seen, and it will drive an on/off LED indicator with or without some amplification. We will let the phone line supply the current needed for that simple (LED) amplifier.

Photo A. *Built-in voltmeter and speaker amplifier let you monitor the status of the phone line as well as hear what is on it.*

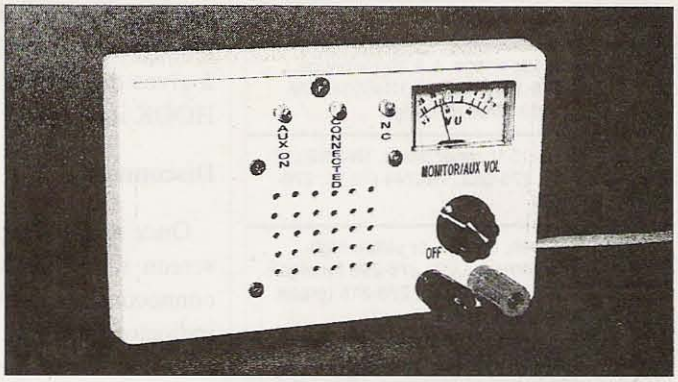

Photo B. *A more compact version, but with everything included. Tell at a glance if the computer or the kids are connected to the phone or if they got disconnected. The binding posts on the lower right let you use the monitor as an auxiliary amplifier in the workshop or the ham shack.*

A direct approach

Fig. 1(a) shows a direct approach: a voltmeter across the line. In the real world, sometimes the voltage changes from one of the lines being plus to the other one: something about the call going through another switching office. Whatever causes it, the lines can and do change polarity. So, many devices that connect to a phone line have a full-wave bridge rectifier across them. That keeps the voltage going in the same direction to your project: plus to the plus input. Keep in mind that the RING voltage runs around 90 V rms. So do use higher voltage diodes. And of course, your project may need some protection from the RING voltage.

On hook

When the phone is hung up, or on hook, the line sees little or no practical load. The voltage will measure about 48 V DC. As long as your measuring system draws only a small current, it may stay on the line all of the time. In fact, I have an OFF-HOOK indicator, **Fig. 2,** across the line all of the time. In the past, I left a meter like the one in **Photo B** across the line until the LED indicator was available for that duty. While I cannot give you a precise figure, the line does not seem to mind something on the order of one or two mA.

LED me see indicator

Fig. 1(b) shows an LED circuit that will let you know when the phone is on hook. As long as the phone line delivers at least the voltage dropped in the zener diode, plus what the LED needs, the LED will light. Staying within the limits just mentioned, only the extra-bright, high-efficiency LEDs will give a good light at that low a current. Of course, a cheap LED with some shade makes a useful indicator. Still, that makes a good starting point. If the light is lit, the modem did not pick up the line: for that matter, neither

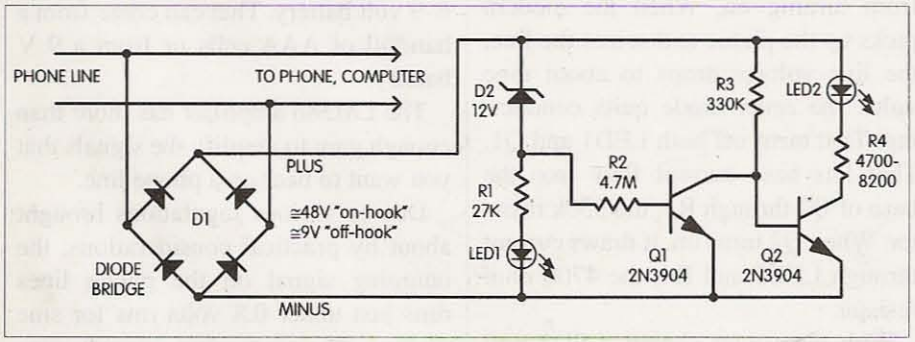

Fig. 2. *Off-hook indicator. Tell at a glance if someone else is using the phone, or if it's OK for the computer to go "on-line." While you are at it, let the phone line supply the power. The diode bridge feeds the DC from the phone line to the OFF-HOOK indicator. LED1 shows when the phone is hung up, on-hook. LED2 shows when someone or something has picked up the phone, taken it off-hook. Voltage across the phone line runs about 50 V on-hook, falling to around 9 V off-hook. The different voltage levels trigger either LED1 or LED2: green, red.*

R1	27k
D1	Diode bridge, 1 A 200 V bridge, 276-1161; or four 1N4003s, 276-1102 wired as bridge
D2	12–15 V zener diode, 1N4742 (12 V), 276-563; 1N4744 (15 V), 276-564
LED1	Green, orange, or yellow high-brightness LED, 276-206 (orange); 276-205 (yellow); 276-215 (green, not too bright)
Binding posts (274-662) or banana jacks (274-725) (for plugging in meter rather than building in one)	
Meter	0–1 mA (22-410) and a 56k resistor; or use a 39k resistor plus the 15k that comes with the meter
Suggested values for other common meters to get about 50 V full scale:	
0–500 µA	100k for 50 V FS
0–200 µA	250k, 50 V FS; 270k, 54 V FS (220k + 27k standard values will come close to 250k)
0–100 µA	500k, 50 V FS; 560k, 56 V FS (470k + 27k standard values will come close to 500k)
0–50 µA	1 meg for 50 V FS

***Table 1. Fig. 1** parts list. Radio Shack part numbers in all parts lists.*

did the teenagers at the other end of the house.

The LED, zener diode, and resistors cost little and take up little space. However, it would be nice to know, not by default, but by direct indication, when the modem or the children have picked up the phone. By adding three resistors, two transistors, and one more LED, you have a direct indication. **Fig. 2** gives the simple circuit for an OFF-HOOK indicator.

R1	27k
R2	4M7 (4,700,000 ohms)
R3	330k
R4	4.7k–8.2k
D1	Diode bridge, 1 A 200 V, 276-1161; or four 1N4003s, 276-1102 wired as bridge
D2	12–15 V zener diode 1N4742 (12 V), 276-563; 1N4744 (15 V), 276-564
Q1	2N3904 or equiv., minimum beta, H_{FE} 100
Q2	2N3904 or equiv., minimum beta, H_{FE} 100
LED1	Green, orange, or yellow high brightness (see **Table 1** for P/Ns)
LED2	Red high brightness, 276-086; 276-307 is cheaper and smaller, but perfectly usable

***Table 2. Fig. 2** parts list.*

Disconnect

Once in a while during a session, the screen says that it cannot find some connection. A quick glance at the LED indicator from **Fig. 2**, or the voltmeter, tells me what happened. The LED went off, and the voltmeter went high, meaning that something caused the modem to hang up. After some annoyance and a little while, the screen says something to the effect that " ... connection reset by peer ... try connecting again." Not sure what that means, except that it disconnected the phone line from the computer during a session. For that reason, I built just the circuit of **Fig. 2** and leave that part of the Line/Modem Monitor across the line all of the time. That frees up the system shown in **Photo A** to go to work with my son.

How and why

In either circuit, **Fig. 1(b)** or **Fig. 2**, as long as the line voltage stays above about 18 volts, the zener diode and LED1 will conduct enough current to light the LED. R1, the 27k resistor, limits the current in LED1 to a value compatible with the telephone line. The 4.7 megohm resistor, R2, supplies base current to transistor Q1. That causes enough current to flow through the collector circuit of Q1 to keep Q2 from turning on. When the modem picks up the phone and seizes the line, the line voltage drops to about nine volts: the zener diode quits conducting. That turns off both LED1 and Q1. That lets base current flow into the base of Q2 through R3, the 330k resistor. When Q2 turns on, it draws current through LED2 and R4, the 4700 ohm resistor.

With the values shown, LED2 will have a nominal 1.5–2 mA current. Again, for best results, that calls for one of the high efficiency LEDs. I built some of these "off-hook" indicators before the high-efficiency LEDs were readily available. They worked, but with these LEDs you see the status of the line with less eye strain.

Voltmeter or LED?

Depending upon your particular application, you may find a voltmeter a quick, practical answer. The LED circuit costs little and could be left across the line without tying up a multimeter that has many other uses. When we get to the construction section, we will give this some additional consideration.

What's on my line? Or, hearing is knowing

With some sort of voltage indicator on the line, we can tell when the modem has picked up or seized the line. That does not mean that the modem has sent dial tones or that the intercept operator isn't telling you to "... please hang up and try your call again." Those are messages that your computer cannot readily give to you. Most modems let you program them to give some sort of sound until they connect. Sometimes you can even hear them. We have a cure for that with the other part of the Line/Modem Monitor.

Sound off!

The simple audio amplifier shown in the middle of **Fig. 3** can give you a real earful. It uses readily available parts and draws little current: under eight mA without an input signal. Despite what the spec sheets say, my VOM showed around eight mA, an acceptable level to give reasonable life for a 6–9 volt battery. That can come from a handful of AAA cells or from a 9 V battery.

The LM386 amplifier has more than enough gain to amplify the signals that you want to hear on a phone line.

Due to various regulations brought about by practical considerations, the outgoing signal on the phone lines runs just under 0.8 volts rms for sine waves. The incoming signal runs somewhat lower: around one-tenth of that. The outgoing dial tones from the telephone measured right at 0.77 V. The outgoing dial tones from the computer measured just about 0.5 volts. The dial tones consist of two sine

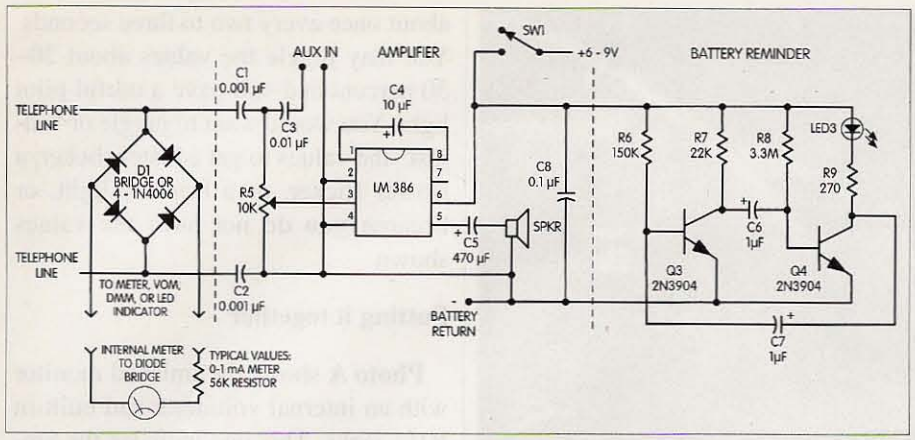

Fig. 3. Line monitor with voltmeter, monitor amplifier, and battery reminder. Meter or LED indicators let you know if the line is in use. Amplifier lets you hear beeps, tones from your computer, as well as incoming signals from the phone line. That includes answering beeps from another computer, as well as messages from the operator telling you to "... try your call again." The amplifier will let this system double as half of a speaker phone. The section to the left of the first dotted line lets you monitor the line voltage. The speaker amplifier sits between the dotted lines. The optional battery reminder is to the right of the dotted lines. It uses little power and its gentle wink can remind you that the unit is still on. The first section may connect to the internal meter which is shown, or it may connect to an external VOM/DMM or the LED OFF-HOOK indicator, ***Fig. 2.***

tones in various combinations to produce the various dial-numbers. The communication tones or pulses from the modem confuse a voltmeter. They are not sine tones. Therefore, the voltmeter cannot give accurate readings unless it is one of the special voltmeters made for this type of measurement. However, those readings can have a useful significance.

The communication pulses from my computer showed up at about the 200 mV level on the analog VOM. A more accurate measurement could be obtained by isolating a scope and connecting it to the phone line. Isolation is necessary because the phone line likes to stay balanced with respect to ground. It does not like grounds on either side of the line.

However, since the VOM is more commonplace, I suspect that most of us find the VOM readings much more practical and meaningful. A cheap DMM showed a nominal 200 mV at the same time the VOM did.

In simple English

Simply stated, you now have some readings that you can use for comparison if you start going rounds with your modem. If you use a VOM to check for these low-level AC signals, use the OUTPUT function or put a 0.1 µF capacitor between the line and the meter to keep the 48 volt telephone "battery" voltage out of the meter.

Setting up the LM386

You may set the gain on the 386 to accommodate the level of interest to you. By adding the capacitor shown in the spec sheets, you have enough gain to hear the incoming pulses, the incoming voice announcements, and, of course, the outgoing tones and pulses. The volume control lets you set a comfortable listening level. You may want a higher volume listening to the intercept operator than when listening to your computer talk to another computer.

DC isolation

As mentioned earlier, with the phone hung up, the phone line has a nominal 48 volts across it, and the ring voltage runs around 75 V (measured) to 90 volts AC at a nominal 25 Hz. Both of these voltages must be kept out of the inputs to the 386. Any size capacitor will keep the DC out, almost. When a blocking capacitor first charges, that could give enough of a pulse to damage the amplifier. Use a small capacitor and give it a parallel path to use for charging, and that will protect the amplifier. Really, it works. The 10k volume

C1, 2	0.001 µF 100 V
C3	0.01–1 µF
C4	10 µF 16 V
C5	470 µF 10 V
C6, 7	1 µF 10 V
C8	0.1 µF 10 V
R5	10k pot, 271-215 (includes On/Off switch)
R6	150k
R7	22k
R8	3M3 (3meg3, or 3.3 megs, or 3,300,000 ohms)
R9	270
Q3, 4	2N3904 NPN, minimum beta, H_{FE} 100
LED3	Red (276-068), green (276-069) — cost a bit more than others, but have a nice holder
LM386	Low power audio amplifier
8-pin DIP socket	For LM386
D1	see **Table 1**
Binding posts, banana jacks	see Table 1; jacks also used if you want to wire the AUX IN
SW1	On/Off; SPST, 275-406 (if you do not use the pot/switch above)
Meter and suggested values for other meters	see **Table 1**
Speaker	2 inch replacement type, 40-250 or a 273-092 8 ohm (4–16 ohms OK). Spkr may be as large as you like, 1 inch to on-sale 5 x 7 inch oval (bigger box needed)
Box	ABOUT 7 x 4 x 2" for system shown in **Photo A**. Smaller box (270-213) will work if you build just part of the system, or the unit shown in **Photo B**. See what they have in stock when you get there.
Circuit board	Perfboard, an easier-to-wire PCB from Far Circuits (see caption).

***Table 3. Fig. 3** parts list. PCB available from Far Circuits, 18 N 640 Field Court, Dundee IL 60118; (847) 836-9148; [farcir@ais.net]; $5.00 each.*

Continued on page 20

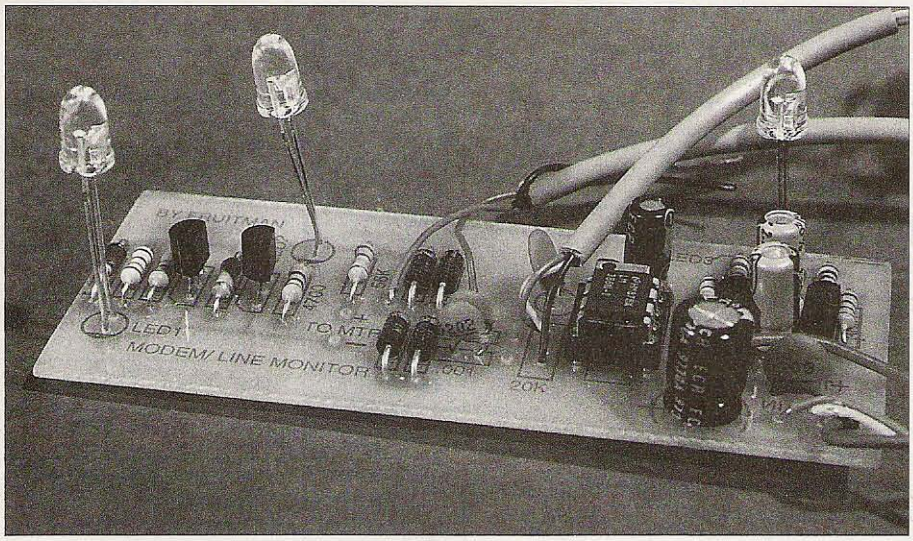

Photo C. *Printed circuit board used in the second unit,* ***Photo B****. Center of board, D1, diode bridge. To the right of that, C1, C2. I used 0.002, as they were handy. Changed them to 0.001 as called for in the circuit due to an apparent problem with slower network connections. The smaller the caps, the better. To their right, the connections to the volume control. This prototype board says 20k, but the actual value is 10k. Amplifier to the right of that. Lower right is C5, 470 µF cap going to the speaker. Above that is the battery reminder and LED3. LED1 lower left.*

More than a Modem Monitor

continued from page 19

control combined with the two 0.001 µF capacitors in **Fig. 3** do just that.

The 25 Hz ring voltage sees a nominal 12 megohms looking at the 0.001 µF capacitors. That sends an insignificant part of the ring voltage to the input of the amplifier. If the volume control is wide open, and if my arithmetic is close, that would be around 0.2 volts. With the amplifier on, I have heard a series of pulses when the phone rang. That also meant that I got to go on-line later — after the children got off the line.

Another advantage of a small capacitor lies in its ability to reject low frequencies. The nominal 25 Hz ring voltage is much lower than the lowest frequency of interest in this application. So, a small capacitor will help reject both the DC voltage and the unwanted low frequencies.

Photo D. *Interior view of model B (****Photo B****). AUX INPUT upper left of photo. Notch in box for input connector with RJ11 plug. Volume control and ON/OFF switch, top center. Notch in circuit board allows it to fit in this box, which has a special compartment for a 9 V battery.*

Battery reminder

The battery reminder shown on the right side of **Fig. 3** can save you some consternation. You may want to include it in other battery-operated projects. It draws little current, and the friendly wink from the LED can remind you that the project is on and draining the batteries. In this case, it's a slow drain; in other projects, it might be a faster fade for forgotten battery-operated equipment.

The circuit consists of a simple cross-coupled amplifier, which makes it an oscillator, with the LED in series with one of the collectors. With the values shown, the LED will flicker on about once every two to three seconds. You may juggle the values about 20–30 percent and still have a useful pilot light. You would want to juggle or "adjust" the values to get a faster flicker, a slower flicker, or a brighter light, or because you do not have the values shown.

Putting it together

Photo A shows the finished monitor with an internal voltmeter and built-in RJ11 jacks. This one includes the amplifier and the battery reminder. You could save a bit of work by replacing the meter with a pair of jacks and simply plugging in your VOM/DMM. You could use one of the LED indicators. Either method will tell you at a glance if someone, or the computer, picked up the line.

Photo B shows a somewhat smaller model that includes everything. It has the internal voltmeter, the LED indicators, and the speaker amplifier. The modem connections consist of a wire with modular plug coming out of the unit. That saves a lot of panel space, and a lot of milling. You can get around the lack of loop-through feature by using a double plug, the type that lets you connect two plugs to the same jack. **Photo D** gives an interior view of this system. For those who like to make their own boards, **Figs. 4–6** give you the layouts.

Milling, drilling

A piece of graph paper taped to the front panel may help with the layout. Place the parts on the paper and mark their positions with pencil. That makes it easy to change if needed. The graph paper can prove most helpful if you use the speaker amplifier. By drilling on the grids, you can get nice, uniform holes for the sound, without having to put an external grill on the box. I figured that one out after cutting a large hole for the speaker and making a speaker grill out of a piece of perfboard. It covers up my 'machining' in **Photo A**.

Although I found the layout shown in **Photo A** convenient, you may make it to your liking. I used the extra large

Phone Lines

Many of us have seen the notation REN 1 on a telephone device. After checking with several authorities, I found a definition for that. It means that when the device is "on hook" hung up, it will draw no more than about 1 µA: The telephone device should not exceed that nominal limit. Actually, all of the devices connected across that line should not total more than REN 5. At least, that is my understanding of REN, Ringer Equivalence Number.

A public utility may complain if one of the systems shown in **Figs. 1, 2,** or **3** is left on the line. They should have little to say if you momentarily connect a circuit across the line in order to determine the state of that line. When trying to tell if a phone is dead or if it is the line, I have hung an analog voltmeter (Simpson 260) across the line for a few seconds.

A private telephone system, such as we have at work, has not complained, and the circuit of **Fig. 2** has proved most helpful.

If you remove everything to the left of C1 and C2 (the first dotted line) in **Fig. 3**, the rest of the circuit should not give the public utilities cause for concern. The audio amplifier will let you monitor the outgoing and incoming audio signals. The battery reminder will remind you that the amplifier is on.

Once the modem picks up the phone line, you could reconnect the first part of the circuit and have the advantage of a visual indication of the state of the line.

The voltmeters shown in **Fig. 1** draw more current than the public utilities like to see leaking out of their system. You could replace the meter with an electrometer, an ultra-high impedance meter, but that defeats the purpose of the system: It becomes a complex instrument instead of a simple, practical method of getting useful, needed information. You could use CMOS circuitry and suitable resistors to limit the current to the 4–5 µA range.

If you remove LED1 and R1 in **Fig. 2**, you should have an OFF HOOK indicator that complies. The impedance presented by the combination of the 4.7 meg resistor and the transistor figures out somewhere in the area of 15 times the minimum that they, the phone company, like to see.

In short, this article shows how to make some systems that can help you determine the state of the phone line and let you monitor the signals where that is permitted. Some of the public utilities may or may not object to your using this on their line. A private, in-house system probably will not. You will have to determine if it is suitable for your application.

I have found these systems useful while tracking down problems involving dial-up telephone connections, whether for a simple voice connection or for a computer/modem connection.

binding posts because they were available. That saved a trip to the store. There is nothing critical about how or where the parts go in the monitor.

First, drill pilot holes for everything. Then, make the large holes for the RJ11, modular jacks, should you choose that option. If you use an internal meter, make a hole for it next. Mount it last. I suggest the large holes first as they are the ones most likely to give the most trouble. On some occasions, they have given enough trouble that I had to start over: new cover.

I try to mount as much as possible on the cover. That preserves the box and simplifies the wiring. The battery holders mount on the inside of the box. The handle came from a hardware store. It is a drawer pull and looks so much nicer than the "electronic equipment" handles. You can get the drawer pulls in a variety of decorator colors: the chrome and the bright brass go well with most decors.

Photo B, a better way

The more compact unit shown in **Photo B** has the smaller binding posts. The trick with the graph paper worked

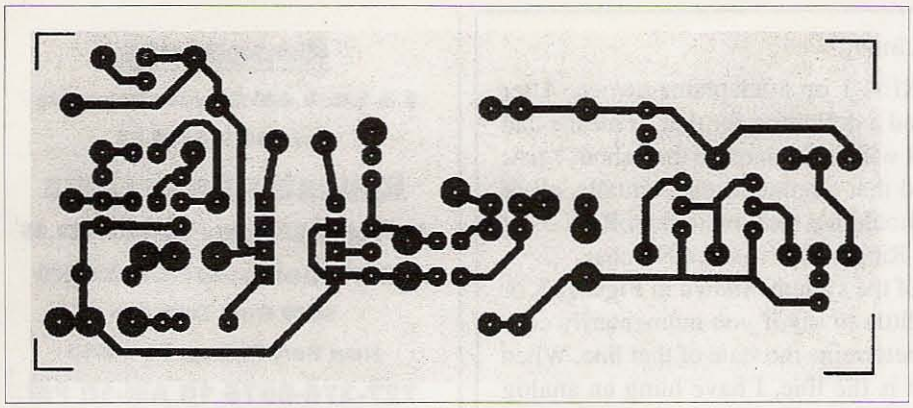

Fig. 4. Foil side 1:1.

well. It worked especially well since my neighbor Walt Olson was kind enough to mount the speaker, the LEDs, the board, and particularly the meter. He likes to spend time with his mill. I let him. The meter came from an old tape recorder and would have strained my "machining" abilities beyond the limit. Walt managed to cram 10 pounds of parts into the proverbial 9-pound box. That is why the model in **Photo B** is so much smaller than the unit in **Photo A**.

Circuit boards

The model in **Photo A** uses perfboard. However, one of the extra nice but inexpensive boards from Far Circuits went into the unit in **Photo B**. That makes construction almost a snap. As **Photo C** shows, you can populate as much of the board as needed for your application. That could include the amplifier, the battery reminder, and the OFF-HOOK indicator.

The only problem that I have had with the boards came from missing a solder connection or two. When you finish soldering the board, go over it with a reading glass and a bright light, looking for solder whiskers that extend from one run to the next. Also, look for unsoldered wires sticking through the board. That's what I said, too, until I had to go back over a board to see why it did not work.

Checkout time

If your version includes just a meter and the modular jacks, plug a suitable cord into the phone line and into the monitor. The meter should read near full scale, about 50 volts. Take a phone off-hook: The meter should drop down to about 9 volts. The NC and C marks on the meters in **Photos A** and **B** indicate Not Connected and Connected.

LED indicators

If you chose the single LED indicator of **Fig. 1(b)**, it should light when you connect the input to the phone line. Taking a phone off-hook should turn off the LED. If it does not, take a voltmeter and check the phone-line voltage. It should have dropped to around 7–9 volts. Hang up the phone and put the voltmeter across the zener diode. It should read 12–15 volts depending upon what you used. If it reads around 1/2 to 3/4 volt, disconnect the unit and reverse the connections to the zener diode. If the cathode, the end with the band, reads minus, reverse the leads from the diode bridge to the indicator.

Make sure that the LED went in the right way. Put a clip lead across the zener diode and connect a nine volt battery across the resistor and the LED. Even at that low current level, the LED will give a visible glow. If you want to be real sure, hang two or three nine volt batteries in series and try it again.

Off-Hook Indicator

If you went for the full feature OFF-HOOK indicator, **Fig. 2**, all of the above applies. When LED1 turns off, LED2 should light. You can test that with a single nine-volt battery in place of the diode bridge. Watch that you put the plus to the top of the circuit, minus to the transistor emitters. If LED2 does not light, put a clip lead from the

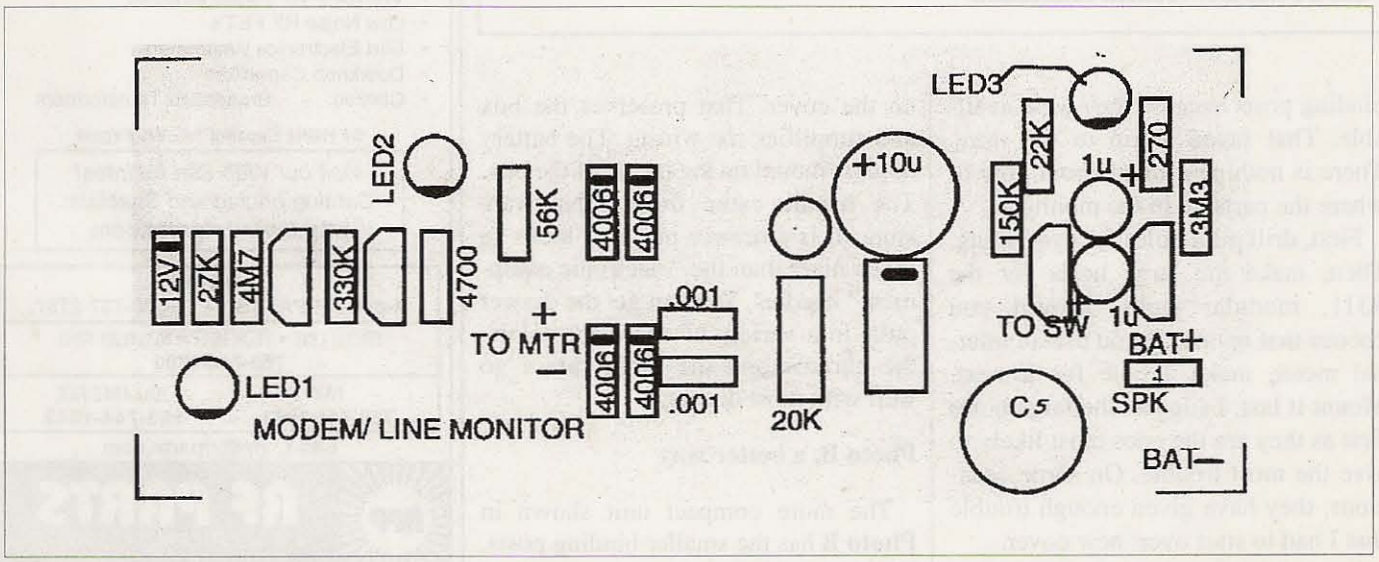

Fig. 5. Component side.

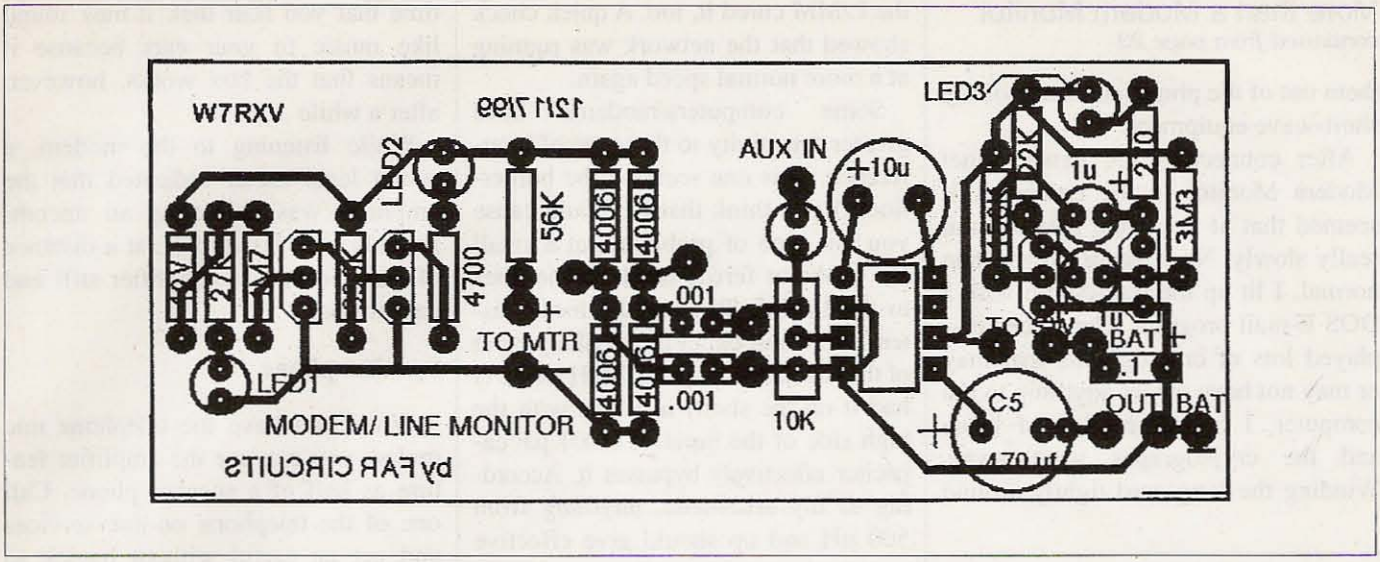

Fig. 6. X-ray view of board.

collector of Q2 to its emitter. If the LED still stays dark, check that the anode of the LED goes to the battery plus.

You are most likely to encounter these problems with perfboard construction. With a PC board from Fred, if you have a malfunction, it will probably come from a diode getting into the board the wrong way, or a missed solder connection.

Special (bug) feature

After my neighbor, Walt, kindly packaged a unit for me, I gave him a board of his own to play with. He said that when his computer went on line the red LED lit as it should. But, if he turned a bright desk light on the green LED (LED1), LED2, the red LED, turned off. After we verified that the LED did indeed respond to incoming light, I looked for a cause and a cure.

The cure came in the form of a resistor shunted across the green LED (LED1). Any value from 10k to 1 meg works well. It seems that you can excite the elements in an LED by driving a current through them the normal way, or you can shine a bright light on them and they will generate a voltage. In fact, some of them even give off their characteristic glow. I thought that it was just an overactive imagination until I asked the right people some questions.

I checked with George, ex-WA6CJZ, to find out just what was happening inside the LED. He teaches physical chemistry at Arizona State University. I work in the same department. George had a simple (to him) explanation. When a bright light hits the interior of the LED, it excites electrons. They move to a higher plane, then drop back to their original state. In the process they give off a photon and generate a nominal 1+ volts. They have only a minute current available when excited by a bright light. An ordinary DMM or VOM loaded down the "LED battery" and showed practically no output. I measured it on a scope and later on an electrometer. Under those almost ideal conditions, a red LED showed about 1.3 volts and a white LED showed close to 2 volts. The white LED has more voltage across it when driving it the normal way with a battery and a current-limiting resistor: about 3.5 volts. So, I would expect to see a bit more voltage across it when exciting it with a strong light.

With the output of the LED battery going into a high impedance circuit, **Fig. 2**, R1 and R2, it delivered enough voltage and current to turn Q1 back on turning off Q2 and LED2. Mystery solved. Annoyance abated. Walt wanted to use it as a photocell. I just wanted the OFF-HOOK indicator to work as I had seen them work for a number of years.

One more "special" feature

I happen to live in a relatively high RF field: 0.6 V/M day, 1.2V/M night. While working for local radio stations I measured that several times. A 5000-watt station has its four-tower array less than two miles from my home. Guess where the main lobe is at night. Once in a while it took a filter to get

Continued on page 24

continued from page 23

them out of the phone and some of my short-wave equipment.

After connecting the newer Line/Modem Monitor to the computer, it seemed that at times the network ran really slowly. No, I mean slower than normal. I lit up the old 486/66 with a DOS E-mail program. The screen displayed lots of cryptographs that may or may not have meant anything to the computer. I pulled the L/MM loose and the cryptographs went away. Winding the long cord tightly around the L/MM cured it, too. A quick check showed that the network was running at a more normal speed again.

Some computers/modems have greater sensitivity to that type of interference. This one seems to be borderline. If you think that RF could cause you this type of problem, put a small RF choke or ferrite beads in the lines to the L/MM. To keep the local "listen" show host out of the auxiliary input of the first L/MM, I put a 7 mH choke (I had it on the shelf) in series with the high side of the input. A 0.001 µF capacitor effectively bypasses it. According to my arithmetic, anything from 500 µH and up should give effective suppression.

Speak out

If you added the speaker amplifier, turn it on, and if you used the battery-reminder option, watch for the flickering LED. A good pretest consists of putting a milliammeter in series with one of the battery leads, or across the ON/OFF switch with the switch in the OFF position. It should read around 5-10 mA depending upon the battery voltage. If it reads nothing or too high, look for missed connections or shorts.

Amplifier testing

Normally, the amplifier gets its input from the phone line. However, since a utility amplifier has many additional applications, I added an external input, the oversize binding posts in **Photo A**: the AUX IN. Before connecting the unit to the phone line, you may feed a low level signal into the EXTERNAL INPUT terminals and listen for the sound. Fifty to one hundred mV from a radio or a signal generator will drive the amplifier to full output. Do not expect hi-fi, but rather a sound like you would hear from a communications receiver.

If that sounds good, disconnect the signal generator, plug the amplifier into a phone line, and turn down the volume. Pick up a phone on the same line and dial a number. You should hear the tones loud and clear. You will have to mute the telephone mic or keep it away from the speaker to prevent acoustical feedback. The first time that you hear that, it may sound like music to your ears because it means that the box works, however, after a while ...

While listening to the modem, a sound level meter indicated that the amplifier was delivering an uncomfortably loud 90 dB SPL at a distance of one meter. The amplifier still had gain to spare.

Speaker phone

When you have the telephone mic muted, you can use the amplifier feature as half of a speaker phone. Call one of the telephone on-line services and get an earful without having to hang on to the telephone receiver.

Modem, at last

When everything looks good, connect the monitor to the phone line and to your computer. You will need a second cord for the version in **Photo A**, or a two-to-one jack for the unit in **Photo B**. The two jacks are wired in parallel, so either one can go to the phone line. If you have either the voltmeter feature, or one of the LED indicators, you should know at a glance the state of the phone line. If no one else has the line tied up, tell your computer to connect to a remote site. You should hear the dial tones followed by the beeps, squeaks, and other assorted sounds that accompany a successful connect, or silence to indicate a successful disconnect.

You can get an idea of what is going on when you send a fax from your computer to another computer or to a regular fax machine. In addition to what the computer screen says, I get useful information regarding the progress of the fax transmission from the speaker amplifier. It also lets me monitor E-mail sessions and "search" sessions without having to keep an eye on the light or the meter to see why the computer cannot find some host. Try it a couple of times. I think you will like it.

Now, during your on-line sessions, you will be able to confirm the statements on your computer screen by glancing at your Line/Modem Monitor or by listening to it. 73

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Inside Digital TV/VCR Tuners

Part 4: Testing and binary data format.

The first three parts of this series on digital TV/VCR tuners discussed the two types of tuners, along with control and the test system that I used during my study of the digital tuner. Specific subjects covered were the synthesizer used to control the local oscillator (VCO) within the tuner, a data transmitter used for sending control data to the tuner, and a data receiver used for observing the data that has been sent to the tuner. In this part of the series we will discuss "how to test" the digital tuner and will describe the methods for setting up the binary data format used for controlling a digital tuner.

The testing of a digital tuner is reasonably simple once a method has been developed for clocking serial data into the tuner. With a data transmitter, microcontroller, or computer operating as a controller, it's necessary only to enter band select information and frequency, and select data in a binary format for the tuner to operate. Upon receiving data in the correct format, the tuner functions in a manner like that of the more familiar analog varactor TV/VCR tuner. Binary formatted data is used to control the tuner's frequency synthesizer. **Fig. 1** shows the data sequence format from MSD on the left to LSD on the right.

The frequency synthesizer within the digital tuner has a main divider chain that sets up the frequency ratio between the tuner's local oscillator (VCO) frequency and the reference frequency applied to the reference port of the phase detector. When the divide ratio number is known, it is then converted from a decimal number to a binary number. In a binary format, the ratio number is clocked serially into the tuner's register.

For the TV/VCR digital tuners that I have encountered, the main divide ratio is determined by dividing the VCO frequency by 62.5 kHz. Some digital tuner synthesizers have optional step frequencies other than 62.5 kHz, but when used, the local oscillator (VCO) frequency band is altered to some degree. Gaining control of the optional step feature usually requires setting up the control data format to clock 34 bits of data instead of the normal 18/19 bits.

As an example of the process involved in finding the data format, choose a VCO frequency of 101 MHz, as is the case when the tuner is set for TV channel 2. Dividing 101 MHz by 62.5 kHz yields a divide ratio of 1616. Converting 1616 into a binary number provides the data format that can be clocked into the tuner's synthesizer. The binary conversion may be done using a great many different techniques, but the easiest is shown in **Fig. 2**. Although the use of a calculator will speed the conversion process, it isn't required when the indicated steps are followed. To help keep track of the final number and to verify the accuracy of the conversion, it is recommended that a worksheet as shown in **Fig. 2(b)** be used as a guide.

Method for calculation

Starting with the known information such as the desired oscillator frequency and the synthesizer step frequency, determine the decimal divide ratio that is needed to generate the desired oscillator frequency.

When the divider ratio is known, subtract the largest binary number from it. In the example, the divide ratio is 1616 and the largest binary number that can be subtracted from it is 1024. Subtracting 1024 from 1616 leaves a remainder of 592. A binary "1" is assigned to the location in the

MSD																	LSD
4	3	2	1	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Band Selectors				Frequency Select Data in Binary Format														

Fig. 1. Data format required for controlling a digital TV/VCR tuner.

Known	Desired oscillator (VCO) frequency = 101 MHz
	Synthesizer step frequency = 62.5 kHz
Find	Synthesizer divide ratio
	Binary number to be clocked into the tuner's register

Steps	N = divider ratio = OSC freq/step freq = 101 MHz/0.0625 = 1616						
	(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**
	1616 – 1024 = 592	592 – 512 = 80	80 < 256	80 < 128	80 – 64 = 16	16 < 32	16 – 16 = 0
Assign	1	1	0	0	1	0	1

(a)

Osc. Freq.	**N**	**16384**	**8192**	**4096**	**2048**	**1024**	**512**	**256**	**128**	**64**	**32**	**16**	**8**	**4**	**2**	**1**
101 MHz	1616	0	0	0	0	1	1	0	0	1	0	1	0	0	0	0
448 MHz	7168	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0

(b)

Fig. 2. Shows the required input information and the steps involved in converting a decimal number to a binary number. (a) Shows the steps used to find and convert from a decimal number to a binary number. (b) Shows how the binary number is charted in the desired format for clocking data into the digital tuner's register.

chart under the number 1024. A binary "1" is assigned each time a number can be subtracted from the remainder. A binary "0" is assigned in the location when a subtraction cannot be performed. In the case of the remainder "80" being smaller than "256," there is no subtraction so a binary "0" is assigned under the 256. Also in the example, 16 is the last number where a subtraction takes place which allows the assignment of "0" to all of the other binary locations.

So that the process of converting from a decimal number to a binary number is clear, a second example is provided in the chart for a VCO frequency of 448 MHz. In this case, a synthesizer divide ratio of 7168 will be required. As the subtraction process occurs, a binary "1" is placed in the columns headed up by 4096, 2048, and 1024. All remaining columns contain a binary "0".

In part five of this series I'll provide a BASIC program that will calculate the binary number for any tuner "receiver" frequency, along with the local oscillator frequency that is selected.

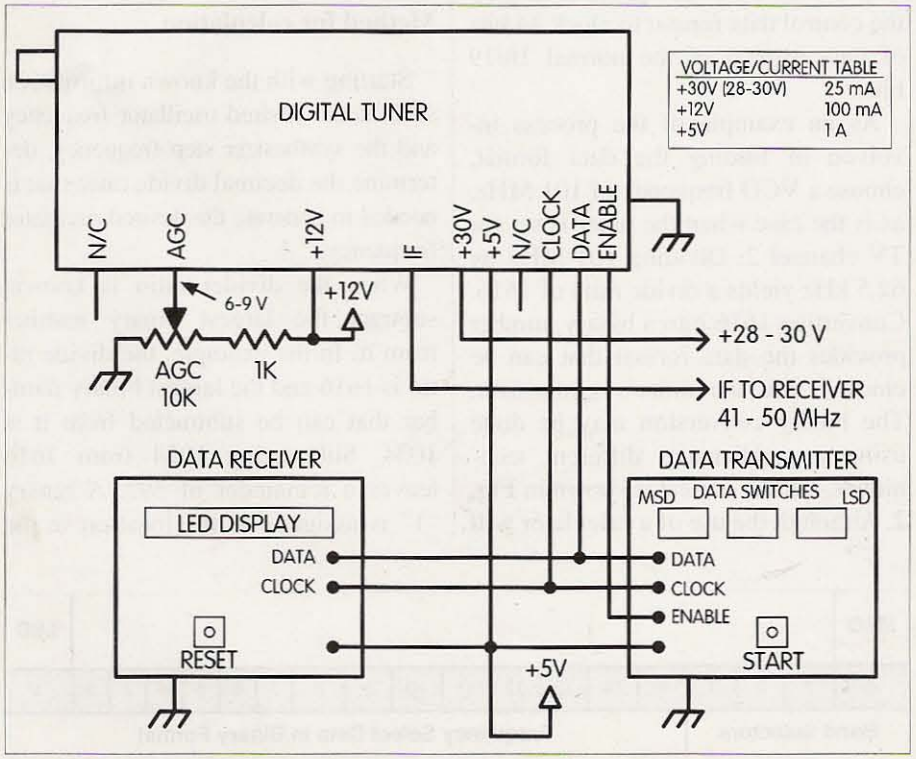

Fig. 3. Test setup and power for testing and/or using a 3-wire digital tuner.

Test setup

Fig. 3 shows the connections to the digital tuner, data transmitter, data receiver, and all of the power supply voltages. A voltage table is provided that may be used as a guide as to the typical current that the user should supply for operating all of the pieces contained in the test system.

Even though the figure is pretty clear as to how things are connected, a few words may help clear up any questions that might remain. All like terminal functions are tied together on all items. As an example, the data terminals on the tuner, data transmitter, and data receiver are connected together. The wires should be of short length and insulated, but shielding is not required. In other words, excess wire length should be avoided, but the units do not have to be crowded.

To gain a perspective on the physical layout of a digital tuner, refer to **Fig 4**. The two main areas of interest are the mixer/oscillator section, and the synthesizer section. The synthesizer section is readily identified because there will be a crystal mounted close by the synthesizer IC. In most tuners, the mixer/oscillator IC will be a surface mounted device soldered onto the circuit side of the circuit board (bottom side). Knowing the physical layout of the tuner becomes important during the test and checkout of the tuner.

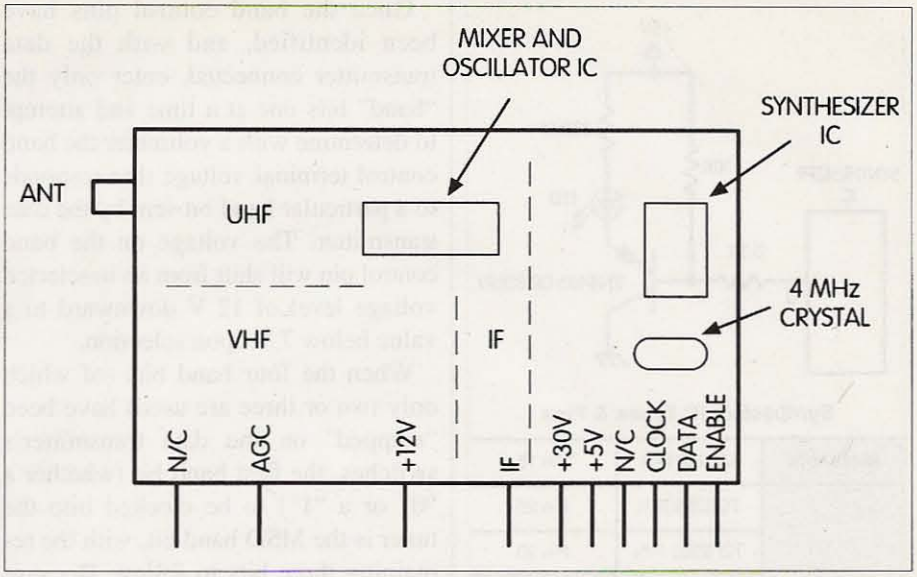

Fig. 4. Typical component placement and RF sections within a digital tuner.

Testing the tuner

All of the required voltages must be applied to the tuner so that it will be active and ready to operate. The input data is entered into the tuner by setting the switches on the transmitter and pressing the "start" switch. The tuner resets for the next data entry whenever the ENABLE line goes HIGH. Data entered previously into the tuner is retained by the tuner as long as power is applied and the ENABLE line remains LOW.

Band and frequency select data can be sent to the tuner at any time after power is applied. But during the initial stages of testing, the data set position relative to how the synthesizer data register "sees" the data can be an unknown and requires some initial experimentation. Shifting the data bank back and forth a bit or two will usually suffice, but finding the MSD and or LSD bit location within the tuner's register may be a little elusive.

One technique that I've used that appears to work with most tuners, particularly those having a synthesizer chip with known band control pinouts

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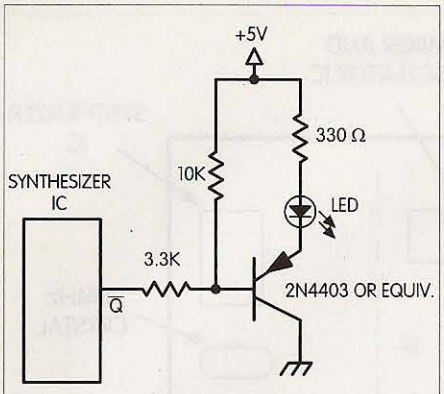

Synthesizer IC Types & Pins

Motorola	MC44817D	Pin 15
Toshiba	TD6359 P/N	Pin 20
	TD 6380 P/N	Pin 20
	TD 6380 Z	Pin 16
	TD 6381 P/N	Pin 20
	TD 6381 Z	Pin 16
	TD 6382 P/N	Pin 20
	TD 6382 Z	Pin 16

Fig. 5. Synthesizer phase lock indicator. LED transistor driver is connected to the lock detector's output pin.

(one of four), is to measure the voltage on the selected pin. In the absence of known pinouts, tracing the tuner's band control transistor base circuits back to the synthesizer IC provides a level of confidence. A strong magnifying glass and an ohmmeter are usually required during the tracing process.

Once the band control pins have been identified, and with the data transmitter connected, enter only the "band" bits one at a time and attempt to determine with a voltmeter the band control terminal voltage that responds to a particular band bit sent by the data transmitter. The voltage on the band control pin will shift from an unselected voltage level of 12 V downward to a value below 7 V upon selection.

When the four band bits (of which only two or three are used) have been "mapped" on the data transmitter's switches, the first band bit (whether a "0" or a "1") to be clocked into the tuner is the MSD band bit, with the remaining three bits to follow. Because the band select bits are "pass-through," only one of four bits is selected for each of the tuner's bands.

The first frequency data bit (MSD) will be the first data bit that follows the fourth band bit. The LSD data bit will be the last bit to be clocked into the synthesizer. An illustration of the band and data bit format that is expected by the digital tuner was shown in **Fig. 1**.

A more random method for determining the data set position for the data transmitter's switches is to find the lowest LSD switch setting that affects the synthesizer's divide ratio. Counting the switches upward to 19 will identify the MSD position. With a step frequency of 62.5 kHz, the lowest LSD switch will shift the oscillator frequency by 62.5 kHz. The next lower switch will have no affect on the divide ratio.

One of the most helpful hints that I can provide is to suggest monitoring the synthesizer's "lock" feature. Entering data into the synthesizer and not knowing whether or not it's responding is quite unnerving at times. Most digital tuner synthesizer IC's have a dedicated pin that goes to a logic LOW when the system locks. Building up an LED driver circuit as shown in **Fig. 5** will provide visualization of what the synthesizer is doing. Connecting the LED driver, as shown, requires that a wire be soldered to the appropriate IC pin (IC pins are indicated for specific chips). This step should be avoided if you lack skill in soldering in cramped spaces. Excessive heat must be avoided to prevent damage to the synthesizer IC.

Of course, monitoring the local oscillator frequency with a frequency counter, when one is available, will provide direct feedback as to what the synthesizer is doing as well as indicate

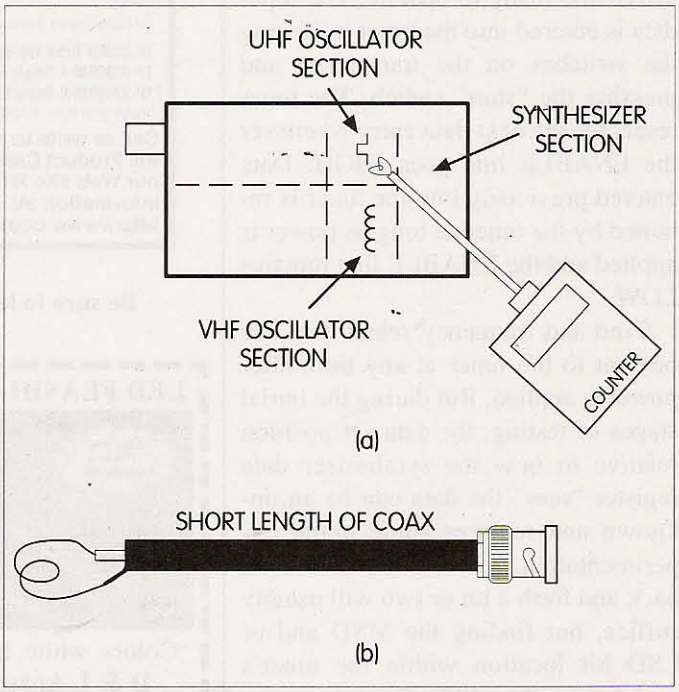

Fig. 6. Coupling signal energy from the tuner's VCO into a frequency counter. (a) Shows the approximate placement of the pickup coil. (b) Shows details of a suitable counter sampling probe. 2T insulated wire; coil diam. about 1/4"; coax type optional, RG-174, RG-58 work well.

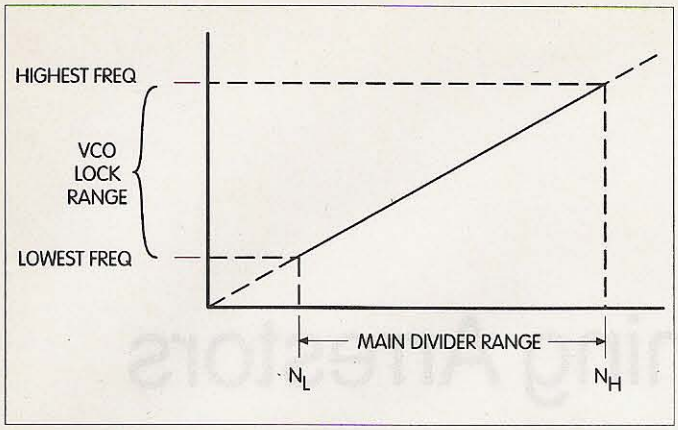

Fig. 7. VCO lock range as a function of the divide ratio of the main synthesizer divider. Dotted ends indicate ambiguity of the lock range per individual tuner.

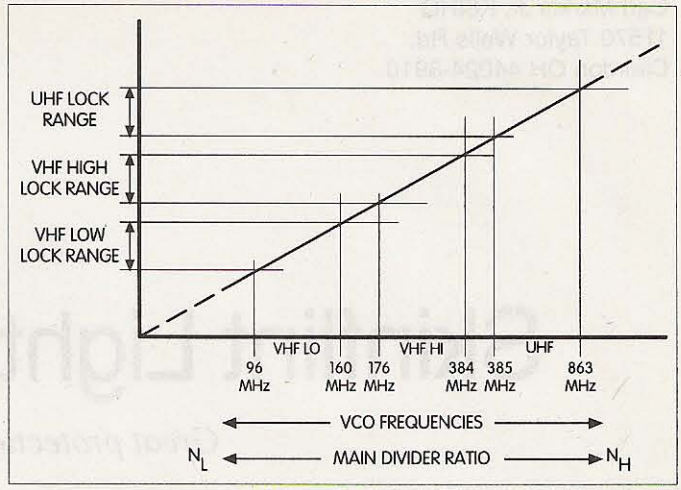

Fig. 8. Typical VCO tuning curve showing frequency vs. lock range.

the frequency of VCO operation. Coupling is provided to the counter through a small pickup loop that is placed adjacent to the oscillator coils within the tuner. **Fig. 6** shows the details of the pickup loop and typical placement within the tuner. A tight coupling between the coupling loop and the oscillator coil is usually needed to achieve a "good" count.

Tuner response

One of the problems that I encountered during the initial test period was determining if and how the tuner might be responding. The use of the counter and "lock" indicator were of great assistance to me. Perhaps not knowing the band edges was the biggest deterrent.

To share my findings regarding the band limits and VCO lock capability, I've developed two charts shown in **Figs. 7** and **8**. The first chart is an expanded section showing the VCO tuning ramp from the lowest to the highest divide ratio for a given band. The VCO in various tuners has been set up to "lock" within the frequency requirements of the TV channels. But in some cases, the VCO will lock at a band of frequencies wider than the TV requirements, as indicated by the dotted lines representing the lock ambiguity. During initial testing, finding the near center frequency in each band provides the best opportunity of getting a "lock." Locating the lowest and highest frequency for each band is done by changing the divide ratio incrementally until the synthesizer drops out of lock.

Fig. 8 shows the typical VCO tuning curve and band by frequency. Some tuners exhibit a band gap between segments and others do not, which is a function of the lock ambiguity. The frequencies shown in the chart are the typical band limits that may be used for finding the near band center "lock" frequency during initial testing.

What's next

Parts five, six, and seven of this series on TV/VCR digital tuners will follow. Part five will provide a BASIC program that will allow the conversion of decimal frequency numbers to binary control numbers as required for tuner synthesizer control. Parts six and seven will wrap up the digital tuner discussion with a procedure for making printed circuit boards. 73

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Skinflint Lightning Arrestors

Great protection on the cheap.

Who needs coax high voltage impulse (EMP) protection? You can bet you do, if you expect to keep that expensive low loss coax cable usable after a harmful electrical event. And this is not to mention what would happen to those super-sensitive field effect transistors (FETs) in the front ends of the new solid state transceivers.

It is good common practice to provide outer shield coax grounding at the base of a tower so that if a near miss lightning strike occurs, proper safety precautions are observed. However, there is the problem of the 2,000 volt breakdown between the inner conductor and shield of the coax cable. By the time the breakdown occurs, any equipment left connected to it in the ham shack would have suffered substantial degrading, if not outright destruction. It is a costly problem for everyone concerned.

The first thing to be considered is the basic three classes of coax cable. The large 4,000 volt breakdown types, such as RG-213, RG-8, RG-17, and so on, are relatively expensive in today's marketplace. Then there are the smaller cables used by hams who anticipate running output powers of 600 watts (continuous) or less. Quite a cost savings can be realized with such cable, along with the very flexible nature of the product. These cables are the 1000 volt breakdown types such as RG-58, RG-59, RG-8X, and so-forth. Then there is the third type, such as RG-6, RG-174, special Teflon low loss, and so on. These types have breakdown voltage specifications of, typically, 700 volts and in some cases 200 volts. Obviously, these are to be used in the UHF/VHF ranges such as 145 MHz and 432 MHz; however, high SWR in the range of 3:1 can produce breakdown very easily in these types.

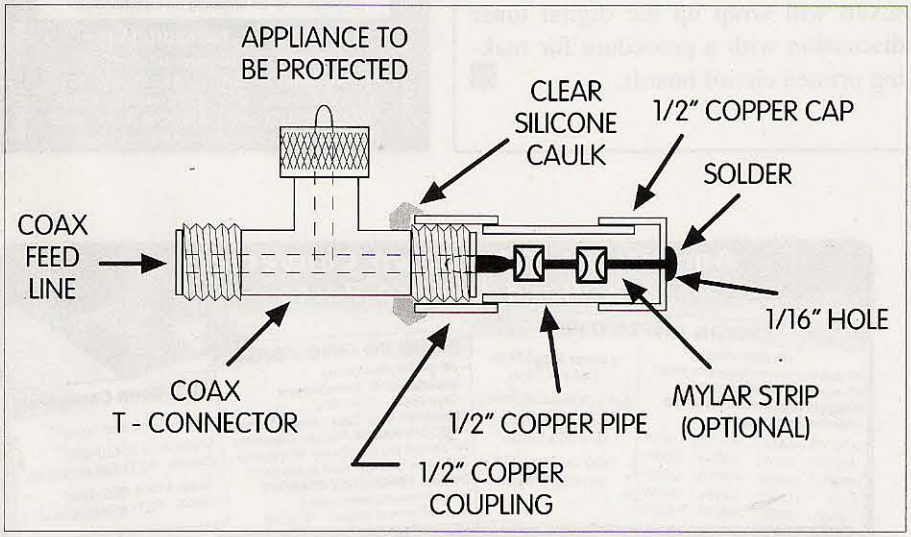

Fig. 1. *Gas discharge coax lightning arrestor. Notes: (1) Ensure that gas devices do not short center conductor to shell. A piece of Mylar can be inserted. (2) Use clear silicone caulk around housing to make the moistureproof connection. (3) Two 350 V gas discharge spark gaps (700 V breakdown). Ensure centered, or use a piece of Mylar drafting material as an insulator (1 µS 700 V response). (4) Specifications — 20,000 A surge current, 10^{10} ohm insulation resistance, 1 pF capacitance, 1 mS response (100 V/µS).*

As can be seen, the buildup of EMP (electromagnetic pulse) between the inter and outer shield of coax can happen in just microseconds even with a near miss of lightning. If a strike *does* occur, it is probable that the tower will be the arrestor, and maybe you will not lose the rotor and rotor cable. Arresting of the rotor cable will occur at earth ground. Take the rotor cable and ensure that it is taped securely to the tower leg before descending down to

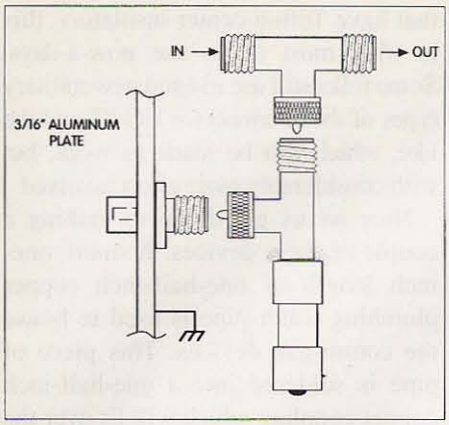

Fig. 2. Gas and gap assembly (full protection). Notes: (1) Gas discharge to protect sensitive FET devices in today's transceivers (IGFET dual gate). 700 VDC and overclamping, 10,000 amp 1 uS response. Clamping of static voltage buildup on antenna also. (2) Impulse voltages exceeding approximately 2000 VDC. Spark gap device 0.25" gap, hard clamp for near-miss lightning strike protection, for coax cable RG-213, RG-8, RG-17, etc. (3) Most transceivers have a 56 ohm 2 watt resistor across the SO-239 antenna connector to bleed off static voltage buildups.

the earth ground. This usually will provide your best chance of surviving a near miss.

The coax cable is yet another problem. The near miss lighting strike will hit the antenna and run down the coax via the shield until it finds a low resistance path to earth ground. Well, maybe you will lose fifty feet or so of coax if you have a good earth ground at the base of the tower.

The worst case is a near miss which does not run to earth ground but instead stays on the center conductor of the coax. This is a real problem, since it will mess up your nice expensive solid state equipment, should it be attached, and possibly burn "punch through" holes between the inner conductor and the shield of the coax, through the insulation material. Usually this will happen in several places along the coax until it reaches earth ground level and arrests itself.

Now, you are saying OK, what do I do to provide inexpensive protection from this problem? There are many home-made remedies, including the shorting of coax at the station when not in use.

However, I have the feeling that if any of nature's fury is ever headed my way, it can be kept outside at the base of the tower and I will sustain minimum damage. It is always a good rule of thumb to keep the tower at least 50 feet away from any structure, and well grounded to earth. A good system of center conductor protection for coax cable is going to be described here.

The first thing to consider is how fast the response is to EMP. Any device responding after about five microseconds is probably too late. I like the numbers one microsecond and 700 volts. If a device can clamp off at those parameters, it is likely that the cable will survive and it is probable that the transceiver FET will do OK, just in case you forgot to disconnect from the antenna system.

The following information is provided so that you can home-brew your own inexpensive devices with

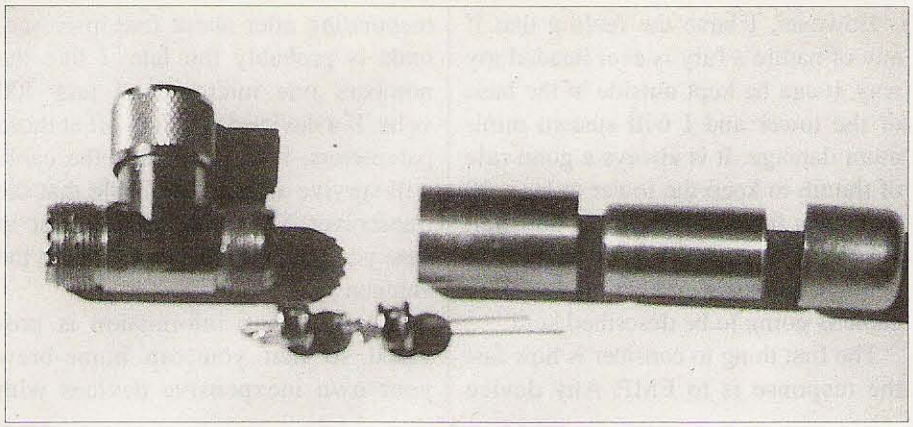

Photo A. *Gas discharge EMP arrestor parts laid out for assembly.*

components available from the sources given.

Another important thing to note is the incoming 120 VAC power input source. This electrical service requires that neutral and ground be connected to earth ground at the circuit breaker box that powers your residence. This National Electrical code requirement provides a nice earth ground for your ham shack equipment unless disconnected. In most cases, we just do not electrically disconnect at the ham shack when we finish operating. The coax shield is now grounded via the residence earth ground and the tower base ground, which is usually a considerable distance apart. This sets up a naturally bad situation for ham equipment destruction. I recommend some type of coax disconnect system in the shack which can be quickly engaged. A relay which disconnects the coax from equipment when not in use can be devised. Now, at least you have a chance of surviving. In any case, these are the three rules I recommend to provide some degree of protection.

Quantity	Description	Cost	Source
1	UHF coax T connector	$2.45	Hosfelt #552A
2	Siemens B1A350	$5.60	Mouser #444-GT350L
1	0.5" copper pipe coupling	$0.15	Local
1	0.5" copper pipe 1" long	$0.10	Local
1	0.5" copper pipe cap	$0.20	Local
	Total	$8.50	

Table 1. *Gas discharge arrestor parts list.*

Make your ham shack an island when not in use!

My three rules for survival are:

1. Ground the coax shield at the base of the tower at least 50 feet from entry to the shack and disconnect when not in use.

2. Adhere to National Electrical Code (NEMAL) rules in residential homes regarding the AC power source. Both neutral and buss ground returns go to the circuit breaker box and then directly to the earth ground rod at the box. Disconnect AC power when not in use.

3. Use a gas discharge device to provide 700 volts and less than one microsecond clamping and breakdown between the center conductor and shield of the coax cable at base of tower and RF earth ground.

Now, let's look at a little history on the "gas discharge" device, which is sometimes referred to as a "comm-gap" device. They are available in four or five different breakdown voltages, and all respond in the one microsecond range. They are similar to a neon lamp bulb. There are at least three manufacturers of these devices. One of these manufacturers retails the devices via Mouser Electronics under a catalog number of #444-GT-350-L; this is a Siemens stock number of B1A350 with a cost of $2.80 each. Sometimes you can find these devices at flea markets for $1.00 each if you are lucky. This source comes from the OEM folks who have production over-runs that filter into the flea market arena.

Since we now have SO-239 and PL-259 UHF-type coax connectors that have Teflon center insulators, this is what most of us use now-a-days. Some folks still use old and new military types of the N connector UG-21 and the like, which can be made to work, but with considerably more effort involved.

Now let us get down to making a couple of these devices. A small, one-inch length of one-half-inch copper plumbing water pipe is used to house the comm-gap devices. This piece of pipe is soldered into a one-half-inch copper coupling which will fit over the UHF coax T connector. Now fit the one-half-inch copper pipe end cap over the pipe and solder in place. Drill a small, one-sixteenth-inch hole into the center of the cap so that the wire lead of the comm-gap will pass through. This completes the housing, and we can move on to the attachment.

Twist together one lead of each comm-gap device to provide a good mechanical coupling, and solder. Clip the excess leads and prepare one lead of the assembly for insertion into the female center pin of the T connector. Usually, a needle-nose pliers is all that is needed to make a small loop which fits tightly into the connector. Solder this connection as quickly as possible to minimize the heat to the center pin of the connector.

Now, push the copper pipe assembly over the pair of comm-gap devices, taking the remaining lead through the cap hole until the assembly is in place. Bend the lead and trim and solder to the copper cap end. Take an ohmmeter and check continuity between the center and outside case of the coax T connector. No shorts should exist. A little silicone RTV (clear caulk) can be used to provide a seal.

Let's check for continuity between the T connector outside case and the

Quantity	Description	Cost
1	UHF SO-239 coax receptacle	$0.75
1	0.5" copper pipe cap	$0.25
1	UHF T coax connector, or a gas discharge device	$2.45
	Total	$3.45

Table 2. *Spark gap parts list.*

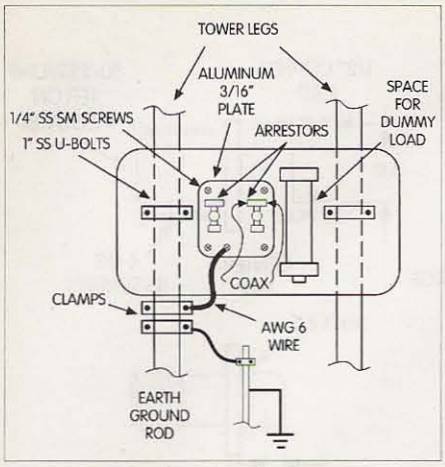

Fig. 3. Tower plate installation.

copper end cap. Continuity must exist. When attaching to the associated SO-239 connector on the antenna or tower base, ensure that the cap is facing up and the coax cable is coming out from the sides. This ensures that moisture will not be able to seep inside of the arrestor housing. You have just made a 700 volt one microsecond EMP device, for under $8.50, which should provide adequate protection.

A quick look in your favorite ham publication will make you aware of the cost of commercial versions in the $50 range. These devices have no frequency or RF power limitations. The usable SWR range is about 7:1, which is well beyond any usable antenna system specification. If you are over 3:1, you just do not have a usable system!

Spark gap lightning arrestor

Now that we have the EMP protection between the center conductor and shield of the coax taken care of, it is time to consider the direct lightning strike possibility. This means catastrophic breakdown and failure of gas discharge and coax cable. We need to ensure that most of the strike will be conducted directly to the earth ground system. Remember, we want the shortest and straightest path to earth ground.

The spark gap will ensure that voltages exceeding 2,000 volts for a period beyond the one millisecond time frame will have a direct path to earth ground. This can be done with a one-quarter-inch air gap between the shield and center conductor. Here's how I do this at this QTH.

See the **Fig. 4 (b)** side view for the assembly details. This is done simply by using a good SO-239 coax receptacle, UHF-type, with the Teflon center insulator and the nickel or silver plated shell. Purchase a one-half-inch copper pipe cap from the local hardware store. Attach it to the back of this SO-239 with clear 100% silicone caulk. Ensure that there is continuity between the copper cap and SO-239 shell. Allow time for drying, and then mount to an aluminum ground plate as follows.

Quantity	Description
1	24" x 12" x 3/4" CDX ply, coated with shellac and spray enamel paint
4	1/4" x 1/2"L SS sheet metal screws
2	1-1/4" x 2" SS U-bolts
2	Gas discharge spark gaps
3	Ground rod clamps
1	8' ground rod
1	#6 AWG lug and bolt
2	1' #6 AWG solid copper wire
1	3/16" thick 8" x 8" aluminum plate

Table 3. Tower plate parts list.

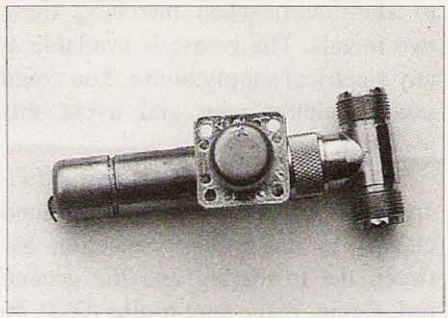

***Photo B.** Final assembly — gas discharge EMP arrestor and spark gap unit.*

At this QTH, we use a 24- x 12-inch 0.75-inch-thick CDX plywood piece which has a couple of coats of shellac and a couple of coats of enamel paint to provide a tower base mounting system. I use a small piece of three-sixteenths-inch-thick aluminum stock to mount all the coax connections on, and then one-quarter-inch stainless sheet metal screws in the four corners to mount to the plywood base. This assembly is then mounted to the two tower legs with U-bolts (stainless are good!) to provide a really nice looking transition point.

On this aluminum plate, mount a copper lug with AWG #6 or better solid copper wire to a leg of the tower. I always use anti-oxide grease (copper

to aluminum) when matching these two metals. The grease is available at any electrical supply house. You could use aluminum wire and avoid this problem.

Then purchase an electrical NEC-approved ground rod and two ground clamps to make the connection between the tower leg and the ground rod. Again, make sure to use AWG #6 or larger solid copper wire. Also, if the tower is not aluminum, ensure wire connects to both of the ground clamps.

Now you have a good, safe RF ground for your radio station. This is NOT to be connected to the electrical grid power system. Keep electrical power and RF grounds separate if AC power neutral and ground returns are tied together. Current traveling on the return neutral may like your RF ground better than its own, and real trouble begins.

For the experts, yes, I am aware of the National Electrical Code and its safety issues. A ground rod in the earth is considered to be an acceptable and required safety ground by the NEC.

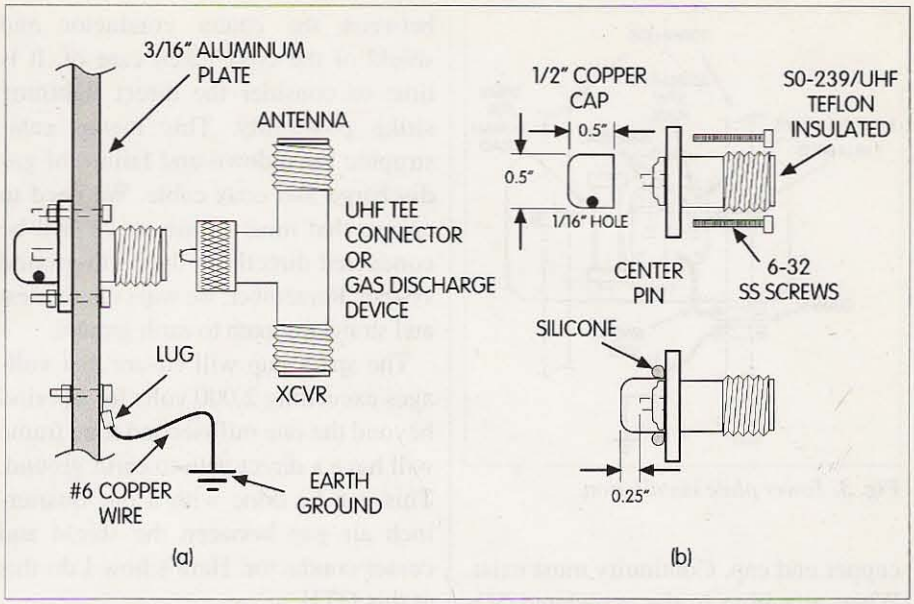

Fig. 4. (a) Spark gap lightning arrestor assembly. (b) Construction details. Notes: (1) SO-239 is silver or nickel plate. (2) Copper plumbing 1/2" cap. Small 1/16" vent hole in bottom side (face ground). (3) Physical earth grounding.

The use of one for AC power and three for antennas is an example of the inconsistencies. It is recommended that an AC switch and relays be used to disconnect and isolate your power source when the station is not in use. Unplug your station!

It is a good idea to put a large MOV device across the 120 VAC source to ensure that the ills of the power grid do not eat your expensive electronics when you are using your station.

Use common sense!

Now, you have gas discharge devices for static voltage buildup problems and near miss lightning strikes, and a spark gap device for the really wild things that nature can send your way. The required safety and earth ground requirements have been met with the tower base aluminum plate assembly, and we are now interested in how the coax cables are to attach to all of this.

Well, the UHF T connector takes care of all of that. Just cut the coax cable and attach a UHF-type PL-259 male plug to each end, and attach to the two female ends of the T connector. Please use a good grade of PVC electrical tape to weatherproof the PL-259s. You are now both safe and efficient. Play it safe!

Sources

Mouser
958 N. Main St.
Mansfield TX 76063
1 (800) 346-6873
(Fax) 1 (817) 483-6899
[www.mouser.com]

Hosfelt
270 Sunset Blvd.
Steubenville OH 43952-1158
1 (800) 524-5414
(Fax) 1 (800) 524-5414

Bill Hendrey KC6JGS, ex-K7KST
J76048, A3-109
P.O. Box 5002
Calipatria CA 92233

Angel Voices

This was no ordinary beam tuning experience.

June in Seattle, Washington, is normally the beginning of summer, and the days are usually sunny and warm. It was 1960, and my ham buddy Jerry W7IDI and I were getting our plans ready so that we could tune Jerry's two meter beam antenna that he had purchased at a flea market. The beam had already been mounted at the top of Jerry's fifty-foot self-supporting tower. The beam used a "gamma match" for loading.

Two hams were required to properly tune the antenna, one at the top of the tower and one on the ground adjusting the "rig." It was decided that Jerry would stay on the ground, since his left leg was still healing from an earlier auto accident. I would be at the top of the tower adjusting the gamma match, which had two adjustments — one was a shorting bar, and the other a variable condenser.

The only tools that I would need would be a crescent wrench, and a flat-bladed screwdriver. The tuning condenser had a lock nut and splined housing over the rotating shaft, which kept the shaft from turning when adjustments were not required.

We had tried for some time to obtain a climber's belt to support the one who would be up on the tower. However, we had no luck in finding anyone who was willing to loan us theirs. It was decided to go to the local hardware store and purchase a seven-foot length of 5/8-inch hemp rope to replace the climber's belt.

When the day arrived, Jerry showed up at the front door of my parents' home and picked me up. We drove the five miles to Burien, where the hardware store was located, and purchased the required hemp rope.

When we arrived at Jerry's house, we started setting everything up. I took a card table outside to the foot of the tower and set it up about eight feet away from the base, while Jerry brought the transmitter. I returned to the house to get the receiver. Jerry returned to get the one-hundred-foot extension cord, and started paying it out from the house. When he was finished putting out the extension cord, he returned and got the test equipment.

"Bill, hold on to the tower and check your rope!"

The two meter beam with its attached coax had been set in place previously, waiting for the day that we could tune the antenna.

Jerry had the transmitter, receiver and SWR bridge hooked to the TR switch (a manually operated transmit-receive switch was used in those days), and a ground attached to the base of the tower, and all of the equipment on the card table to prevent electrical shock hazards. It looked like everything was ready to go.

The last thing that we did was to examine the rope, because I would be leaning out from the tower with that rope around my waist, and that rope had to support my weight. The rope was in perfect condition. Folding it and pulling the loop end through my belt, I got a screwdriver and an eight-inch insulated-handle crescent wrench from Jerry. Then I started climbing up the fifty-foot tower.

When I had climbed to within two feet of the top, I looped my left arm through the tower and pulled the rope off of my belt with my right hand. Carefully, I pulled the rope until I was able to get a hold of the end of it, and feed it through one side of the triangle-shaped tower, across and out the other side, so I could hold the end in my left hand. Twisting my body to the left, I reached around with my right hand and retrieved the free end of the rope and pulled it around my body. Then it was on to my left hand, where I carefully tied a double square knot, square knot on top of square knot, and placed the double knot on one of the angled sides.

The vertical supports of the tower were made of large angle iron, with smaller angle iron for the horizontal

support, all of which were heavily galvanized, so that the edges of all of the angle iron were soft and smooth. Had there been sharp edges on the angle, I would have had to put something between the rope and the tower where they touched.

After I tied the knot and set the rope across my back, I tested the rope as I carefully leaned out from the tower while holding on to the tower with my hands. I bounced my body several times to make sure that the knot was securely fastened before I let go of the tower and stood securely in place. I then climbed up two more feet so that the rope would be around my waist just above my belt, and I was able to reach up with the wrench and loosen from its splined shaft housing the nut which held the Rotor shaft firmly in place. I yelled down to Jerry to go ahead and tune up.

Plugging in the equipment, and picking out a clear frequency on his receiver, Jerry fired up his transmitter into the antenna, and checked the SWR. It was way off. Next, Jerry asked over his mike if the frequency was clear, and, hearing nothing, gave his call and explained that we would be testing on this frequency for the next half hour. Next, Jerry yelled up to me, "Mesh the plates, Bill."

Inserting the screwdriver into the slotted end of the rotor shaft, I turned the rotor shaft until the rotor plates were fully meshed with the stator plates. I let Jerry know that all was ready, and he retuned his rig and took the reading. "Give it a small tweak," Jerry yelled.

I inserted the screwdriver and turned the rotor shaft slightly. Jerry retuned his rig again and said, "Try it again, Bill." I inserted the screwdriver into the slot and turned it a little more. "That's looking a lot better," Jerry said. "Turn it some more." Again I repeated the process as before, and Jerry took his reading. Back and forth we went, trying to find the best setting for the lowest possible SWR reading.

As I reached up to insert the screwdriver into the slot of the rotor again, I heard a voice call out to me. It was about three feet above me, and about six feet in front of me. It called out, "Bill, hold on to the tower, and check your rope."

Stunned, I looked up into the clear blue sky between the elements and the boom of the beam, in the direction of the voice that called out to me, but there was no one there. I felt a prickly feeling all over my body. "Jerry," I called, "did you just call me?"

Jerry said, "No."

"Well, someone just called out to me and it sounded like it was coming from the sky in front of me."

Jerry said, "You're just hearing things, Bill — let's finish this up. Make that adjustment for me."

Again I reached up and turned the rotor shaft a small tweak, when the voice called out to me again — only this time it was more insistent, "BILL, HOLD ON TO THE TOWER AND CHECK YOUR ROPE," it said.

"Did you hear it that time, Jerry?" I called out.

"What did it tell you this time, Bill?" Jerry asked.

"It told me to hold on to the tower and check my rope."

"What did I tell you before, Bill? Now let's finish this project."

Leaning out on the rope, away from the tower, I felt very secure. The rope was firm, and at the angle I was leaning at, it even dug into my flesh a bit where it went around my waist just above my belt. I inserted the screwdriver into the shaft on the tuning condenser and gave it another small tweak. "OK, Jerry," I yelled. Jerry made some more adjustments and decided that I needed to climb up higher and readjust the shorting bar by moving it two inches farther out.

Before I could start to climb higher up on the tower, the voice sounded very angry and gruff this time: "B-I-L-L!!! HOLD-ON-TO-THE-TOWER-AND-LOOK-AT-YOUR-ROPE-RIGHT-NOW!!!"

"Jerry, did you hear it that time? It sounds very angry." I said.

"I give up, Bill. I guess this won't stop until you look at your rope and see that nothing is wrong with it, and we can finish this up," Jerry said.

Stepping back down two feet from the top of the tower, I looped my left arm through the tower as I had before, and carefully pulled the rope around with my right hand, feeding it through my clenched left hand that was sticking out of the inside of the tower. When I got to the point that was across my waist, I stopped.

What I saw gave me a sudden chill. The point at which the rope lay across my waist behind me, that had supported all of my weight, was cut all the way through as if a scalpel had cut it. The cut was clean and even, with no raggedy ends or strands sticking out. Just one, single, hair-thin piece of hemp held the two ends from separating completely.

"Jerry, you've got to see this rope right now," I said.

Standing on the ground, Jerry yelled up to me to climb down and show him what the matter was with the rope. Very carefully, I folded the ends of the rope so that I could keep the ends in the same position, without separating the little strand of hemp. I placed the rope in my mouth and held it with my teeth. I untied the rope and carefully placed the rest of it over my right shoulder before starting back down the tower. I wanted the free ends to be behind me where I could not step on them as I descended from the tower.

When I reached the ground, Jerry was there waiting for me. I carefully took the rope out of my mouth and handed it to him. Jerry stood there for a moment with his mouth hanging open.

Holding the free ends of the rope together in his right hand, about three inches below the cut, Jerry asked me, "How did you do this, Bill? Turn around and let me see your back."

I turned slowly around and Jerry eyed me very carefully. As I turned, I lifted my shirt so that he could see where the rope had rested against my waist, which left a red welt where the rope had dug into flesh. The only other tool that I had in my back pocket was the red insulated handle of Jerry's crescent wrench, which was sticking out of my right back pocket a few inches. I did not carry any other tool or

Continued on page 62

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Houston TX 77006

Introducing the Perfective 1

This noninvasive current meter features a clever circuit that YOU can build.

The problem with making current measurements using the standard mA meter is that the meter must be inserted into the measured circuit. These meters have internal resistance, which adds to the resistance of the circuit being measured. This causes a reduction in the circuit current, and thus a lower reading than expected. No more.

You know, what instigated this whole project was a student's comment in class one time. I was lecturing on the use of the milliammeter and explaining how the internal resistance of these devices often causes bad readings in a circuit. I commented that when we all get to heaven and St. Peter issues us our little mA meters, they will be PERFECT, with no internal resistance or resulting voltage drop.

The students took this with a sigh, but one in the back looked worried. I asked him what was wrong, and he replied: "Mr. Lorfin, I wonder if YOU will ever get to see one ..."

Well, I thought about this and realized how true that might be. So I decided that I had better invent one for myself while there was still time, if I was ever going to behold one's beauty.

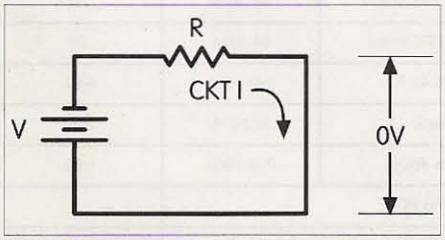

Fig. 1. Representative circuit showing current flow.

This project is the result.

P.S. The student made an A in the course.

In search of perfection

Sometimes, a circuit may be working perfectly until you make a current measurement, and it may not be working so well while you are making the measurement. Also, from the results of the measurement, you might mistakenly think that there is a defect in the measured circuit when there really is not one. This has been quite a problem for me and others in the past.

To fix it? Well, it was hard to imagine a standard DC-AC milliammeter that has zero measuring resistance and zero burden voltage. However, one day a thought came to me that resulted in this design, a design that has overcome this fault and resulted in the "Perfective Current Meter."

This instrument is not difficult for anyone to build. I built the prototype shown here for about $60. Let me hasten to add that this was going first-class, using new parts not obtained as cheaply as could have been.

In **Table 1**, I've listed the specified internal resistance and burden voltage values for one commercial DVM. In **Table 2**, we see some typical current readings, taken with random resistances and voltages, using the meter in **Table 1** and the Perfective 1 Current Meter, or Perf1. Note that the errors greatly exceed the rated accuracy of any digital current meter. Of course, in many circuits the error is not this gross; however, an error is always there, and most people tend to consistently fail to compensate for it when making current measurements.

In meters using protective fuses, these fuses can add to the internal resistance of the meter in addition to the normal shunt resistance, especially if they have not been selected so as to have minimal resistance.

One idea in use to reduce this problem is to use lower values of shunt resistors

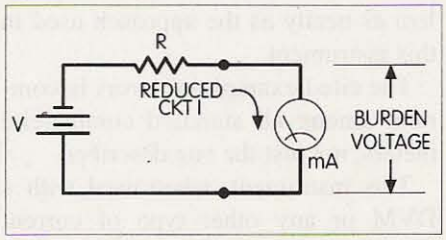

Fig. 2. Representative circuit showing added circuit resistance from standard mA meter.

Range	Ohmic Value	Burden Voltage (full scale)
4 mA	200Ω	800 mV
40 mA	20Ω	800 mV
400 mA	2Ω	800 mV

Table 1. *Specified internal resistance and burden voltage values for one commercial DVM.*

Applied Volts	Ohms	I w/Meter	I w/Perf1
7.5	25	280	306
10	125	82	84
2.5	15	142	166
5	15	295	340

Table 2. Table 1 *readings versus Perf1 readings.*

Frequency	P–P Burden Voltage
DC	Adjustable to zero
100 Hz	Virtually unmeasurable
500 Hz	Approx. 0.5 mV peak, or less
1 kHz	
3 kHz	
6 kHz	
30 kHz	Approx. 20 mV peak

Table 3. *Burden voltage for DC and AC measurements using Perf1.*

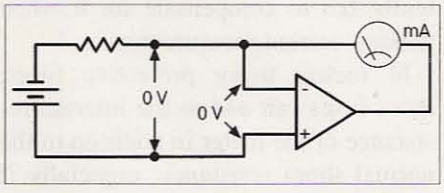

Fig. 3. *Representative circuit showing perfective mA meter with zero burden voltage.*

and amplify the shunt voltage. This is effective, but does not solve the problem as neatly as the approach used in this instrument.

The cited example of errors is common among all standard commercial meters, not just the one described.

This instrument, when used with a DVM or any other type of current meter, overcomes the problem to near perfection. DC burden voltage can be

				Approx. Cost ($)
I1	LED lamp	Red fixture	276-270	2.20
I2	LED lamp	Green fixture	276-271	2.20
1	Cabinet	3 x 5-1/4 x 5-7/8"	273-253	7.00
T1-4	Sets, binding posts	Nylon banana, individual	274-662	4.00
T5, 6	Binding post	Chassis mount, dual banana	274-718	3.50
6	Spade lugs	#6 terminal	64-3043	.25
SW1	Switch	SPST toggle	275-612	2.79
1	Tie point	2-point with ground	274-688	.25
1	Line cord	6 ft., 3-wire	278-1258	2.99
1	Grommet	5/16"	64-3025	.10
Q1	TIP 120 or equiv.	NPN Darlington, TO-220	276-206B	1.29
Q2	TIP 127 or equiv.	PNP Darlington, TO-220	RSU11371101	1.69
IC1	Op amp	LM358 low power	RSU11929072	.89
BR1	Rectifier	1.4 A bridge, round case	276-1152	1.19
BR2	Rectifier	1 A bridge, dip	276-1161	.99
D1, 2	Reg. diodes	LM385 n.a. Radio Shack		
	or	1N5221B 2.4 V zeners	RSU11673431	.89
	or	Any zener up to 4.3 V		
D3–7	Diodes	1N4000 series	276-1102	1.25
D8	Diode	1N34 germanium	276-1123	.11
C1–4	Tantalum	10/16 VDC	272-1436	3.60
C5	Electrolytic	10/35 VDC radial	272-1025	.59
C6	Ceramic	0.01/500 VDC	272-131	.49
C7–8	Ceramic	0.1/50 VDC	272-135	1.00
C9–10	Electrolytic	10/35 VDC axial	272-1013	1.20
C11-12	Electrolytic	3300/25 VDC radial	RSU11935368	2.60
R1, 4, 5, 13	Carbon film, 1/4 W, 5%	1k	271-1321	.40
R2		470	271-1317	.10
R3		10k	271-1335	.10
R6 if used		180	271-1110	.10
R7		220k	271-1350	.10
R8		10k 15-turn pot	271-343	1.49
R9–10		4.7k	271-1330	.20
R11–12		100	271-1311	.20
R14		56	RSU11344637	.10
F1	Fuse	Miniature 0.25 A PT	RSU11322864	.89
8	Nuts, bolts	Assortment	64-3011	.20
2	Standoff	1/2" #6 hole for main board	64-3024	.20
2	Standoff	1/4" #6 hole for PS board	64-3024	.20
1	Transformer	12 VCT @ 0.45 A	273-1365	4.99
1	Sonic device	Radio Shack	273-074	2.99
2	Heat sinks	For transistors above	276-1363	1.80
1 ea.	Main circuit and PS PCB			
APPROXIMATE TOTAL				$59.00

Table 4. *Parts list.*

trimmed to zero, resulting in zero ohms internal resistance also. The burden voltage for DC and AC measurements using this instrument is approximately as shown in **Table 3.**

These measurements were taken at a current of 0.1 amp. Note that the frequency range here exceeds that of the standard DVM. Any existing burden voltage varies linearly with the amount of current; consequently, it is less for smaller currents being measured. It should be noted that the above burden voltage was measured at the SENSE terminals, which does not take into account test lead and connector resistance, etc. — more on this later.

How it works

The operation of this circuit is based upon the "burning desire" of an op amp to keep its two input terminals at the same potential. A feedback path from the op amp output to the inverting input gives an op amp capability to do this.

In this circuit, the op amp is connected as an inverting amplifier (see **Fig. 3**). The feedback resistor is the readout meter. The input resistor is the intrinsic resistance of the circuit into which the op amp is inserted. In order to keep its two input terminals at the same potential, the op amp provides output current of a magnitude to match the circuit current, but of opposite polarity; this is standard inverting.

Amplifier operation

The above results in an interesting situation — the two input terminals of the op amp appear to be shorted together; the circuit being measured does not realize that the op amp is even inserted into it. A low frequency op amp was specifically used here to greatly reduce any tendency for the circuit to oscillate while still providing sufficient bandwidth for the circuit. A drawback to this circuit is that the op amp must be able to provide the same current as is flowing in the circuit being measured, hence, the power transistor output stage and the relatively heavy power supply. For current ranges within the capability of the op amp itself, no transistor boost would be

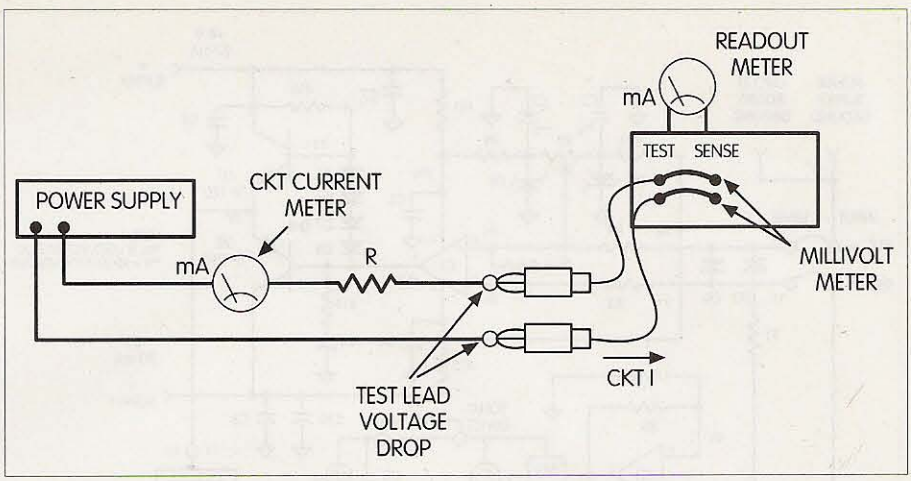

Fig. 4. Testing for proper operation. See text.

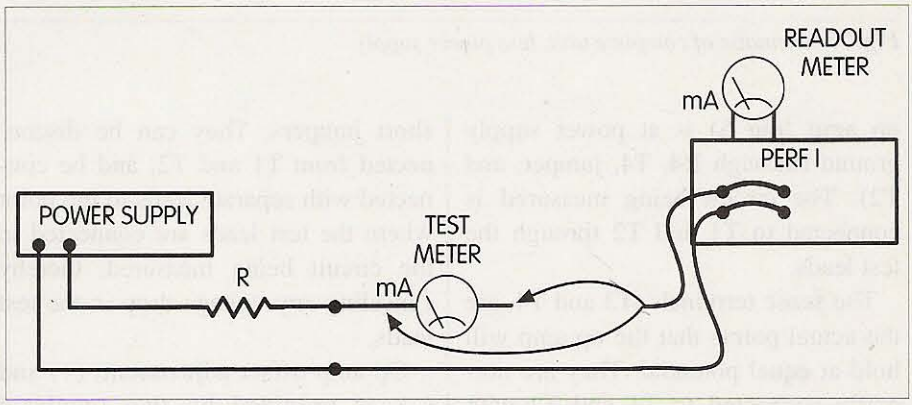

Fig. 5. Demonstrating the lack of added circuit resistance afforded by the perfective mA meter. See text.

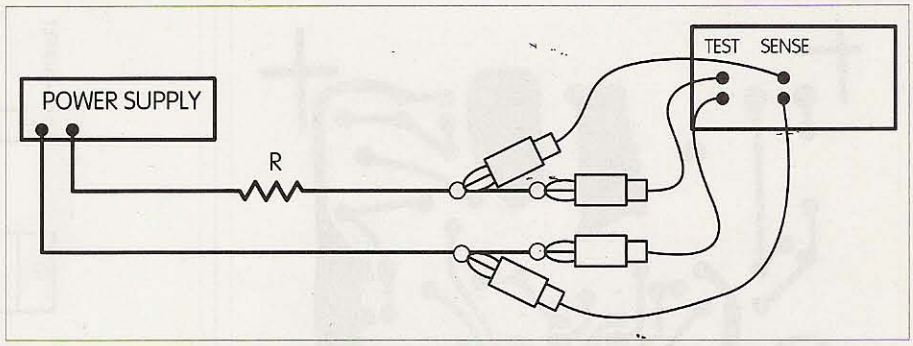

Fig. 6. Connecting so that test lead and connector resistance is canceled. See text.

needed, and a lighter supply could be used. The power supply voltage can be quite low, in that the supply voltage only needs to be high enough to overcome the small voltage drop of the readout meter and to operate the op amp itself.

The transistors (Q1 and Q2) are Darlington types for large current gain. Bias for the transistors is provided by D5 through D8. Note that D7 is a germanium diode. This combination of diodes resulted in the best biasing for good AC output capability and proper idle current. D5 and D8 are mounted on the heat sinks to provide transistor bias stability due to temperature changes occurring with transistor operation. R14 and C6 provide compensation to prevent the circuit from oscillating.

Note that the readout meter is connected from the transistor emitter junctions (the output, T6) back to the inverting input of the op amp (through T5, T1, jumper, T3, and R5 to pin 6) and that the noninverting input of the

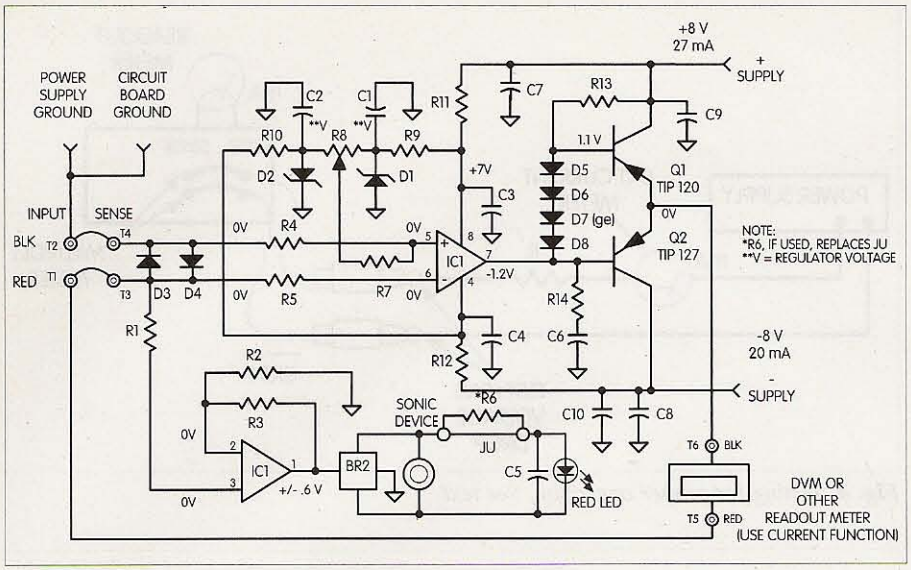

Fig. 7. Schematic of complete unit, less power supply.

op amp (pin 5) is at power supply ground (through R4, T4, jumper, and T2). The circuit being measured is connected to T1 and T2 through the test leads.

The sense terminals, T3 and T4, are the actual points that the op amp will hold at equal potential. They are normally connected to T1 and T2 with short jumpers. They can be disconnected from T1 and T2, and be connected with separate leads to the point where the test leads are connected to the circuit being measured, thereby canceling any voltage drop in the test leads.

Op amp offset adjustment, (+) and (–), is provided by two regulated voltages applied to the 10k pot, R8. Adjustment of R8 will apply any desired amount of offset voltage to pin 5 through R7. Regulation of these voltages was done in the prototype using the LM385 regulators. If these are inconvenient to obtain, any type of regulator device will suffice, provided that it will operate satisfactorily from a 5 volt source. See the parts list, **Table 4**. If a different level of regulated voltage is used here, you might desire to change R7 — use about 100k per volt of regulated voltage for ease of adjustment.

Since the circuit should normally have virtually no voltage present across the input terminals, voltage here indicates that there is a problem of some kind, such as an open readout meter circuit. Warning of this, or other problems, is provided by the second section of the op amp package. This section amplifies any voltage present here, turns on the red panel lamp indicating a circuit malfunction, and activates the sonic device.

The sensitivity of this warning circuit can be adjusted by the value of

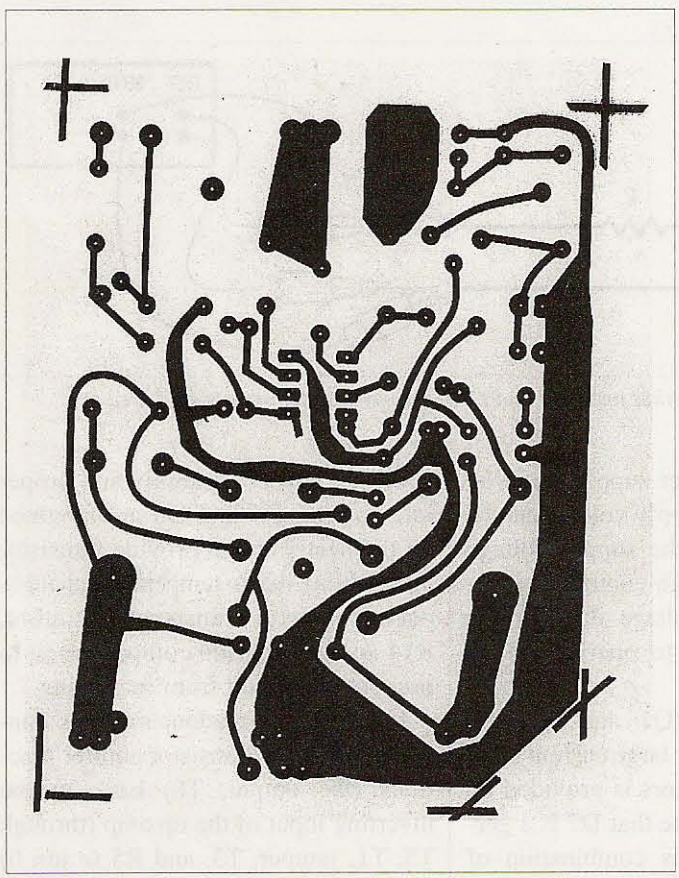

Fig. 8. Main PCB, foil side (100%).

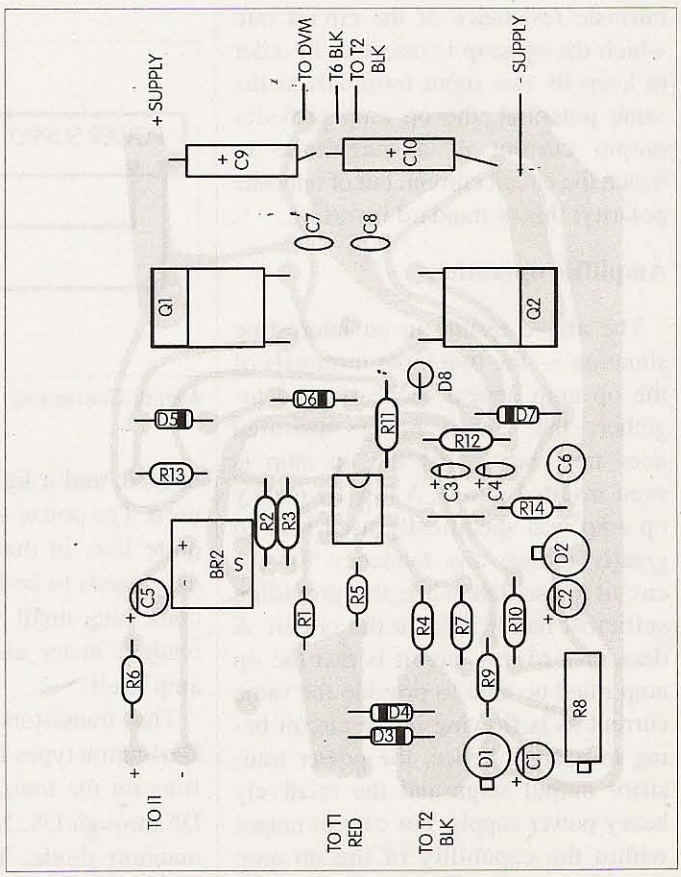

Fig. 9. Parts placement, main PCB.

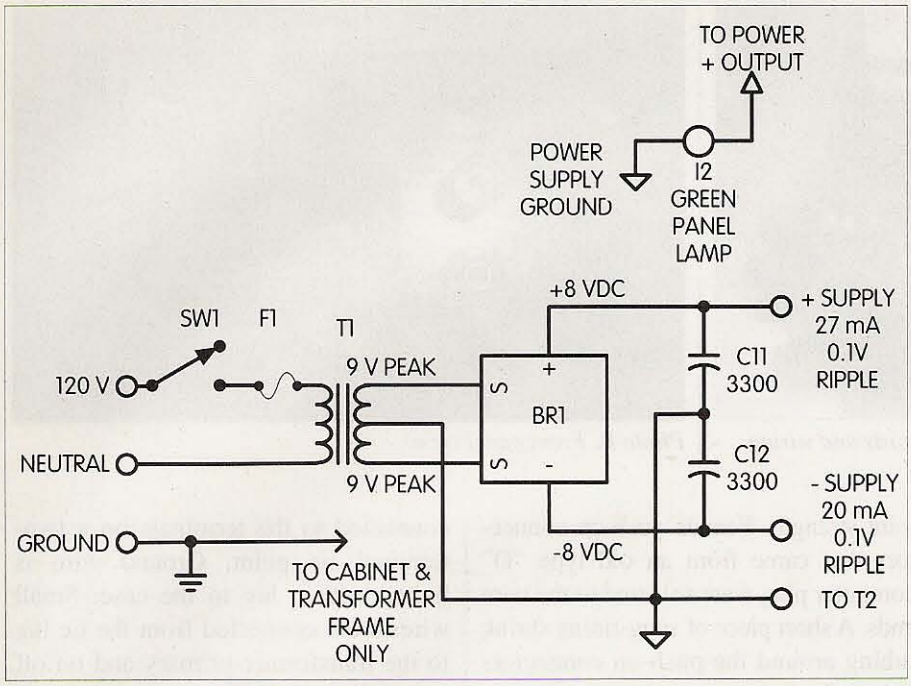

Fig. 10. Power supply schematic.

R3. R6 is necessary if a standard LED is used. It would be jumpered for LEDs with a built-in limiting resistor. The small sonic device was soldered directly to the LED pads on the bottom of the circuit board, being mounted so that it points out from the side of the board. Two diodes, D3 and D4 at the input terminals, offer a path for current to flow (but with voltage drop) from the measured circuit, if this instrument is turned off or is otherwise inoperative.

The power supply used here is good for about 0.5 amp of current; however, a heavier supply will permit a much greater current measurement, as the output transistors are rated for 5 amps. The particular heat sinks used here would not be suitable for more than about 1 amp of steady current flow with the supply voltage of 5 volts or so. This supply voltage is sufficient to operate the circuit while resulting in minimal heating of the output transistors. For this reason, it is suggested that whatever changes might be made, you should not use a supply voltage higher than this. Using the power supply featured, current measurements above approximately 0.5 amp can result in lowered power supply voltages and increased ripple, which will most likely cause the circuit to malfunction.

Building the circuit

Note that all parts can be obtained from Radio Shack except the circuit boards. There are no parts used here that are critical as to tolerance. All parts listed can be substituted with equivalents. Construction is straightforward.

Connection of some wiring is critical in order that current flow does not contribute to offset voltage:

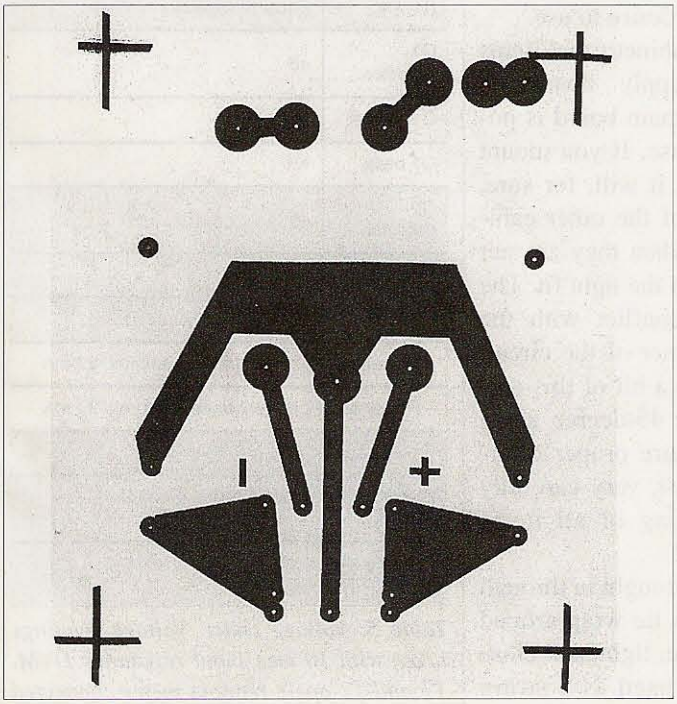

Fig. 11. PS PCB, foil side (100%).

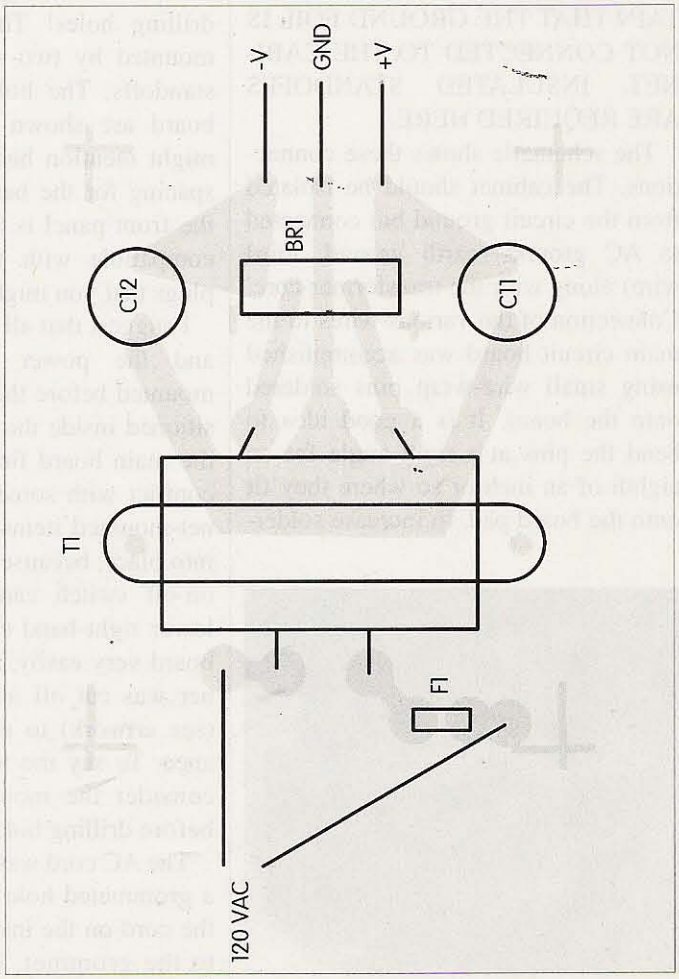

Fig. 12. Parts placement, PS PCB.

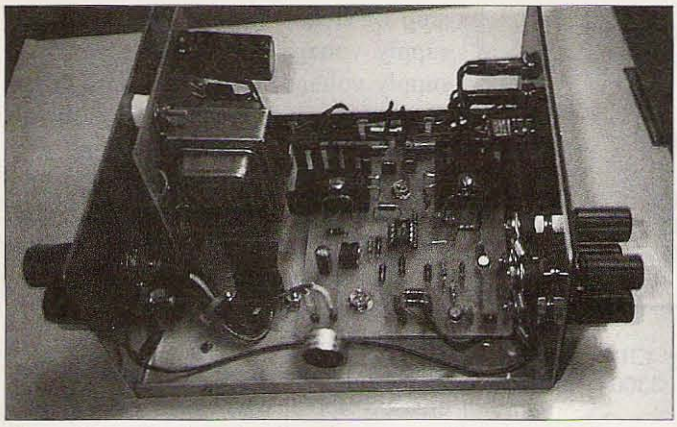

Photo A. *Inside view showing placement of boards and wiring.*

Photo B. *Front panel view.*

A. Power supply ground wire directly to the BLK INPUT TERMINAL.

B. Circuit board ground wire connected as above.

C. RED INPUT terminal (T1) directly to the RED METER terminal.

D. RED SENSE terminal (T3) to the INVERTING op amp input.

E. BLK SENSE terminal (T4) to the NONINVERTING op amp input.

F. WHEN MOUNTING THE POWER SUPPLY BOARD, BE CERTAIN THAT THE GROUND FOIL IS NOT CONNECTED TO THE CABINET. INSULATED STANDOFFS ARE REQUIRED HERE.

The schematic shows these connections. The cabinet should be isolated from the circuit ground but connected to AC ground (earth ground, third wire) along with the transformer core. Connection of the various wires to the main circuit board was accomplished using small wire-wrap pins soldered onto the board. It is a good idea to bend the pins at a right angle for an eighth of an inch or so where they fit onto the board pad, to increase solder-joint strength. Female push-on connectors that came from an old type "D" computer plug were soldered to the wire ends. A short piece of snug-fitting shrink tubing around the push-on connectors is in order.

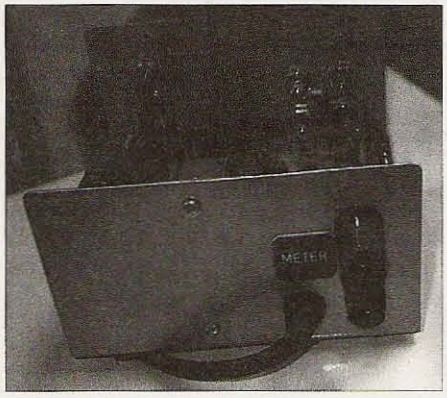

Photo C. *Rear view.*

Being able to separate the board from the wiring is wonderful, should you have to remove it from the case. Due to the tight fit of everything inside the cabinet, you must carefully consider the mounting of all items before drilling holes! The circuit board is mounted by two screws on 3/8-inch standoffs. The hole positions on the board are shown on the artwork. I might mention here that the standard spacing for the banana jacks used on the front panel is 0.75 inches. This is compatible with the double banana plugs that you might desire to use.

I suggest that all cabinet panel items and the power supply board be mounted before the main board is positioned inside the case. If you mount the main board first, it will, for sure, conflict with some of the other cabinet-mounted items when they are put into place, because of the tight fit. The on-off switch can conflict with the lower right-hand corner of the circuit board very easily, so a bit of this corner was cut off at a 45-degree angle (see artwork) to ensure proper clearance. To say the least, very carefully consider the mounting of all items before drilling holes!

The AC cord was brought in through a grommeted hole. A tie wrap around the cord on the inside, tightened close to the grommet, is used as a strain relief. The neutral and hot wires are connected to the terminals on a two-terminal tie point. Ground wire is bolted with a lug to the case. Small wires were connected from the tie lug to the transformer primary and on-off switch (hot wire). Be very careful with routing, insulation, and connection of the hot wire. I always place a piece of shrink tubing around the on-off switch to cover the hot wire terminals. A large

IC1 Pin #	Volts
1	±0.6
2, 3, 5, 6	zero
4	–7
7	–1.2
8	+7
D1, D2	Equal to regulator voltage
Q1 collector	+8
Q1 emitter	zero
Q1 base	1.1
Q2 collector	–8
Q2 emitter	zero
Q2 base	–1.2
+ Power supply current drain = approx. 27 mA	
– Power supply current drain = approx. 20 mA	
Power supply ripple = 0.1 V P-P	
Power supply ripple @ 0.1 A current = 0.2 V P-P	
Power supply ripple @ 0.4 A current = 0.65 V P-P	

Table 5. *Voltage chart. Voltage readings taken with 10 meg input resistance DVM, T1 and T2 open, readout meter connected to METER output jacks on rear.*

piece of shrink tubing was placed around the tie point to cover it.

Test for proper operation

It would be a good idea to first read pertinent voltages as shown on the schematic to see if yours correspond. Connect the readout meter to the "METER" terminals and put it into the current function. Ranging is done by adjustment of the READOUT meter. Jumper the input and sense terminals together as shown on the schematic. Apply NO input. Now check your voltages against those listed.

Connect a variable DC voltage supply through about 50 ohms to test leads going to the INPUT terminals (**see Fig. 4**). A millivoltmeter or oscilloscope can be used to record millivolts at the SENSE terminals. Apply a steady current of 200 mA through the resistor to the test leads. This 200 mA from the supply should be indicated by both milliammeters. These two readings should agree. Adjust the 10k pot, R8, for zero millivolts at the SENSE terminals. Vary the current from 0 to 400 mA, and note that the SENSE voltage should not vary by more than approximately 0.1 mV, max. This variation is the input signal voltage to the op amp; this will vary some from one op amp to another due to differences in gain of the devices. A much greater variation of voltage here with current means that the SENSING is not proper, possibly due to incorrect wiring of the terminals. If this test checks out, you can then measure the millivolts present at the test lead clips. This will be very small and due to the resistance of the test leads and INPUT terminal connection resistance (the banana plugs). This voltage will vary with current and will be equal to the total resistance of the leads and connections multiplied by the current flow. The method of eliminating this is discussed later.

Testing for accuracy

First, obtain two digital current meters and connect them in series. Determine their comparative accuracy at different current levels. Next, connect one to the Perfective 1 Current Meter output terminals and connect the other to read input current. Generate a current flow and compare the readings. Reverse the input polarity of current flow into the Perfective 1 Current Meter and determine comparative readings of output for the positive and negative current flow; these should be very close. You should be certain the offset adjustment (R8) is close to zero, as this will cause a difference in the above readings if not. Tests on the prototype have been within less than 1% of each other.

Demonstrating the action

Try using different values of voltage and resistance; connect the circuit as shown in **Fig. 5**. Take a reading on the READOUT meter. This will be the reading you will get without the aid of this instrument due to the resistance of the TEST meter. Now jump around the TEST meter as shown in **Fig. 5** and note the increase in current reading on the READOUT meter. This is the true circuit current that will flow when no meter is inserted into the circuit or when you are using the Perfective 1 Meter.

This difference illustrates the usefulness of this instrument. The greatest difference will be evident when the range setting of the TEST meter is such that you get closest to full-scale reading on it.

Using the Perfective 1 Current Meter

This circuit was designed to be used with any type of current meter. Of course, to measure AC current, the meter in use will have to have this feature. Observing polarity of connection will ensure a proper polarity indication on the meter readout when in the DC function.

Normally, the SENSE terminals and the INPUT terminals will be wired together by short wire jumpers connected directly between the two. As mentioned before, the only point of connection where the burden voltage will be zeroed is at the SENSE TERMINALS. The test leads connecting the measured circuit, as well as INPUT TERMINAL connection resistance, will cause voltage drop (burden voltage) due to the current flow. This voltage drop has been measured at around 20 mV or so and will vary with the characteristics of the test leads used.

If you is desire to have the resistance of the TEST leads zeroed out, separate SENSE leads should be connected from the SENSE terminals directly to the point of connection of the TEST leads (see **Fig. 6**). This will naturally require four leads going from the instrument directly to the measured circuit. Of course, the jumpers between the two sets of terminals should be removed for this type of REMOTE SENSING. It is important that the SENSE test leads be connected to the measured circuit itself next to the point where the TEST leads are connected, not to the clips of the TEST leads. This will ensure that the TEST lead clip resistance will be zeroed out also.

A confusing problem can result from the negative leads of test instruments and/or circuits being connected together through the third-wire ground of the AC line cord. Oscilloscopes normally have their negative lead connected to the third-wire ground. Some multimeters do also. To prevent this problem, you can use a three-to-two-wire adapter on the AC line cord of the offending instrument to remove this connection. To test for this, use an ohmmeter to see if negative leads are connected to the third-wire ground terminal on the AC line cord. 73

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More New Freeware!

With the sudden rush of enthusiasm over PSK31, some hams feared that the RTTY mode might gently slip away into the night, and for a time there were numerous converts to the warbly mode. However, there is new life being pumped into the longstanding champ of digital modes.

There were already some soundcard programs that function very well on RTTY, namely MixW and TrueTTY. I have both and they are very good.

But now you can get an absolutely free piece of well-written software dedicated to RTTY that runs under Windows and even has a version for the much maligned pre-Pentium 486 machine. I am running it successfully on my 120 MHz Pentium with 32 megs of RAM, though I am led to understand that may be as slow as the 586 processor can be expected to run the program well. Even so, with today's hungry programs, this is a nice-working, well-thought-out piece of software that should gain a lot of followers long before this column appears.

I had heard of the MMTTY program for a couple of weeks, and everyone kept telling me how great it was, so I had to find it and give it a try. It wasn't difficult to find. It is on several sites. The best thing to do is to use one of the English sites. The one I used is listed in The Chart. The first version I downloaded had some instructions that were obviously translated and the Help files required manipulating, so I went to a little extra effort and printed the Help files separately.

That was a good idea, until a few days later when version 1.58 appeared — with excellent rewritten Help files. Some folks got together and really did a bang-up job of writing understandable instructions and put them on the VE5KC Web site. These are just about as close to perfection as anyone's instructions can ever get — and way out in front of some of the files that come from those who wrote this word processor I am using. Sometimes, I fear for the day when I finally upgrade from this "comfortable-old-shoe" version of Word and have to learn all over how to format a page.

You will have virtually no problem getting the MMTTY program set up and running. If you have been using a soundcard program, have audio cables in place to your soundcard, and perhaps the luxury of a PTT circuit (or a RigBlaster box, to do it the easy way), then the MMTTY program will install and you will feel right at home.

It took about 15 minutes from the time I started executing the installation until I was tuning a RTTY signal and making a contact. I wasn't yet proficient with the many macros you will find already programmed, but I was struggling (thrilling?) along using the program and, of course, making my usual excuses for being a little slow at the operating "because this is an unfamiliar program."

Most hams will put up with that. I have programs that I use which give me a little problem occasionally. The other day, I was telling the contact at the other end what had happened, and he gave me the best explanation for the problem anyone ever has. He said he simply called those things: "woolly buggers." I liked that. I can use it when I press a wrong key or just simply address a peculiar algorithm the programmer hasn't discovered yet.

I am finding a real advantage in having joined the MMTTY reflector, which is easily done from the download area where you download the program. I have been checking my E-mail the past several days and there is a good amount of reflector activity. There have been at least two or three good hints that make life easier for the operator with this new program. These reflectors can be very handy, at least at first, and if they get to be a nuisance, it is usually quite easy to unsubscribe. But I recommend joining, at least at this time.

The program is a little different in its makeup, as the programmer, Mako JE3HHT, has tried to put in all the bells and whistles anyone could ever dream of asking for. You will have to agree he did a very fine job.

There is even a scope for the purists among you. This does not seem to be necessary, as there is a spectral display and a waterfall already in place, and you will soon discover you will tune most accurately with either one of the latter. The scope can be turned on and off and tweaked a bit for clarity. I read somewhere that the scope tends to slow the system a bit. That would be excuse enough to leave it off.

On a quick count, I find 29 macros available. Most of them have been pre-programmed, but you will find the author has his own personal information in many places which you will want to change to conform with your personal and station info. The editing is simple enough, and the instructions in the Help file will keep you out of trouble.

Macros are great for several reasons. I recall working a ham a while back who had just about everything he felt necessary for a successful QSO broken up into chunks and stored in the many macros in his software. Between using macros and typing ahead, he could get by without ever making excuses for his typing skills. He referred to himself as "the macro king." I felt he had a very good method. It can be difficult, even for the best typist, to look like his skills are under control at all times.

Another need answered well by macros is getting the message out with the least amount of composing, or rather the shortest number of letters, and turning it back to the other operator. The reason is that often a slight change in propagation will bring copy crashing down, especially in RTTY. So short, well-planned, exchanges do wonders for the success ratio of completed QSOs.

If nothing else, I like to have, in addition to a CQ message, and answer-CQ, a turnover, a BTU, a name and QTH and an SK macro ready. The big advantage there is it is so much easier to let the computer recall the other station's call and insert it at the right time. I can type my own callsign easily, but remembering and typing someone else's is usually time consuming and brings the orderly process of "conversational typing" to a grinding halt.

Now-a-days, most programs will insert the other station's call and the operator's name automatically in the macros and we look pretty smart. I like that (things that make me look smart, that is).

As I write, I have the program running and have just made two contacts in midcopy here, and both of those were hams using the MMTTY software. Both were marveling how intuitive and easy the setup is. I think the ending phrase after that bit of news is, "that says it all."

As you explore this program, you will discover that a full-fledged log is included, with the capability to export to an ADIF file that you can import into your favorite logging program. You will also find complete instructions for logging in the Help files. Very nice.

Something else you will find on the MMTTY download site is a little 6-page primer called "RTTY Basics." This is a well-written, informative read that gives you a good overview of what is different about the mode. Worth reading for newcomers and a good refresher for any old-timer. It not only covers some basics we all should know but also gives a few specifics as to how the MMTTY handles certain classic RTTY anomalies.

You will find this file as you pass into the "Help" region of the URL. I thought it was a download file, but I had to print it from the site. It is not very big, about six pages, but it contains a lot of good info worth having around.

Some updates are in order. The URLs listed in The Chart have a way of becoming dated. I just received word from a reader who "archives" his *73* mags and refers to them a little later. It seems he was reading a January (this year, I think) issue and needed help to look up the RCKRtty software URL. I know I had reviewed it, and there was a problem accessing the Web site.

I expected the worst, but went to my copy of The Chart and copied and pasted it to the browser and all is well, except that there is a reference to a new URL and it looks like there should not be confusion with the new address. It is edited in The Chart now.

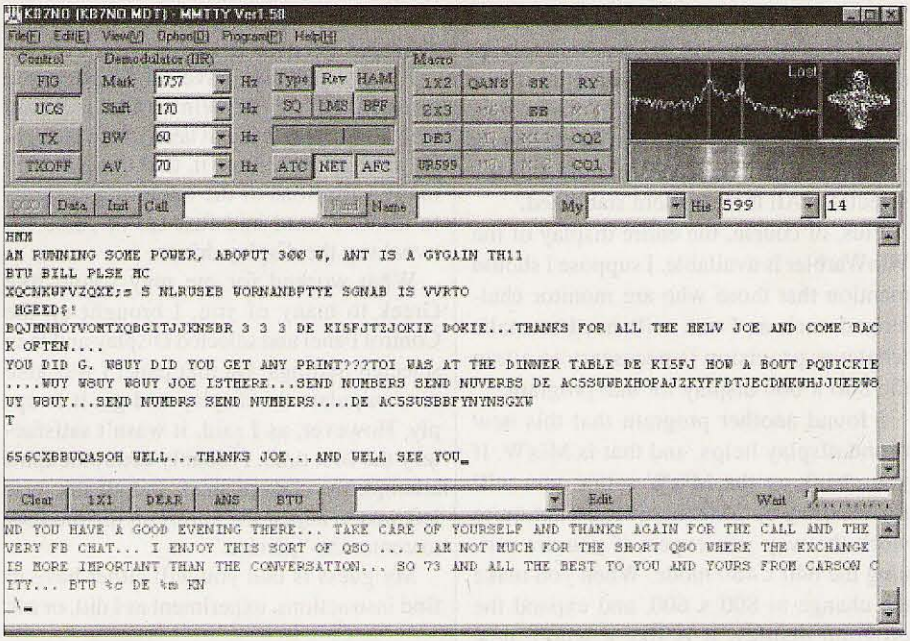

Fig. 1. *Screenshot — MMTTY freeware for RTTY. This is version 1.58. By the time this reaches print, there may be many changes. This is the start of the really fine Help files that do their job. The program runs on Windows and reminds you of the PSK programs in that so much is automatic. The setup and operation are very intuitive. Many of the macros are predefined. You will need to edit them, but the Help file will lead you well. The tuning screen is displaying the "scope," which can be optimized or removed entirely. I found that tuning was a snap, and the AFC worked well to keep the signal fine-tuned. The program takes advantage of the DSP in the soundcard and the "BPF" button at the top stands for Band Pass Filter, which can be tweaked from the "Options" menu. You will notice that log entries do not seem to contain a "QTH" box. If you click on "Name," it will change to accept a QTH entry. I conversed with users on the air who were working their first RTTY, as well as to those with "green key" experience, and all agreed it was an exhilarating ride. The copy compares at least favorably with any other method anyone had used. It looks like "everyone is doing it" and Mom doesn't object. Quite a success story!*

I had forgotten, but the author of RCKRtty promises a program for the MFJ-1278 (along with other popular TNCs). The MFJ is difficult to find aftermarket software for, and since I do not have one of the magic little boxes, I asked the inquiring ham to let me know how he liked the package. I know there are others who are disgruntled with the factory package and have asked. So we shall see, and I will let you know what happens.

At the same instance, I was informed that the N1RCT Web site no longer lists RTTY software. I know there are other listings on the Internet and have promised to look around. It so happens there is a link to a listing of soundcard communications software for most modes we discuss here on the URL where you will download MMTTY. So, for now, that is an excellent place to browse for your software needs.

Some of you may have been as much in the dark as I have been. I have been using a small, by today's standards, monitor (13" diag.) and still am, but I have accomplished an improvement. And you may be able to do the same thing.

Here was where the problem became apparent. As you recall, I was testing, using and loading the upgrades for WinWarbler. That was going well, until the last few updates stopped displaying about one inch of the right side of the panel on my monitor.

I fiddled and adjusted with no success and asked Dave, the author of the program, for advice. It seems this old-fashioned setup comes normally with a 640 x 480 pixel display. If the monitor is a true SVGA, as this one is marked, then there is a choice to go to 800 x 600 display.

I made a hurried attempt at this and, sure enough, it could be accomplished, but I was lacking some tweaking to get the results I expected. Dave chided me a bit for my lack of patience and I got back to it in a few days, and I am now using the 800 x 600 display option that was available all the time with the video driver that came with the machine. Maybe not originally but at least after some upgrades. This is about a 1994 monitor, maybe 1993, so I suppose I am lucky to get it to do the job.

With the new display mode, the

WinWarbler displays perfectly and a problem I was having with the program totally disappeared. That was the inability to select text for the QTH box. Selecting seemed to be a very delicate operation and you needed to avoid scrolling during the selection. All that problem stabilized.

Plus, of course, the entire display of the WinWarbler is available. I suppose I should mention that those who are monitor challenged such as I am, will need to make whatever provision is necessary to attain the 800 x 600 display for that program.

I found another program that this new found display helps, and that is MixW. If you check on the MixW setup, you will find display options that just do not quite work the way you expect if you are running the 640 x 480 mode. When you make the change to 800 x 600, and expand the program display, it is like a whole new program.

I thought at first that the word processor display was going to take a hit. It does, but not a serious one. The display will expand to fill the monitor, and the only real problem is that the 12-point type font looks more like 10-point. That could be changed by increasing the font size, but it is readable after you get used to it.

I suggested that Dave might put some instructions with the WinWarbler software that would help those in need of the change. He said, and I believe it, that there are too many variations of the operating systems to allow a hard and fast set of rules for tweaking the display driver.

What worked for me may sound like Greek to many of you. I brought up the Control Panel and selected Display and then selected Settings. On that panel I was able to manipulate the display and get it to apply. However, as I said, it wasn't satisfactory the first time. Probably about the third attempt, the change stuck and all that was left was to adjust the knobs on the monitor to center the "picture."

My guess is that you will either have to find instructions, experiment as I did, or ask your local "guru" for help. It is definitely worth the effort if you can do it without spending the bucks for the large monitor and proper driver. And, if 500 or so bucks does fit into your budget, then you would surely enjoy the largest monitor you can afford.

A lot more can be done, such as displaying screens side by side for some of the more complex setups. At this time, if I want to run two simultaneous displays, it is necessary to display them one on top of the other and switch back and forth. Anyway, for whatever it is worth, these computers keep doing more fun stuff if you just throw enough money at them.

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

Source for:	Web address (URL):
Mix W Soundcard program for PSK31, RTTY, new modes, MTTY, FSK31, more	http://tav.kiev.ua/~nick/my_ham_soft.htm http://users.nais.com/~jaffejim/mixwpage.htm
MMTTY New RTTY soundcard freeware plus links to other software	http://www.geocities.com/mmtty_rtty/
TrueTTY — Sound card RTTY w/ PSK31	www.dxsoft.com/mitrtty.htm
Pasokon SSTV programs & hardware	www.ultranet.com/~sstv/lite.html
PSK31 — Free — and much PSK info	http://aintel.bi.ehu.es/psk31.html
Interface for digital - rigs to computers	www.westmountainradio.com/RIGblaster.htm
Interface info for DIY digital hams	www.qsl.net/wm2u/interface.html
Site with links to PSK31 and Logger 7. Also Zakanaka and scope program	www.chronicle networks.com/~dwm/logger-zakanaka.htm
PSKGNR — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm
Digipan — PSK31 — easy to use — new version 1.2	http://members.home.com/hteller/digipan/
TAPR — Lots of info	www.tapr.org
TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/
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RCKRtty Windows program with free DL	http://www.rckrtty.de/
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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/
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 Infamous Chart — Almost everything ...

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DX4WIN Now Available with PSK31 Functionality

One of the premier DX logging programs has just been made even better. DX for Windows, a product of Rapidan Data Systems in Virginia, now gives the DXer the capability of real-time PSK31 operation from a window within the program itself.

It is no longer necessary to manually enter critical QSO information, or operate a separate program while working a station on PSK31. Now, a couple mouse clicks and keystrokes are all that are necessary to operate this exciting new mode in a manner that is fully integrated with your "e-log."

Beyond PSK31 functionality, DX4WIN is a multifaceted program that allows you to place your log on your home PC or laptop, while maintaining a connection to a DX cluster via AX25 packet or the Internet. It also provides the capability of making QSOs happen either with a CW keyboard, or via a separate RTTY window. Oh, and do you have one of the new computer-controllable rigs, or an antenna rotator? It will interface with those toys as well. Here is an alphabetical listing of some of the key functions of DX4WIN version 5. The entire list is too extensive to include here.

Awards. Support for DXCC, WAS, WAS and WPX (mixed, mode and band) 5-band DXCC, 5-band WAZ. Separate flags to track the mixed, mode and band awards. Support for custom awards, county, IOTA and VUCC.

Contesting. When contest mode is enabled and a starting time is defined, a new QSO will be checked for a duplicate contact in the contest. An incrementing serial number can be displayed during a contest. Master data files can be used from other contesting software for callsign recognition.

CW keyboard. A full-function CW keyboard which works under Windows. User-programmable memories accessed using function keys. Adjustable weighting and visual transmit buffer. Uses interfaces to serial and parallel ports. Buttons available to send stored CW messages using the mouse.

External data. Support for the Buckmaster, Flying Horse (RAC), QRZ!, Octavia and Amsoft callsign databases on CD-ROM. Support for the GOLIST to obtain QSL manager information. Support for QSL information from a callsign CD-ROM (when provided). Import and Export filter for ADIF filters for: ARRL, CT, DX4WIN, DXBase (3 & 4), DXDesktop, DXLog, EasyLog, GemRadio, HyperLog, LogBook, LogEQF, LogicW, LogMaster, LogPlus, LogWin, N6TR, NA, SD, SecondOP, SwissLog, TopLog, TurboLog, WB2DND, WF1B, WJ2O, WRTC, and others. QSOs that generate errors when imported are still included in the log with an error message attached. It is not necessary to edit an error file and retry the import. Users can define their own import/export filters. Utilities are provided to convert some file formats, such as dBase and comma-delimited, to fixed-field ASCII suitable for the import function.

Gray line. Display shadow and gray line on world map. Calculates gray line data between user's station and DX countries. User defined gray line "window." Calculates sunrise/sunset data for user station and DX station for up to one year.

Help. Extensive context-sensitive help with hotlinks to related topics help available by pressing F1 key. User's guide is available from installed file or can be purchased printed and bound to lie flat.

Import/export of logs. Master Call Data: Master Call data can be imported from contesting programs, converted, and used in DX4WIN/32 for contesting or general logging.

Multiple logs. Many users keep separate logs for previously held callsigns, locations or DXpeditions in order to be able to make submissions for awards. With DX4WIN you can also logically split the log file, allowing summaries and award calculations to be limited to certain groups of QSOs. Limiting the summaries to a date range allows the user also to monitor "progress" in a contest.

Operating system. 32-bit programming designed to run under all 32-bit versions of Windows. User-friendly install program. The log file is a single file and can be in any directory. Log files are small (500k for 8000 QSOs) and there are no index files, etc., making it easy to back up a log on a floppy disk. Log files can be backed up at a user-specified time interval. Supports serial ports 1 through 8 and parallel ports 1 through 3.

Packet. Large packet window (up to 16,000 lines). Contents of packet window can be copied to the clipboard. Large number of DX spots (up to 16,000 entries). Packet spots are color-coded to reflect

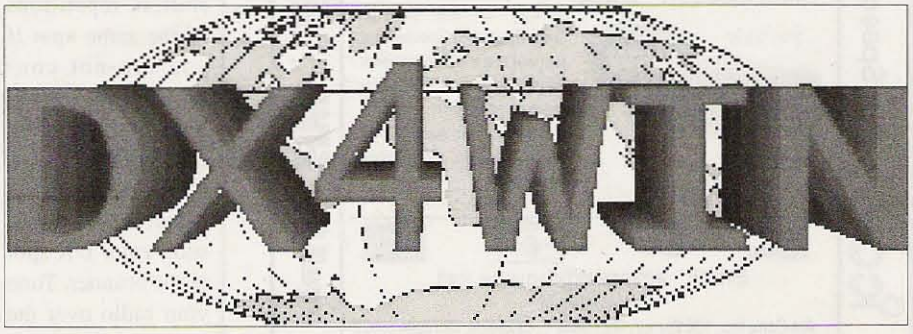

***Photo A.** DX4WIN logo.*

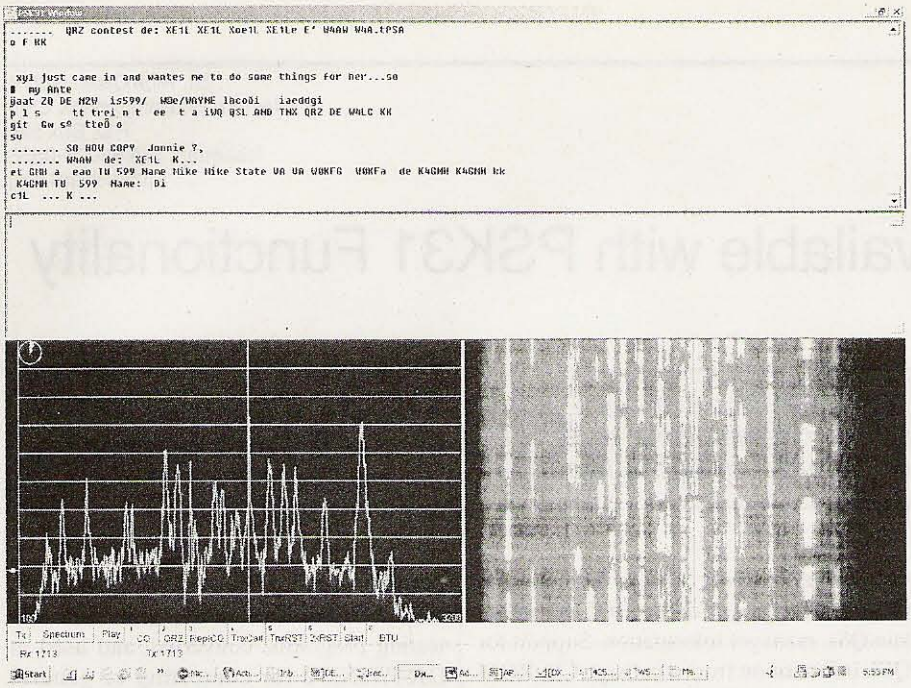

Fig. 1. This is a screen capture from the PSK31 Rumble contest.

status of new country/new mode/new band. Color coding is based on the DXCC, WAZ, or WPX status. DX spots are saved so they are available again when the program is restarted. Filtering of spots based on the prefix and/or the CQ zone of the spotter. Avoid getting excited about a spot that was reported on the other side of the world. Voice or CW announcements of DX spots using the Windows sound system. QSX frequencies in spots are recognized in different ways, like QSX 200, WKD 14205, UP 3, DN 4, etc. Additions/deletions and updates of QSOs are reflected in the colors of the spots immediately. New DX spots replace older spots for the same station on the same band; no endless repetitions of the same spot if you are not connected to the cluster. Support to announce DX, grab DX spot, move radio to the frequency of a DX spot, enter DX spot in the scanner. Tune your radio over the bands and let the DX spotting window find the spot that is closest in frequency. DX spots can be sorted by time, arrival sequence, frequency, callsign of spotter, and priority/callsign; when you sort by priority, all new countries are grouped together, followed by new mode/band, etc. Buttons available to select stored packet commands via mouse. TCP/IP access of worldwide cluster sites using the Internet.

QSL management (outgoing). DX4WIN can check your log for outstanding or unanswered QSLs and mark those QSOs again to send follow-up QSL. You can remove multiple QSLs to the same station for the same band and mode. Mark additional QSLs going to the same manager or station for efficient mailing. Change method of routing (buro, direct, etc.) based on availability of a QSL buro.

QSL managers. When entering a QSL manager for a station, the information is stored in the QSL manager database. An editor is provided to make changes to the QSL manager database. Over 1,000,000 QSL managers can be stored.

RTTY. RTTY terminal window using programmable function keys for sending of "canned" exchanges and information which can contain callsigns, reports, etc. If not being used for RTTY, window may be used for secondary packet connection.

World map. World map window graphically represents bearing and path from user's QTH to DX countries, and is updated by spots as they are received. Show propagation based upon received spots, with user definable parameters. Shows shadow and gray line. Various map projections including great circle projection centered on your QTH. Zoom in on an area, and get coordinates and distance to a location based on the mouse position.

Now, back to the newly integrated PSK31 function. I got a chance to try it out in the October 2000 PSK31 Rumble, and was really impressed. I have been using Zakanaka, and while having the ability to monitor three QSOs at once is a fun feature that is not present in DX4WIN, I found that being able to do the logging without switching programs and manually entering all the database fields is a HUGE plus.

Fig. 1 shows the basic functionality of the PSK31 window in DX4WIN, which contains the following features:

1. Waterfall display with zoom function (lower right).

2. Spectrum display with frequency markers (lower left).

3. Dual receive window.

Continued on page 50

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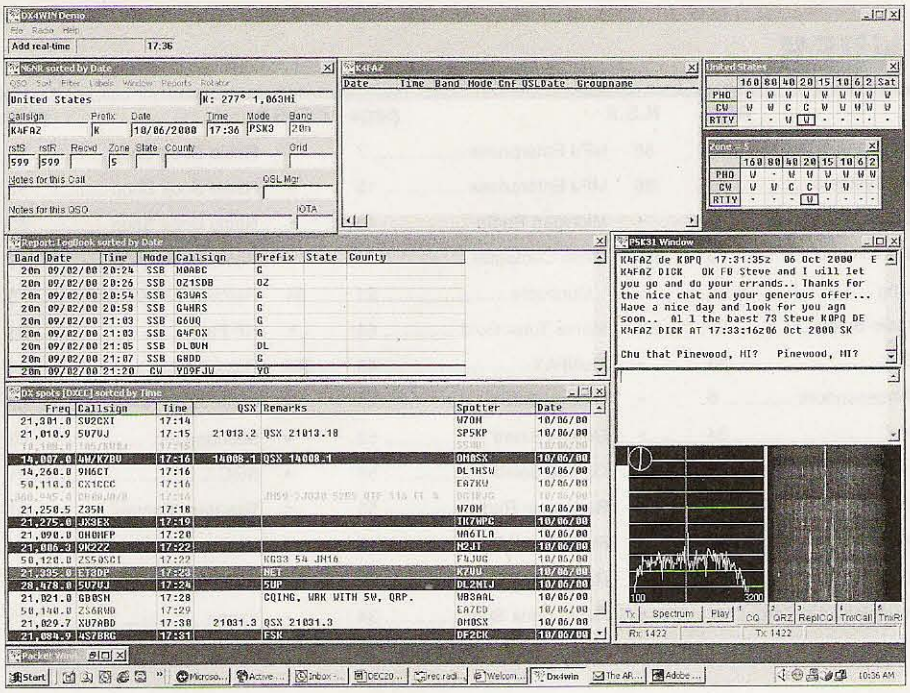

Fig. 2. Here is the main view of DX4WIN.

The DX Forum

continued from page 48

4. Intelligent text selection in receive window to set fields in QSO window.

5. 16 macros that use text form current QSO (bottom button bar).

6. Type ahead for transmit window.

7. 25 seconds playback.

I mentioned that the PSK31 window operates within the main logging program. Take a look at **Fig. 2**. DX4WIN gives you the ability to arrange a number of functional windows on your screen, depending upon the resolution and size of your monitor. **Fig. 2** shows the layout of my operating position's screen. In the upper left is the window that is used to enter the data into the log. The mode and band data come directly via CAT from my FT-1000D (I also have an FT-847 in my office connected to a long wire with DX4WIN running on my business PC). I also have windows that display DX spots off the packet cluster (bottom left), a few of the most recent entries in my log, and displays of calls, countries, and zones worked. The PSK31 window is minimized and shaped to fit in the lower right, allowing me to monitor in real time. All I need to do is hit the maximize button on the upper right-hand corner of the PSK31 window, and it is back to full screen as shown in **Fig. 1**. Neat, huh?

If you are interested in this program, you can drop a line to Rapidan Data Systems, or you can download a demo version from their Web page and try it out for yourself. Here is the contact info: Rapidan Data Systems, P.O. Box 418, Locust Grove VA 22508; telephone: (540) 785-2669; fax: (540) 786-0658; E-mail: [sales@dx4win. com] or [support@dx4win.com]; Web: [http://www.dx4win.com].

Just listening — an emphasis on the joy of SWLing

I haven't had much time to do much shortwave listening these days, but I did track down some information that I had seen on one of the SWL newsgroups. Just a few days ago I happened upon a discussion on one rec.radio.shortwave newsgroup concerning military operations on 11175 kHz.

Steve Lawrence, in Omaha NE, sent a message to the group that unraveled the mystery of what was being heard on that frequency. In his message he said, "[it is] the United States Air Force Strategic Command Primary Frequency coming from, practically, my backyard here in Omaha (the town of Elkhorn, actually, is where the giant antennas are located). The detail which operates this huge network is based over at Offutt Air Force Base, also a couple of miles from here. They use this frequency to communicate with aircraft ... mostly strategic bombers, but many aircraft can turn up here at any given time."

Tom Sevart N2UHC, in his reply to one of this thread's contributors, provided some additional information concerning some of the operational terms heard on the frequency: "It gets interesting. The 'delta, bravo, victor...' you refer to is probably an Emergency Action Message (EAM) sent out to all listening stations. It is a coded message which could mean just about anything, including 'launch nuclear missiles.' The Hurricane Hunter aircraft (look for callsign TEAL) use this frequency when chasing hurricanes. I have heard a few interviews from ABC's Nightline program talking to Hurricane Hunter aircraft commanders. This is probably the most listened to utility frequency, and for good reason. Just keep an ear peeled."

Embedded in one of the responses to this thread was a reference to a Web page where information concerning 11175 kHz, as well as numerous other frequencies, may be found. It is the Web page of the Worldwide Utility News Club, aka WUN. Quoting from the WUN Web page, here is a brief description of their organization, and the services they provide.

"With several losses of information available to utility listeners, efforts went into creating a continuing source of utility information, QSLs, and logs. After discussions with many utility fans via E-mail, The WORLDWIDE UTILITY NEWS Club ... or WUN (Like we're #1), was born January of 1995, with its first newsletter sent to members as the February edition. The WUN is the world's first electronic club, and there are no dues or fees from us for joining. You are welcome and encouraged to join in the conversation regarding the "nonbroadcast" or utility stations that may be found in any mode under 30 MHz. WUN also sends a monthly electronic newsletter. To become a member of WUN, you join by simply sending E-mail to the WUN list server at: [majordomo@qth.net], with the following command in the BODY of your E-mail message: subscribe wun.

"The WUN list server is also used for posting hot utility news and general discussion of UTE-related topics. Those subscribed on WUN will receive the newsletter and be able to exchange info, logs, and late-breaking "hot" logs with everyone on the list. The WUN monthly newsletter consists of the following columns: 1. International Civil Aero. 2. Nautical News. 3. Digital Review. 4. Logs Column. 5. The QSL Report. 6. Utility Round-Up. 7. Military Newsreel. 8. Numbers and Oddities. 9. Product Reviews.

"WUN has an Official Club WWW page site: [http://www.wunclub.com]. The WWW pages contain back issues of the WUN Newsletter along with other utility files, links, etc. Any questions, or for more information, please contact Jason Berri, WUN Web Page administrator at webmaster@wunclub.com."

And now the news ...

I just got an E-mail from Bill W7TVF. Here is what he said:

"Hi Fellows,

"W7TVF will be active from Niue Island again from November 19th through December 10th as ZK2VF. Operation will be from 160 meters to 6 meters. Priority will be given to Europe, Africa, and South America on 160 and 80 meters during their grayline. Plenty of time will be spent on all bands for anyone who needs a QSO. An 847 will be used as a beacon on six meters all the time that I am active so if six opens I will be QRT on HF until six mtrs closes. The Six Meter Beacon will be on 50.115. I will be operating from the 'Beautiful Namukulu Motel' with Alpha power and good antennas. The QSL info is the same as last time, which is direct with SASE and return postage to Bill Dawson W7TVF, P.O. Box 4049, Pahrump NV 89061. No donations are needed.

"Again I would like to thank all of you for the extremely courteous operating by almost everyone and that made it a pleasure for me also. The pile-ups were big but easy for me to operate because of your help. I will try to create some even bigger pile-ups this time. Thanks, and CU from Niue Island in November. Bill Dawson W7TVF, ZK2VF."

And I received this from Charly K4VUD on October 4th (I don't know at this moment if he found the extra crew member he needed. Oh, the joy of trying to publish date-sensitive material on two-month production schedule!):

"As of today, two hams are slated to arrive in A5 on December 1, 2000. The 1kW xmit power is OK'd (with an extra fee!!!). I will likely try to xmit below the American phone band and listen way up into the Am. phone band ... that way, jammers must also violate FCC rules.

"Likely will start out on the usual DX freqs and if a pile-up develops, then announce the QSY freq. Will definitely try the 40 meter SSB split and listen up in Am. phone band. Will use odd-numbered freqs on 40m. Will call on the hour on 160m during likely openings.

"If we can get a third ham on this trip, all three of us will save some money on Bhutan's tourist fees for groups of 3 or more. Come on, just need one more daring adventurer for this trip!

"73, Charly K4VUD, applying for A52UD!!!"

Vox populi

For months, I have been threatening (is that the right word?) to introduce this segment of the DX Forum. The intention all along has been to provide a printed venue for the personal opinions of members of the DX community. The only requirement I have is that folks behave themselves, and be respectful of others.

I received some inputs early on, but none of those folks read the rules, or they just plain didn't care who they offended. But recently, some considerate DXers began sending in comments that were obviously well thought out. In every case they requested anonymity, and as I promised from the beginning that I would respect an individual's right to privacy, I am withholding their identity.

The big-ticket item thus far has to do with the comprehensive changes in the licensing requirements that were enacted on April 15th of this year by the FCC. They primarily have to do with DXers' concerns over the reduction of code speed requirements, and what impact that may have on the pursuit and enjoyment of DX. One DXer from the Phoenix metropolitan area in Arizona wrote, "I am one of those luckless hams who gave in to his XYL and purchased a home in a deed-restrictive community. Consequently, I operate with clandestine antennas, and only at 200 watts to boot. I have had reasonable success in working DX

on CW, but alas I have a rough time punching pile-ups of any size on SSB. My fear is that with the recent changes here in the US, other countries will follow suit, and that DXing will migrate away from CW. Am I going to be left out in the cold with nobody to talk to?"

Another ham up here in the Pacific Northwest caught me at a breakfast gathering and voiced a somewhat related concern. I think he was whining a bit, but his comments are worthy of at least a response from the readership. Here is what he said: "It sure didn't take long for the 'slow-coders' to show up down in the bottom 25 [of 20 meters]. I called CQ the other day and this guy with a new 'cereal box' callsign called me back at something less than 10 wpm. I thought I was going to fall asleep just waiting for him to finish calling me. I keep hearing more and more of these ponderously slow operators showing up down there. Why don't they stay in the Novice band where they belong until they can learn to keep up with the rest of us?"

Interesting comments, eh? Let's take the first comment first. I can understand the concern that one might have about losing access to DX stations via what many feel is the most power-efficient, noise-tolerant mode of communication. It is true that some recent DXpeditions were undertaken with the expressed intent of being an SSB-only event. However, having been on the other end of pile-ups at BY1QH and 4Z85TA, I can tell you that my endurance runs much higher on CW than on SSB. If my experience is at all in common with other DXers' on the receiving end of a pile-up, I think we are safe in assuming that CW will always be thought of as a required, if not preferred, mode of communications in their DXpedition planning.

And as for my fellow moss-covered DXer from Seattle, GET A LIFE!! It is clear to me that there is no more effective tool for marginalizing CW in the years to come than the harboring of a parochial attitude toward those who are obviously trying to gain exposure to the CW operator's craft, and are striving to increase their skills. I will confess to you that I, too, find it difficult to carry on a conversation with someone operating below 20 wpm, but darn it, I am very much encouraged by the fact that they are out there. It gives me hope that folks who enjoy "pounding the brass" will still populate post-April 15th ham radio. If anything, we who can rip along at a brisk pace, and carry on an enjoyable high-speed conversation, or run high Q-rates in a contest, owe it to ourselves to mentor and encourage those who have recently-gained access to that portion of the spectrum.

Well, there you have some opinions, and mine as well. What do you think? I hope that this will stimulate some lively discussion on both sides of any given issue. I look forward to hearing from you. Your opinions, regardless of whether or not they are agreeable, are very much appreciated.

Pulling the big switch

So much for this month's offering. I hope the opinions expressed in Vox Populi didn't cause you to take offense. They weren't intended to, at least not by me. Oh, and how could I forget? Have a blessed Hanukkah, and a very merry Christmas this year, so until January ... *73 and good DX!* 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."

Steve Nowak KE8YN/4
1011 Peacock Ave. NE
Palm Bay FL 32907-1371

Who Needs "ER"? HR Responds to a *Real* Emergency!

It always amazes me that no matter how well prepared we believe we are, emergencies are so full of surprises. Of course an emergency is difficult to prepare for since by its very definition it is unexpected. While I pride myself on planning ahead and thinking about many of the possible contingencies, recently I had an experience that reminded me how surprises are the only thing on which you can truly count.

Last Friday afternoon I was sitting in a meeting at the hospital. It being the afternoon and this being Florida, there was a thunderstorm in progress. The rain was coming in sheets and there was significant electrical activity. I noticed that the delay between the lightning flash and the thunderclap was often quite short but at the time that didn't raise any particular concerns. When the lights flickered, everyone noticed since that shouldn't happen in a hospital. Hospitals are required to have power fed from several directions as well as have generators that automatically activate in a power loss. There were several comments around the table as to how unusual it was to see the lights flicker. A few moments later every department director's pager went off at the same time with the text message that the hospital's entire telephone system had been disrupted. Obviously the lightning strikes had been even closer than we had expected. The bottom line was that the entire communications system within the hospital was compromised.

As you might expect, in a hospital, a disruption in communications is a serious problem. A patient who needs an x-ray or to be set up for a blood transfusion or who needs some other assistance usually does not have the option of waiting. Add to this the fact that in this day and age there is a greater emphasis on working efficiently, so most departments do not have people sitting at a desk waiting to answer the telephone. Instead, staff members are expected to be at the bedside performing patient care duties and are able to be contacted by digital pager. There are backup systems, of course, including the internal telephone system, overhead voice paging, and messages through the hospital computer system. With these redundant backup systems, it is normally quite difficult to disrupt key services. This time, though, all of the regular systems were impacted in some fashion.

Because we always expect the worst, there are additional layers of redundancy, which provide additional protection even in such extreme cases. Some telephones are connected to lines that become direct lines if the central switch is impacted. Several of these are assigned to the main telephone numbers for the hospital for incoming calls. Other direct lines are available as well. Many fax machines are intentionally connected to dedicated lines and are equipped with handsets so that they can provide voice communications in an emergency. Finally key departments such as security and plant operations have two-way radios, and key personnel have cell phones that are certified so as not to interfere with patient monitoring equipment.

With all this redundancy, Murphy still showed up early on, and his famous law took effect almost immediately. The lightning strike had not only affected the telephone system, but also the overhead paging system. The digital paging system could not be accessed as readily as normal. The same lightning bolt that had caused the communications problem had also eliminated the air conditioner for the computer room, so the hospitalwide computer system which normally handles patient orders and department-to-department messages had to be taken off line. Finally, hospitals have alarm buttons which are used to summon the team which responds to a cardiac arrest. Obviously there can be no doubts about the reliability of this system and the ability to dispatch the team that responds.

The hospital immediately implemented its backup plans. Two-way radios were retrieved from their regular users and immediately issued to those people who would be needed in a patient emergency such as a Code Blue. Hospital employees and Hospital Auxiliary volunteers were assigned to act as messengers to carry requests from the nursing units to departments such as laboratory and respiratory therapy. The healthcare professionals on their end began to prioritize their needs and did an outstanding job of restricting communications to critical issues only. The cell phones were used to contact the technical employees who were not already on site and advise them of the need for their presence. Calls were also made to outside services and suppliers needed to begin repair of the main systems.

The direct phone lines worked, but they were in almost constant use for communications with the outside world and did not provide a good mechanism for department-to-department communications. The fax machines quickly became occupied, as the nurses on the patient floors sent faxes to pharmacy, lab, x-ray, etc., with orders for patient needs.

Fortunately, the hospital has had a long-standing relationship with the Indian River Amateur Radio Club in central Brevard County. IRARC has a repeater located on

Continued on page 62

HOMING IN

Radio Direction Finding

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T-Hunting by the Bay

For a dozen years, I have told you that southern California is the "center of excellence" in mobile hidden transmitter hunting. To hear them talk, you would think that hams in the shadow of Disneyland and Tinseltown had invented this sport, which is usually called T-hunting or foxhunting. They didn't, but they certainly have led the way in promoting it for a couple of decades.

When it comes to clever hiders, they're hard to beat. I have written of transmitters they have placed in shopping carts, telephone books, fire hydrants and more. It's all in a day's (or night's) fun for them.

But there's no shortage of clever hams elsewhere in the country (and the world). Hams farther north in the Golden State are also making the most of radio direction finding (RDF) adventures.

From San Francisco and Silicon Valley to the great farmlands eastward, hams in the Bay Area converge to test their RDF skills four times a month. On the first Saturday evening, they gather on a hilltop in Fremont to hunt two transmitters. One is intended primarily for beginners. There are no mileage or time limits for this "easy" fox. The other one is intended for experienced hunters, who are required to find this "hard" fox first, after which they can look for the other one.

***Photo A.** Paul Shinn prefers his Doppler RDF set, but gets out to take bearings from his truck bed when the signal is weak.*

On the first Sunday of the month at 8 a.m., there's a hunt at the Livermore Swap Meet. It's a great way to attract newcomers. Then the Central Valley Hunt takes place on the second Saturday. The third Saturday of the month is a "hider's choice" event. Huntmasters have several sets of rules and boundaries to choose from. One is the Pack-A-Lunch Hunt, which starts at 10 a.m. in Pleasanton and often involves several foxes and creative scoring.

Woven by the Web

The primary scribe for Bay Area T-hunters is Jim Sakane KD6DX. Jim is a locksmith in Fremont who discovered the joys of RDF about four years ago. His Web site has megabytes of photos, plus play-by-play commentary on past hunts from the point of view of hider or hunter, whichever role he played at the time.

Over the years, I have corresponded by E-mail with KD6DX, plus Mike Allison KN6ZT, Bonnie Crystal KQ6XA, and others who are promoting RDF contesting in that part of California. When I mentioned that a weekend vacation would take me to nearby Stockton, an offer to ride on a hunt was quickly forthcoming.

My host on this balmy September evening was Paul Shinn, a broadcast engineer who participates in hidden transmitter hunts to sharpen the RDF skills he needs for tracking down interference problems related to his work. He has also done lots of experimenting with Doppler antenna switchers.

That weekend's event was a Bay Hunt. Hunters could start anywhere, and the transmitter could be anywhere within ten miles of the shore of the San Francisco Bay, or to the first ridgeline. There was no formal scoring.

On a Bay Hunt, coordination among the hunters on a 440 MHz repeater is encouraged. This isn't a fully cooperative all-hunters-versus-the-hider hunt where everyone shares bearings to see how quickly someone can find the fox. That is done some places as a practice exercise for locating stations in distress.

On this hunt, the cooperation is merely to help everyone get started. Since the boundary is large and hunting teams are dispersed at the start, this is important. This time it was even more so, as hunters determined that the signal was quite weak everywhere. Was the T in a very low spot? Flea-powered? Covered up in some way?

Since I had arrived in Stockton at the last minute, we were late getting started. The first piece of information we needed was the hunt frequency, which we couldn't get until we had driven over Altamont Pass and gotten into coverage area of the 70cm repeater. Then we heard reports from other hunters that the only signals significantly above the noise were coming from East Palo Alto near the Dumbarton Bridge.

Paul decided to take Highway 92 and get to the west side of the Bay as soon as possible. "Since the freeways are lined with huge sound walls on the east side of the bay, I took the San Mateo bridge across the water to the west side," Paul explained. "That let me take Highway 101 southward and not be surrounded by walls."

As we crossed the San Mateo Bridge, we still had no indication on the Doppler, but Paul hopped out as soon as we reached the

Photo B. *It can't be in the water, so it must be on the bridge! Assessing the situation are (left to right) Dave McIntyre KG6ACD, Paul Shinn, and Charlie Skiles W6RMR.*

west bank and took a beam bearing from his truck bed (**Photo A**). Sure enough, there was the signal, coming up the bay from the southeast. That was the direction of southbound Highway 101, so off we went.

When we arrived in East Palo Alto, there was still no strong Doppler indication. Paul turned off onto highway 84 and stopped to take another bearing. Now the signal was to the east. According to Paul, "I knew that the farthest east I could go on my bearing line was the Dumbarton Bridge, since any farther took me into the water or back to the east side of the bay."

At that moment, another team drove up. They said they hadn't found it. We looked out at the bay and the bridge, but didn't see any clues (**Photo B**).

Based on the convergence of bearings, we had to be close, so we headed for the bridge. Just before the toll plaza was a turnout that went down by the water. We took it, drove a short distance, and the signal suddenly became very strong. It's here!

The ammunition-can transmitter was at the top of a ten-foot bridge support column, just under the roadbed (**Photo C**). Now it was time to examine the equipment of the hunters that who already arrived, and to wait for some more (**Photo D**).

Early warning

Dopplers are the "weapon of choice" for most mobile T-hunters in the Bay Area. Yagis, quads, and other gain antennas seem to be limited to initial bearings and on-foot use at the end of the road. That's in sharp contrast to southern California, where 4-element yagis and quads are sticking through inch-and-a-half-diameter holes on the roofs of almost every hunting vehicle, swinging back and forth as they go down the road. If a Los Angeles area hunter uses a Doppler on VHF or UHF, it's either in addition to a beam or necessitated by the need for "stealthiness" when tracking jammers and bootleggers.

I'm sure that several kinds of Dopplers are in use in the Bay area, but every one I saw at this event was a MicroFinder by AHHA! Solutions of Livermore. Rich Harrington KN6FW of AHHA! was one of the hunters, so I took another opportunity to ask him when it would be appropriate for "Homing In" to review this product. KN6FW and KN6ZT developed MicroFinder Version 1 back in 1997. It was so popular that all stock was sold out in a few months. The Version 2 units went even faster. Let's hope that Version 3 will come out soon and there will be plenty on the shelf, so that I can finally bring a review to you.

Another important item of T-hunting equipment, used by Paul and most other Bay Area teams, is a handie-talkie tuned to the hunt frequency with the antenna removed. Placed on the dashboard, this receiver gives early warning when the signal is strong enough to indicate that "You are here!"

That helped KD6DX and his partner Greg Ottria KE6PTP, who started this hunt from a hill near Eden Hospital in Castro Valley. Greg's bearing indication on the strong signal at the hilltop turned out to be very accurate. When they left the hill, the signal dropped into the noise. It remained unintelligible until they had followed their initial bearing to the east end of the Dumbarton Bridge. Their Doppler got intermittent bearings through the noise, however.

Jim wrote that as Greg drove west on the

Photo C. *Hiders Andy Mascsak WD6CJK (left) and Tony Flusche AB6BR pose with their low-powered transmitter under the Dumbarton Bridge.*

Photo D. *After the hunt, participants review their bearings and swap stories. On the right is Rich Harrington KN6FW, hardware designer of the MicroFinder.*

Dumbarton Bridge, he commented that they were elevated and the signal was weak, so the transmitter must be very low to the ground and still very far away. "Just as I finished saying it, the signal rose rapidly and then my 'You are here' radio blasted its speaker. I was so busy wondering what was happening that only moments later I looked at the Doppler and it indicated to the rear. Greg found a service road exit a few hundred yards ahead. We took it and followed our Doppler to the transmitter."

Later, over some really good pizza, I learned about many more dastardly Bay Area hiding deeds. One was the Furby Hunt, put on by Bill Dunbar N6IMS and Art Samuelson W6VV. That's what the signal sounded like at the start point — a Furby toy chatting away more-or-less continuously into what appeared to be a voice-activated transmitter. But was it just one?

N6IMS called the hunters by radio to tell them that the special rules of this hunt demanded that each team independently determine how many transmitters there were and then find them all with least elapsed mileage to win.

Jim Sakane's Web narrative tells how he used the multipath quality indicator on his Doppler set to deduce that there were two transmitters chatting in a Furbish "dialogue." I suspect that others did something similar, unless they had an RDF antenna hooked to a receiver with S-meter and could ascertain some difference in signal strength or direction of the two Furby foxes. Careful viewing of the Doppler led Jim to conclude that the bearing for one was 70 degrees and the other was 95 degrees.

As it turned out, the targets were four miles apart in separate new-construction areas, one just north of Interstate 580 and the other in Pleasanton. How did two Furbys hold a QSO? Jim explains: "N6IMS removed the brains from both Furbys and carefully placed them into an electrically nurturing controller box at Site 2. Domo's voice was connected directly to the Site 2 transmitter. Lulu's voice went to a UHF link transmitter that communicated with the body of Lulu at Site 1."

Since both brains were in one controller box, they were able to play and talk to each other. Furbys put themselves to sleep after a short time, so Bill added circuitry to provide pseudo-separation and reintroduction every 30 seconds.

There seems to be a sort of informal contest in the bay Area to see who can make the smallest effective fox transmitters. They have miniaturized the Montreal Fox Controller with surface-mount components to near postage stamp size. (See "Homing In" in the April 1998 issue for a full description of that project.) The winner for smallest fox at the pizza parlor that night was Henry Schroeder KF6PCE, whose transmitter, antenna, battery, and controller fit into a 35mm film canister.

If you don't want to drive a long way to the starting point, have the starting point close to you. That's what Paul Shinn did, beginning last May. The post-hunt barbecue that he promised was enough incentive to bring five vehicles to Stockton for the first one. That hunt featured two transmitters 10 kHz apart, one supposed to be easy and the other hard. The hard one turned out to be extra difficult because an antenna connection failed. Only one team heard it and found it. Paul has just begun a Web site to promote these Central Valley hunts.

Jim's and Paul's Web sites have many more tales and photos of Bay Area T-hunts, plus information on how you can join the fun when you're in the area. Complete rules, maps, and upcoming hunt schedules are there. You can jump to these sites by link from my "Homing In" site.

Give a hoot

Is your listening "for the birds"? We certainly hope so. This is the third year that "Homing In" readers are helping Canadian researchers find out what happens to juvenile burrowing owls that hatch in Saskatchewan and Alberta during summer

Photo E. *To see burrowing owls during the day, look down, not up.*

Photo F. *Researchers want to know why the burrowing owl population is decreasing. This one is using an infrared "peeper" camera on the end of a flexible shaft to look at hatchlings deep in a burrow. Her head is covered so that she can see the video monitor on her goggles.*

months (**Photo E**). These birds, which are classed as "endangered" in Canada and "threatened" elsewhere, head south in late September and October to parts unknown, possibly southern Texas and northern Mexico.

Unlike other Strigiformes, it's unusual to see a burrowing owl in a tree. They prefer to take over abandoned badger or ground squirrel burrows in grasslands (**Photo F**). They can also be found near urban areas, using artificial burrows such as pipes, culverts, and piles of rock or concrete. They usually stand near the entrance of their home during the day and fly a short distance away if approached. At night, they go airborne for long periods, looking for food.

About 200 Canadian-hatched owls were banded last summer, and 70 of those were fitted with miniature VHF transmitters. In previous years, attempts to follow the birds southward with small aircraft have been unsuccessful, due to weather conditions that kept the planes from flying, but not the birds.

That's where you come in. Hams and scanner listeners are needed to carefully tune from 172 to 173 MHz for these radio tags. Monitors in Texas (particularly the Corpus Christi area) are especially needed, but these birds might spend the winter anywhere from southern California to Mississippi. Last winter, three hams (KC1QF, K5BL, and K5DXM) reported hearing signals. Farthest west was Tucson, Arizona, and easternmost was Fort Smith, Arkansas. The banded birds were not actually sighted, so it's possible that these signals were not actual owl tags. That's why even more monitoring hams are needed this year, preferably with RDF capability.

Continued on page 62

QRP

Low Power Operation

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Loose Ends

This month, I plan to tie up some loose ends. We'll start with the small QRP bench power supply that was first shown last time. In the photos, you'll see my version. I've been working on this project for a week or so. There are some loose ends that need to be addressed on my version as well.

As you can see, I've managed to put the entire project into a very small box. I used 1/4-inch aluminum angle to hold the PC boards upright. The transformer fits into the space between the power supply PC board and the second PC board.

Metering circuit

That second PC board is a DPM panel meter driver. I used a surplus digital panel meter for adjusting the output of the supply. These digital panel meters run from a nine-volt source. The surplus digital meter requires its own power supply. They cannot read their own supply voltage. The DPM panel meter driver provides the required isolated voltage at about 5 mA. More than enough for this surplus meter. I got my DPM from one of the surplus supplies at this year's Dayton Hamvention. You can pick up digital panel meters from just about any surplus parts dealer.

An ordinary analog panel meter would have worked just as well. The downside in using an analog meter was trying to find one that would fit the cabinet I was building the supply in. Also, the price of a good analog meter would have been many times that what I paid for the surplus digital meter.

I decided to go with more power than the LM317T regulator could supply. I ended up using the LM317K regulator. This regulator requires a large heat sink. In the photos, you can see the heat sink mounted on the regulator. By placing the regulator on the top side of the board, the heat produced will not affect the operation of the supply. The power supply PC board will handle either the TO-220–style 1 A regulator or the TO-3–style regulator.

Because I will be using the supply for the workbench, I also added a ten-turn front-mounted pot. All I had in the junk box were 10k units, so to get the ten-turn pot to function, I placed a 1.8k resistor across its terminals. This gives me a range of from about eight volts to a tad over 14.9 volts. The combination of ten-turn pot and fixed resistor are in place of the 5k PC board–mounted trimmer. Wires are run from the trimmer location to the ten-turn pot.

Five-way binding posts round out the supply. Also in the works, I have been thinking of placing a small 12-volt DC fan on the rear of the supply. The fan would help cool the regulator during high current operation. Right now, this is only a thought, but since there is room on the back apron, why not?

Wiring the supply

The way the PC board has been designed, all interconnections are done with AMP MTA cables and connectors. Of course, you can hardwire all the required wires to the PC board and bypass the fancy connectors. But after you have built several projects using MTA connectors, you'll never go back to hardwiring anything again. Since I did not get my supply wired in time, the photos show only several of the many wires connected. Also, to protect the supply, a fuse holder has yet to be installed on the rear apron. Since space is a bit limited inside the case, I chose a fuse holder that used 5- x 20-mm fuses. This leaves me enough room to wire the primary side of the supply inside the confined space.

Button things up

By the time you read this, the QRP bench supply will be all finished and in use. As a matter of fact, during testing I used the supply to operate a small QRP rig. It performed perfectly. I also use the supply to recharge batteries and even run the filaments on a tube base QRP rig!

I hope you plan on building your own QRP bench supply. Remember that this is a project that just begs for you to tinker with

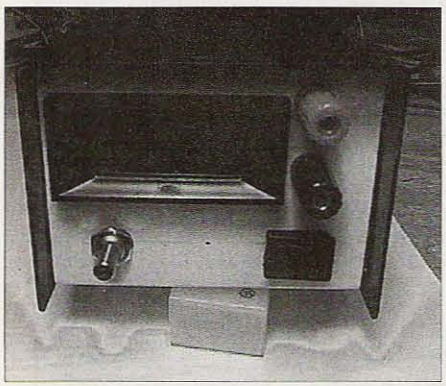

Photo A. *The QRP bench power supply. A knob, LED, and labels will finish up the project.*

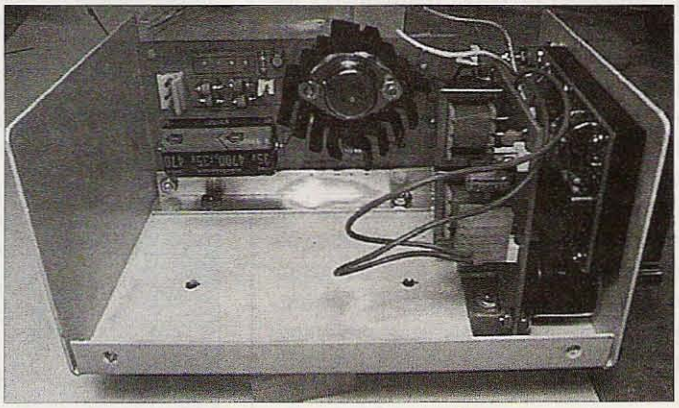

Photo B. *Inside the QRP bench supply. The transformer is not shown.*

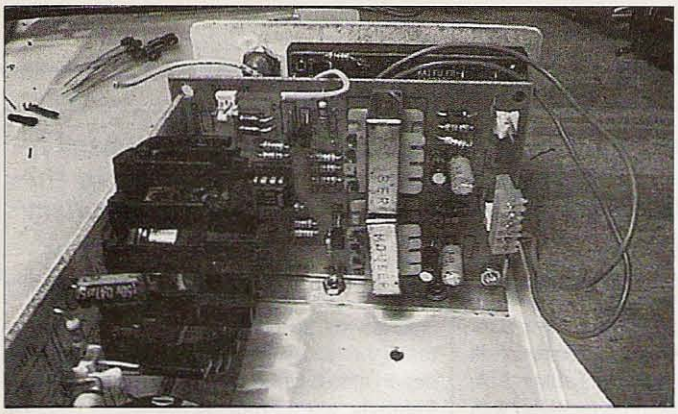

Photo C. *Here is a view of the panel meter supply. The QRP bench PC board is mounted on edge.*

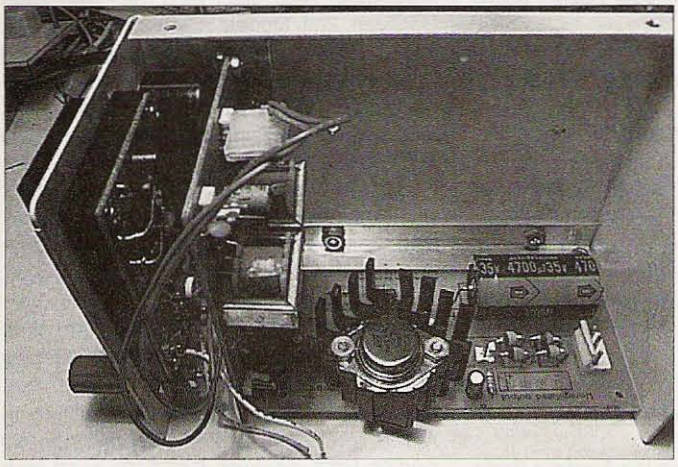

Photo D. *Here's a view of the QRP bench supply, showing the large heat sink that holds the regulator IC.*

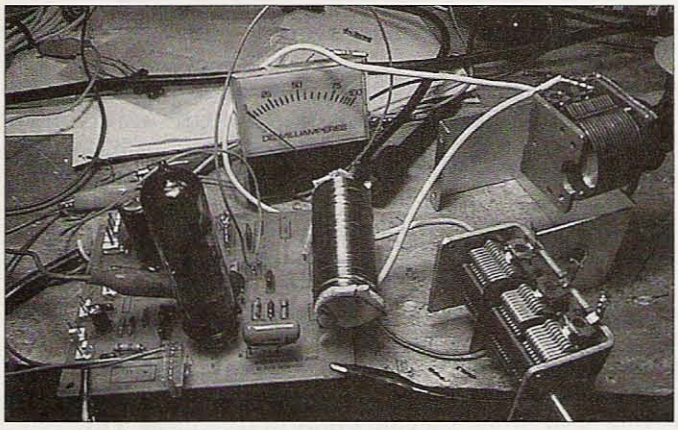

Photo E. *Oh, my! Tubes? Yes, sitting someplace on 40 meters, this guy does about five watts output. It's got more bugs than a rain forest, but it does work!*

it. There's nothing cut into stone, and the circuit can easily be adapted to suit many needs. Also, the circuit is very forgiving, so you can make drastic changes in component values and the thing will still work!

You can get the PC board from FAR Circuits, 18N640 Field Ct., Dundee IL 60118-9269. It's $4.50 plus $1.50 shipping for up to three boards. Be sure you ask for the QRP bench power supply.

The Barney project

Barney KB8SKL and I work at the same steel mill. It's not unusual for us to spend an hour or so talking about ham radio at work. Barney is always building something, but usually moves on to another project before the last one he started gets finished.

Since Barney is from the old school, you can ask him what a 6EA8 is used in and he'll tell you it's an IF amplifier used in TVs. He'll also tell you the pinout and the make and model of the TV chassis that uses them! I can spout off the pinouts of most ICs, but have to dig out the old handbook when it comes to tubes.

Now, having said all of that, Barney and I have been talking about putting a tube or two to work as a QRP transmitter. Barney talked me into using a 6GW8. "A power house of a tube" says Barney.

Yup! That's what it's called. The Barney project started out as a QRP transmitter that is based on a single audio tube. Designed for 80 and 40 meters, the transmitter will produce about five watts. You only get a peak at the first design stage. I've laid out a PC board and I am in the middle of debugging the circuit. Looks like an interesting project.

Next time, I dive into the Heathkit HW-9. After selling the one that I assembled, I finally picked up another set. We will do some modifications, look over some Heathkit factory fixes, and align the radio, too. Should be a lot of fun, so stay tuned!

Best holiday wishes to one and all! 73

QRX

continued from page 8

electronic devices — including your 2-meter HT and all other ham radio gear — remains in place.

FYI, the aviation industry now differentiates between intentional and unintentional transmitting devices. Devices such as cellular telephones, hand-held two-way radios, two or more inter-connected electronic games, or hand-held computers that receive E-mail are considered to be intentional RF emitters and are totally banned at all times. Scanner radios and ham radio transceivers fall into this category. On the other hand, most airlines permit unintentional RF emitters such as laptop computers or CD players to be used after a plane crosses through 10,000 feet.

Thanks to David Black KB4KCH and Newsline, *Bill Pasternak WA6ITF, editor.* 73

Never Say Die

continued from page 6

Wylder, Sewall, Stearn, Hoyle, Jueneman, and so on, that I've reviewed in my *Secret Guide to Wisdom* book. After you've done some of my suggested reading, you may start wondering how the spiritual establishment has been able to ignore so many important developments in their field of supposed expertise. Or, you may not.

My role in life has developed into my being an iconoclast — a breaker of icons, challenging conventional or cherished beliefs and institutions as being false. And, since there seems to be no shortage of false conventional beliefs, I'm having a wonderful time letting the hot air out of the establishment panjandrums with my secret guides to health, wealth, and wisdom.

Drugged!

I'm enjoying all the political nonsense about the high cost of prescription drugs for the impoverished elderly. Will the micro-movement I'm starting to get people to stop poisoning themselves, and thus have no need to further enrich the pharmaceutical giants, pick up enough momentum to make today's prescription drugs as popular as bloodletting to cure dropsy?

If we can get people to stop abusing

Continued on page 60

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 February 2001 issue, we should receive it by December 31. Provide a clear, concise summary of the essential details about your Calendar Event.

JAN 20

ST. JOSEPH, MO The Missouri Valley ARC and Ray-Clay ARC will sponsor their 10th annual Northwest Missouri Winter Hamfest, 8 a.m.–3 p.m., January 20th, 2001. The event will take place at the Ramada Inn, I-29 and Frederick Ave. (exit 47 on I-29), in St. Joseph MO. Special room rates are available for Hamfest participants. Talk-in on 146.85 and 444.925. VE exams, major exhibitors, and flea market all indoors. Free parking. Admission is $2 each, or 3 for $5 in advance; $3 each, or 2 for $5 at the door. Pre-registration requests received after Jan. 5th will be held at the door. Swap tables are $10 each for the first two tables. Commercial exhibitors welcome, write for details: *Northwest Missouri Winter Hamfest, c/o Neal or Carlene Makawski WBØHNO/KAØIKS, 3704 Meadowoak Lane, St. Joseph MO 64503. Tel. (816) 279-3406; E-mail [nem3238@ccp.com].*

JAN 21

HAZEL PARK, MI Hazel Park ARC's 35th Annual Swap & Shop will be held at the Hazel Park High School, 23400 Hughes St., Hazel Park MI. Open to the public 8 a.m.–2 p.m. Plenty of free parking. General admission is $5 in advance or at the door. Tables $14; reservations for tables must be received with check. No reservations by phone. Talk-in on 146.64(-), the DART repeater. For more info about the swap, tickets or table reservations, mail to *HPARC, P.O. Box 368, Hazel Park MI 48030.*

SPECIAL EVENTS, ETC.

DEC 8–9

BETHLEHEM, IN The Clark County ARC will operate W9WWI, 1500Z Dec. 8th–2200Z Dec. 9th, in celebration of the Christmas season. Operation will be on General 75, 40, and 20 meters. QSL with an SASE for a certificate to *CCARC, 1805 E. 8th St., Jeffersonville IN 47130.*

DEC 18–JAN 2

CINNAMINSON, NJ Join the Amateur Radio Lighthouse Society in their "Lighthouse Christmas Lights" special event, to promote public awareness of ham radio and lighthouses; to contribute to the recognition that lighthouses, lightships, and their keepers deserve; to foster camaraderie within the ham fraternity; and to provide fellowship amongst the members of the Amateur Radio Lighthouse Society. This is not a contest and you do not have to operate from a lighthouse in order to participate. Time: 0001 UTC Dec. 18th–2359 UTC Jan. 2nd. Modes: Any and all! SSB, FM, PSK, SSTV, even light beams and semaphores. Repeater operation is also allowed. Bands: Any authorized bands including WARC. Suggested frequencies (±20 kHz): 1.970, 3.970, 7270, 14.270, 21.370, 28.370. Procedure: Call CQ Lighthouse or CQ/LH. Exchange: ARLS members give out call sign, ARLS membership number (see your newsletter mailing label for yours if you don't know it), your name, and state or province. Nonmembers give call sign, name and state or province. Awards: Certificate for working 10 or more lighthouses/ships or 5 or more member ARLS stations. Send log info to *ARLS, P.O. Box 2178, Cinnaminson NJ 08077 USA.* Include SASE 9- x 12-inch envelope and $1 for return of certificate. Send questions via E-mail to *Jim K2JXW at [weidner@waterw.com].* 73

NEVER SAY DIE

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their bodies, they'll stop going to their doctors and getting prescriptions for drugs to help them not feel the warning signals their bodies are sending as their lifestyle breaks down one part of their body after the other.

One more thing. Every one of these drugs has side effects, and none of them is beneficial.

As a result of my guest appearances on the *Coast-To-Coast* show, listened to largely by insomniac seniors, all paying hefty prescription drug bills, where I've preached my stop-poisoning-yourself sermon, I've been getting endless letters, E-mails, and phone calls from people thanking me for changing their lives. They're drug-free at last and feeling better than they have in years.

My message to them: Please spread the word.

SETI

The Search for Extraterrestrial Intelligence, from my viewpoint, is a huge waste of time and money. But then, scientists are well known for their single-minded pursuit of their own special interests, while ignoring the work of others which might disturb their beliefs.

In the case of ETs, there are lots of relevant-published materials which confirm beyond any reasonable doubt that ETs are here and have been for a very long time.

Further, they're eons ahead of us in technology. They communicate by telepathy. They are able to travel through time—which helps explain how they can come here from zillions of miles away.

UFO research expert Stanton Friedman, on the *Coast-To-Coast* show, called SETI a Silly Effort To Investigate. I like that.

With millions of UFO sightings in countries all around the world, one has to be truly ignorant to reject the UFO reality.

But then, there's sure a lot of ignorance going around. And some of these contraptions are bigger than a football field, and they've been seen up close.

So why is the government keeping so silent on the subject? Why are they ignoring all Freedom of Information requests for government data? It doesn't take a genius to figure that one out. 73

PROPAGATION

Jim Gray II
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Juneau AK 99802

Erratic (with Possible Sleigh Static)

The best description of propagation conditions for December is erratic. Sunspot numbers will continue to remain very high, and a fair amount of associated solar activity will continue to plague the HF operator, although I don't foresee any highly disruptive events.

The poorest conditions are predicted for Christmas, from the 24th–26th, while a lesser disturbance may be expected from the 16th–19th. Look for the first and last days of the month to be your best bets, with other fairly good periods occurring on the 7th–9th and 21st–23rd. The rest of the month will be tedious at best, but patient listeners may occasionally find a surprising opening as conditions fluctuate.

One of my dad's favorite tricks was to park his receiver on a seemingly unused frequency and wait for something to pop up while he caught up on his reading or correspondence. He was often able to snag a rare contact before the station became saturated with calls. Southern Asia and the Indian Ocean were among his favorite hunting grounds, especially when the aurora wasn't too active. For daily auroral activity, look at the NOAA POES satellite Web site at [http://www.sec.noaa.gov/pmap/index].

Band-by-Band Summary

10/12 meters

Good worldwide openings can be found from sunrise to just after sunset. Europe, the Middle East, and Africa are typically open until about noon. Central and South America should be open from mid-morning to late afternoon, but expect some noontime fading. Look for afternoon to early evening opportunities into the Pacific, Australia, and the Far East. A short-skip of 1,000–2,000 miles will be typical.

15/17 meters

Openings to most areas of the world can be found from sunrise to early evening. Europe, North Africa, and the Middle East typically peak around mid-morning with South Africa coming in just a bit later. Early afternoon is best for Central and South America, but they can be worked from late morning to early evening. The

Continued on page 62

December 2000

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

EASTERN UNITED STATES TO:

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

CENTRAL UNITED STATES TO:

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

WESTERN UNITED STATES TO:

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

Propagation

continued from page 61

Pacific and Asia are typically best in the late afternoon or early evening. Short-skip distances average about 1,000 miles.

20 meters

Worldwide DX is workable just about around the clock — even low power stations can find strength here. Peaks typically occur for a few hours after sunrise, from late afternoon into early evening, and again just before midnight. Try Europe and Africa in late afternoon, Central and South America in the evening, and westward into the Pacific from before midnight until sunrise. Expect a 500–1,000 mile short-skip during the day and 1,500–2,000 miles at night.

34/40 meters

Daytime openings should not be overlooked, but these bands are definitely best after dark. Europe and other areas to the east can be worked in the early evening while Central and South America are pretty much always open throughout the hours of darkness. The Pacific and Far East begin building around midnight and peak before sunrise. 1,000–2,000 mile short-skip is typical after dark while 1,000 miles is typical during the day.

80/160 meters

Worldwide DX may be observed from local sunset until local sunrise. Europe, Africa, and the Middle East start to build after sunset and peak before midnight. Other parts of the world can be worked from midnight until sunrise. Atmospheric noise on these bands should steadily decrease throughout December since most tropical storm activity will have subsided in most regions of the world except between Australia and French Polynesia. Activity on 40 meters is a clue that these bands might be open. Short-skip is usually from 1,500–2,000 miles. Happy Holidays! 73

Angel Voices

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implement. There wasn't any way possible for me to have cut the rope as I stood near the top of the tower. And we had both checked the rope before I had climbed up on the tower.

"Tell me again what the voice told you, Bill," Jerry said.

Very carefully, I explained how each time the voice had called out to me from a few feet away and up in the sky.

"That's it," Jerry said. "We're through for the day. Don't bother to go back up there, leave it. We'll do this another time. Here, hold the rope so I can wrap a few turns of electrical tape around it so it won't pull apart."

The ends of the rope were still flush with each other, except for the little strand of hemp. Both ends of the rope were clean, not ragged.

Both of us started asking questions back and forth. "It's just amazing," I said.

"Who was the voice you heard up above you, Bill? And what could have possibly cut this rope so cleanly?" Jerry asked.

He stood there and looked at me, and I looked at him.

Jerry said, "Let's put all this gear away and then go to your house — I want to show this to your folks." And that's what we did. When my parents saw the rope and heard our story, they too were amazed.

Jerry finally finished tuning his beam with the help of another ham friend, who had a climber's belt. Looking back now over all those years gone by, I am still in wonder about the events that happened that day, because in the ensuing years they have happened again several times, though not in connection with amateur radio. 73

On the Go

continued from page 53

the hospital's roof and has several operators assigned to report immediately to the hospital if the county activates any number of its disaster plans. Jim Bayless W4BAL was at the county Emergency Operations Center when I put out the call, and immediately got the ball rolling. Soon we had one operator in the Emergency Department (Vern KØEGA); Jim in the lab; and Bob W4PRK covering cardiopulmonary, which includes respiratory therapy and EKG. When Roy W6QCM got in, he immediately set up in radiology and contacted his wife Gail KG4HZW. Gail began contacting other hams to ensure that if necessary, coverage would be scheduled for the next 24 hours.

Working with the Senior Vice President of Nursing, we determined the most critical areas to cover and ended up with Al N4TME assigned to the Intensive Care Unit, Gail covering the Cardiac Surgical Unit, and Norm W1TLZ covering the third floor nursing station. When an emergency surgical case was begun, Roy was reassigned to the surgery office. Although the phone system was beginning to work again, in order to provide that extra layer of reliability it was decided that a ham was good (and cheap) insurance. After all, during repair operations we all know stressed components can fail, or it may become necessary to remove and replace circuit boards or modules which will take the circuit off line. The hams provided the assurance that until everything was proven to be fully reliable, no patient would be at risk.

The bottom line was that the hospital had planned effectively for such an emergency, and the Indian River Amateur Radio Club's role was included in their plan. The communications emergency was handled so that no serious disruptions occurred and most of the situation was transparent to the patients in the hospital. While several elements of the plan did not work out exactly as anticipated, the multiple levels of redundancy worked out. Ham radio once again "rogered up" and made a big difference. 73

Homing In

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My Web site has details of the Burrowing Owl Project, including all of the frequencies, equipment suggestions for monitoring and RDF, plus what to do if you hear a possible tag signal. If you're not on the Web, send me a self-addressed stamped envelope and I'll reply with a hard copy. To rapidly spread the word whenever signals are heard, I have just started the "biotrackers" Internet mailing list (also called a discussion group or reflector). To subscribe, send E-mail to [biotrackers-subscribe@egroups.com] with "subscribe" in subject and body.

By the way, burrowing owls don't actually hoot. As they fly at night, they emit loud cries. If you disturb one in its burrow, it may try to scare you away by mimicking a rattlesnake. 73

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)

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Reprints of My Editorials from *73*. Very few things in this world are as we've been taught, and as they appear. I blow the whistle on the scams around us, such as the health care, our school system,. our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

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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-in. 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)

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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)

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

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

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

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

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the March 2001 classified ad section is January 10, 2001.

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

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