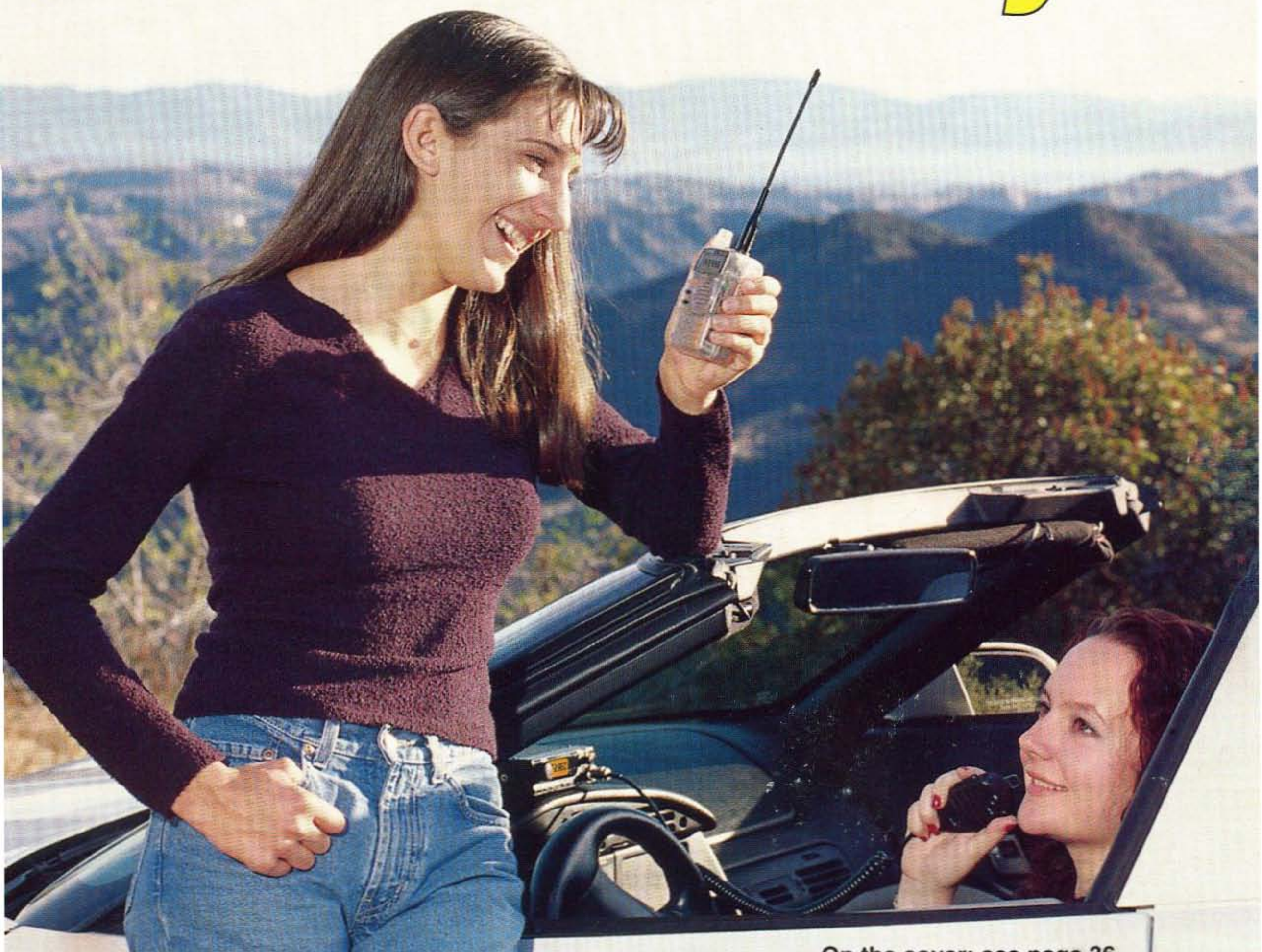
JAN/FEB 2000
ISSUE #471
USA $3.95
CANADA $4.95

THE NEW!

73® Amateur Radio Today



Ten is Hot!
And so is the Alinco DR-M03!

Ham PR at the Triathlon

CW = Fun! Read All About It

To Build: Audio Generator

On the cover: see page 36

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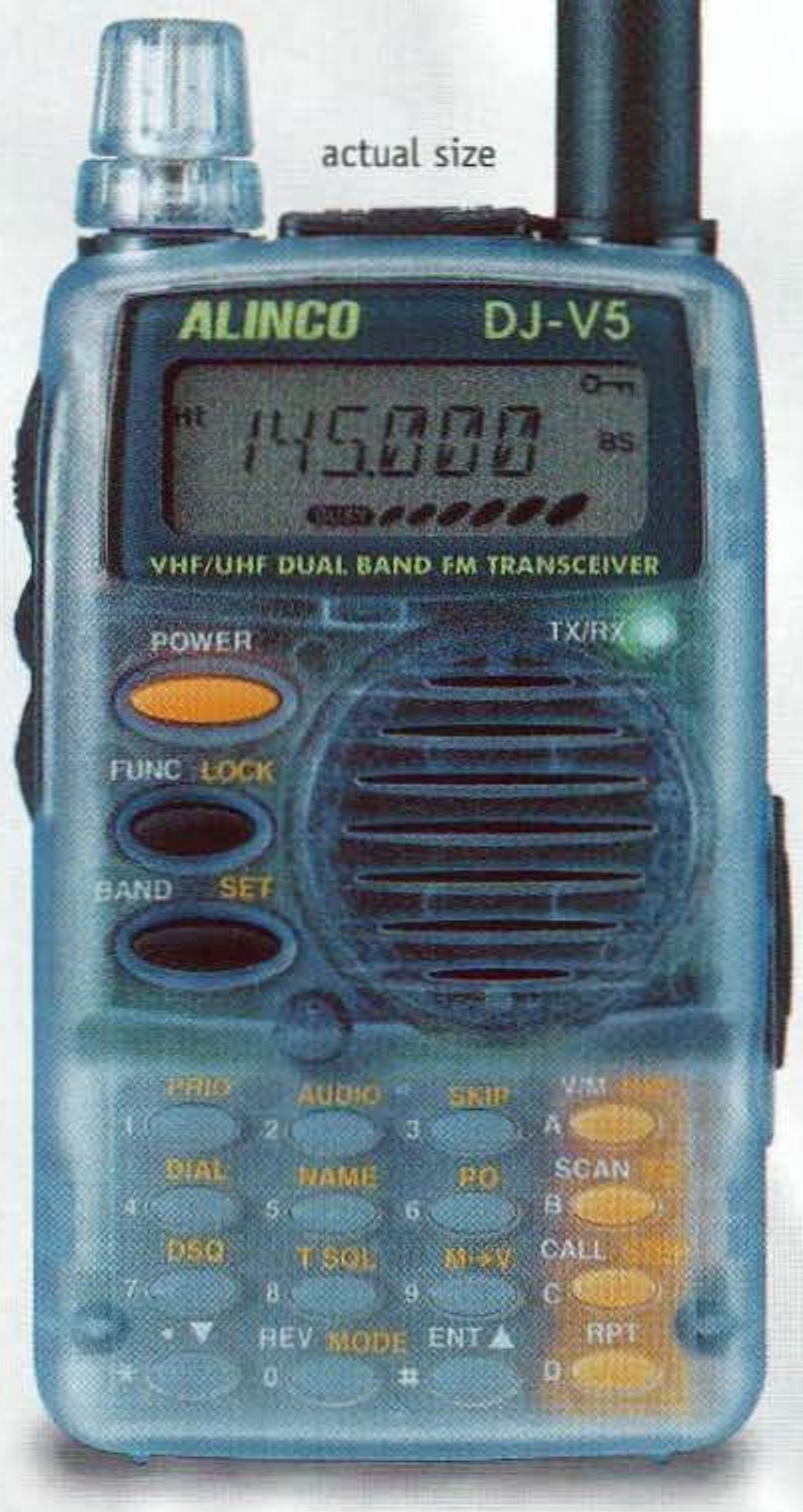
Different.

VHF/UHF. 5 watts.

New.

200 memories.



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THE NEW!

73 Amateur Radio Today

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DEPARTMENTS

Web Page
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E-Mail
design73@aol.com

QRX . . .

Special Bulletin for Those Who Think Uncle Wayne is Crying "Wolf!"

If you're one of the (albeit) minority who think that Wayne has been raising false alarums or cooking the numbers in some way, guess again.

Sorry, but here's some bad news. The Amateur Radio Service has stopped growing and could easily slip into a decline. So say the latest amateur radio census statistics published in the latest issue of Fred Maia's *W5YI Report*. According to Maia, growth in the number of United States ham radio licensees has nearly halted overall over the past year.

Fred told *Newsline* that his numbers exclude hams whose licenses have expired but remain within the two-year grace period. And while the overall number of U.S. hams is up by a bit over 3,000 over a year ago, it still only amounts to less than one-half of one percent in actual growth.

Only Techs showed any real increase, up by more than 10,500 from a year earlier. Tech Plus and Amateur Extras rose slightly, too, but Advanced and General were down slightly. The biggest percentage loss was among Novices. Their ranks declined by more than 5,000 operators over the past twelve months.

Thanks to W5YI Report, *via* Newsline, *Bill Pasternak WA6ITF, editor.*

Continued on page 8

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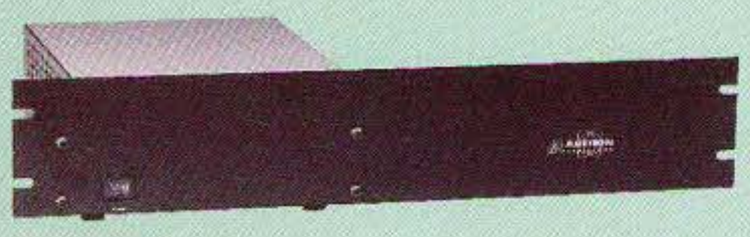
MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅜ x 6 x 9	3.4
SS-18	15	18	1⅜ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅜	4.2
SS-30	25	30	3¾ x 7 x 9⅝	5.0

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 9⅜	4.2
SS-30M*	25	30	3¾ x 7 x 9⅝	5.0



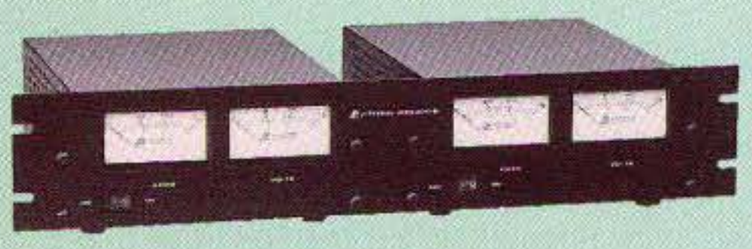
MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅜	6.5
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅜	6.5
SRM-30M	25	30	3½ x 19 x 9⅝	7.0



MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

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

WITH SEPARATE VOLT & AMP METERS

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

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

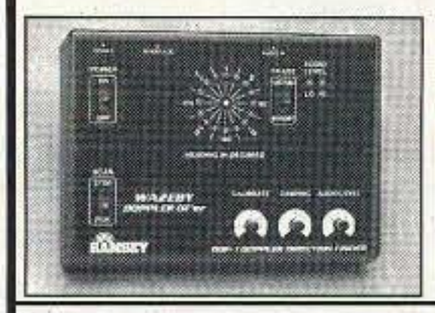
NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

*ICS – Intermittent Communication Service

RAMSEY

Doppler Direction Finder



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

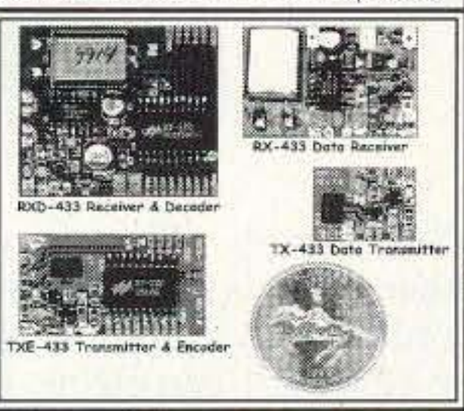
DDF-1, Doppler Direction Finder Kit $149.95

1 GHz RF Signal Generator

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

RSG-1000B RF Signal Generator $1995.00

Wireless RF Data Link Modules



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

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

Super Pro FM Stereo Transmitter

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

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

World's Smallest TV Transmitters

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

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

CCD Video Cameras

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

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

AM Radio Transmitter

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

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

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

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

PIC-Pro Pic Chip Programmer

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

PIC-1, PICPRO PIC Chip Programmer Kit $59.95

FM Station Antennas

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

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

Order Toll-free: 800-446-2295

Sorry, no tech info, or order status at 800 number

For Technical Info, Order Status
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Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1
w2nsd@aol.com

Mea Culpa

Yes, this is a combination January/February issue. Yes, all subscriptions (including lifers) will be extended a month. And, yes, this is all my fault. Mea culpa. I plead guilty — with an explanation, naturally.

You've noticed the thinning of *73*. Well, since all of the other ham rags have been thinning too, as the ham industry has been slowly starving, maybe you haven't paid a lot of attention. A healthy magazine has to have about 50% advertising, with the other 50% of the revenues coming from circulation.

Since the *only* way a company can generate sales is by advertising or PR, the companies who react to a drop in sales by cutting their ad expenses are heading on an inevitable downward spiral toward bankruptcy. That's about the dumbest move a company can make. No, when times get tough, that's when survivors put even more effort into their PR and advertising. That's when they milk those reader service responses for everything they're worth. That's when they listen to their customers.

I, and *73*, managed to survive the greatest catastrophe in the history of amateur radio, the monumentally stupid ARRL so-called Incentive Licensing proposal. That beaut killed ham equipment sales for over three years, putting almost 90% of the ham dealers around the country out of business, and virtually wiping out the entire American ham equipment industry. Gone were giants such as Hallicrafters, Hammarlund, National Radio, Multi-Elmac, and a long list of others. No more Stancor, Thordarson, Barker & Williamson, Gonset, Sideband Engineers, Telrex, Clegg, Central Electronics, Lakeshore Industries, etc.

I watched the American giants topple, making the entry of the Japanese manufacturers to fill the vacuum easy. While the ARRL was trying to get the FCC to force the American hams off phone and back to CW, the Japanese pioneered the no-code license, resulting in a huge growth of Japanese hams, which fueled the growth of Icom, Yaesu, Kenwood, Standard, and the other Japanese manufacturers.

One unintended result of the ARRL proposal was the closing down of thousands of American school radio clubs (oops!), thus cutting off the entry of teenagers into the hobby. And since 80% of the teenagers who had become hams went on to careers in high-tech industries, this cut off the entry of tens of thousands of youngsters into our electronics industries. Meanwhile, the Japanese schools organized radio clubs, generating over a million new hams, which resulted in hundreds of thousands of high-tech career-oriented youngsters. Our high-tech businesses were starved for engineers and technicians, while the Japanese companies had an endless supply.

When I visited Japanese electronics and computer research labs and factories, I was met at every turn by smiling Japanese hams, saying hello to W2NSD. When I'd give talks to American ham clubs, I'd meet a bunch of old men.

How much the League's 1963 Incentive Licensing proposal crippled our American electronics and computer industries can never be measured, but I'd say that this one incredible blunder cost our country trillions, as well as seriously hurt our military capability.

Ooops, I've digressed. First time.

At the same time as our ham industry has been cutting their advertising, making sure they'll not survive, I've been so busy doing other things that I haven't been paying much attention to *73* or raising hell with the industry over their self-destructive response to the drop in sales.

My year on the New Hampshire Economic Development Commission got me interested in finding out all I could about our school and health care systems. Extensive research showed me how our school system could be enormously improved, and run at a fraction of its current cost. And I found the same thing with health care. Indeed, I discovered that the cause of *all* illnesses has been known for years, but that the medical industry has been covering it up in order to make doctors and pharmaceutical and insurance companies rich. I decided it was time for me to blow the whistle.

Yes, ham radio is a lot of fun and it's provided me with a lifetime of adventure, but here was an opportunity to help millions of people to be healthy and add many productive years to their lives. So I dropped almost everything, including *73*, to pursue this new goal — getting on talk radio and pushing my *Secret Guide to Health* book.

The Changes

Two volunteers are now working to repair the damage my neglect has caused. Dave Ingram K4TWJ, who should be familiar to you through his many articles, columns, and books, has stepped in to beef up the editorial end of the magazine, and Evelyn Garrison WS7A, the wonderful lady who helped make Icom a ham household name, will be selling advertising. Well, I haven't had the time I used to for selling.

Dave will be looking for lots of reviews of new ham gear, and Evelyn will be pestering the manufacturers to get us new gear to review. Let Dave know if you think you're qualified to be a reviewer and in which ham fields you're an expert.

Dave and I are interested in the same thing you are — we want to read about a piece of new ham gear and to be driven wild with desire. We want to know about the benefits and the fun we'll have, more than a list of the features. And we aren't much interested in a lot of technical data.

Speaking of fun, I enjoy reading about the fun other hams are having, whether it be something unusual in a Field Day effort, a mountaintop VHF expedition, or a DXpedition to some weird place. Or maybe a fiendish fox hunt situation. This is a hobby. It's for fun, so a ham magazine should be fun to read.

By combining the Jan/Feb issues we'll get back on schedule so that starting in March you'll get every issue in your hands by the first day of the cover month.

Yes, of course, I'll continue my editorials. We tried eliminating them for a couple of years and the circulation quickly plummeted, so we sure won't ever try that again.

With Dave doing the editorial work and Evelyn working to keep the industry from

Continued on page 37

Big Savings on Radio Scanners

COMMUNICATIONS ELECTRONICS INC.

Order on-line and get big savings

Take advantage of *73 Amateur Radio* special savings by entering your order directly on the internet at the Communications Electronics web site. Visit CEI at http://www.usascan.com, click on "CEI News" and get big E-Value savings. Resellers, get special pricing when you fax your sales tax license to CEI at +1-734-663-8888.

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SAVE $30 on one **Relm MPV32**

Save $30 when you purchase your RELM MPV32 transceiver directly from Communications Electronics Inc. For fast delivery, enter your order through our web site http://www.usascan.com or call Communications Electronics at 1-800-USA-SCAN. TERMS: Good only in USA & Canada. Only one coupon is redeemable per purchase. Void where prohibited.

RELM® MPV32-A Transceiver

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

Looking for a great hand-held two-way transceiver? Amateur radio operators depend on the RELM MPV32 transceiver for direct two-way communications with their ham radio repeater, fire, police department or civil defense agency. The MPV32 is our most popular programmable frequency agile five watt, 32 channel hand-held transceiver that has built-in CTCSS. This feature may be programmed for any 39 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.

Bearcat®895XLT-A1 Radio Scanner

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

300 Channels • 10 banks • Built-in CTCSS • S Meter

Size: 10-1/2" Wide x 7-1/2" Deep x 3-3/8" High

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

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

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10 Priority Channels • Programmed Service Search

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1,000 Channels • 20 banks • 50 Select Scan Channels

PASS channels: 50 per search bank + 50 for VFO search

Frequency step programmable in multiples of 50 Hz.

Size: 2-1/2" Wide x 1-3/8" Deep x 6-1/8" High

Frequency Coverage:

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LETTERS

Number 6 on your Feedback card

From the Ham Shack

Bill Thim N1QVQ. In a recent editorial, you mention connecting repeaters to HF so no-coders could catch the HF bug. Here in Connecticut we have just such a system. It is administrated by the "Rocky Hill Donkey Dusters" club, with the callsign KB1CDI. We have one 440 machine, one 220 machine, three 147 machines, one 6 meter machine, one 10 meter FM machine, I-PHONE Internet phone, and the ability to dial up any HF SSB frequency 160–10 meters. It is a great incitement for no-codes to be driving to work while talking to DX stations via 10 meters or I-PHONE or both at the same time. Keep up the good work.

Great! But how about some articles on how others can do it, too? — Wayne.

Frank HL/N8HI (Korea). I just got a message from S.P. Kim HL1VXQ, the manager of KARL. In regards to Americans operating an amateur station here, one must submit an application 3 months prior to their planned operation. One copy of the amateur's license, and the specs in regards to the amateur gear to be used, rig, antenna, etc. The radio license fees: over 50 W is 100,000 Won per year, under 50 W, 80,000 per year. This data is to be sent to the Korea Amateur Radio League, 275-7 KEC B/D 6F, Yangjaedong, Seochoku, Seoul, Korea. They claim that it takes approximately 3 months for the application to clear, so it takes some planning. The recipient will use an HL preface followed by their callsign. I will ask them if they could put the application up on their Web page in English. Mike and I've been waiting since 1978 for this. Having the HL9 callsign all these years was OK, but one could not erect an antenna at their home without fear of being declared *persona non grata* or worse. As a result, many avid DXers had to go to a military base in order to operate. Cold winter nights, poor heating, hot summers, mosquitoes, very distant toilet facilities — it was a pain in the tush. Recently, all the old communications vans that we used for our ham stations have been taken away and bulldozed into sawdust, plus there is no longer an amateur radio club here in Korea. That's largely due to military ham being assigned to other fun places. Hi! With the help of a very nice gentleman, Dong Jeong HL1TSZ, the KARL Assistant Manager, the whole process took less than an hour. The application was multilingual, so there was no problem there, but is extensive, asking about one's final 6146 or such, PLL or what have you, frequencies anticipated, general run type info. They are in the process of converting their Web page to English, so the application will be available for downloading. Processing then should take around 20 days. The license will be good for one year, renewable, but then the fee is reduced to perhaps 30,000 won. Now all they need is a couple of hotels or motels with 5 over 5 stacked 20 meter beams on 'em, then watch the DXers converge!

The next time I'm visiting Seoul, I'll trade in my HL9WG call for an HL1. — Wayne.

Donald Pottorf. I'm looking for old *73*s and other ham radio magazines that feature circuits to build. Any help out there? Please contact me at ECM Inc., 400 G Ave., Douglas AZ 85607; tel. (520) 364-4458.

Jim Giunta W3WA. I have been hoping that you would comment on the situation on 3950 MHz. I am sure you are aware of the controversy concerning the Liberty Net that meets every Saturday night a 10 p.m. Eastern time. I have listened many times to the comments made by those who participate, and although I do not always agree with what they say, I can see no reason why anyone, including the FCC, would want the net to cease operating. I understand that the net has been asked to justify its reason for operating. Have you every heard of the FCC asking any net to do this in the past? Doesn't the First Amendment also guarantee free speech on amateur radio? It was always my understanding that the Second Amendment was for the purpose of protecting American citizens from the government. If not the government, than who would it be that we are to be protected from? In your view, would it not be in the best interests of amateur radio for the FCC to concentrate its efforts on finding and eliminating the jammers who interfere with the net each and every week, rather than trying to dictate the content of what is said on the net as long as it is not profane or illegal? I look forward to your comments in your editorials.

Hey, when you're right, you're right! — Wayne.

Les Warriner WA7HAM. Reference *73*, pg. 8, October 1999, letter from Greg Hoover W8GH. I agree that it is a barefaced attempt by the FCC in concert with the ARRL to make all persons solely identified by a unique identifier, i.e., SSN/TIN. But the military has gotten away with it for years. When I first joined I had a "Service Number" (19195697). That number was normally preceded with an identifier as to branch, AF, RA, etc. Then they suddenly changed that system to the SSN of everyone. Now the tune of the powers that be seems to be another unique identifier such as an implant in the lobe of the ear, etc., which will be your identifier throughout life. To be implanted at birth much the same as the SSN is now being required on all newborns before they leave the hospital. When we get to the point that all will wear brown suits and have tattoos on our forearms, I wonder if anyone will wake up …

I suspect that there may be no way to get the general public's attention away from sitcoms, ball games, and Judge Judy. It's strangely analogous to the games that distracted the Romans while their empire was being destroyed. — Wayne.

Gregg Hoover W8GH. Here is an update to my letter published in the October 1999 issue.

The Debt Collection Improvement Act of 1996 was ostensibly written to stem the high default rate for federal loans. The SSN demand is specifically authorized only for agencies to use in collecting and reporting on their loans in default. The law states that a federal agency can only demand a Social Security number (SSN) if a person is in a relationship with the agency that may give rise to a receivable due to that agency, such as a partner of a borrower in or a guarantor of a Federal direct or insured loan administered by the agency.

Each agency shall disclose to a person required to furnish a taxpayer identifying number under this subsection its intent to use such number for purposes of collecting and reporting on any delinquent amounts arising out of such person's relationship with the government.

From the start, I had a strong gut feeling

Continued on page 59

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

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

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

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

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!

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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.

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QRX . . .

Number 8 on your Feedback card

Continued from page 1

More Changes for Hamvention 2000

More changes are coming to the Dayton Hamvention, as it plans its year 2000 event. The latest shift is in the hours of the flea market. Friday it still opens at 8 a.m. and closes at 6 p.m., but Saturday and Sunday will now also see an 8 a.m. start. For the past few years, 7 a.m. has been the opening of the flea market area.

Also, flea market sellers will now be required to be in place one half hour prior to opening. No more setting up as the crowds are coming in.

The Dayton Amateur Radio Association is also taking a hard-line stand on a tough moral issue. Effective with Hamvention 2000, there is a total ban on the sale of any and all adult materials.

And, lest we forget, The Dayton Amateur Radio Association no longer calls its flea market a flea market. Flea market sellers are now referred to as outside vendors. This is probably the result of combining the inside sales and flea market committees into one.

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

FAR Scholarships

The Foundation for Amateur Radio, Inc., a nonprofit organization with headquarters in Washington DC, plans to administer seventy-three (73) scholarships for the academic year 2000–2001 to assist licensed radio amateurs. The foundation, composed of over seventy-five local area amateur radio clubs, fully funds ten of these scholarships with the income from grants and its annual hamfest. The remaining sixty-three (63) are administered by the foundation without cost to the various donors.

Licensed radio amateurs may compete for these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled in or have been accepted for enrollment at an accredited university, college, or technical school. The awards range from $500 to $2500, with preference given in some cases to residents of specified geographical areas or the pursuit of certain study programs. Clubs, especially those in Delaware, Florida, Maryland, Ohio, Pennsylvania, Texas, Virginia, and Wisconsin, are encouraged to announce these opportunities at their meetings, in their club newsletters, during training classes, on their nets, and on their World Wide Web home pages.

Additional information and an application form may be requested by letter or QSL card, postmarked prior to April 30, 2000 from FAR Scholarships, P.O. Box 831, Riverdale MD 20738.

The Foundation for Amateur Radio, incorporated in the District of Columbia, is an exempt organization under Section 501(C)(3) of the Internal Revenue Code of 1954. It is devoted exclusively to promoting the interests of amateur radio and those scientific, literary, and educational pursuits that advance the purposes of the Amateur Radio Service.

GM to Put Internet in Its Cars

General Motors Corp., the world's largest automaker, says that it plans to offer wireless Internet access in some vehicles within a year. This, according to the *Detroit News*, which says that plans call for a system that will allow a driver to check E-mail, surf the Web, and download data while cruising around town or over the nation's highways.

According to the article, GM will show a Cadillac Seville equipped with voice-activated Internet service that allows the driver hands-free access to the Internet via GM's Onstar communications and navigation system. The Detroit automaker had previously said it intended to offer Internet access in its cars, but Mark Hogan, president of GM's recently formed e-GM unit, made public when this will happen during an interview with the paper at the Tokyo Motor Show.

GM says that being the first to offer mobile Internet service will give the automaker a head start in the race to market online technology. Commenting on safety issues, Hogan said that the system really focuses on audio-based telephony where a customer can interact with the Internet via voice. That way, says Hogan, the driver can concentrate on the main task, which is safely driving the car.

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

The Mind is Immortal

According to Graham Kemp VK4BB of *Q-News*, contacts between the living and those who have already crossed over into the hereafter may be the ultimate form of communication. And the technology of the next century could make it possible for such QSOs to take place.

Business Week magazine has discussed 21 ideas that may be key to understanding the next century. One idea is the simulation of an individual's brain activity, making it possible for future generations to converse with a virtual equivalent of the person years after his or her death.

By the 2030s, technology may be developed to simulate a nervous system's electrical activity, allowing thoughts and feelings to be preserved. A person's life could be recorded using tiny video cameras housed in eyeglass frames. These cameras could be linked to IBM's newest hard disk, which is the size of a quarter and stores 300 MB, or one month worth of data.

IBM is also developing software to index video content automatically, allowing users to easily access a specific moment in their lives.

By 2099, a "Soul Emancipator" will be able to access the hard data and reconstruct a person's thoughts and feelings, allowing future generations to receive realistic answers to questions posed to a person who has been dead for years.

And no, this is not science fiction. For the hams who are here three generations from now, talking with silent keys will probably be a fact of life.

Thanks to Q-News, *via* Newsline, *Bill Pasternak WA6ITF, editor.* 73

***Last year, James Alderman KF5WT** set up a portable station at a Dallas trailer park for Kids Day on the Ham Bands, and invited kids to experience the thrill of amateur radio. In addition to 8 contacts, the kids enjoyed making posters, coloring maps, and relaxing with cookies and punch. A good time was had by all.*

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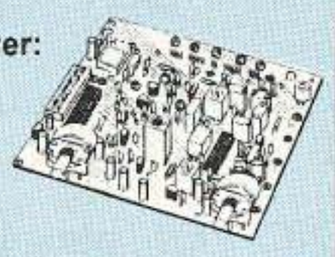
- **Kit** (ham bands only) ...**only $139** (TCXO option $40)
- **Wired/tested** ...**$209** (includes TCXO)



R304 Synthesized UHF Receiver: various bands 400-470MHz.
- Kit (440-450 ham band only) incl TCXO ...**$179**
- Wired/tested...**$209**

CRYSTAL CONTROLLED:
- **R100 RCVR.** For 46-54, 72-76, 140-175, or 216-225 MHz. ..... **kit $129, w/t $189**
- **R144 RCVR.** Like R100, for 2M, with helical resonator in front end.....**kit $159, w/t $219**
- **R451 RCVR,** for 420-475 MHz. Similar to R100 above. .....**kit $129, w/t $189**
- **R901 RCVR,** 902-928MHz .....**kit $159, w/t $219**

SUBAUDIBLE TONE ENCODER/DECODER

Access all your favorite closed repeaters!
- **Encodes** all standard CTCSS tones with crystal accuracy and convenient DIP switch selection.
- **Decoder** can be used to mute receive audio and is optimized for installation in repeaters to provide closed access. High pass filter gets rid of annoying rcvr buzz.

- TD-5 CTCSS Encoder/Decoder Kit .....now only **$39**
- TD-5 CTCSS Encoder/Decoder Wired/tested.....**$59**

TRANSMITTING & RECEIVING CONVERTERS

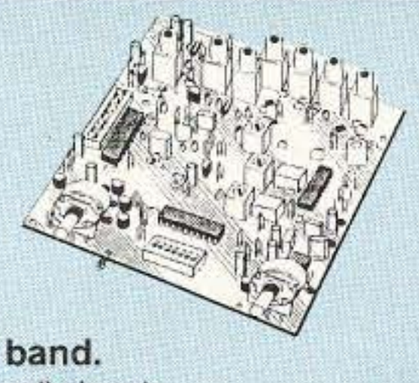
No need to spend thousands on new transceivers for each band!

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

- **Transmitting converters for 2M, 432 MHz.**
- Kits only $89 vhf or $99 uhf.
- Power amplifiers up to 50W.

R121 AVIATION RECEIVER

NEW



Exciting new AM receiver for the 118-137 MHz aircraft band.
- Ideal for monitoring at small airports.
- Allows pilot control of runway lighting.
- High-quality ELT monitor to detect and locate downed aircraft.
- Dip switch frequency selection.
- Superior sensitivity and selectivity.

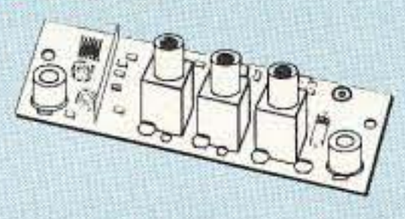
R121 Receiver module wired/tested **$209**
R121 Receiver in A87 cabinet **$299**

LOW NOISE RECEIVER PREAMPS

LNY-( ) ECONOMY PREAMP ONLY $29/w&t

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

LNP-( ) PRESELECTOR ONLY $39/w&t



- Eliminate intermod!
- Low noise preamp
- Sharp 3-section filter
- Available for bands from 137 to 170 MHz.

LNG-( ) GaAs FET PREAMP

STILL ONLY $59, wired/tested

Available for 28-30, 46-56, 137-152, 152-172, 210-230, 400-470, and 800-960 MHz bands.

WEATHER FAX RECEIVER

Join the fun. Get striking images directly from the weather satellites!

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

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

See product review with actual satellite pictures in June 1999 QST, along with info on software and antennas.
- **R139 Receiver Kit** less case **$159**
- **R139 Receiver Kit** with case and AC power adapter **$189**
- **R139 Receiver w/t** in case with AC power adapter ...**$239**
- Internal PC Demodulator Board & Imaging Software **$289**
- Turnstile Antenna **$135**
- Weather Satellite Handbook **$20**

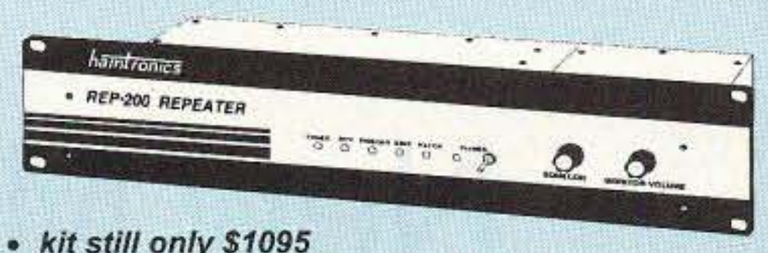
WWV RECEIVER

Get time & frequency checks without buying multiband hf rcvr. Hear solar activity reports affecting radio propagation.

Very sensitive and selective crystal controlled superhet, dedicated to listening to WWV on 10 MHz. Performance rivals the most expensive rcvrs.
- **RWWV Rcvr** kit, PCB only **$59**
- **RWWV Rcvr** kit with cabt, spkr, & 12Vdc adapter **$89**
- **RWWV Rcvr** w/t in cabt with spkr & adapter **$129**

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

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



- ***kit still only $1095***
- ***factory assembled still only $1295***

50-54, 143-174, 213-233, 420-475 MHz.

☛ **FCC type accepted** for commercial service in 150 & 450 MHz bands.

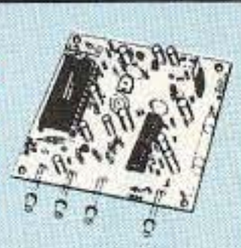
Digital Voice Recorder Option. Allows message up to 20 sec. to be remotely recorded off the air. Play back at user request by DTMF command, or as a periodical voice id, or both. **Great for making club announcements!** .....**only $100**

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

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

You'll KICK Yourself If You Build a Repeater Without Checking Out Our Catalog First!

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



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

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

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

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

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

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

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

TD-2. Four-digit DTMF decoder/controller. Five latching on-off functions, toll call restrictor. .....**kit $79, w/t $129**

TD-4. DTMF controller as above except one on-off function and no toll call restrictor.....**w/t $89**

WEATHER ALERT RECEIVER

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

Automatic mode provides storm watch, alerting you by unmuting receiver and providing an output to trip remote equipment when an alert tone is broadcast. Crystal controlled for accuracy; **all 7 channels** (162.40 to 162.55).

Buy just the receiver pcb module in kit form or buy the kit with an attractive metal cabinet, AC power adapter, and built-in speaker. Also available factory wired and tested.

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

Buy at low, factory-direct net prices and save!
For complete info, call or write for complete catalog.
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Min. $6 S&H charge for 1st lb. plus add'l weight & insurance.
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Dave Ingram K4TWJ
4941 Scenic View Dr.
Birmingham AL 35210

Number 10 on your Feedback card

New Millennium Wish List

A budget-conscious guide to exploring new amateur radio horizons.

What special treats and easy-to-explore frontiers await today's progressive-minded amateurs? Our new senior editor, K4TWJ, gives us a peek preview of some unique and surprisingly affordable activities guaranteed to keep your radio life exciting. Look for fun coverage of them all in the new 73. — Wayne.

Amateur radio today is a bunch of activities that can keep you inspired and enthusiastic for years. Many folks, however, limit their enjoyment to one or two always-popular areas, like DXing and contesting, rather than investigate other avenues of special interests just for fun. Why? Most need basic "what is it and how do I get started?" details.

***Photo A.** Operating AM with a restored-to-new vacuum tube rig from eras past offers more thrills and excitement than cruising Route 66 in a classic auto — and it is also noticeably less expensive! Here, we see well-known amateur radio photographer Joe Veras N4QB operating 10 AM with a classic Johnson Ranger transmitter and Collins 75A-4 receiver. Now that is a real glow-in-the-dark ham rig, gang!*

Bearing that in mind, I have compiled a list and a review of some hot activities you can tune in and monitor in your own shack. The list is not complete, but it is a good starting point from which we can expand in future issues.

If your favorite activity isn't listed, please pass along the details: frequency and time(s) of operation(s), and notes for inclusion in a future/updated listing. Amateur radio is fun, and we want to see everyone enjoying it to the max! My opening list of activities is shown in **Table 1**, and brief introductory explanations of each area follow here. Enjoy!

AM operations

Yes, AM is making an encore comeback on the bands — and it sounds absolutely marvelous. Do not just take my word for that statement: Listen between 29.0 and 29.1 MHz on weekends and judge for yourself. You will hear operators using Johnson Rangers and Valiants, B & W 5100s, Heath DX100s, Collins 75A4s, and National NC-300s, plus broadcast-quality microphones and recording studio–type audio equalizers (**Photo A**). You'll enjoy the resultant "bright lights and glamour" sound, heartwarming memories of classic glow-in-the-dark tube rigs, and the surprisingly high signal strength of low power/barefoot stations. Then you'll start scouring hamfest flea markets for a classic setup to restore.

QRP activities

This is one of the hottest areas of special interest in amateur radio — and it continues growing at a phenomenal rate. New clubs, newsletters, kits, projects, and QRP contests are springing up almost monthly. While big-time equipment manufacturers reported declined sales a few months back, producers of QRP gear were backlogged. Honest!

Why such interest in QRP? It is low profile and low cost hamming at its best. You can carry a little two- or three-watt transceiver and battery pack in your pocket, set up with a wire antenna almost anywhere, and span the globe when conditions are good (**Photo B**).

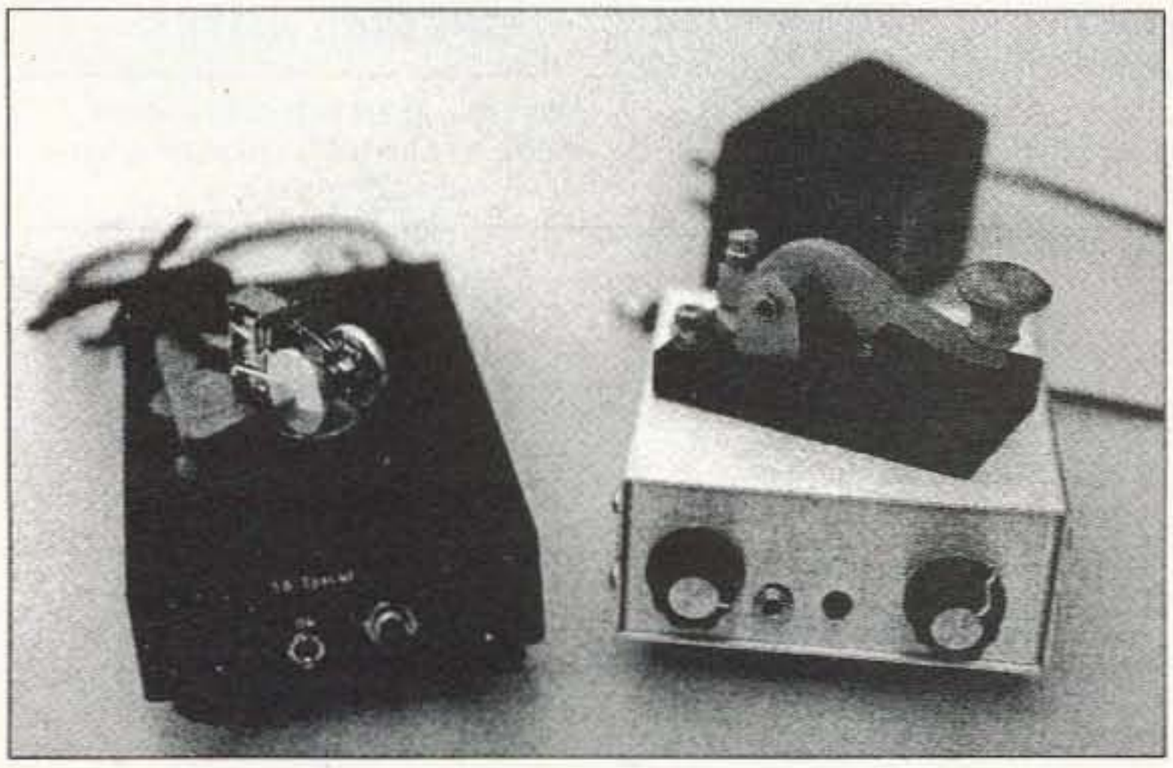

Photo B. *Home-brew delights! QRP transceivers like these 3 watt 20 and 30 meter units make dandy weekend traveling companions. They can be powered from batteries or wall adapter–type power supplies, and they work out great from almost any location. Now that is what we call "HF to go!"*

If you enjoy using new rigs but aren't on a big budget, you'll love QRP. More articles, projects, and reviews of QRP goodies are slated for future issues. Remember, too, that all the upcoming secret tips for QRP success are equally applicable to 100-watt–type home and mobile setups. Read Mike Bryce WB8VGE's "QRP" column for more news and info on QRP.

County hunting and mobiling

You have probably heard about this colorful awards program, and may even be halfway to earning your own "Worked All Counties" award, but have you considered being the hunted rather than the hunter? It's a blast — you help others increase their totals, while at the same time you can try out contest- or DX-style operating. Try out this terrific way to enjoy mobiling!

Slow scan TV

This mode has captured hams' attention for several decades. SSTV is the only video medium that supports real-time worldwide exchanges of pictures without requiring a broadband satellite for relaying signals. Each day's operations on SSTV are both exciting and unpredictable. You may see views of another operator's setup, a sunset across Sydney Harbor, or a fresh snowfall in Japan. Technical-minded SSTVers experiment with and build their own equipment. Others use Kenwood's battery-powered VC-1H SSTV unit to have a ball working both HF and VHF. Why not check out SSTV? You'll like what you see!

PSK-31

This is one of the latest forms of printed communications. It is similar in concept to RTTY or AMTOR, and joining PSK is a breeze. You just add a couple of audio cables between your transceiver and home computer's sound card, include a simple line level (1 volt) to mike level (.06 volt) and speaker level (.5 volt) interface, and load PSK-31 shareware into your computer. Tweak levels, fire up your gear, and you are ready for action.

Exactly how popular is PSK-31? Listen in the "data range" of 20 meters (14.065 to 14.080 MHz) and judge for yourself. The familiar "twee-loos" of RTTY and the "chirping cricket" sounds of AMTOR will be heard around 14.065 to 14.080 MHz, and the warbling single/continuous tone of PSK-31 will be heard around 14.070 MHz. Being computer-based, this new mode holds high potential for future expansions — and right now is the ideal time to get in on the ground floor. Watch for more on PSK-31 coming in future issues of *73*, and stay tuned to the digital world in general through Jack Heller KB7NO's "The Digital Port" column.

10 meter FM

Looking for new thrills? Just tune your FM rig to the international "direct" frequency of 29.600 MHz, and then continue as usual until DX stations begin opening its squelch. You'll be amazed at how many stations can reach out hundreds or thousands of miles with low power on 10 FM. European

ACTIVITY/PURSUIT	FREQUENCY(IES)/RANGE(S)		TIME(S) OF OPERATION	SPECIAL NOTES
AM operations with classic rigs	29.000 MHz–29.100 MHz informal net on 3870 kHz 9 p.m. PST Wednesdays		Any time 10 meters is open — especially on weekends	Incredibly great sounding stations. Watch for upcoming article on great sounding stations.
QRP operations and contests	CW	SSB	Any time and all the time. Contests and informal QSO parties held during approximately 40 out of 52 weekends per year.	QRP is a hot and growing interest among amateurs of all license classes. Also see "QRP" column by Mike Bryce WB8VGE.
	1.810 MHz	1.910 MHz		
	3.560 MHz	3.985 MHz		
	7.040 MHz	7.285 MHz		
	10.106 MHz	---		
	21.060 MHz	21.385 MHz		
	24.906 MHz	24.950 MHz		
	28.060 MHz	28.385 MHz		
	50.060 MHz	50.885 MHz		
	All frequencies ± 10 kHz according to activity.			
County hunting and CHC mobiling	14.055 MHz	14.335 MHz	Any time and all the time. Greatest amount of activity on weekends — when folks are traveling.	Working toward a County Hunters award is super fun. Being a hunted county is even more exciting.
	Frequencies approximate.			
Slow scan TV	3.845 MHz		Any time and all the time. International SSTV Net meets on 14.230 MHz Saturdays at 1800 GMT.	Musical sounding tones with "clicks" ... worldwide pictures!
	7.220 MHz			
	14.230 MHz			
	21.340 MHz			
	28.680 MHz			
	50.200 MHz			
	Frequencies approximate.			
PSK-31	14.070–14.075 MHz		Any time and all the time.	Today's easiest-to-join mode of printed communications.
10 meter FM	29.480 MHz–29.700 MHz		Any time 10 meters is open — especially on weekends.	Combines the quiet monitoring concept of FM with the range of 10m. Also see KE8YN/4's "On the Go" column.
6 meter FM	52–54 MHz repeaters	52.525 MHz simplex	Any time 6 meters is open.	Also follow the "On the Go" column for more info.
AO-27: The orbiting FM repeater/satellite	145.850 MHz uplink	435.800 MHz downlink	During daytime, 1 or 2 hours either side of noon, local time. Actual pass is 15 minutes.	Also see Andy MacAllister W5ACM's "Hamsats" column for latest news.
	(± Doppler shift)			
SO-35: The orbiting parrot repeater/satellite	436.300 MHz uplink	145.825 MHz downlink	Exact operating schedule to be announced.	
	(± Doppler shift)			
RS-13: The 15 to 10 meter relaying satellite	21.210 MHz–21.250 MHz uplink	29.410 MHz–29.450 MHz downlink	Schedule of times announced on AMSAT Net, 14.282 MHz, Sundays at 1900 GMT.	
ICOM Users Net	14.317 MHz		1900 GMT Sundays	Rig news, notes, and info galore!
Collins Users Net	14.263 MHz		2100 GMT Sundays	
Swan Users Net	14.250 MHz		2200 GMT Sundays	

Table 1. *Ham radio fun!*

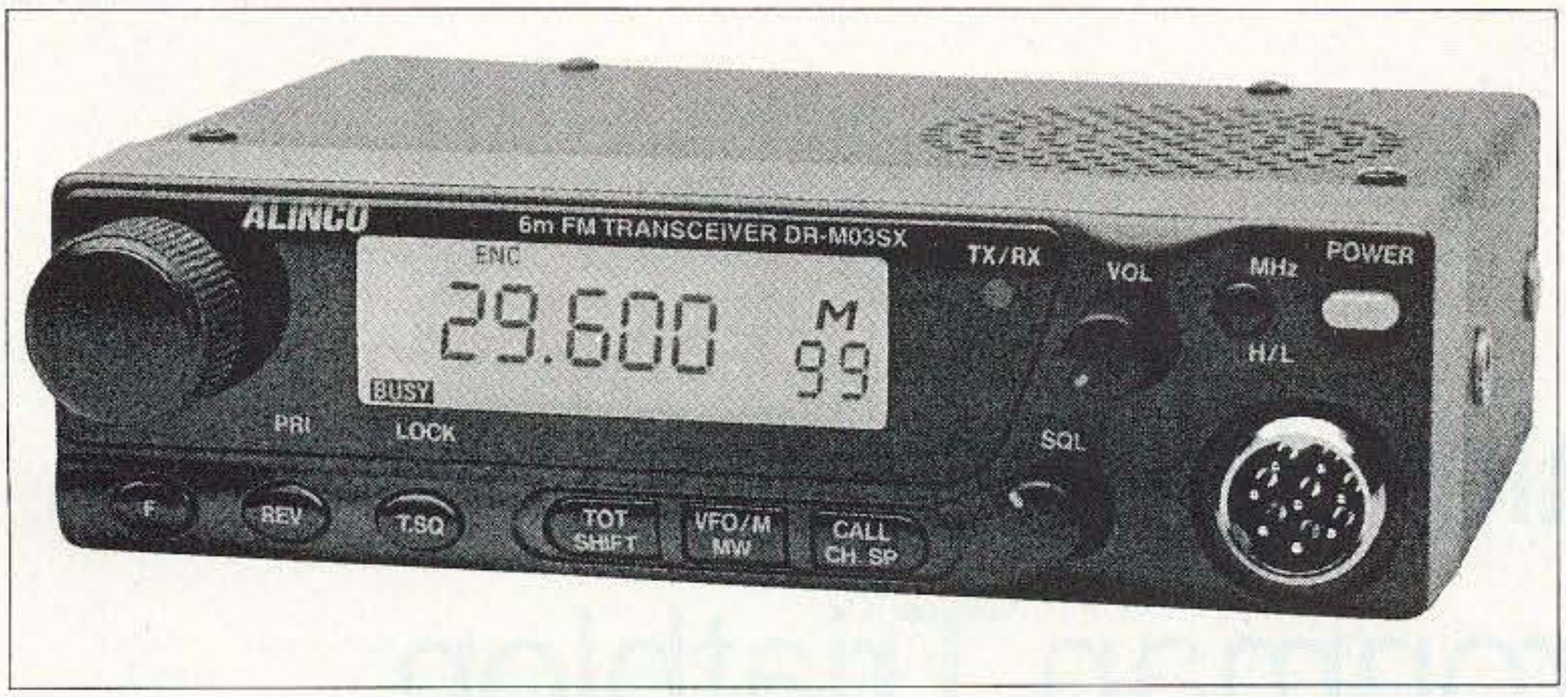

Photo C. *Imagine working European stations via a New England–based repeater or reaching into the South Pacific through a West Coast repeater, and you have a good idea of the newfound fun awaiting you on 10 FM. Yes, and all you need is a low power transceiver and basic antenna to join the action. The fun starts on 29.600 MHz. Check it out!*

and African FMers roll in during morning hours when ten is "hot." Australian, Hawaiian, and Japanese stations are solid many afternoons and evenings, while some stations throughout the U.S. and South America frequent 10 FM almost continuously (**Photo C**). Repeaters on 10 FM (some in the U.S., some in distant lands) typically operate on 29.620, 29.640, 29.660, and 29.680 MHz, with "100 kHz down" inputs on 29.520, 29.540, 29.560, and 29.580 MHz. A second simplex channel on 29.480 MHz is also becoming popular. For more details on 10 FM, see Steve Nowak KE8YN/4's "On the Go" column. We will also be highlighting crossband linking on 10 FM during upcoming months! Stay tuned.

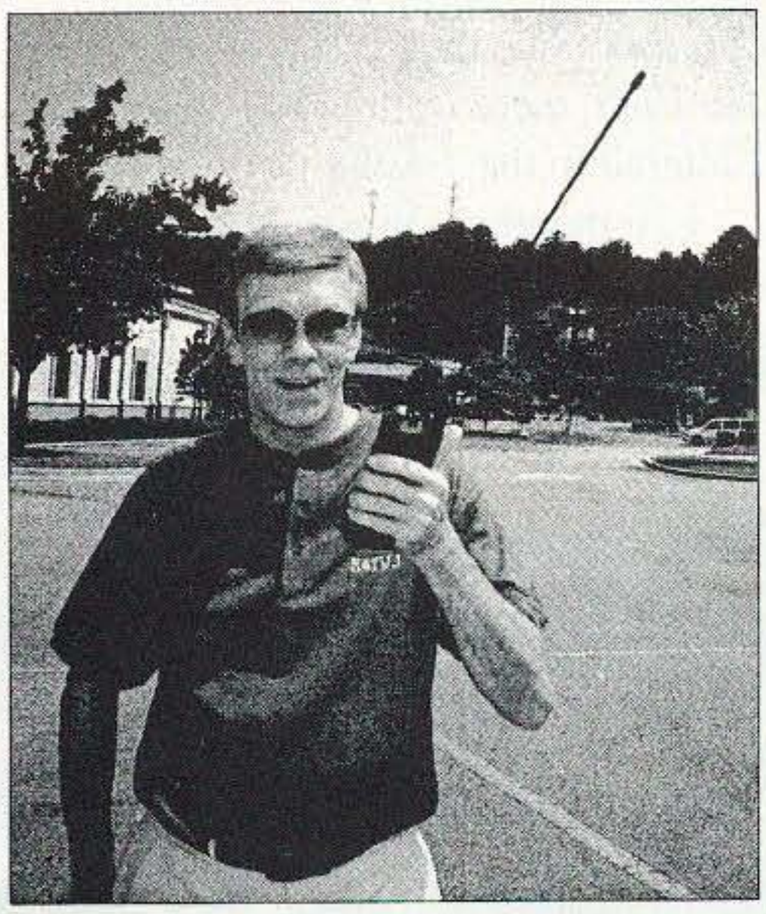

Photo D. *K4TWJ shows us how to pioneer new radio frontiers in (of all places!) a shopping mall parking lot. He is catching an AO-27 satellite pass "QRP style" using only a dual-band FM talkie.*

6 meter FM

The "Magic Band" is also seeing long-range FM action when the MUF goes up to 50 MHz or sporadic-E propagation flourishes — and that happens more and more often with today's increasing sunspot activity. Leaving your 6 meter FM rig squelched and tuned to 52.525 MHz puts you in the action. Be sure you know your grid square when working 6 FM, as everyone on six chases "rare" grid squares — it's sort of like DXCC hunting. Follow KE8YN/4's "On the Go" column for more details.

AO-27

FM activities via OSCAR satellites are usually considered inappropriate, but AMSAT OSCAR 27 is different. This satellite is an FM repeater with an uplink frequency of 145.850 MHz and a downlink frequency on 436.800 MHz (both ± Doppler shifts). AO-27 can handle the full duty cycle demands of FM because its repeater is only switched on during daylight (when its solar panels are in the sunlight), and because it relays only one signal at a time (you make brief transmissions and share satellite time). Using a full duplex–type dual-band FM talkie with a tall whip antenna, you can typically

Continued on page 59

David Herring KC5VKB
2806 55th
Lubbock TX 79413

Number 14 on your Feedback card

Buffalo Springs Lake Half-Ironman Triathlon

Ham PR at its best.

It was 3:30 a.m., June 28, 1998, when my alarm jolted me from my short nap. I remember mumbling, "I'm too old for this," as I reached for the alarm clock. "Man, what a short night," I thought!

Just a few hours earlier, the Lubbock Amateur Contest Club (LACC) had been taking a break under the air conditioning inside the American Red Cross building to watch the 10 o'clock news. The LACC had invited the newspaper and the local TV stations to come see what we were doing for Field Day.

Sure enough, there we were on TV, with the effects of the 105-degree temperature and 80% humidity etched on our faces! We were set up behind the Red Cross building with the tent, generators, radios, and all the other stuff you find at Field Day. Our main goal was to get the media to do some stories about amateur radio.

It seemed to have worked. Having a feeling of mission accomplished, we ended our one-day Field Day. Quickly tearing down the tent and packing up all the other stuff, we turned our attention to the next obstacle: The Buffalo Springs Lake Half-Ironman Triathlon.

Just two weeks earlier, the LACC had been contacted by Marti Greer, director of The Buffalo Springs Lake Half-Ironman Triathlon. She wanted the club to take over the communications for the race. Realizing that this was a good opportunity for our small club, we accepted.

The Buffalo Springs Lake Half-Ironman Triathlon (BSLT) is one of the three qualifiers in the U.S. for the Ironman Triathlon held each October in Kona, Hawaii. The event is held at Buffalo Springs Lake (BSL), 5 miles southeast of Lubbock, Texas. The BSLT consists of a 1.2-mile swim, a 56-mile bike race and a 13.1-mile run. In 1998, there were over 1,200 athletes entered in the Triathlon.

I remember thinking while Josh

Photo A. *Swimmers start the first leg of the BSLT.*

Photo B. *The transition area is always a busy place.*

MFJ TUNERS

MFJ-989C *Legal Limit* Antenna Tuner

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

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

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

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

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

MFJ-989C
$359.95

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

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

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

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

MFJ *No Matter What*™ Warranty

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

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

MFJ-986 Two knob *Differential-T*™

MFJ-986
$329.95

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

MFJ-962D *compact* Tuner for Amps

MFJ-962D
$269.95

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

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969
$199.95

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

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E
$149.95

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

MFJ-941E *super value* Tuner

MFJ-941E
$119.95

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

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

MFJ-945E
$109.95

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

MFJ-971 *portable/QRP* Tuner

MFJ-971
$99.95

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

MFJ-901B *smallest* Versa Tuner

MFJ-901B
$79.95

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

MFJ-16010 *random* wire Tuner

MFJ-16010
$49.95

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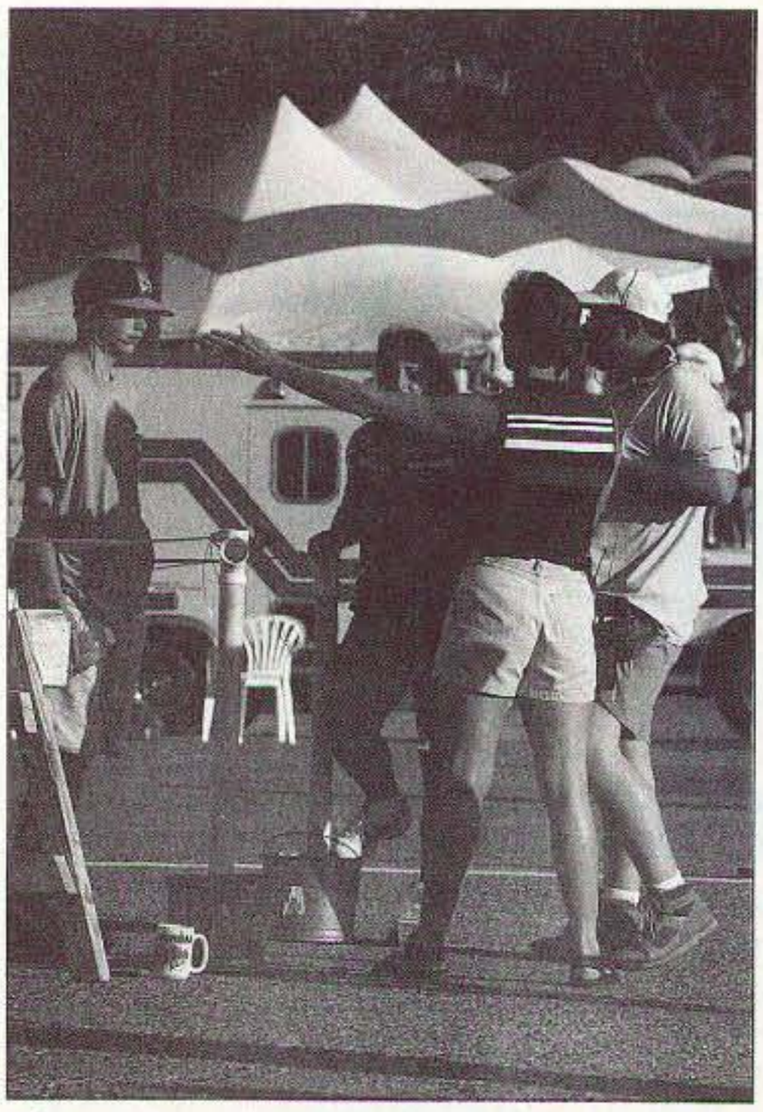

Photo C. *Josh KC5VKA (left), Contest Director Marti Greer, and Sloan KC5YPY help a contestant in the transition area.*

KC5VKA (who happens to be my 14-year-old grandson) and I were driving out to the lake, "How in the world we were going to do this big event with only ten people?"

About that time, the lights of the lake appeared over the edge of the canyon and the adrenaline started to pump! We made our way to the BSL fire station, where the other members of the LACC were already setting up the radio gear. We were to share the room provided to us with the Texas State Guard, who were providing traffic control for the race.

After the radio and antenna were in place, we had a short meeting and decided who would work where on the race course. Ron Daughtry KC5TWV would handle the net control duties for the event. Ron did a great job on a moment's notice! Rick Roy KB5KYJ would be the rover station — his duties would be to pick up and transport any of the tri-athletes who were in trouble. Little did Rick know how busy he would be. Sloan Butler KC5YPY was the man in the hot seat. He would be at the transition area to relay all the information back and forth to net control. In 1999, Sloan received help from Josh KC5VKA.

Each member of the team had several miles of the course to cover. This meant a lot of driving along the bike course. With over 1,200 riders on the course, you had to give it your full attention.

We were responsible for several things: Report the position of the first 30 riders, check the rest stops and make sure they had water and ice on hand (which proved to be quite a task), and check on the health and welfare of the athletes.

When you work an event this size you need reliable communications. We were fortunate to have the use of Lee Kitchens N5YBW's repeater, located in Lake Ransom Canyon just below BSL. This machine covered all of the canyon area with no problem. Thanks, Lee, for your help! Joey Johnston KC5MVZ set up his 444.275 machine on the rim of BSL for our backup repeater — luckily, it wasn't needed. To keep in touch with each team member directly, we used 434.050 simplex.

Once the race started, we were busy as beavers. Net control bombarded us with requests for infor- mation on the race leaders, then the status of the rest stops along each member's section. The rest stops quickly ran out of water and ice. This information had to be relayed back to the transition area, where Sloan KC5YPY notified the race officials. Just a note about Sloan: He must have run a short marathon himself — man, was he tired!

As the race progressed, the course started taking its toll on the bikers. A report came in from Jerry KC5MVT located at Spiral Staircase Road. He had a rider down with heat stroke and needed an ambulance. Jerry had extensive EMT training and knew what to do — which was good, as it took the EMTs 45 minutes to reach his location.

Then came more reports of riders in trouble. Rick KB5KYJ, our rover station, stayed busy all day picking up those whom the course had defeated. On one of these occasions, Rick came upon a runner who had gone down on his descent back into the lake area. This guy was in big trouble!

Rick remembers: "When I picked this guy up and put him in my truck, he was still trying to run — he didn't know where he was!" While Rick was wrestling with more victims of heat stroke, Harrell Ellis KD5ADO had taken up position behind the last runner in the triathlon. The runner, Chris, was a young handicapped man in a wheelchair, who had come all the way from England for the race. Harrell followed Chris in his van and provided

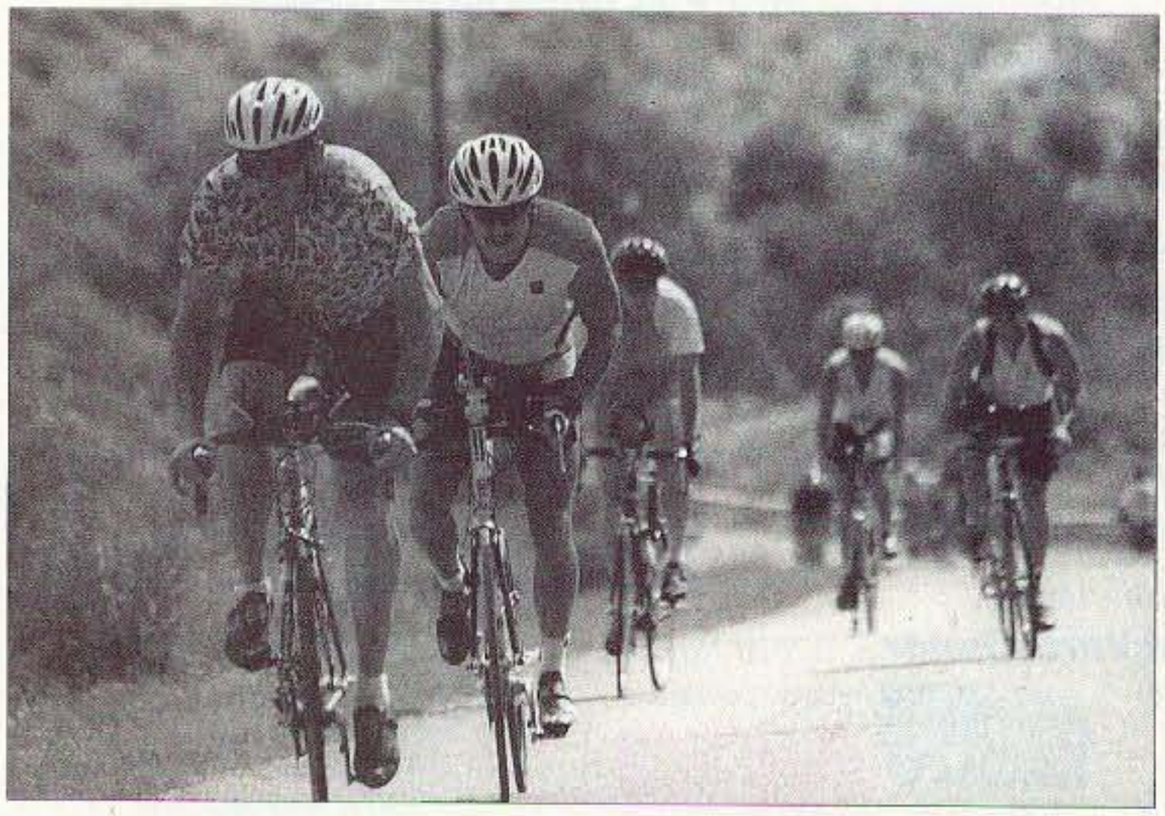

Photo D. *Cyclists paid a price in Horseshoe Bend Canyon.*

Photo E. *At long last ...*

***Photo F.** BSLT hams. Back row: Joey Johnston KC5MVZ, David Herring KC5VKB, Jack Taylor KM5SI, Harrell Ellis KD5ADO, Sloan Butler KC5YPY, Koy Carson K5KOY. Front row: Josh Herring KC5VKA, Rick Roy KB5KYJ, Eric Howard KC5RWK. Not shown: Bill Vickers KJ5BX, David Knight KC5HNI, Jerry Russell KC5MVT, Ron Daughtry KC5TWV, Bob Metheny KD5GDD.*

water and moral support for 32 miles. Unfortunately, with only one mile to go, Chris could not finish the race. This is real-life drama and ham radio was there.

Doing an event like The Buffalo Springs Lake Half-Ironman Triathlon is really fun, even though it lasted for 10 hours. It gives you a needed shot in the arm where amateur radio is concerned. It's good to help the community and let them know what hams can really do. In 1999, we used 14 hams at the event; in 2000, we will probably need 20. This thing just keeps getting bigger!

Oh, I almost forgot: Something funny happened out on the Farris Rd. section of the course. Koy K5KOY had gotten out of his truck and was intending to get some bottled water out of the back so that he could have some to drink. All of the sudden, a young lady who was in the triathlon stopped and asked if he needed something to drink! "Man, I must have looked pretty bad," Koy recalled, "for her to stop her race and offer ME water!" Even though the temperature was well over 100 degrees, I think she was just saying thanks to a hot and sweaty ham who was watching over them.

In case you think this is the only thing going on in the Lubbock ham community think again. Lubbock is abuzz with activity. It wasn't always that way, but things are really looking up for the new millennium.

We have a very good 2 meter net on Tuesday night at 8:00 CDT. Hosted by Randy Hobbs KC5HNH, this net covers a two hundred mile radius around Lubbock. In September the entire ham community came together at the Panhandle South Plains Fair for a weeklong exhibition of the capabilities of ham radio. This proved to be very successful, as almost 80 people signed up for the upcoming ham radio classes.

Early this year, the LACC will start its code classes up again. And finally, we have a new RACES/ARES group in Lubbock. I would like to thank Clinton Thetford N5UQF and the rest of the RACES committee for their tireless efforts in bringing this to a reality. 73

Steve Nowak KE8YN/4
1011 Peacock Ave. NE
Palm Bay FL 32907-1371
[ke8yn@juno.com]

Inside Alinco's DR-M03

This 10m transceiver is right for everybody.

Have you ever thought about running HF from your car or portable operations setup but decided that the equipment was too big and too expensive? Well, surprise! Things have changed in the last few years, and there are more options than ever. Ten meters is one of the most interesting bands to work, and a lot of the real action on 10m meter FM is through repeaters. A good 10m rig is built to optimize performance for both simplex and repeater operations. One of the latest is the new Alinco DR-M03 10m FM transceiver, which has just been released.

When I first opened the box it was shipped in, I was surprised at how compact the unit was. The new arrival, complete with its microphone, DC power cable, mounting bracket, and instruction manual, is shown in **Photo A**. The rig is smaller than the 2m rig I have been using in my car for the past few years. This transceiver measures only 1 inch high by 5 inches wide by 4 inches deep. The lines are clean, with a logical panel layout and only 2 cables and a speaker jack for connections in the rear. This is not a radio to intimidate the average ham; it is a radio that said one word to me — fun. Being the logical individual that I am, I set the radio down and read through the instruction manual. It was more like speed reading, or skimming. Well, I actually did flip the pages. In any case I soon had the radio hooked to the power supply and antenna in the shack. I was right: This radio was going to be a lot of fun.

The user friendliness of any technical item is very important to me. This is especially true for rigs that I use in the car, because hitting a wrong button can mean losing a frequency until I pull into the driveway. This rig's front panel is laid out so that the controls are accessible.

On the left is the large tuning knob. On the right above the microphone plug is a push-on, push-off power switch. In the center is a large, easy-to-read digital frequency display with the volume and squelch controls to the right. There are six other controls below the display, and one other button near the top, but their placement does not distract or cause inadvertent entries.

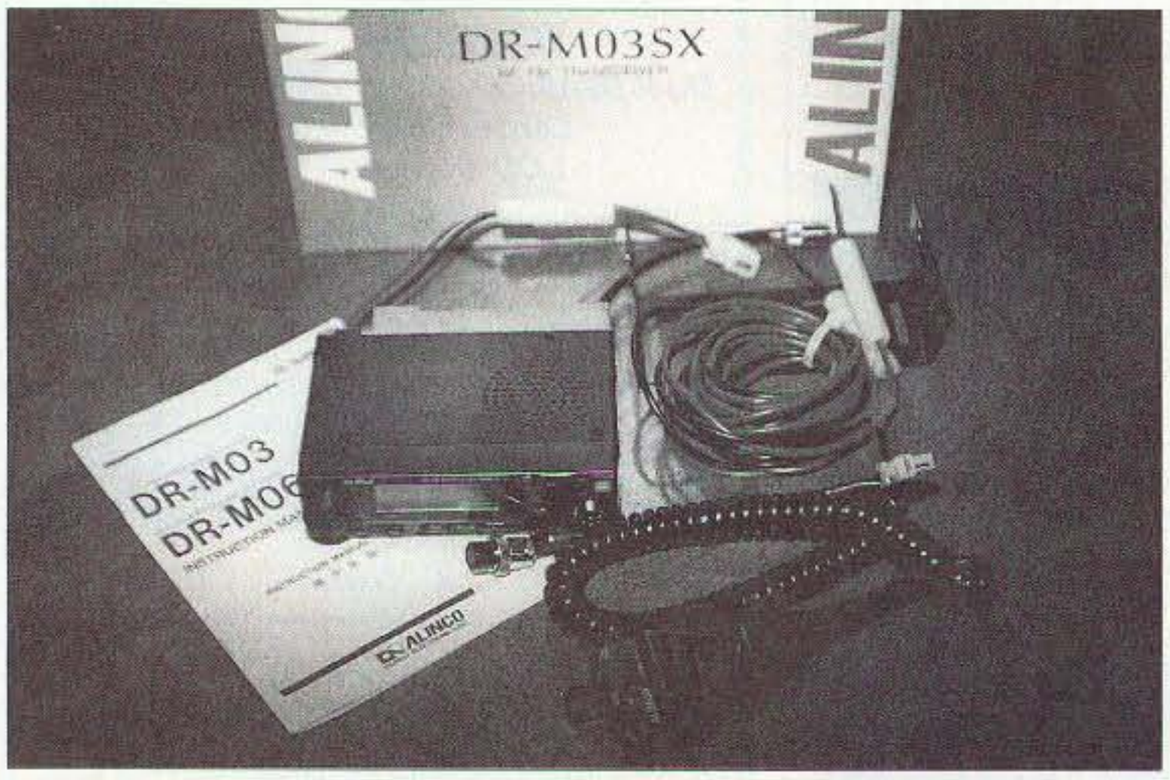

Photo A. *Alinco's DR-M03 comes with microphone, manual, mounting bracket, and DC cables.*

A tour of the front panel

The display (**Photo B**) is backlit and easy to read in daylight or darkness. It displays the current frequency to two decimal places and adds a small 25, 50, or 75 at the end to indicate a total of 4 decimal places. The rig covers from 28.0 to 29.7 MHz. There is a Busy indicator when a signal is being received that is strong enough to open the squelch, and a bar graph showing relative signal strength of a received signal or relative power during transmission. There are other displayed indications which I'll touch on later. And there is the standard LED that glows red when the rig is transmitting and green when a signal is received.

Typical of most modern radios, many of the controls serve multiple purposes. I was pleasantly surprised to find that the labeling is clear enough to understand without the necessity of constantly referring back to the manual. A few controls, such as the

***Photo B.** Front panel view of the DR-M03.*

power switch, squelch, and volume controls, are single purpose, while most of the others are multifunctional. The main tuning knob can be used to select frequency, memory channel, transmit offset, and subaudible (CTCSS or PL) tones. At the top of the rig is a button that allows the frequency to be changed in 1 MHz steps to speed frequency adjustment. Its alternate function is to switch between the 10 watt high power or 1 watt low power.

Yes, but what can it do?

Now, I don't know about you, but as much as I like gadgets, gizmos, horns, bells, and whistles, I get a little overwhelmed when I see a lot of features on a new rig. I like to know what this means to me. In other words, why is a particular feature important and what is its function?

As I mentioned before, below the display are six buttons. The first is the all-important function key, which allows you to access the alternate uses of the other keys. Press the function key then another button to activate that button's secondary use. Interestingly, the function key itself has a second function. If it is held down for more than half a second, it opens the squelch to permit monitoring the frequency for weak signals. This is handy if you hear a station that breaks the squelch but does not hold it open — just hold the function key down for over half a second and the squelch stays open until you release it.

The second button reverses the transmit and receive frequencies. This of course allows you to see if you are able to hear another station on the input frequency. In some cases, a signal may be more clear direct than through a repeater. It's fairly common for me to use a repeater in the Boston area to work a station in Europe or Texas from my car in Florida. Sometimes the path from Texas might be more direct. In such cases, rather than tying up the repeater, you can switch to a simplex frequency and rag chew. This same button also activates the priority function, which allows a selected frequency to be periodically monitored. When this feature is selected, the rig automatically switches to monitor a selected frequency for a half second every five seconds. You can listen to the main frequency but automatically check the second frequency to see if anything is happening there. Since I tend to do a lot of emergency and disaster service support, the idea of keeping an eye on an alternative frequency is very appealing. Of course, this same feature will let you copy traffic while waiting for a call on a totally different frequency.

The third button is primarily used to set the CTCSS tone. This is similar to what you find on the local 2 meter or 440 MHz repeater — a subaudible tone is transmitted with the carrier that is set to operate a particular repeater. When conditions are favorable (and with the rising sunspots plus always-available sporadic-E propagation), this becomes an important feature so that an operator doesn't bring up every repeater on a given frequency. Likewise, if a repeater is tone encoded, you need the ability to generate the specified tone in order to activate it. Many, but not most, 10m repeaters are tone encoded at this time, and as conditions continue to improve, more may be. This same button can be used to lock most of the functions on the rig. Once

locked, only the push-to-talk, power level, and monitor selections (and the unlock function, of course) work.

Have trouble remembering to unkey the mike? The next button can be used to set a timeout timer for a period of up to 7 minutes. While most of us would never admit to having a heavy finger on the PTT button, we all occasionally get long-winded. However, there is a real potential benefit to this feature. I'm thinking seriously of playing with a crossband repeater that would have an input on VHF or UHF and its output on 10 meters. This TOT would provide protection for the system on top of the repeater controller. After all, a stuck carrier-operated relay has proven the demise of more than one transmitter! I think I would set the timeout timer for about 90 seconds and sleep better at night. This button in its secondary mode allows the repeater offset and direction to be selected. While current practice is that 10m meter FM repeaters have the input 100 kHz down from the output frequency, practices do change with time.

We have the ability to switch between the VFO and memory channels with the next button. This is fairly straightforward, with the VFO used to select a frequency that is then stored into a memory location, which logically it should be, and is the alternate function of this same button. Of course, you can store not only the frequency, but also the offset and any tone which might be required. More about memory operations in a bit. One thing to remember is that when using the priority function, if the VFO determines the primary frequency, the secondary will be a memorized frequency or vice versa.

The final button is used to activate a call frequency. This frequency, which is probably your favorite or most often used, is stored in a special memory location. By pressing the call button, you immediately access this frequency without the need to scroll through the memorized frequencies. This button also is used to set the incremental spacing for transmit and receive frequencies.

The unit has 100 memory channels. At first I thought this might be a bit of overkill, since there are two recognized simplex frequencies (29.60 and 29.48 MHz) and four pairs of repeater frequencies (29.52/.62, 29.54/.64, 29.56/.66 and 29.58/.68 MHz). Intuitively, it would seem that much fewer memory locations would be required. However, many repeaters have CTCSS encoding, so you need additional memory locations to store the tone information. Although there are nearly 50 repeaters listed in the current repeater directory as transmitting on 29.62 MHz and many are not encoded, you'll need different tones for Talladega, Alabama, than for Sioux City, Iowa, and Metairie, Louisiana. Don't laugh: One day you'll be working the world through Boston, Massachusetts, and the next it will be through a repeater in San Juan, Puerto Rico!

I haven't decided whether it is better to cluster the memorized selections by local (channels 1–10 are northeast, for example), or by frequency. If by frequency, when you hear a repeater that is sending a solid signal on a given frequency, it would be easier to scroll through the selections to choose the proper CTCSS tone.

Okay, but how does it work?

Just fine, thank you. I decided to try the rig out in the car, so I mounted it on top of the other two rigs that are already bolted to the floor. This unit comes with one of the most secure and easy-to-use mounts I've ever seen. It is supplied with enough cable to reach the battery in my car, and both legs have fuses at the battery end. The DC plug, incidentally, is interchangeable among Alinco's DR-M03, DR140, and DR605, "switch hitting" to mate with your interest of the day. Although there is a jack for an external speaker, and I tend to favor larger speakers, particularly in the car, I have to admit that I was quite satisfied with the audio quality using the built-in speaker. I've used a couple of different antennas, and as we all know, when it comes to the antenna, don't scrimp. Get a good antenna and make sure your modern state-of-the-art plastic and alloy automobile provides an adequate ground plane. A mobile whip works well for

VHF and UHF since transmissions are line-of-sight ground wave; with 10m, you will often be dependent upon the sky wave, which is the signal that bounces between Earth and the ionosphere. Did I mention not to scrimp on the antenna? Good.

I initially loaded the memory with the four basic repeater pairs and the two simplex frequencies. Initially, I expected that the repeaters I would be using would be in the southeast United States. However, after listening for a while I began copying some of the repeaters' identification and realized that some of the machines I could hear and wanted to work were farther away than I had anticipated, not to mention tone encoded. I pulled out my trusty repeater directory, looked at the date on the cover, and headed to the radio store to get a current one. Then I sat down and began programming in additional repeaters. From my home QTH in Florida, and my travels on the east coast and across the peninsula, I have done my best with repeaters in New England, Canada, and Puerto Rico.

My routine when driving is to hit the power button as I start down the road. I leave the rig on memory (as opposed to VFO). The microphone has two buttons on the top that can be used to move up or down either through frequencies or through memory locations. Just hold one of these buttons for a second or so, and the rig begins to scan. When a signal is detected, the scanning stops on the busy frequency for about five seconds and then continues. If I hear a strong signal, I can stop the scan by tapping the up or down button on the mike. Obviously, if you press the push-to-talk button, scanning will also stop. Occasionally, I will switch to the VFO setting and then go into scan mode just to see what else is happening on 10m.

In mobile operations, once I have the memory locations loaded, the only front panel controls I tend to use are the power and volume controls. Since I can control scanning and transmit from the mike, that is all I need. Okay, I do peak at the display, but usually I am more interested in which memory location I am using rather than the actual frequency.

What's next?

This rig presents a number of interesting possibilities. I've been in the position where my work required a fair amount of travel, and there's nothing more boring than motel rooms night after night. Since this unit draws only 3 amps on transmit and 800 mA on receive, a small power supply will readily power it for portable operations. A ten meter dipole with ten feet of coax can be rolled up easily so that the rig, antenna, and power supply can fit into the corner of a suitcase. This would be a great rig to take along on vacation. If my bicycle hadn't been lost by the movers a few years ago, I would be tempted to attach this and a gel cell and operate two wheel mobile. I've been tempted to try to fit one into a fanny pack (or bum pack as my Kiwi friends prefer) and operate totally portable. What about adding a solar panel to charge the gel cell? Then, of course, there's that crossband repeater I mentioned earlier.

Low cost, big thrills

To me, the Alinco DR-M03 10m transceiver is the type of rig that makes ham radio fun. It's easy to use. It works well as a mobile rig, yet its small size presents a number of additional opportunities. It got me thinking about what else I could do with it and when to try other areas of the hobby that I hadn't played with before. Like I said — fun.

Thinking about new HF adventures? Check out this neat little 10 FM radio from Alinco.

For more information on the DR-M03 or its 6m sister, the DR-M06, contact Alinco USA, 438 Amapola Ave., Suite 130, Torrance CA 90501; telephone (310) 618-8616 — or test-tune an Alinco at your favorite dealer today. 73

Craig Kendrick Sellen
Mallard Meadows, Room 405
476 Belmont St.
Waymart PA 18472

Number 22 on your Feedback card

Junk Box Audio Test Generator

This scavenged helper is easy to build and fun to use.

I designed this device to be a junk box home-brew project. Some of the parts were scavenged from old computer boards — only the chip was bought new. Among many other things, it could be used for modularly testing a transmitter or for troubleshooting commercial radio sets.

This is an AF function generator covering the frequency range between 25 and 25,000 Hz in three bands. It has sine, square, and triangular or sawtooth outputs; output sufficient to drive any amplifier; and distortion low enough to make it useful in high precision test measurements.

How it works

The frequency generator uses a dual op amp IC, the TL082 or an LF353, to produce the basic waveforms. The first of the two op amps in the IC is used as an oscillator, the frequency of which can be set by means of potentiometer P2; its range depends on the value of the capacitor C3 and is selected by means of switch S1. Trimpot P1 is used to adjust the duty cycle of the oscillator. The second op amp is an integrator that converts the triangular waveform produced by the oscillator to a square one, a 50% duty cycle. Potentiometer P4 is used to adjust the amplitude of the squarewave signal. Potentiometer P3 is used to adjust the amplitude of the triangular waveform. The signal from the output of the oscillator is taken to the circuit designed around the two transistors to be converted from a triangular wave to a sinusoidal wave. The two trimpots P5 and P6 are used to adjust the symmetry shape of the positive half and the negative half portions of the sine wave signal for the best symmetry and minimum distortion. P7 is the potentiometer that adjusts the output level for this waveform.

As you can see, the circuit consists of fairly basic building blocks with independent adjustments for every one of them, which makes this a very versatile and easy-to-operate instrument. The power supply is also incorporated on the circuit board in two ways. If you want to use a 12 VAC @ 0.05 A or more, use diodes D4, D5 and capacitors C13, C14 as shown. If you want to use a 24 VAC @ 0.05 A or more transformer, use all four diodes D4, D5, D6, and D7 as shown and omit C13, C14.

Construction

I assembled my prototype on a PC board, but a perfboard can also be used.

First of all, let us consider a few basics in building electronic circuits on a printed circuit board. The board is made of a thin insulating material clad with a thin layer of conductive copper that is shaped in such a way as to form the necessary conductors between the various components of the circuit. The use of a properly designed printed circuit board is very desirable, as it speeds up construction considerably and reduces the possibility of making errors.

Soldering the components to the board is the only way to build your circuit, and your success or failure depends on the way you do the job. This work is not very difficult, and if you stick to a few basic rules, you should have no problems. The soldering iron that you use must be light, and its power should not exceed the 25–30 watt range. The tip should be fine, and must be kept clean at all times. For this purpose, you can use some very handy specially made sponges that are kept wet, and from time to time you can wipe the hot tip on them to remove all the residues that tend to accumulate. DO NOT file or sandpaper a dirty or wornout tip. If the tip cannot be cleaned, replace it. There are many different types of solder on the market, and you should choose a good quality one that contains the necessary flux in

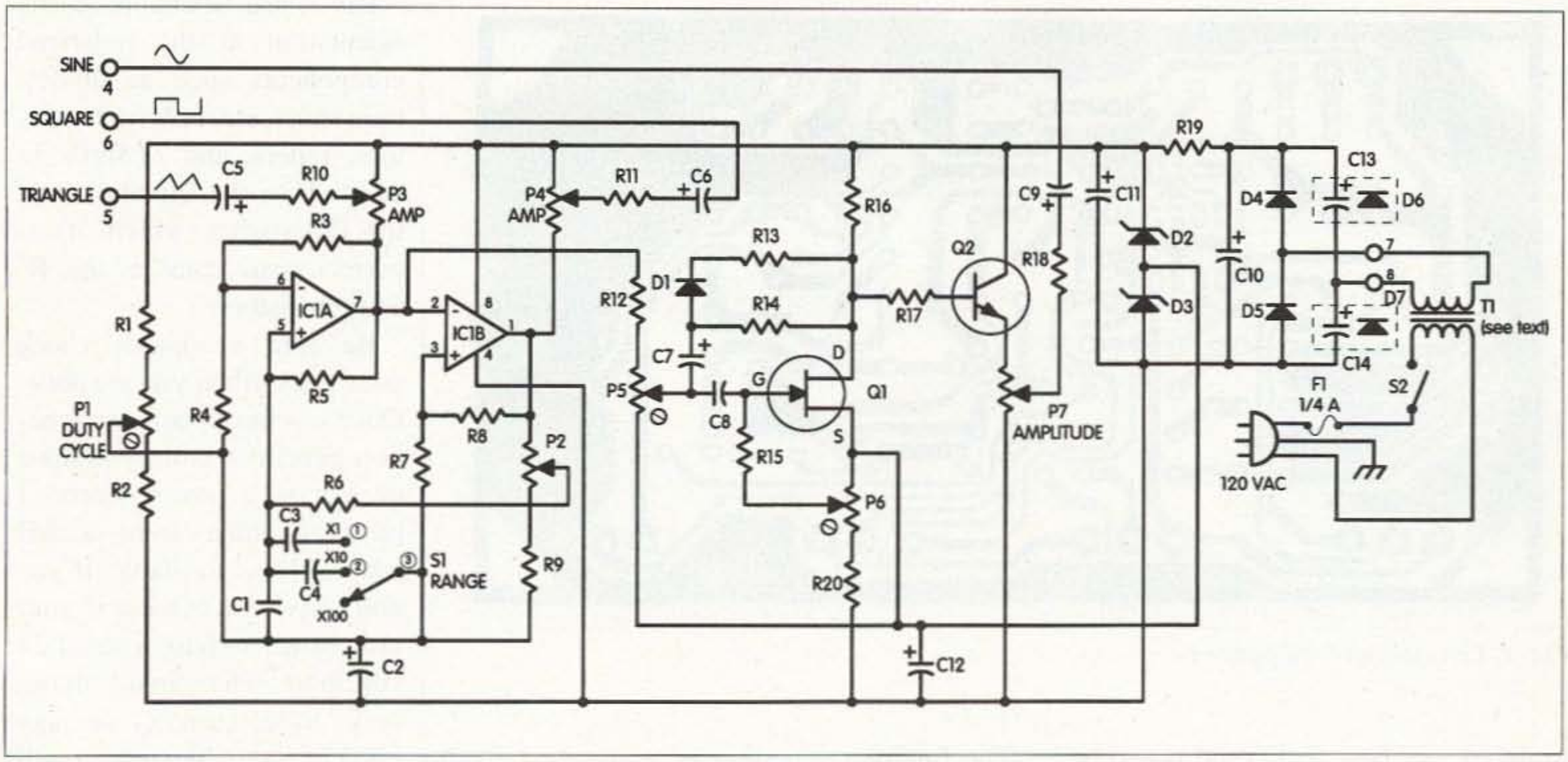

Fig. 1. Schematic. P2 is frequency control. Not shown are C15 (0.1 µF, 200 V) and a bidirectional red-red LED that can be mounted off the board in series across (ahead of) the primary windings of T1.

its core, to ensure a perfect joint every time. DO NOT use soldering flux apart from that which is already included in your solder. Too much flux can cause many problems, and is one of the main causes of circuit malfunctions. Nevertheless, if you have to use extra flux, as is the case when you have to tin copper wires, clean the area very thoroughly after you finish your work.

In order to solder a component correctly, you should do the following:

• Clean the component leads with a small piece of emery paper.

• Bend them at the correct distance from the component's body, and insert the component in its place on the board.

• You may sometimes find a component with heavier gauge leads than usual, that are too thick to enter in the holes of the PC board. In this case, use a mini-drill to enlarge the holes slightly. Do not make the holes too large, as this is going to make soldering difficult afterwards.

• Take the hot iron and place its tip on the component lead while holding the end of the solder wire at the point where the lead emerges from the board. The iron tip must touch the lead slightly above the PC board.

• When the solder starts to melt and flow, wait till it evenly covers the area around the hole and the flux boils and gets out from underneath the solder. The whole operation should not take more than 5 seconds. Remove the iron and let the solder cool naturally, without blowing on it or moving the component. If everything was done properly, the surface of the joint will have a bright metallic finish to it, and its edges should be smoothly ended on the component lead and the board track. If the solder looks dull or cracked, or has the shape of a blob, then you have made a dry joint and should remove the solder (with a solder pump, or a solder wick) and redo it again.

• Take care not to overheat the tracks, as it is very easy to lift them from the PC board and break them.

• When soldering a sensitive component, it is good practice to hold the lead from the component side of the board with a pair of long-nose pliers,

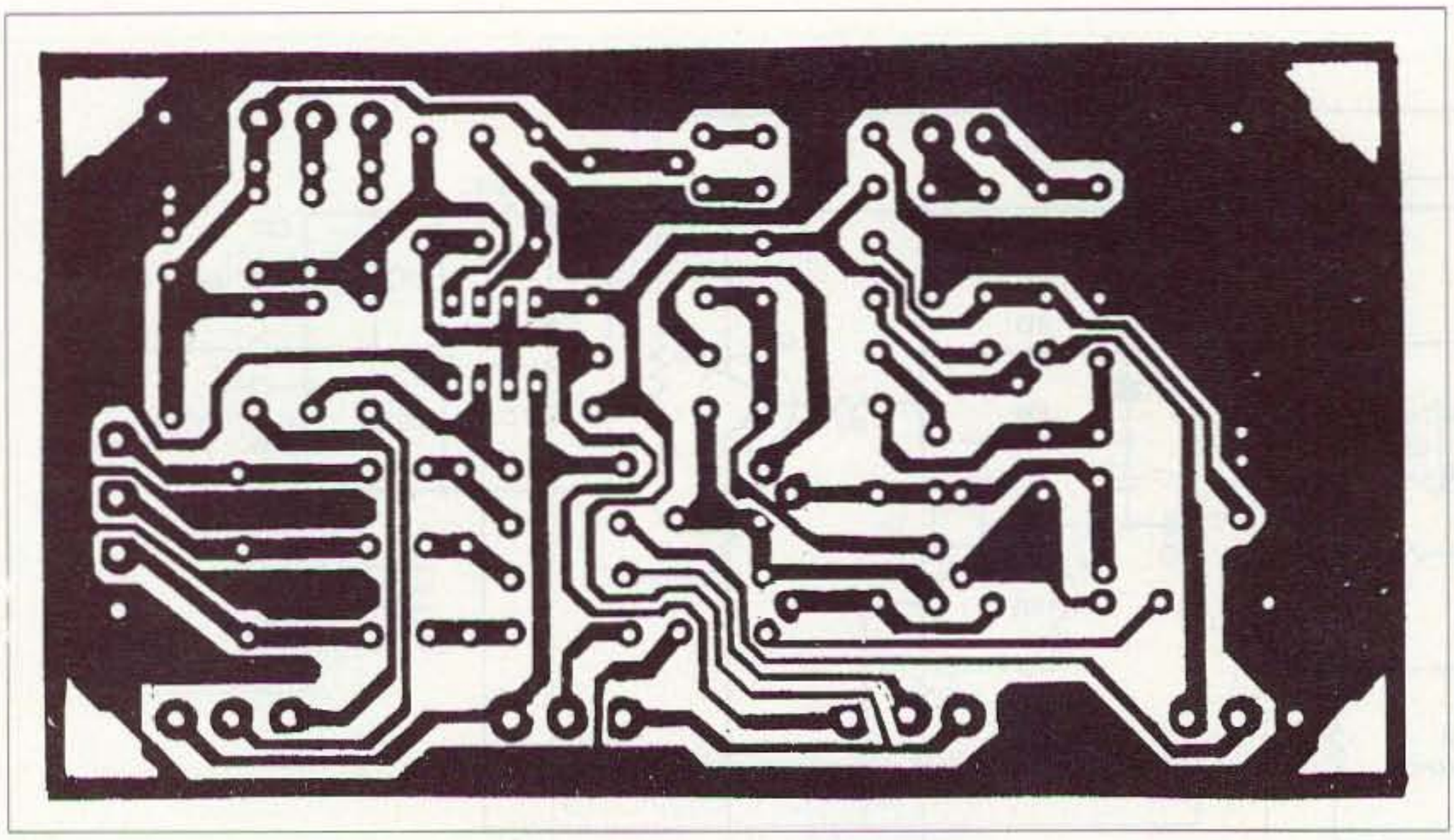

Fig. 2. Circuit board foil pattern.

to divert any heat that could possibly damage the component.

• Make sure that you do not use more solder than is necessary, as you are running the risk of short-circuiting adjacent tracks on the board, especially if they are very close together.

• After you finish with your work, cut off the excess of the component leads on the foil side and clean the board thoroughly with a suitable solvent to remove all of the excess flux residues that still remain on it.

The function generator is relatively easy to build, and if you follow the instructions carefully, you should have no difficulties. Once you have the board and all of the components, you can begin by following the parts placement diagram. Mount all the resistors, then all the capacitors, then the diodes and semiconductors. Connect shielded cable from the board to the potentiometers, as well as to the output terminals and the range switch (S1). Then the rest of the wiring can be done.

Pay close attention to the orientation of the polarized components such as diodes, transistors, electrolytic capacitors, zeners, and so forth, in addition to the orientation of the DC source, which, if incorrect, can damage the IC and transistors.

Be sure to double check your work when you are done. Once you have your own function generator built, you must decide on a power source. I powered mine from a AC adaptor I had available. If you don't have one of these in your junk box, purchase a small 24 volt unit. The circuit draws very little current, so any adaptor rated at a suitable current will do, and you're in business.

The only difficulty you may have is with the components that are not mounted on the printed circuit board, namely the potentiometers, the switches, and the outputs. As mentioned, these should be connected with the rest of the circuit with shielded cables which should be kept as short as possible to avoid introducing noise and distortion to the output signal.

Again, start building the circuit from the least sensitive components to make sure that you don't damage any components during soldering. The first components to be soldered should be the output pins and the IC socket. Identify the resistors and solder them one by one into their places. Do the same with the capacitors, taking care to insert the electrolytics the right way in. Solder the trimpots, the diodes, and the transistors, taking care to put them in the right way and not to overheat them.

Make a careful visual inspection of the board to ensure that you have not made any mistakes, then insert the IC carefully so as not to bend the leads as you put it in its socket. Connect the potentiometers, the range selector

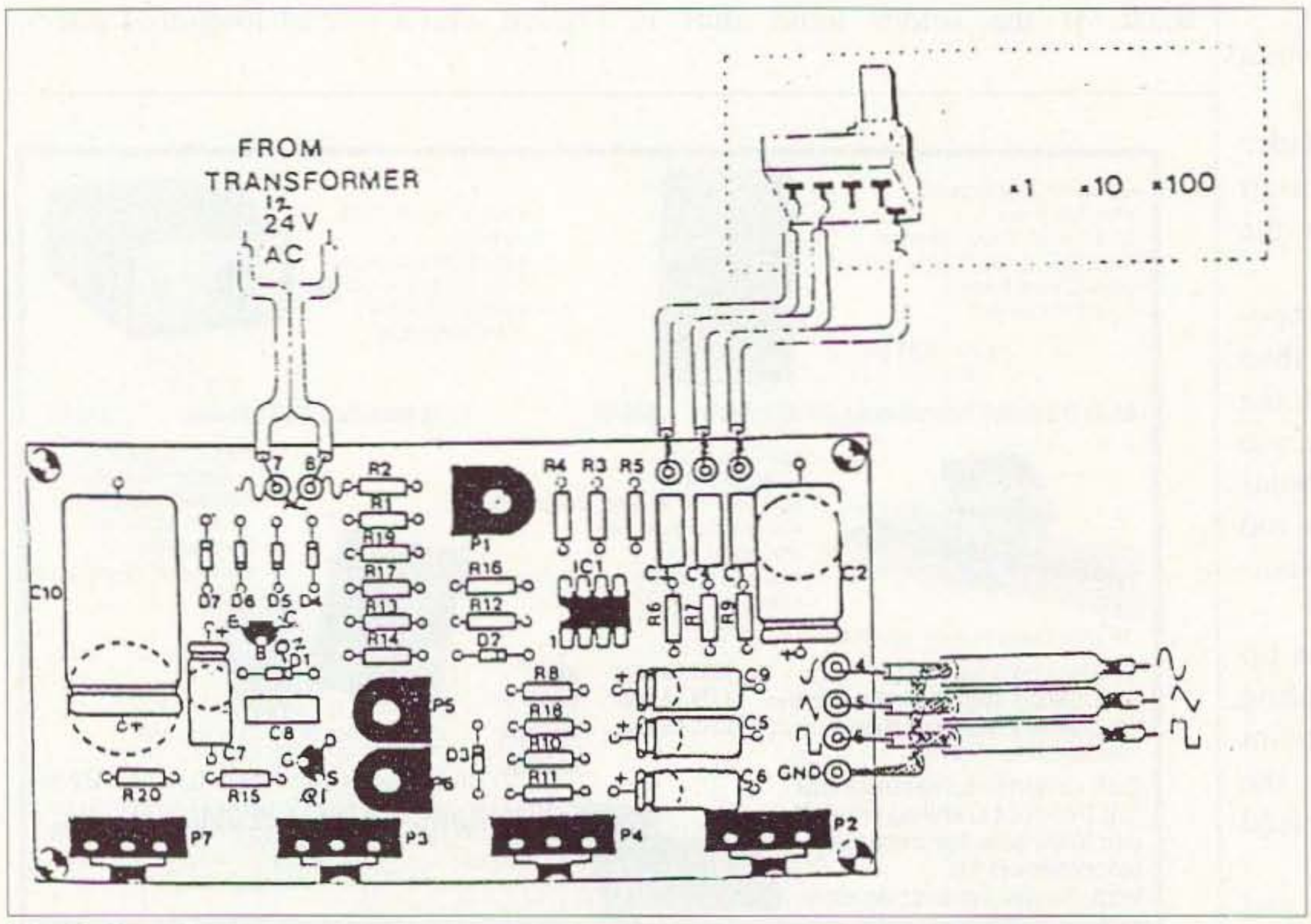

Fig. 3. Parts layout.

Technical Specifications	
Frequency Response 25–25,000 Hz in 3 ranges	
Range A	25–250 Hz
Range B	250–2500 Hz
Range C	2500–25,000 Hz
Distortion	0.5% max.
Output Voltage	
Sine & Triangular	4 V RMS (10 V PP)
Square wave	10 V RMS (16 V PP)
Output impedance @ 600 ohms	

Table 1. Technical specifications.

switch, and the output pins as we described above, and the function generator is ready for testing.

Calibration

If you have an oscilloscope handy, connect the output of the generator to its input. Use a 12 V or a 24 V transformer to supply the generator with power, and adjust the trimpots to get the best possible waveshape on the screen. The potentiometer P1 should be adjusted first, till the square wave is perfectly adjusted for a 50-50% duty cycle. Then, by means of trimpots P5 and P6, you should adjust the waveshape of the sinusoidal waveform till it is symmetrical and as smoothly shaped as possible.

If you do not have an oscilloscope on hand and you only want to use the instrument as a general purpose audio generator, you will not be very wrong if you set the trimpots in their middle position. However, if you do so, distortion is likely to be higher and the instrument is no longer reliable for precision measurements.

If it doesn't work

• Check your work for possible dry joints, bridges across adjacent tracks, or soldering flux residues that usually cause problems.

• Check again all the external connections to and from the circuit board to see if there is a mistake somewhere.

• See that there are no components missing or inserted in the wrong places.

• Make sure that all the polarized components such as diodes, electrolytics, or transistors have been soldered in the right way.

• Make sure that the supply has the correct voltage.

• Check your project for faulty or damaged components. 73

Parts List		
All resistors are 1/4 W 5% unless otherwise noted, values in ohms		
R1, R2	4.7k	
R3, R4, R7, R8, R16, R20	10k	
R5, R6	33k	
R9	390	
R10, R11, R17, R18	1.8k	
R12	27k	
R13	330k	
R14	270k	
R15	1 meg	
R19	560	
P1	1k	
P2	5k	linear pot (front panel)
P3, P4	10k	log pot (front panel)
P5	25k	trimpot
P6	10k	trimpot
P7	5k	log pot (front panel)
All capacitors are 50 W VDC unless otherwise noted, values in µF		
C1	0.001 (1000 pF)	polyester or mylar
C2	100	25 V electrolytic
C3, C8	0.1	polyester or mylar
C4	0.01	polyester or mylar
C5-C7, C9	10	25 V electrolytic
C10	220	35 V electrolytic
C11	100	35 V electrolytic
C12	50	16 V electrolytic
C13*, C14*	100	25 V electrolytic
D1		1N4148 or 1N914
D2, D3	10 V 0.5 W	zener 1N961B, 1N5240B, 1N4740A
D4, D5		gen. purp. 1N4001, 1N914, 1N4148, 1N34, 1N270
D6*, D7*		same as above
IC1		dual op amp TL082, LF353
Q1		FET 2N3819, 2N3820, MPF-102
Q2		NPN 2N3903, 2N3904, 2N2222
Miscellaneous: PCB or perfboard, pins, IC socket, case, line fuse, xfmr, solder.		
***Note: Use C13, C14 with 12 VAC transformer. Use D6, D7 with 24 VAC transformer.**		

Table 2. Parts list.

Dan Metzger K8JWR
6960 Steamview
Lambertville MI 48144

Read All About It!

Part 2 of good stuff from The Hertzian Herald.

So what do you send after WX HR IS ...? Well, there are my ten favorite tech tips ... and the story of Rip Van Ham ... and ten (hopefully, non-) shocking safety pointers for handling electricity ... and ...

Last night I talked for an hour and twenty minutes to Bernie on 40-meter CW. Bernie had been an engineer on the EDVAC, which he staunchly maintained was the first "real" electronic computer. (ENIAC, which was in the next room at the U. of Pennsylvania, was really just an overgrown calculator, he said.) He gave me all sorts of details about the tubes and memory elements used in the earliest computers.

I have had equally enjoyable CW ragchews with:

• Paul, in Ireland, who gave me travel tips and sent pictures of his family, and of spots to visit if we come over.

• Larry, a state legislator in Texas, who was CW mobile.

• Prose, whose first rig was a spark transmitter in 1923, and who told me what a thrill it had been to work "DX" of 25 miles.

• Ed and Larry, who were landline CW ops, and attempted to teach me American Morse over the air.

• Rod and Betty, who were in their honeymoon cottage in Canada. (When I apologized for intruding, the new XYL came back with, NO PROB — CABIN FULL OF KIDS ES GRANDKIDS, SO ONE MORE WELCOME.

• Ty, for whom I was his very first CW QSO.

And yet I keep running into ops who sent RST, NAME, and QTH on the first round, WX and RIG on the second, and QRU ES 73 on the third. To me, radio is *communication,* and you're not really communicating with the ham on the other side until you get beyond these preliminary and really rather repetitive exchanges.

So what *do* you send after WX HR IS ...? Some of us get so wrapped up in the formality of those first two exchanges that we forget how to loosen up for the fun that comes after them. Here are some icebreakers:

1. AGE HR IS 53 ES BEEN HAM SINCE 1958. If your ages are similar, on the next go-around you can talk about common interests: school, kids, house-fixing, grandkids, retirement. If you both got into radio around the same time, you can compare notes on your first rigs. (If you get hold of an old-timer, don't fail to ask about those 1930s ham stations, or the WWII experiences — there are some great stories out there.)

2. I TEACH ELECTRONICS AT A JR COLLEGE (or whatever you do for a living). RUFF DAY, KID DROPPED SCOPE ON FLOOR (or whatever disaster happened to you). Folks all love to complain about their jobs.

3. OTHER HOBBY HR IS BARBERSHOP HARMONY. I SING BASS IN A MENS CHORUS (or boating, or golf, or whatever). Most hams have other hobbies, and they love to tell you about them.

4. TOOK GRANDKIDS TO ZOO TODAY (or whatever you did today, or last week). The other ham will surely respond with a kid or grandkid or pet story. One guy in West Texas seemed to take comfort from telling me the whole story of how his cat had been bitten by a rattlesnake that day, and what a good cat it had been.

5. HR WRK MOSTLY 40 CW, BUT WILL TRY 160 CW THIS WINTER (or whatever your favorite modes and bands are). I got a real education in amateur satellite communications with this line once.

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6. USING VIBROPLEX BUG HR — NW HR IS WW2 J38 STRAIT KEY. CW ops love their keys more than their rigs. I've gotten rhapsodies about WWI keys and home-brew bugs with this leader.

Contesters and SSB ops may want beams and kilowatts, but you can CW ragchew on 100 watts and a dipole. A successful technique is to find someone with a good fist and a 599 signal at your speed and monitor the QSO for a few minutes. If it's nearing its end, call one of the stations when they sign. This is more likely to get you a copyable signal that won't fade on you than just calling CQ. Listen on the FISTS CW club frequencies — 7.058 and 14.058.

So give it a try — send *something* besides QRU after you send WX HR IS ... I guarantee you'll find that there are almost no boring hams. Every one of them has an interesting story, for those who have the skill to draw it out and the patience to listen.

Ten tech (no, not Ten-Tec) tips

Here are my favorite ten tech tips. If you have a favorite, perhaps you could send it along, and we'll do another column of reader tech tips.

1. If you store a car battery over the winter, don't store it on the floor of your garage. The air temperature changes by 20 or 30 degrees from night to day, while the floor temperature holds constant. Temperature differences between the top and bottom of the battery cause differences in generated EMF that produce internal currents, which discharge the battery. Place the battery on a styrofoam sheet for thermal insulation from the floor.

2. If you have to wind an RF coil, don't use PVC-insulated hookup wire. PVC has severe dielectric losses at certain frequencies which depend on temperature. I once fought an 80-meter home-brew rig for two weeks before I replaced the PVC wire in the tank coil with enameled magnet wire.

3. Cheap panel meters with no zero adjust can often be re-zeroed by holding a soldering gun close and turning it on and off. Several tries may be necessary to get the residual magnetism right.

4. Plastic-face meters may accumulate a static charge, making the pointer stick. Simply breathe moisture on the face to drain the charge.

5. When measuring resistances below 10 ohms, be sure to short the leads first. If the meter cannot be made to read zero, subtract this lead resistance from your reading.

6. Pencil lead is conductive. Never mark a circuit board with a pencil.

7. Torn loudspeaker cones can be repaired with tissue paper soaked in nail polish.

8. Most DVMs lose accuracy above a few kilohertz and are completely useless above 10 kHz. Analog VOMs are generally reasonably accurate into the megahertz range.

9. The tip bolts on a soldering iron loosen with time. If the gun won't heat, tighten the bolts.

10. Operator error is far and away the most common cause of service calls. If you are called upon to service an instrument, don't operate it yourself; have the person who called operate it so you can spot improper operation.

Rip Van Ham sleeps 27 years

Rip Van Ham was a jolly sort, captivated in his youth by the magic of radio and spending long hours as a teen sending CW, ragchewing with ham-club buddies, and home-brewing the "ultimate" 807 rig. But in his 25th year his key fell silent and a great sleep overcame him, from which he did not

awaken until the summer of 1996, twenty-seven years later.

And what an awakening it was! All of his buddies on 160-meter AM mobile were gone, and in their place was a crowd of 2-meter FMers using things called "repeaters" that made strange beep-boop noises, talked in robotlike voices, and covered impossible distances.

And their radios were incredibly small; and they had buttons instead of knobs on them. Yes, the new hams said they used "radios." In 1969, only CBers and BCLs had "radios." Hams had transmitters and receivers — a few rich ones had transceivers — but they'd be embarrassed to say they had a "radio," and the new hams talked politics and religion on the air — a thing unheard of in 1969.

So Rip got himself a radio — a used one — but from a Japanese company. The old companies were all gone: Hallicrafters, National, Hammarlund, Gonset, WRL-Globe, E.F. Johnson, Allied-Knight, "King" Collins, even Heathkit — all gone. But the new radio was incredibly inexpensive, even to someone used to 1969 prices, and it was far more stable than anything he had ever used. And, wonder of wonders! It displayed the frequency in glowing digits, down to tenths of a Kc — oops — make that 1 kHz.

He tuned to the 40-meter CW band and heard guys sending "QRL?" He had to look it up in the back of his yellowed old log book. Oh! A great idea, but useless in 1969; the answer then was always "QRL!" "Yes, the frequency is busy, they're ALL busy. Sandwich yourself in if you can."

Then, when Rip looked for the 40-meter Novice band he found it moved 50 kHz. And there he heard a great silence, and he wondered what had happened to the thousands of lads with DX-20s and Globe Chiefs and homebrew 807s who used to make that part of the spectrum a mad cacophonous party every night of the week. The guys he heard giving their ages were all in their 50s, 60s, 70s, even 80s. Where were all the kids?

He sent a tentative CQ. Yes, that was still recognized. And the RST—QTH—NAME routine was unchanged. But these hams gave honest signal reports. He got a 229 from a DX station! Rip was used to 599 = Great, 589 = OK, 579 = weak, and Anything Else = Insult. And they sent N when they meant 9. And in a ragchew someone used SK to mean deceased. Rip wondered if that came from Silent Key, or ···—·— meaning End Of Work. And another new term: Elmer. Never heard that before; wonder when it came in.

Oh, but many things were still the same. Wayne Green was still writing his blazing editorials, just like he was in 1969. And Lou McCoy was still writing antenna-tuner articles. And hams still sent "73," and meant much more than "best regards" by it.

And they still hurled their waves at the sky and marveled at how they bounced back to random corners of the globe as they wondered who would reply to their calls. And radio was still magic.

This will kill you

Hello, OMs and YLs. We had a major flood at the home QTH last month, engendered by a ruptured washing machine hose coupling. (I wish somebody had warned me to replace those things regularly — $10 could have saved me many hundreds.) Thinking about water disasters got me thinking about electrical disasters, and how to avoid them. Here is a grab bag of safety tips.

• Electric shock usually kills by paralyzing the breathing muscles. It follows that most shock victims can be saved by simple mouth-to-mouth artificial respiration.

• Most booklets on resuscitation talk vaguely about clearing the airway of "foreign material." Let's speak plainly. A common reaction to shock is vomiting. You have to clear this stuff from the mouth so it isn't forced into the lungs.

• A minority of shock cases may cause malfunction of the heart or other organs, but you really need professional training to deal with that. Anyone can do the "pinch the nose and blow air into the mouth" trick.

• If a 3-wire appliance such as a skill saw or a microwave oven blows the breaker when you plug it in, it may have a short from the hot wire to the metal case. Don't think you're clever if you can get it working by using a two-wire extension cord or 2-wire adapter plug — the case is still hot! Touch that case and a ground point (wet floor, faucet, stovetop, etc.) and you're fried.

• When re-terminating 3-wire cords, it is a good idea to leave the safety ground (green) wire a little longer than the others so that it will be the last to sever in case the cord is strained.

• Automobile battery explosions are much more common than most people realize. (In a class of 20, I typically find about two students who have been involved with one.) Never charge a battery in an enclosed area. Charging produces hydrogen gas — very explosive. Open the doors and windows or do it outside.

• When jump-starting a car, make the last connection to the negative of the car with the good battery, but not at the battery terminal. Connect it to the car chassis at a place away from the battery so when the spark jumps it won't be near any explosive gas.

• When working on cars, take rings and watches off. One of my students once showed me the melted remains of his girlfriend's class ring, and a row of blisters down his arm. The ring had bridged the 12-volt line to the car chassis when he had thrust his hand under the starter to probe for a dropped nut. He was lucky it was a girl's thin band on his outside little finger, because it melted and fell off. If it had been a man's wedding band on the ring finger it would have resulted in an amputation.

• Electric shock is NEVER a joke. What may seem a harmless tickle to you could be fatal to someone with a heart condition or a pacemaker, and jokesters never have absolute control over who their victims might be. Even young people may have medical conditions unknown to themselves that could make a normally harmless shock fatal. If there is even a 1-in-10,000 chance that someone could be harmed, the joke is no longer funny. 73

73's DX Dynasty Award

This is the current list of DXDA award winners. The DX Dynasty Award is the most enjoyable DX award around. Any correspondence concerning DXDA should be addressed to DXDA, c/o *73 Magazine*, 70 Hancock Rd., Peterborough NH 03458 USA.

BASIC AWARD—100 COUNTRIES WORKED

1. W1RFW
2. WB2DIN
3. KT1A
4. W3FDU
5. KA9JOL
6. WB1BVQ
7. NW7O
8. AK4H
9. W3HCW
10. KZ2W
11. K9FD
12. WD5N
13. KA9TNZ
14. K9GBN
15. N5GAP
16. WB3FMA
17. NN6E
18. AL7HG
19. N6CGB
20. KI6AN
21. K9JPI
22. N4WF
23. K6PKO
24. KW7J
25. VE6JO
26. WA4IUV
27. W4ZFE
28. N4KMY
29. WØHBH
30. K8KJN
31. KG1V
32. K1KOB
33. KY3F
34. PY2JY
35. YB5BEE
36. YB5BEH
37. WB9SBO
38. NØAFW
39. KA9MOM
40. N3II
41. W6DPD
42. KE8GG
43. VE6VK
44. KD9RD
45. W4WJJ
46. KØHSC
47. KI6GI
48. IK1APP
49. KJ4RR
50. K8MDU
51. N1EIU
52. K1DRN
53. WD8REC
54. ZL2BLC
55. VE3EFX
56. W9MCJ
57. N6IV
58. KN8D
59. KC5YQ
60. WB6ITM
61. KA2AOT
62. K4LHH
63. VE2QO
64. KE5AT
65. W9SU
66. W3OOU
67. NR2E
68. KF5PE
69. N3FBN
70. KB4SJD
71. N3EZX
72. IK8GCS
73. WB4I
74. NG1S
75. WB7UUE
76. HK4EB
77. KØBFR
78. N7GMT (KF7SH)
79. AA4VN
80. KA1LMR
81. N8AXA
82. NM2I
83. KD9YB
84. HC2CG
85. VE1BXI
86. YC2OK
87. N4GNL
88. GM3UBF
89. 5Z4BP
90. IØAOF
91. VE1BN
92. KA2NRR
93. 5Z4DU
94. KB8ZM
95. HK4CCW
96. W2JQ
97. HC2AGT
98. WD5N/M
99. VE1BHR
100. VE1AGZ
101. K5AOB
102. KW2D
103. PY3ARZ
104. WB4ETD
105. N2FPB
106. KD3CQ
107. K4NNK
108. VU2DNR
109. AA5BE
110. PY3OG
111. VE4ACF
112. VE4SI
113. PJ2KI
114. WB4CKY
115. W6EQB
116. KK4IY
117. IK1IYU
118. N6GCN
119. KB1AF
120. KB8BHE
121. KE2CG
122. VS6CT
123. G3IZQ/W
124. WB6FNI
125. KAØIAR
126. K9SM
127. W6BCQ
128. KA5MSL
129. WB4FLB
130. N7GLT
131. WAØX
132. KF4GW
133. N4QGH
134. VE1CBK
135. 7J1AAL
136. K6ICS
137. NZ7W
138. WBØN
139. WC7F
140. F6IFE
141. KL7N
142. KE8LM
143. WA6YOO
144. VE2MFD
145. N3APQ
146. HK1DBO
147. NM3V
148. IK6GFY
149. WB6UAN/M
150. NK6Z
151. KB6IUA
152. W9OKH
153. WB5FXT
154. NB3E
155. N2ESP
156. YU2EJU
157. OZ1DXX
158. IK5IIU
159. KA1ION
160. KD3AI
161. OK1AEH
162. W9LCR
163. 8P6SH
164. KA6SPQ
165. ZF2KH
166. W6MVV
167. JA8CAQ
168. KI6WF
169. K2MRB
170. AA6GM
171. JAØSU
172. NU8Z
173. GØGRK
174. YB8VM
175. DV1BRM
176. WØTU
177. N7CNH
178. PY3IO
179. YBØZCA
180. YBØAF
181. VE3PQB
182. W2SV
183. N1ADE
184. WP4AFA
185. KS7V
186. W2OFB
187. G4ASL
188. N5JUW
189. KA8WAS
190. 5NØWRE
191. AA4IP
192. JR5KDR
193. KD2WQ
194. KA3NIL
195. WA8YWK
196. VE1ACK
197. HP2XVB
198. WB5KYK
199. N5JUJ
200. N4OBJ
201. 9Q5NW
202. KW2D
203. VE1HA
204. HP8BSZ
205. IK8JJQ
206. YC3DKN
207. I3VKW
208. K2EWA
209. KD3CR
210. N9GDG
211. KF8K
212. FD1BEG
213. DU1DZA
214. N8IMZ
215. KK4YA
216. LU1JDL
217. KA8YYZ
218. KA4TMJ
219. WA9DDC
220. YI1CIS
221. YC3FNL
222. GØFWG
223. KV4B
224. N5IET
225. WA9WIG
226. N3CDA
227. KE6KT
228. IK7DBB
229. JY5EC
230. N1ETT
231. PY2DBU
232. I8IYW
233. NØISL
234. KC4BEB
235. WA7QQI
236. KA1RJG
237. OZ9BX
238. KB4HBH
239. KA3RWP
240. NJ1T
241. W4DCG
242. YCØRX
243. VE7OJ
244. AA4W
245. N9GMM
246. KB4HBH
247. KM4HF
248. CE1YI
249. KA1FVY
250. N2GVB
251. N2DAO
252. WF8E
253. YBØHZL
254. N5MBD
255. N4SNS
256. KA3TGY
257. JN3XLY
258. N4DUV
259. KA9MRU
260. KA4OTB
261. N4JED
262. AB4KA
263. WA7OET
264. KA3RVH
265. CE7ZK
266. NI9J
267. WB9PTN
268. KB8DAE
269. WØCL
270. WB7VUB
271. JF6TUU
272. ZY3IO
273. KB4VIR
274. OE6CLD
275. N7JJQ/DU3
276. KK4FB
277. DU1AUJ
278. K2EWB
279. NI5D
280. N2JXC
281. NØIWT
282. WB3BDH
283. K1CVF
284. KA3CXG
285. KA1SPO
286. WA4NWT
287. KJ4OI
288. KA3UNQ
289. WB2VMV
290. KD4MM
291. OE3DHS
292. KD9HT
293. DL8OBC
294. G3KVA
295. WA4NEL
296. KA4VZO
297. NØIDT
298. KA1FUE
299. KD7EO
300. JH8MWW
301. KB8ICD
302. JA1CKE
303. N3GEE
304. JA5MG
305. KA1FTU
306. WA8KMK
307. N2IBW
308. N4THE
309. N3CYD
310. JA4TF
311. W6YLL
312. WA1S
313. KC5WA
314. N6WK
315. PY4OY
316. KG7BO
317. WB3FQY
318. WCØA
319. VE4AMU
320. YCØMCA
321. WA3LEU
322. KB2GLO
323. OZ1FNX
324. K6GCF
325. KC4PCX
326. KA7EXD
327. DK9EA
328. HL5AP
329. SM7BRO
330. ON6DP
331. WA3KKO
332. KB9ABI
333. DA2UI
334. SMØBNK
335. WA2BMQ
336. WAØQIT
337. 5Z4BH
338. KB9ALG
339. OA4ANR
340. OD5ZZ
341. VE3ZD
342. LU2ATR
343. HL5FRG

344. UB5LRS
345. N1ICC
346. UY5XE
347. PS7AB
348. IK4NPC
349. KD1CT
350. DU1CHD
351. UB4WZA
352. LU3CF
353. G7AZP
354. VE5AAD
355. IK3ITX
356. SM4SEF
357. N9CPK
358. VE2JWK
359. N7JXS
360. KO4VO
361. JE1GWO
362. JM2DRM
363. IK1SLE
364. JF7QUE
365. HL5BUV
366. VE3GLX
367. N7QXQ
368. JE6KLR
369. KK6JY
370. N2BI
371. KK4XL
372. JA3SSB
373. KBØADI
374. I1-50156
375. VU2SMN
376. EA6AAK
377. N3IHS
378. N8MOT
379. KB2NEK
380. PY2DBU
381. WA2CKP
382. WB2PPN
383. JA1-2Ø762/BV
384. AB4ZD
385. YC8EMH
386. WA8RLB
387. N5VWM
388. VE7SKB
389. KB4BCC
390. VE7GSE
391. YC8BWN
392. KN6ER
393. KD1CJ
394. G2BFO
395. KB7ROK
396. VK2EQ
397. 4X4-2175
398. JE1BGL
399. KF2LC
400. WV2X
401. LU5EWO
402. WAØCLR
403. VO1UL
404. VE6AML
405. WD4REX
406. WAØCLR
407. VE3VJC
408. WA1MKS
409. JH6FHJ
410. JE9EMA
411. WK8X
412. TI2YLL
413. KP4WN
414. KD6MOS
415. KI7CM
416. JH1IED
417. JN6MIC
418. BU7FC
419. DL1EMO
420. KD4TWP
421. 5W1GC
422. JA7JI
423. W5RUK
424. LU3OJZ
425. WD4OHD
426. 7L1MFS
427. ON4BCM
428. WØUHL
429. N4WJV
430. LU5DSE
431. HS1NGR
432. DU1SAN
433. 4X/G3WQU
434. K3BSA
435. CP8AK
436. K8IHQ
437. JA7NUZ
438. HL5FXP
439. N9PM
440. K9UQN
441. WA7SNY
442. HL5YAW
443. DS5WQT
444. JH7GZF
445. K6CIL
446. JK1QJE
447. WA8NPX

150 COUNTRIES ENDORSEMENT

1. WB2DIN
2. N4WF
3. N6GCB
4. K9FD
5. NØAFW
6. N3II
7. WB1BVQ
8. KA2AOT
9. KI6G1
10. N7GMT
11. IK8GCS
12. IK1APP
13. VE6JO
14. VE4ACF
15. WB4I
16. IK1IYU
17. KE2CG
18. G3IZQ/W1
19. WB6FNI
20. K8MDU
21. VE6VK
22. KB6IUA
23. WB5FXT
24. YU2EJU
25. IK5IIU
26. KE8LM
27. KA1ION
28. KA6SPQ
29. W6MVV
30. JA8CAQ
31. KI6WF
32. JAØSU
33. WD5N
34. W2SV
35. W6BCQ
36. F6IFE
37. VE2MFD
38. WP4AFA
39. 5NØWRE
40. KD2WQ
41. VE1ACK
42. N5JUJ
43. 9Q5NW
44. KB8BHE
45. I3VKW
46. KD3CR
47. N8IMZ
48. GØFWG
49. N2FPB
50. KE6KT
51. OZ9BX
52. NJ1T
53. CE1YI
54. YBØHZL
55. JN3XLY
56. KA9MRU
57. CE7ZK
58. KB8DAE
59. K2EWB
60. NI5D
61. KD3CQ
62. KA4OTB
63. WB2VMV
64. KD4MM
65. KD9HT
66. KA3NIL
67. NØ1DT
68. KA1TFU
69. KA4TMJ
70. JA4TF
71. KA3UNQ
72. KB8ZM
73. K2EWA
74. WA1S
75. PY4OY
76. WCØA
77. OZ1FNX
78. KA7EXD
79. ON6DP
80. VE1RJ
90. N6WK
91. WA3KKO
92. KB9ABI
93. SMØBNK
94. WAØQIT
95. 5Z4BH
96. OA4ANR
97. OD5ZZ
98. VE3ZD
99. HL5FRG
100. UB5LRS
101. PS7AB
102. KD1CT
103. DU1CHD
105. IK3ITX
106. VE2JWK
107. N7JXS
108. JM2PRM
109. HL5BUV
110. VE3GLX
111. KK6JY
112. EA6AAK
113. N3IHS
114. WA2CKP
115. VE6AML
116. WAØCLR
117. WA1MKS
118. KD6MOS
119. KP4WN
120. LU5EWO
121. 5W1GC
122. JA7JI
123. W5RUK
124. LU3OJZ
125. ON4BCM
126. WØUHL
127. N4WJV
128. LU5DSE
129. VO1UL
130. DU1SAN
131. 4X/G3WQU
132. K8IHQ
133. K9UQN
134. WA7SNY
135. HL5YAW
136. K6CIL
137. WA8NPX

200 COUNTRIES ENDORSEMENT

1. N3II
2. WB2DIN
3. K9FD
4. IK8GCS
5. NØAFW
6. WB1BVQ
7. VE4ACF
8. KI6GI
9. N6GCB
10. K8MDU
11. YU2EJU
12. KE8LM
13. WD5N
14. F6IFE
15. 5NØWRE
16. KE2CG
17. I3VKW
18. CE1YI
19. W6BCQ
20. CE7ZK
21. KB8DAE
22. K2EWB
23. KD3CQ
24. KD4MM
25. KD9HT
26. KA4TMJ
27. N7GMT
28. JA4TF
29. K2EWA
30. WA1S
31. PY4OY
32. ON6DP
33. VE1RJ
34. WA3KKO
35. WAØQIT
36. 5Z4BH
37. HL5FRG
38. JAI-2Ø762/BV
39. VE6AML
40. LU5EWO
41. 5W1GC
42. JA7JI
43. W5RUK
44. LU3OJZ
45. WØUHL
46. N4WJV
47. VO1UL
48. DU1SAN
49. K8IHQ
50. K9UQN

250 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. WD5N
4. K8MDU
5. KE2CG
6. CE1YI
7. CE7ZK
8. K2EWB
9. KD9HT
10. N7GMT
11. KD3CQ
12. KB8DAE
13. WA1S
14. PY4OY
15. VE1RJ
16. 5Z4BH
17. N2BI
18. I75OI56
19. VE6AML
20. KB8ZM
21. LU5EWO
22. JA7JI
23. W5RUK
24. WØUHL
25. K9UQN

300 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. K2EWB
4. K8MDU
5. N7GMT
6. WA1S
7. PY4OY
8. KD3CQ
9. VE1RJ
10. UY5XE
11. IK3ITX
12. VU2SMN
13. JA7JI
14. W5RUK
15. LU5EWO

350 COUNTRIES ENDORSEMENT

1. WB2DIN
2. PY4OY
3. UB4WZA
4. JA7JI
5. KD3CQ

John A. Kuecken KE2QJ
2 Round Trail Drive
Pittsford NY 14534

Number 31 on your Feedback card

Secrets of Transmission Lines

Part 6: The Smith Chart.

*In the last chapter, we looked at the behavior of transmission lines under steady-state conditions, and paid particular attention to the variation of impedance along the line for various termination conditions. In the experiment, we noted the repetition of the termination impedance every half-wave as well as the cycling of the impedance between Zo*VSWR and Zo/VSWR. In this chapter, we are going to look at what happens between the pure resistance points.*

In the previous work, we showed the expressions for the voltage and current along the line. From these expressions previously given, you can obtain the expression:

$Zx = Ex/ix$
eqn (6-1)

This simply says that at a point x along the line, the impedance is given by the voltage at that point divided by the current at that point. Bear in mind that both voltage and current can have forward and reflected components and may have real and imaginary parts.

The previously stated expressions for Ex and ix can be substituted into this expression to develop the equation for Zx. The actual manipulation is too long-winded for this treatment; however, for those interested, my version of it may be found in *Exploring Antennas and Transmission Lines by Personal Computer,* published by Van Nostrand Reinhold, New York. This book is now out of print, but still is in the possession of a number of hams and libraries. Other more current texts also carry the discussion.

As another shorthand notation to simplify the printing of the equations we define

$\beta = 2*\pi/\lambda$
(6-2)

where
λ = wavelength in the medium

It is also common to refer to the position j along the line as "ℓ" rather than "x" as we have been doing; however, for the purposes of the computer program to follow, we will retain the "x".

Using these conventions, we may write:

$$Z_x = Z_0*\{\frac{[Z_1*\cos(\beta x)]+[j*Z_0*\sin(\beta x)]}{[Z_0*\cos(\beta x)]+[j*Z_1*\sin(\beta x)]}\}$$
(6-3)

where
Z_1 is the terminating impedance
Z_x is as defined in (6-1)
β is as defined in (6-2)

This is the complete expression for the impedance at any point "x" on the transmission line. Note that it has real and imaginary (reactive; remember chapter 2!) parts and that the terminating element Zi can have real and imaginary parts as well.

For a particularly interesting case, let us set Zi = 0 (that is, the end of the line is perfectly short-circuited). For the shorted line Zi = 0, the upper left and lower right terms are zero. Therefore

$$Z_x = Z_0*\{\frac{[0+[j*Z_0*\sin(\beta x)]}{[Z_0*\cos(\beta x)]+0}\}$$
(6-4)

$$Z_x = j*Z_0*\tan(\beta x)$$
(6-5)

Equation (6-5) follows from the fact that sin(a)/cos(a) = tan(a).

The tangent function is such that if (b*x) = 45 degrees, then Zx = j*Zo. In other words, a shorted section of line an eighth of a wave long behaves like an inductor with a reactance equal to Zo ohms. At the half-wave point, the value of the tangent goes to infinity and the line section or stub looks like an open circuit, as we noted with the experiment in the previous chapter. As a matter of fact, the tangent changes algebraic sign just beyond a half wave and the stub looks like a parallel

resonant circuit. These properties of the shorted stub are widely used in impedance matching.

The Smith Chart

Before the advent of the programmable calculator and the personal computer, the principal tool for solving transmission line problems was the Smith Chart, introduced by P.H. Smith of Bell Labs in 1939. This graphical solution was a boon to telephone and radio engineers.

For the power utility engineer, the transmission line equations had to be taken into account only when working with very long transmission lines of hundreds of miles or more. Also, there was usually only one frequency to be considered. In these infrequent cases, the transmission line equations were not too onerous.

For the telephone or radio engineer, on the other hand, the matter was more pressing. The telephone man had to deal with a wide range of frequencies and lines of moderate length, and, for radio work, even cables a few feet in length could show considerable impedance transformation, as we saw in our experiment. Having to solve the transmission line equations for a large number of frequencies using only a pad, pencil, and slide rule was tedious and time-consuming. The simple graphical solutions made possible by the Smith Chart were a welcome relief. Even today, when computing facilities are common features of nearly any antenna or RF lab, the Smith Chart is still used as the common way of displaying impedance/frequency plots.

An example of the usefulness of the Smith Chart can be obtained by considering the following questions.

1. With a given impedance or admittance termination, at what point on the line will a lossless reactance cancel the reflected wave? What size reactance is required?

2. Having measured the impedance-frequency plot at one point on a transmission line, what does the plot look like at another point on the line?

3. What is a given impedance when transformed into an admittance?

With the Smith Chart, questions 1 and 3 can be answered with a draftsman's compass and a straightedge, and question 2 requires only a small amount of calculation.

The Smith Chart is presented in all its glory in **Fig. 1**. At first glance, it can be a bit terrifying; however, we will look at the makeup a step at a time, and it will be a bit more simple to understand.

To begin with, you will note that there is only one straight line on the chart, right up the center. All the rest are circles, and technically the center line is also a circle of infinite radius. Smack dab in the middle of the chart is the characteristic impedance of the chart. If we are working with 50-ohm coax, then the center of the chart is 50 ohms. (For other characteristic impedances, they also print normalized charts with the center labeled one. Then, you multiply all the readings on the chart by the characteristic impedance. For instance, with our 300-ohm twinlead, you would multiply all readings by 300.)

The center line represents the locus of all pure resistances. Anyplace else on the chart has a reactive element. The center or pivot point is very important for the chart. All constant VSWRs pivot about the center of the chart. For example, if we have a 2:1 VSWR on the line then we know that as we move along the line, the impedance will pass through 25 ohms and 100 ohms A circle centered on the 50-ohm point will describe all the

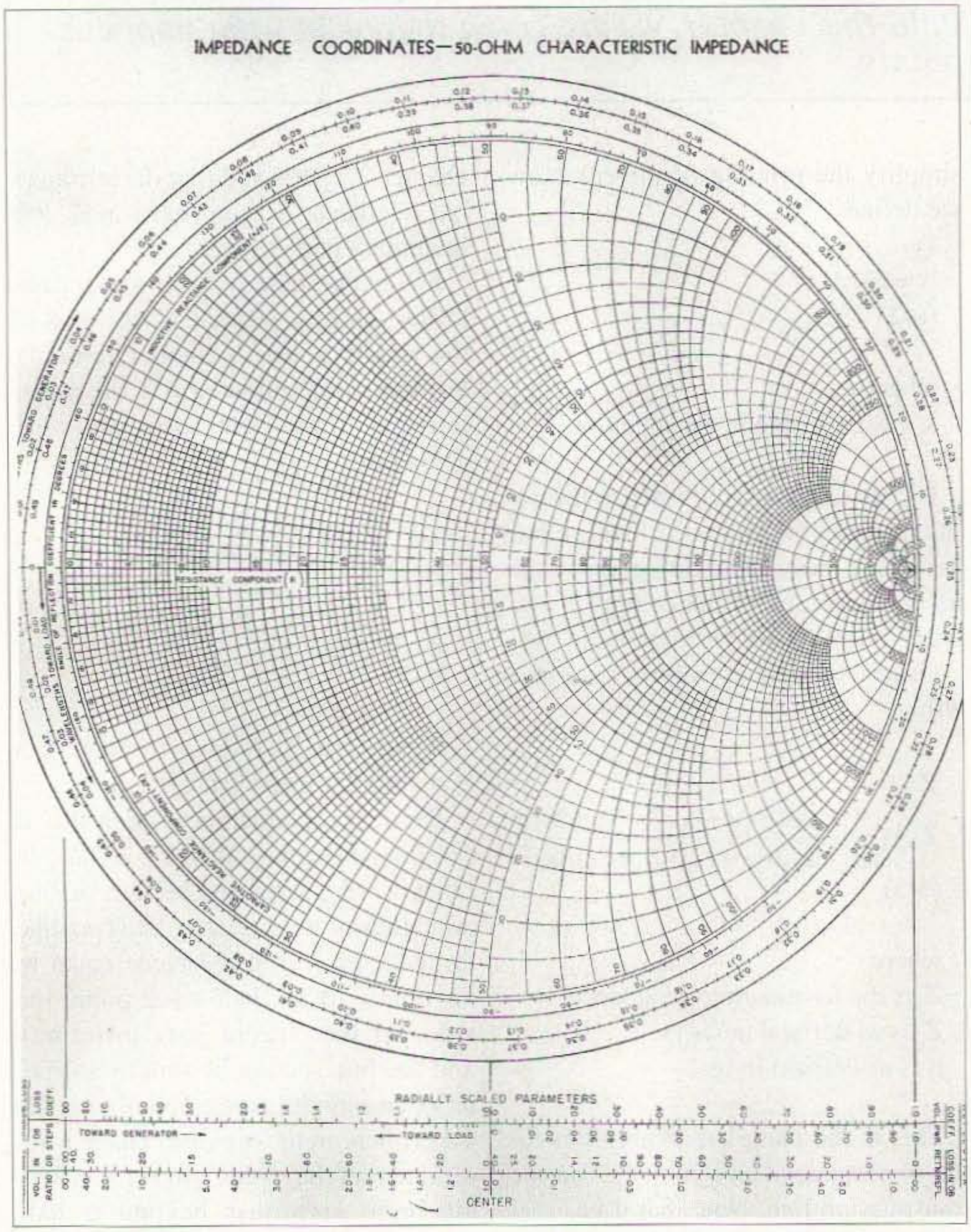

Fig. 1. The Smith Chart, impedance coordinates, 50-ohm characteristic impedance.

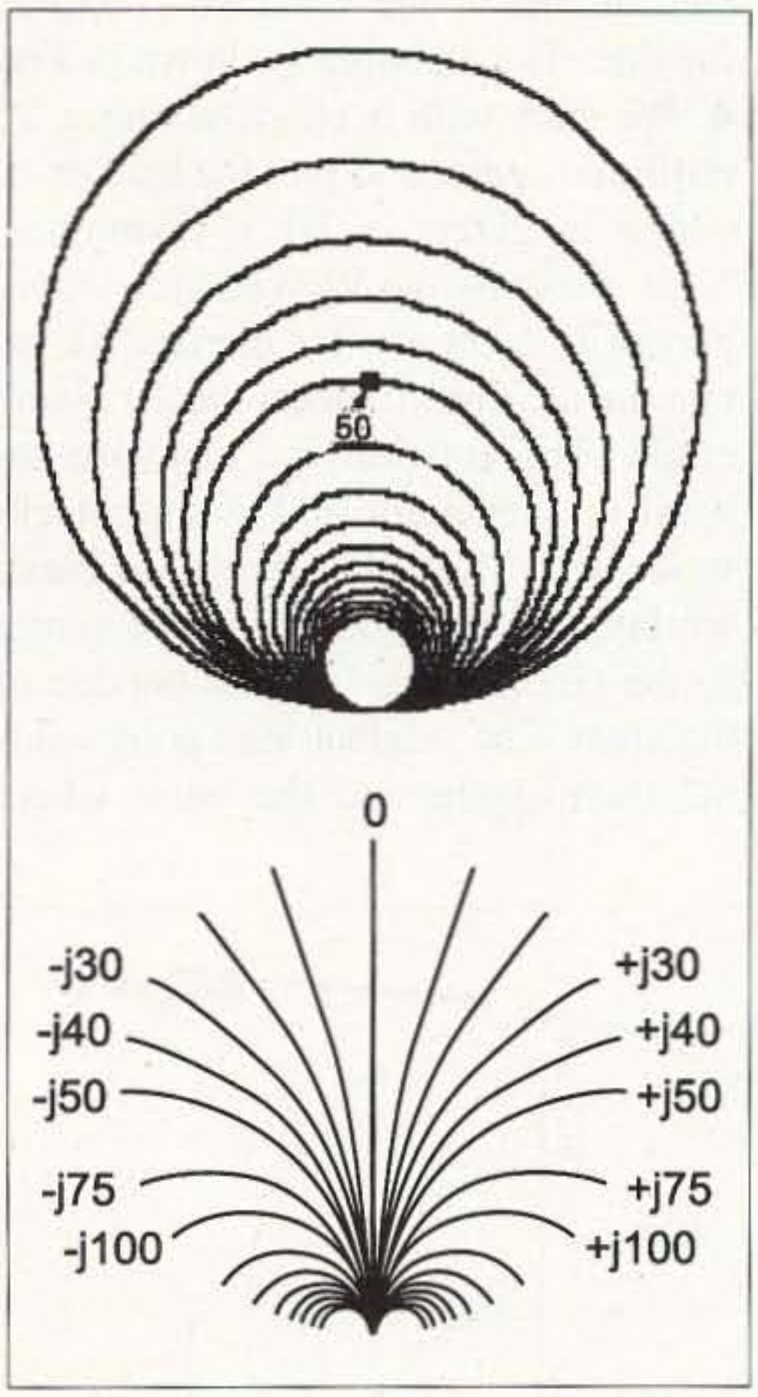

Fig. 2. The Smith Chart makeup. Top: Resistance curves are shown in 10-ohm steps for R<50 and 25-ohm steps for R>50. Bottom: Reactance curves.

impedances the line goes through. A quarter wave on the transmission line represents a half turn on the chart; the full circle represents a half wave, and the impedance repeats itself just as we saw in the last chapter.

Just think about this for the moment. By simply drawing the VSWR circle, we solved the transmission line equations for that load or termination for all possible line lengths.

Fig. 2 shows some of the resistance circles and some of the reactive circles on the chart. You will note that the zero reactance curve is the centerline and the reactance has a non-zero value everywhere else. The resistance circles and the reactance circles are said to be orthogonal, meaning that they always cross at right angles. Also note that all of the circles pass through the R/Zo = infinity point.

Fig. 3 shows how the circles are generated. Looking at **Fig. 3(a)**, we can see that if we terminate the line in a short circuit at R/Zo = zero, then a quarter of a wavelength down the line we will have R/Zo = infinity, and another quarter wave takes us back to the zero point. The R = 0 circle is the outer periphery of the chart. All possible impedances with real and reactive parts ranging from zero to infinity can be plotted on the Smith chart.

Also given on **Fig. 3** are the formulas for generating a Smith Chart in admittance terms. It is often convenient to work in admittance terms, since it is

usually easier to place corrective or impedance matching elements in shunt across a coaxial cable rather than in series. From a practical standpoint, you can cut the cable and install a "tee" and hang a shunt element there more easily than you can insert a series element. The reciprocal of 50 ohms is 0.020 mhos or siemens.

An example of impedance matching with the Smith Chart

Next, let us consider an example of impedance matching using the Smith Chart. We will work in admittance because I intend to do the matching with a short-circuited stub of line of the same Yo (1/Zo) as the line. The example is shown in **Fig. 4**. We start with a chart having a 20 millimho center and plot the load on it, which is given as 10 + j2 mmhos. Next, we draw the VSWR circle. Only part of it is shown, for clarity. We rotate the arc until it meets the 20 mmho circle. The rotation is clockwise toward the generator and counterclockwise away from the generator. Next, we lay a straightedge from the center to the circular scale on the outside of the chart. The original load point reads .02 wavelengths and the point where

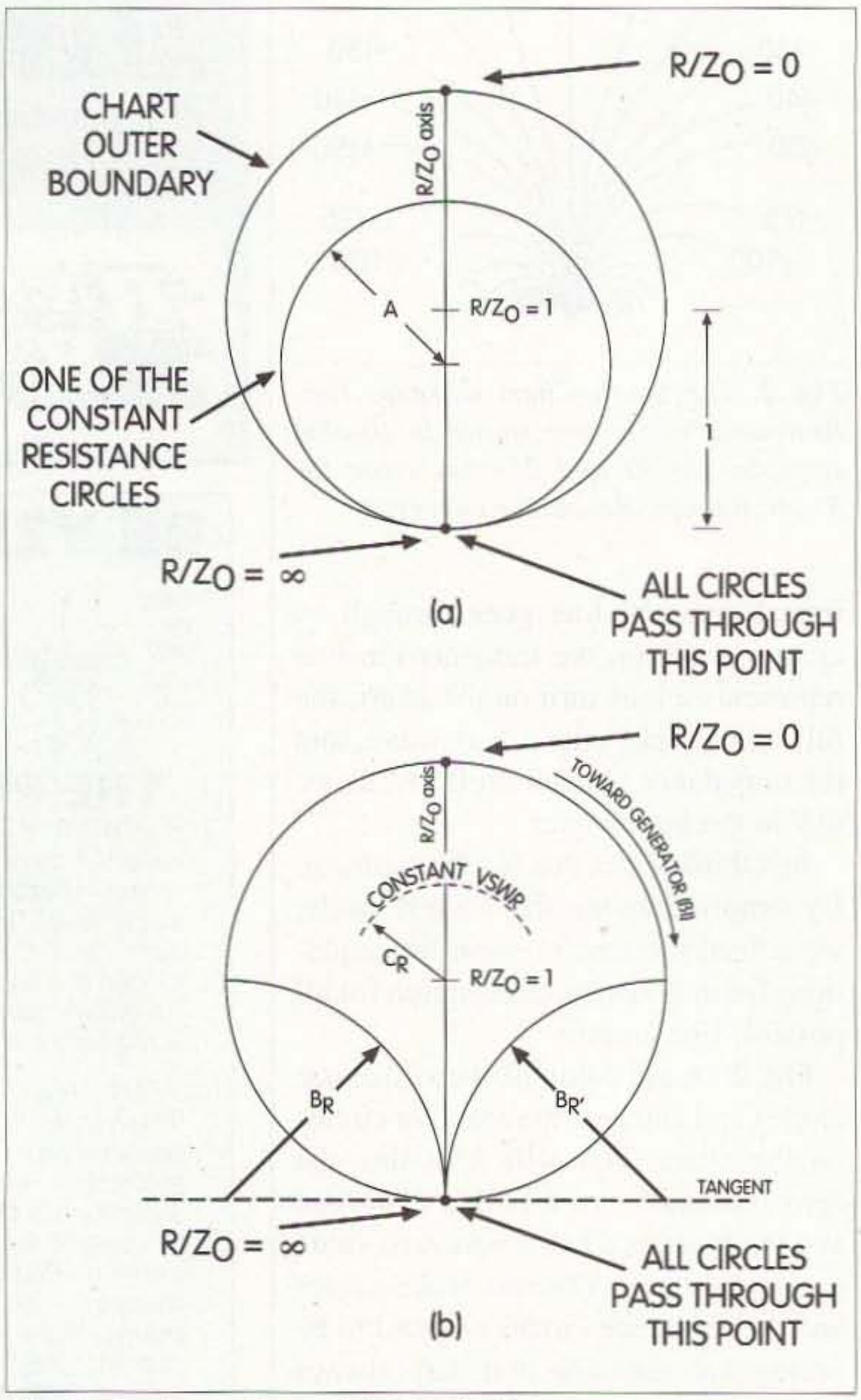

Fig. 3. *Further makeup of the Smith Chart.*

$$A = \frac{1}{1+\frac{R}{Z_0}} \quad \text{or} \quad A = \frac{1}{1+\frac{G}{Y_0}} \qquad C_R = 2A - 1 = \frac{2}{1+\frac{R}{Z_0}} - 1$$

$$B_R = \frac{Z_0}{X} \quad \text{or} \quad B_R = \frac{Y_0}{B}$$

the VSWR curve meets the 20 mmho circle is 0.154 wavelengths toward the generator. Therefore, the point to place the stub is 0.154 - .02 = 0.134 wavelengths toward the generator.

At this point, the admittance is 20 + j14.2 mmho, so we need to supply a shunt element of -j14.2 mmho to match the line. Note that when working in admittance, the signs of the suscep- tances are reversed with respect to impedances; that is, inductance is -j and capacitance is +j. So for our matching stub, we want an inductance. We can find the length required by going to the infinite conductance point (a short circuit) and rotating toward the generator around the periphery of the chart until we reach the -j14.2 location. Since we started at 0.25 wavelengths, the final point 0.402 wavelengths toward the generator means that the stub should be 0.402 - 0.25 = 0.152 wavelengths long. The stub thus applied will yield an impedance of .20 + j0 mmho or 50 + j0 ohms. Of course, both of these lengths are in line wavelengths. If polyethylene cable is used, the physical length will be only about 65% of free space wavelength.

Transforming from impedance to admittance is the equivalent of going from a series circuit to a parallel circuit. On a Smith Chart, it is easily performed graphically. Use a normalized chart marked unity at the center. Plot the impedance point by dividing each component by the Zo. For example, 50 - j100 would become 1 - j2. Plot the result on the normalized chart. Next, draw the VSWR circle centered on the chart and through the point. Draw the diameter through the point. Read the values at the other side of the circle and multiply the result by Yo, in this case 20 mmhos The result for the example will be 4 + j8 mmho.

The experiment

Using the transmission line setup constructed for the previous chapter, terminate the line in a 150-ohm resistor. Next, take a piece of aluminum foil about 2 inches wide, and wrap it

Continued on page 59

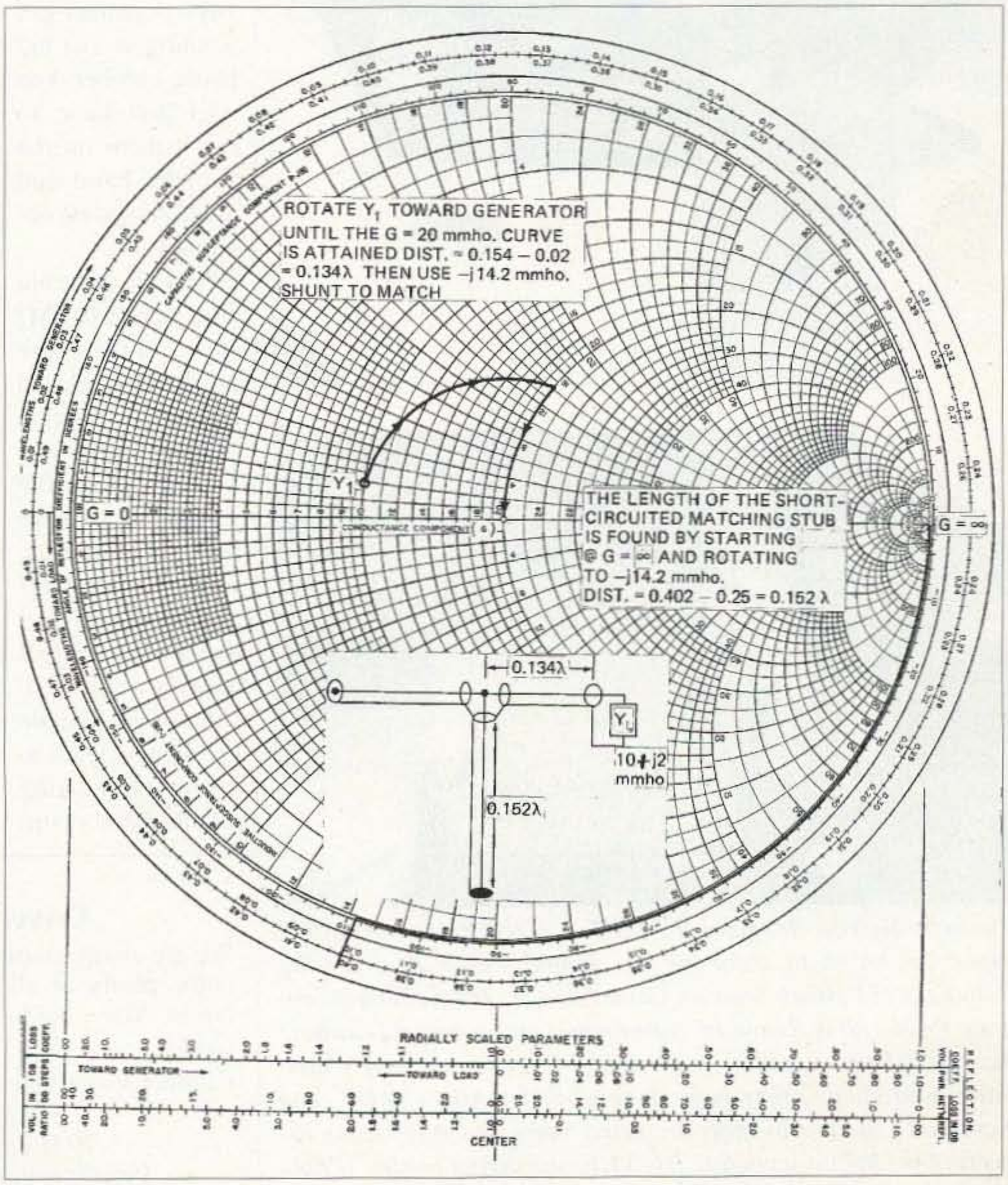

Fig. 4. *Admittance coordinates, 20-millimho characteristic admittance.*

On the Cover

Number 36 on your Feedback card

by Dave Ingram K4TWJ

On our cover, Jessica Reinhardt KD6ARA (in auto) and Allison Hanson KF6MTG (standing) show us the route to big-time FMing on a limited budget. Jessica is working South American amateurs on 10 FM with an Alinco DR-M03$_{SX}$ transceiver, while Allison checks out area 2 meter/70cm action with an Alinco DJ-V5TDC. Now, if we can get the girls to interconnect their transceivers through a pair of quick-brew VOX circuits plugged into mike and speaker sockets, we will also have a neat crossband repeater with globe-spanning range. Yes, and it will have a couple of the best-looking control ops on the band at the helm.

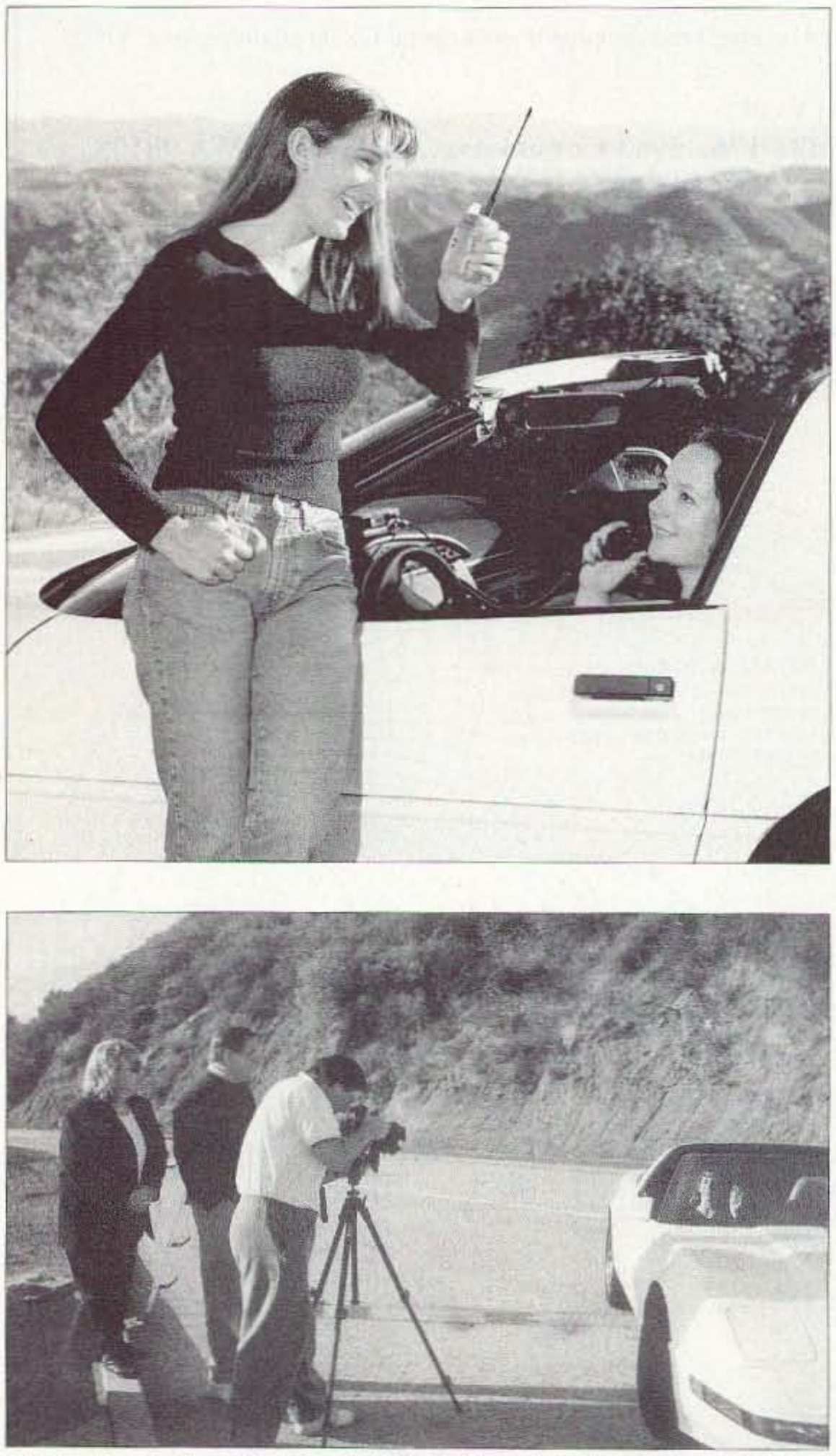

Photo A. *Melissa Reinhardt KD6BIT and Jeff Reinhardt AA6JR supervise the photo shoot for this month's cover, done by Jim Paliungas of Palimor Studios, Camarillo CA. The Reinhardts operate Reinhardt & Reinhardt Advertising, Inc., a general-purpose marketing firm located in Agoura Hills CA. Besides several non-ham radio clients, they have done work for Alinco, AOR, and Kantronics. Both principals are active hams and enjoy many aspects of the hobby, including HF, VHF, and digital modes. (Photo by Jessica Reinhardt KD6ARA)*

In this issue, you'll find a feature review of the DR-M03$_{SX}$ on page 18, and an expanded discussion on 10 FM beginning on page 39 with Steve Nowak's KE8YN/4 "On the Go" mobile column. Sorry, guys — neither girl would give out her phone number. You will just have to catch them on the air (the band and mode should be obvious)!

So what is the big attraction of 10 FM? It combines the quiet and squelched rig monitoring capabilities like those of 2 meters with the globe-spanning range of 10 meters. Since it is one MHz above usual 10 meter CW and SSB activities, the MUF (Maximum Usable Frequency) tends to favor 10 FM during regular band openings. As a result, even low power setups with simple antennas "get out" great on 10 FM. A small 10 FM transceiver is also more affordable and easier to mount in an auto than a "do-it-all" rig. Are you getting anxious to try 10 FM, gang? Terrific! Go for it!

The FM talkie Allison is holding in our cover photo also warrants favorable mention. It is a brand-new version of Alinco's DJ-V5T hand-held FM transceiver that operates 2 meters and 70cm, plus has extendable receive coverage from 76 to 999 MHz (less cell frequencies, naturally). This special DJ-V5 version is unique, as it has a clear blue plastic case so you can whip out your pocket magnifier and watch those tiny electrons flowing during operation (well, that's a good humor thought anyway!). This special version is also geared to operate on readily available "AA" alkaline cells, so batteries and/or a charger are not included — a fact that makes the little gem's price even more appealing. Who could resist such a deal!? Yes, and remember you saw it first right here in the *new 73!* 73

Photo B. *Alinco's DJ-V5.*

Cover Cash

We are always looking for high-quality color prints or slides for use on our cover. You couldn't use a little extra cash?

Contact Joyce Sawtelle at:
73 Magazine
70 Hancock Rd.
Peterborough, NH 03458

NEVER SAY DIE

continued from page 4

self-destructing, this should be one heck of a year. It's a great way to celebrate 40 years of publishing!

Yes, you can help! I'd like to hear which of our articles and columns you enjoy the most, and which the least. I'll share your votes with Dave. I hope you'll talk about *73* on the air so we can build up the readership. You can E-mail me at w2nsd@aol.com, or snail me at 70 Hancock Road, Peterborough NH 03458. Or even fax me at (603) 588-3205.

Shep

The obit for Jean Shepherd K2ORS made the NH papers. He died "of natural causes" at 78. It's a terrible shame for the world to lose a talent like Shep's. His unique radio show entertained millions nightly for 21 years over WOR. And before that from Cincinnati and Philly. His books are wonderful, and are recommended in my *Secret Guide to Wisdom* as four star stress reducers. His stories in *Playboy* won him their humor prizes two or three years in a row. His movies are great, too. I hope you've seen his movies about Christmas and the Fourth of July.

Shep and I used to get together for dinner in New York before his program, or he and his wife Joan would come out on weekends for a day on my boat. I even taught him to water ski, and we'd have evening picnics on a Jamaica Bay beach, with him telling stories.

Anyone who ever heard Shep giving a talk at a hamfest will never forget it.

But, to die at only 78! I hadn't heard from him for the last couple of years, so I didn't know he was sick, or I would have sent him a copy of my *Secret Guide to Health*. Anyone who follows my instructions isn't going to die at 78 of "natural causes." Or at 98 either. Maybe 128. So we might have had 50 more years to enjoy Shep's creative mind. We all have suffered a loss.

If you are unfortunate enough to have missed hearing Shep's radio programs, he was a humorist, along the line of Garrison Keillor and his Lake Wobegon stories. Unless your sense of humor has rusted out through disuse, you'll enjoy Garrison's books and his weekly broadcasts as much as I do.

Unlike Art Bell, Shep had no guests on his show. And no script. He just winged it, night after night, entertaining millions of his "night people." Shep talked about his childhood days in Gary, Indiana, life around the steel mills, and the foibles of his "old man," mother, and younger brother.

He made one of the top news stories of the year when he was fired by WOR. Some question had arisen about the potential for his program to sell products, so Shep asked the listeners to suggest some product he could sell, just to prove the power of his show. Someone suggested a soap bar, so Shep asked his listeners to go out the next day and buy a bar of that particular brand of soap. Every store on the East Coast was cleaned out the next day. But rather than using this as a sales tool to sell more ads for the program, the WOR management was furious that he'd promoted a non-advertiser's product and fired him. Thousands of his fans descended on the studios, down on Broadway, forcing them to hire him back to stop the riot.

Then there was Shep's great *I, Libertine* hoax. Shep had tried to find a book he wanted in a book store, but they looked the title up in the *Books In Print* catalog and said there was no such book. So Shep got even. He had his listeners write in, suggesting the title for a nonexistent book. The winner was *I, Libertine*, by Frederick R. Ewing. Shep then had his audience go into every book store they could find and ask for the book. Sure enough, within days the book was on the *New York Times* best-seller list.

So Bantam books called him and said it was time for him to write the book. Shep got together with science-fiction writer Ted Sturgeon and they wrote the book, which was an instant best-seller. That was Shep's first book.

By a coincidence, Ted's brother Peter was the chap who called me to see if I'd be interested in working with him to start an American chapter of the British group, Mensa. Peter, along with a couple other early Mensa members, met, elected me the secretary, and that's how American Mensa got started. The next few meetings were at my home in Brooklyn. Both Peter and I got fed up with Mensa politics and dropped out. Peter and I still correspond, though he is now living in Vienna.

Serendipitously, a friend found a source for tapes of Shep's radio shows from the 1965 and 1975 eras. Very reasonably priced, too, at $60 for a set of 12 90-minute tapes. Check out www.intercall.net/–jsadur/shepcat.htm for Max Schmid's catalog. For more Shep stuff, check out www.spacelab.net/–bkays/Shep.html.

We lost track of each other when I moved from Brooklyn to New Hampshire in 1962 and Shep moved from the upper east side of Manhattan to The Village, divorced Joan, put on a lot of weight, grew a beard, and enjoyed the young chick perks of stardom.

Hamfest Speakers

A letter from Dr. Robert Suding WØLMD complained: "Dayton and several other ham conventions have lost sight of the essentials. They don't advertise. They treat speakers like the convention was doing them a favor by letting them speak. Dayton used to treat speakers royally, free tickets to banquet, etc. This last year I spoke on SSTV, as usual. Only the session moderator, W9NTP, got tickets to the banquet. But it was a blessing. I heard that during the meal they had some acid rock group blasting away at 120 dB. Blew out all the moderators' hearing aids. When the band ended there was no audience! I had a nice quiet dinner

in Troy, Ohio. Will I ever talk at Dayton again? You gotta be kidding."

It is very discouraging to a speaker to take the three or four days off to speak at a hamfest or convention and then find just a few people in the audience. Why? Mainly because so few of the attendees know the speaker is speaking. A sad fact is that virtually no one takes the time to read the hamfest program book. It goes into the literature bag to be read later. A later that, unfortunately for the sucker companies who've bought ads in the book, never comes. Oh, I used to advertise in convention programs, but I didn't get any subscriptions as a result. None. I found that hams don't read program books.

Few hamfests bother to put up posters telling who is speaking, when and where, and even fewer make public address announcements. I probably made lifetime enemies in Atlanta when I reported on the last Atlanta hamfest I attended, where I counted the attendance at the various speaking sessions. It went from zero to about a dozen for most talks. And the same goes for Dayton, where it has never been easy for attendees to get speaker information.

I used to pull a couple hundred people for my talks, but I'll bet that if the Hamvention had done some serious promotion I'd have pulled a couple thousand. And there seldom was any time that the Hamvention officials made me feel appreciated or special. Last year I was invited to speak at the Peoria Hamfest and they did it right, despite their having to make do with a poor hamfest site. They paid my expenses of getting there and gave me three speaking opportunities, each with a good crowd, and made it clear that they really appreciated me coming.

I asked Shep K2ORS why he didn't give more talks at hamfests. His talks have always been class-A entertainment. He advised me to charge at least $1,000 to give a talk. He said that unless the hamfest committee has to pay for you to come, you don't get much promotion from them, nor any consideration.

So I started charging to talk at hamfests and, sure enough, when they were paying me $1,000 plus expenses, they made damned sure in their hamfest promotion that everyone knew when and where I'd be speaking. The result was packed houses.

Bob Heil K9EID, who is a real showman, did this for the hamfest he organized in St. Louis and it pulled in a huge crowd. I think Bob had over 2,000 in the auditorium that day for my talk.

Hamfests should be using ham super stars to build bigger attendance. We have hams such as Dave Bell W6AQ, Art Bell W6OBB, Ken Miller K6IR, Joe Walsh WA6AQU, and Ross Adey K6UI, who should be headlining at ham conventions. And Bob Suding WØLMD. And, most certainly, Lester Earnshaw of Kachina. There are a bunch of hams who could perk up convention attendance. Get on the stick, hamfest organizers.

I'm available if you pay my expenses, plus agree to put the $1,000 speaking fee into the hamfest promotion. I'll even come a day early if you can line up some local radio and TV talk shows for me to help promote the hamfest.

Crash?

Our stock market has been rising and rising, and this despite the mounting problems in Asia, plus less than assuring conditions in Europe. There are the continuing troubles in Yugoslavia, the drain upon a Germany trying to assimilate basket-case East Germany, the currency problems of the new European currency, and so on.

If enough people get worried about what some major catastrophe might do to our banking system and, just to be safe, withdraw a few hundred or even a few thousand dollars, that alone could trigger a panic. Or if even a relatively small number of people decided that, just to be safe, it would be prudent for them to get out of the market until they are sure that the market is stable, that would pffft everything. The stock market has always delicately balanced, with even slight emotional winds causing serious changes.

Russia is in terrible shape. China is torn between raging business growth and the increasing fear of the communist establishment that they will lose control. Indonesia is in turmoil. Japan hasn't come up with any good answers to the fundamental weakness of their banks. South Africa is crumbling. There are mini-wars and serious problems all through Africa, with no country looking like a good bet for the future. There are religious and tribal wars at every turn.

Then we have the tulip bulb–like investments in Web businesses, where rumors zoom stocks up and down like yo-yos. Bill Gates makes or loses a few billion dollars every day.

So, considering all this uncertainty and the potential for disaster, where should prudent people place their bets? Is it better to ride the wave or to bail out? Would a person do better holding stocks, cash, gold, silver, or … or what?

The stock market is at an astronomical high and way beyond sustainable prices. So, if the market starts correcting, that could trigger a sell-off, which would drive prices down even faster. And this would quickly stop people from buying anything but the basic necessities, collapsing the retailing and manufacturing sectors. And their downturn of expected profits would feed the market selling frenzy.

Housing starts, car buying, and even that newer, faster computer purchase would be put on hold.

And all that doesn't factor in the potential long-range impact of the Y2K bug. Our whole civilization is like a house of cards, with so many things being interdependent.

Campaign Reform

It ain't gonna happen, Charlie. In a review of *The Corruption of American Politic* by Elizabeth Drew in *Business Week*, she has come up with the same solution to campaign reform as I and Tom Sowell have: just stop re-electing politicians. As long as you either vote for them or don't vote at all, you are endorsing campaign corruption.

Politicians spent $532 million of your money on TV ads in the 1998 mid-term elections. Lobbyists eagerly give the pols money just so they'll be able to get to meet with them when something comes up affecting one of their clients. Lobbyists encourage politicians to threaten industries with hearings as a way to shake the money tree. This approach is called "Astroturf" by lobbyists.

But, as long as the fox is guarding the henhouse, we're not going to see any substantive changes. How many people will vote themselves a cut in pay?

The end result of this corruption is that big business interests are running the government, not ours. We're told we are living in a democracy, but that's just another scam. We dutifully vote the way they want us to with the TV political ads their money buys.

So we pay a little more for cars, steel, airline tickets, and all the products advertised on TV in order to keep thousands of lobbyists in BMWs and Congress awash in campaign money. We pay more for our schools, health care, and so on as these industries siphon part of our money into Washington. Half a trillion dollars last time. Who'll bid a trillion? We will.

Those SATs

Betcha didn't know that in the early '60s, when the student SATs peaked, less than 25% of all public school teachers had a postgraduate degree. 15% didn't even have a bachelor's degree! Twenty years later, as the SATs plummeted, more than half of all teachers had master's degrees and under one percent

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Number 39 on your Feedback card

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4
1011 Peacock Ave., NE
Palm Bay FL 32907-1371
[ke8yn@netzero.net]

10 Meter FM is Getting Hot!

Ten meters has great potential for working DX at reasonable power levels without filling up the inside of the car with equipment. It is primarily a daytime and evening band, which fits in nicely with most people's commuting schedule. The ten meter rigs that are being offered today are comparable in size to VHF or UHF mobile rigs and should be able to fit in virtually any vehicle.

Like many of you, I spend a reasonable amount of time commuting to and from work each day. Also like you, I use my drive time as an opportunity to get in a little ham radio activity. While 2 meters and 440 MHz are fun, there is only so much you can do through the local repeater. With the sunspot activity increasing, there is no doubt that HF soon will be the place to be.

Now, there are a number of ways to approach HF, with some operators sprouting a multiband antenna on the vehicle and having equipment for working all modes from RTTY to CW. This can be a tremendous amount of fun, but also can entail an equally large investment. After all, can you really compete with the kilowatt stations on twenty meters using a mobile rig? Even if you put a linear amplifier in the trunk, stacked monobanders still provide more signal than a fender-mounted vertical. There is, however, an ideal band and mode for mobile and portable operation — ten meters.

Mobiling on 10

Ten meter rigs (**Photo A**) are easy to use, often well equipped with "creature features," and remarkably inexpensive. In addition, ten meter antennas are modestly sized and can be readily mounted on any type of mount from a fender-mounted ball to a magnet mount on the roof or trunk (**Photo B**). And, as we mentioned above, ten meters is great for mobiling because the rigs can fit into almost any vehicle.

AM lives on 10

While sideband operation is the standard voice mode for the high frequency bands, ten meters provides a couple of additional options. While AM has lost a lot of popularity on many bands because of its wide bandwidth compared to single sideband, this is not necessarily true on ten meters. There have been a lot of citizens' band radios converted to ten meter use that have retained the AM mode. Generally, the AM portion of the band is between 28.965 MHz and 29.405 MHz, and there are standardized correlations for ten meter frequencies that reflect a 2 MHz conversion from CB channels.

Photo A. *Room for one more — Alinco DR-M03 mounted on top of 2m/440 and HF rigs.*

10 FM: Fantasy land!

The most interesting operating mode on ten meters is ten meter FM. If you take the best features of VHF, UHF, and HF you have an idea what ten meter FM is like. FM presents some distinct advantages. Remember that FM is different because it exhibits capture effect, which means that when more than one FM signal is on a given frequency, an FM receiver will tend to "hear" or capture only the strongest signal. While this does not eliminate all interference, it is significantly less of a problem than it is in AM or sideband operations. Likewise, FM is not as seriously impacted by atmospheric noise as are other modes. For operating 10 meter FM, 29.600 MHz and 29.480 MHz are used for direct two-way communications.

If FM is so great, why don't we use it on every band? Well, don't forget that FM does require a fairly wide bandwidth. Ten meters has the advantage of offering a reasonable range of frequencies, so there is space for wider bandwidth operations. With the ability to operate FM, you find that this is a great band for repeater operations, and this is where the fun begins. There are ten meter repeaters scattered all over this continent. Unlike VHF or UHF repeaters that serve a

***Photo B.** 10 meter antenna mag-mount on roof complements 20 meter and VHF/UHF antennas on trunk lid.*

10 Meter FM Frequencies		
29.48 MHz Simplex Frequency		
29.60 MHz National FM Simplex Frequency		
10 Meter Repeaters		
Input (MHz)	**Output (MHz)**	
29.52	29.62	
29.54	29.64	
29.56	29.66	
29.58	29.68	
ARRL 10 Meter CTCSS Plan		
Call Area	**Tone 1**	**Tone 2**
W1	131.8	91.5
W2	136.5	94.8
W3	141.3	97.4
W4	146.2	100.0
W5	151.4	103.5
W6	156.7	107.2
W7	162.2	110.9
W8	167.9	114.8
W9	173.8	118.8
WØ	179.9	123.0
VE	127.3	88.5

***Table 1.** Copy-and-clip 10 meter frequency chart.*

single area with a radius of fifty miles or so, these *10 meter FM repeaters serve the entire world.* From my car using a magnetic mount antenna and 10 watts while driving along the east coast of Florida, I can hit repeaters from Puerto Rico to Boston. Stations with more power and a better antenna can hit the same repeaters from virtually anywhere. It is not uncommon to hear a mobile in the U.S. working DX stations throughout Europe, Australia, or other exotic locations — one right after another.

The 10 FM bandplan

Most ten meter repeaters are set up in a fairly standard fashion with an input frequency offset from the output frequency. Standard offset for the input is 100 kHz down from the output, so a repeater that transmits on 29.62 MHz would receive signals on 29.52 MHz. The standard output frequencies for ten meter FM are 29.62, 29.64, 29.66, and 29.68 MHz, with the input frequencies down 100 kHz (29.52, 29.54, 29.56, and 29.58 MHz, respectively.) A "copy-and-clip" chart of this is given in **Table 1**.

Tones on 10 FM

With only four frequency pairs, you might expect that there could be a problem with interference between repeaters. In most cases, this will not be an issue due to the differences in propagation — more on that later.

However, as with repeaters on the frequencies, it is possible (and very easy) to use CTCSS, sometimes called PL tones. This technique uses a low frequency tone that is transmitted along with the carrier. The tone is set for a given repeater to prevent interference from signals on the same frequency aimed at other repeaters. In actuality, however, the CTCSS tones may be more of a hindrance than a benefit since propagation will determine which repeater you will hit.

In 2 meter FM, the signal is line-of-sight from your antenna to the repeater. In 10 meter FM, some people may have the ability to contact the repeater by ground wave, but most of us will have our signal bounced between the Earth and the ionosphere one or more times before it hits the repeater. Since the ionosphere reflects differently depending upon the time of day and the conditions dictated by the 11-year sunspot cycle, the point at which the signal returns to Earth will often determine which repeater is available.

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CALENDAR EVENTS

Number 41 on your Feedback card

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

JAN 8

LOVELAND, CO The Northern Colorado ARC will host their Superfest from 9 a.m.–3 p.m. at the Larimer County Fairgrounds, 700 Railroad Ave. VE exams, commercial exhibits, computers, radios and more. Reserve tables from *Michael Robinson N7MR, (970) 225-7501; or [michael@frii.com].* Talk-in on 145.115 (-100 Hz) or 146.52. For detailed information, see the Web page at *[www.info2000.net/~ncarc].*

JAN 9

SOUTH BEND, IN The Michiana Valley Hamfest Assn. will sponsor the 23rd Annual South Bend Hamfest & Computer Expo, Sunday, Jan. 9th, 2000 at 8 a.m–3 p.m., downtown at the Century Center (US Bus 31 North at Jefferson Blvd.). There will be a large flea market featuring manufacturers, dealers and swappers of amateur radio equipment and computer hardware/software. Setup Sunday at 6 a.m. Talk-in on 145.290(-). 5 ft. round tables are $5 each; 8 ft. rectangular tables $15 each.; 8 ft. rectangular wall tables $20 each. Advance tickets $4 each. Electric power $26.25. Make check or MO payable to MVHA and mail to *Michiana Valley Hamfest Assn., 21970 Kern Rd., South Bend IN 46614.* For info or ordering, please send business-size SASE. Contact *Denny KA9WNR, M–F 7 p.m.–10 p.m. EST at (219) 291-0252.*

JAN 15

ST. JOSEPH, MO The 10th annual Northwest Missouri Winter Hamfest will be held on Jan. 15th, 8 a.m.–3 p.m. at the Ramada Inn in St. Joseph. There will be special room rates for hamfest participants. The motel is located at I-29 and Frederick Ave. (exit 47 on I-29). Talk-in on 146.85 and 444.925. VE exams, major exhibitors, and flea market all indoors. Free parking. Admission $2 each or 3 for $5 in advance; at the door, $3 each or 2 for $5. Swap tables 6 ft. by 2.5 ft. are $10 each for the first two tables, 3 or more for $20 each. This includes two chairs and a ticket. Commercial exhibitors welcome, write for details: *Northwest Missouri Winter Hamfest, c/o Dick Merrill KCØAMY, P.O. Box 1533, St. Joseph MO 64502; or call (816) 279-2304.*

JAN 16

HAZEL PARK, MI The Hazel Park ARC will hold their 34th Annual Swap & Shop at the Hazel Park High School, 23400 Hughes St., Hazel Park MI. Open to the public 8 a.m.–2 p.m. General admission is $5 in advance or at the door. Plenty of free parking. Tables are $14 each and reservations for tables must be received with a check. No reservations by phone. Talk-in on 146.64(-) the DART reptr. For more info about the swap, tickets or table reservations mail with an SASE to *HPARC, P.O. Box 368, Hazel Park MI 48030.*

RICHMOND, VA The Richmond Amateur Telecommunications Society (RATS) will hold Frostfest 2000 at the Showplace-3000 Mechanicsville Tpke., Richmond VA. From I-95, Exit 75 to I-64 East, then Exit 192 (Rt. 360 East); go 1/2 mi. on left. Open 8:30 a.m.–3:30 p.m. Handicapped accessible. Talk-in on 146.88. There will be indoor dealers, a flea market, and forums. Admission $6. Call *(804) 330-3165 for reservations; or write Frostfest 2000, P.O. Box 14828, Richmond VA 23221-0828.* For general info, call *(804) 739-2269, Box FEST.* Visit the Web at *[http://frostfest.rats.net].*

YONKERS, NY The Metro 70 cm Network (WR2MSN) will present their Computer and Electronic Flea Market at Lincoln High School, Kneeland Ave., Yonkers NY, starting at 9 a.m. Vendor setup at 7 a.m. Free parking. Ad- mittance is $6; under 12 years free. Talk-in on 440.425 PL 156.7; or 146.910 PL 114. Vendors should call *WB2SLQ after 7 p.m. at (914) 969-1053; or E-mail [Wb2slq@juno.*

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Calendar Events

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com] to register. This show will be held all-indoors.

JAN 23

BABYLON, NY A special day of education for amateur radio will be held on Long Island on Sunday, Jan. 23rd, 2000. This event will include technical forums on all aspects of amateur radio. It is not a flea market or hamfest. There will be no items for sale. Some of the forums will be on license restructuring, antennas, DXing, contesting, purchasing amateur radio equipment, packet, FLEXNET, ARES, APRS, satellite communications, and QRP (low power). There will also be a YL forum on issues concerning women amateur radio operators, and even more forums for everyone. In addition, there will be information booths for all the participating amateur radio clubs in the New York City/Long Island area, as well as booths for the ARRL, QCWA, a tune-up clinic and DXCC/WAS card checking. The event is "Ham Radio University 2000" and will be held Sunday, Jan. 23rd at the Babylon Town Hall Annex on Phelps Lane in Babylon NY. It will be open to the public 9 a.m.–3 p.m. Donation $2.00. Spouses, and children under 12 will be admitted free. Ample free parking. For more info contact *Phil Lewis N2MUN at [lewisp@hazeltine.com] or call (516) 226-0698.* The talk-in will be on the Great South Bay ARC repeater on 146.685, 136.5 PL.

JAN 30

DOVER, OH The Tusco ARC Hamfest will be held at the Ohio National Guard Armory, 2800 North Wooster Ave., Dover OH. Exit Interstate 77 at Exit #87 (Strasburg). Turn right at the exit stop sign, heading south on County Road 74 to the first traffic light. Continue through the traffic light intersection. The armory is on the right. Talk-in/check-in on 146.730(-). Admission is a $3 donation at the door. Dealers admitted at no charge. Tables are $10 each. The building opens at 6 a.m. for setup and will be open 8 a.m.–1 p.m. for the public. Food will be available on site, and after 7 a.m. at the restaurant next door. An ARES forum will also be featured. For more info and to reserve tables, contact *Billy L. Harper KB8CQG, P.O. Box 80407, Canton OH 44708. Tel. (330) 484-4634; Fax: (330) 484-4683; E-mail [bharper@neo.rr.com].*

ODENTON, MD The Maryland Mobileers ARC of Glen Burnie MD will host a Post Holiday Hamfest at Odenton Vol. Fire Dept. Hall, 1425 Annapolis Rd. (Rte. 175), nine miles east of I-95. Indoor flea market, no tailgating. Free VE exams (pre-register with *Jerry Gavin NU3D, (410) 761-1423).* Free parking. Talk-in on 146.205/.805. Tables in advance. Contact *Bill Hampton N3WGM, 7609 McGowan Ave., Glen Burnie MD 21060; or call (410) 766-2199;. E-mail to [diamondb@space4less.com].* Visit the Web site at *[www.space4less.com/usr/mmarc].*

FEB 5

NORTH CHARLESTON, SC The 27th Annual and Original Charleston Hamfest and Computer Show will be held at Stall High School in North Charleston, 8:30 a.m.–4 p.m. Setup Fri., Feb. 4th, 5 p.m.–9 p.m.; Sat., Feb. 5th, after 6:30 a.m. The school is located near I-26 and Ashley Phosphate Rd. Several malls nearby. Talk-in on 146.790(-), (the WA4USN linked repeater system aboard the *USS Yorktown*), and the 145.250(-) repeater near Summerville. Other area repeaters are 147.180(+), 146.940(-), 147.270(+), 147.345(+), 146.760(-), 147.150(+), and 443.800(+). Tickets $5 at the door on Saturday morning (1 prize ticket included). Additional prize tickets are $1 each or 6 for $5. Children under 12 admitted free. 8 ft. tables $8 in advance, $10 at the door, as long as they last. Make check payable to C.A.R.S. Hamfest Committee, and mail with an SASE to *Jenny Myers WA4NGV, 2630 Dellwood Ave., Charleston SC 29405-6814.* VE exams will be given on site. Please bring an original and copy of your Social Security number, amateur license, any CSCEs you have, and two IDs, one with a photo. All testing will be on a walk-in basis and will begin at 12 noon. For more info call *Ed KE2D at (843) 871-4368, or E-mail [efrank@charleston.net]; or call Doc W4MUR at (843) 884-5614.*

FEB 6

LORAIN, OH The Northern Ohio ARS will sponsor Winterfest 2000 at Gargus Hall, 1965 N. Ridge Rd., Lorain OH. Mobile check-ins and directions will be provided on NOARS repeaters 146.700(-) and 444.800(+). All indoor commercial space, reservations required. 6 ft. tables are $10 each. All workers require an admission ticket. Setup for vendors begins at 6 a.m. Doors open to the general public at 8 a.m. Tickets $5 at the door. For more info contact *John Schaaf KC8AOX at (216) 696-5709;* or write *NOARS Winterfest, P.O. Box 432, Elyria OH 44036-0432. E-mail to [noars@qsl.net].*

FEB 7

SUN CITY, AZ The West Valley ARC will hold an amateur radio equipment auction at St. Clement of Rome Catholic Church Social Hall, 15800 Del Webb Blvd., Sun City AZ (1/2 mile S of Bell Rd.). Free admission. The club keeps 10% on equipment sales. Talk-in on 147.30(+). Contact *Fred KC5AC at (623) 214-7054; or E-mail [kc5ac@arrl.net].*

FEB 11–13

ORLANDO, FL The Orlando ARC will sponsor the 53rd Orlando Hamcation Show and the ARRL State Convention, at the Central Florida Fairgrounds, located on Rt. 50 Colonial Dr., 3 miles west of I-4. Open Fri., Feb. 11th, 5 p.m.–9 p.m.; Sat., Feb. 12th, 9 a.m.–5 p.m.; and Sun., Feb. 13th, 9 a.m.–3 p.m. Over 150 commercial booths, over 400 swap tables. RV camping with elect. and water, $16 per night in advance or $20 at the gate. Admission $7 in advance or $9 at the gate. Commercial booths $225, swap tables $35 in advance or $45 at the gate. Tailgate $25 in advance or $35 at the gate. Price is for three days. Setup Fri., Feb. 11th, 9 a.m.–4 p.m. Talk-in on 146.760(-). VE exams, must register in advance. Call *Gil Lineberry at (407) 843-4112.* You can join the foxhunt by registering by 4 p.m. at the info booth. Seminars, lectures, demonstrations, and special guest speakers. Check the Web site for up-to-date info at [www.oarc.org/hamcat.html]. Contact *Ken Christenson, 5548 C Cinderlane Pky., Orlando FL 32808; tel. (407) 291-2465; or E-mail [KD4JQR@arrl.net].*

FEB 12

RENO, NV The Reno Millennium Hamswap and Sale will be sponsored by the University of Nevada Radio Pack Club. This event will be held at KNPB Channel 5, 1670 N. Virginia St. in Reno starting at 8 a.m. Bring your out-of-use equipment from garage and shack. There will be ample parking and no admission or table cost. Bring your own table. Talk-in on the W7UNR rptr. 145.29(-) split; the RAMS rptr. 147.06(+) PL 123; and 444.800(+) PL 123. A raffle, coffee and donuts will be available at the swap. E-mail *Gary K7VY at [k7vy@arrl.net]; or Glen KK7IH at [kk7ih@arrl.net].*

FEB 13

MANSFIELD, OH The Mansfield Mid*Winter Hamfest and Computer show will be held Sun., Feb. 13th at the Richland County Fairgrounds in Mansfield. Doors open to the public at 7 a.m. Tickets are $4 in advance, $5 at the door. Tables are $10 in advance, $12 at the door, if available. Advance ticket/table orders must be received and paid by Feb. 1st. For additional info on advanced tickets or tables, send SASE to *Pat Akerman N8YOB, 63 N. Illinois Ave., Mansfield OH 44905; or tel. (419) 589-7133.* For talk-in call W8WE on 146.34/.94.

FEB 19

ELMIRA, NY The Amateur Radio Assn. of the Southern Tier will present its 19th Annual Winterfest, Saturday, Feb. 19th, 8 a.m.–3 p.m. at the Elmira College Murray Athletic Center Domes, on NYS Rte. 14, 5 miles north of Horseheads NY. Talk-in will be on 146.700(-). There will be dealer displays of new equipment, and a huge indoor flea market. Breakfast and lunch will be served on the premises. Admission is $5 at the door; children

10 and under are admitted free. VE exams start at 9 a.m., walk-ins welcome. For dealer and table rental inquiries, contact *Gary N2OKU at (607) 739-0134.*

OBERLIN, PA The Harrisburg RAC will present their 2000 Winter Hamfest at the Citizens Fire Company of Oberlin, Saturday, Feb. 19th. Directions: I-283 to Swatara/PA-441 Exit #1. Turn north onto PA-441 (toward Bob Evans Restaurant). Turn left at traffic light onto Eisenhower Blvd. Turn right at the next traffic light, remaining on PA-441. Turn right at stop sign. The Fire Hall is 0.2 miles on the right. General admission $3 (XYLs, harmonics free). Inside tables $8 each. Tail-freezing tailgating $1 per space. For table reservations contact *Dick Bordner N3NJB, 2501 South 2nd St., Steelton PA 17113. Tel. (717) 939-4825; or E-mail [N3NJB@aol.com].* See the Web site at *[http://hrac.tripod.com].*

RICKREALL, OR The Salem Repeater Assn. and the Oregon Coast Emergency Repeater, Inc., will present the 2000 Salem Hamfair, Saturday, Feb. 19th at the Polk County Fairgrounds in Rickreall, 9 a.m. until the end of the 3 p.m prize drawing. Pre-registrations post marked by Feb. 4th will receive an extra door prize ticket with each registration. For answers to Hamfair pre-registration questions, call *Evan Burroughs N7IFJ at (503) 585-5924; or E-mail to [n7ifj@teleport.com].* Parking for self-contained RVs on the fairgrounds is just $10 per night per RV. Indicate which nights you wish to park and include the fee with your hamfair registration. Talk-In on 146.86(-). Commercial venders will include Icom, Ham Radio Outlet, StarFire Tech, Capital Engraving, Radio Depot Emergency Communications Supply, and many more.

FEB 20

FARMINGTON HILLS, MI The Livonia ARC will hold its 30th annual Swap 'n' Shop Sunday, Feb. 20th, 8 a.m.–12 noon at the William M. Costick Activities Center, 28600 Eleven Mile Rd. (between Middlebelt and Inkster Rds.) in Farmington Hills. Talk-in on 144.75/5.35. For info, send a 4 x 9 SASE c/o *Neil Coffin WA8GWL, Livonia ARC, P.O. Box 51532, Livonia MI 48151-5532;* or call the club phone line at *(734) 261-5486.* The club Web page is at *[www.larc.mi.org].* Send E-mail to *[swap@larc.mi.org].*

FEB 26

LA PORTE, IN The LPARC Cabin Fever Hamfest will be held at the La Porte Civic Auditorium, 1001 Ridge, 7 a.m.–1 p.m. Chicago time. Admission $5. Tables $5. Talk-in on 146.520 and 146.610(-) PL 131.8. For more info contact *Neil Straub WZ9N, P.O. Box 30, La Porte IN 46352. Tel. (219) 324-7525; E-mail [nstraub@niia.net].*

MILTON, VT The Radio Amateurs of Northern Vermont will sponsor the Northern Vermont Winter Hamfest and ARRL Vermont State Convention, 8 a.m.–3 p.m. at Milton High School, Route 7 in Milton (5 miles north of I-89 Exit 17). Talk-in on 145.15 rptr. Features include a flea market, forums, auction, dealers, book sales, exhibits and refreshments. Admission is $3, free for under 18 years. Tables are free while they last. For large setups, call *W1SJ at (802) 879-6589, or E-mail [w1sj@ arrl.net].* The Web site is at *[http://www. ranv.together.com].* VE exams will be given at 9 a.m. and 2 p.m.; commercial exams at 2 p.m.

FEB 27

ANNANDALE, VA The Vienna Wireless Society's 24th Annual Winterfest will be held at the Annandale campus of Northern Virginia Community College. Coordinates: N38 49.96'; W77 14.28'. From the Capital Beltway, take Exit 6 West, turn left onto Wakefield Chapel Road; after 0.2 mile, turn left. The indoor area opens at 8 a.m.; tailgating area opens at 6 a.m. Talk-In on 146.31/.91. Admission $5, XYLs free. Tailgating $10. DXCC field checks. For info phone *Jim WA4LTO, (703) 392-0150; E-mail [k3mt@erols.com].* Visit the Web at *[http://users.erols.com/k3mt/vws]* for more info. VE exams at 8 a.m. sharp.

CUYAHOGA FALLS, OH The Cuyahoga Falls ARC, Inc. will sponsor their 46th Annual Hamfest, Electronic and Computer Show, Sunday Feb. 27th, 8 a.m.–2 p.m., at Emidio's Party Center, 48 E. Bath Rd. at the corner of State Rd., Cuyahoga Falls. For more details contact *Carl Hervol, Hamfest Chairman, (330) 497-7047;* or send E-mail to *[carlh@ pop.raex.com].*

HICKSVILLE, NY The 2000 Long Island Mobile Amateur Radio Club Winter Hamfest will be held at Levittown Hall, 201 Leavittown Parkway, Hicksville, east of the Wantagh Parkway (Exit W2 East), 1/2 mile south of Old Country Rd. on Levittown Pkwy. Talk-in on W2VL 146.85 rptr. PL 136.5. Open to the public 9 a.m. Sunday Feb. 27th. General admission $6, children under 12 free. Free parking available. Vendors, all spaces $25 each, each space includes one 6 ft. table and admits one person. Advance registration only, no tables sold at the door. Send check to *LIMARC, P.O. Box 392, Levittown NY 11756-0392.* Contact *Hamfest Chairman Eddie Muro KC2AYC at (516) 791-7630 or [hamfest@limarc.org].* Features include amateur radio equipment, CB equipment, TV, VHF tune-up clinic, computers, ARRL information, and ham equipment dealers.

MAR 4

KNOXVILLE, TN The Shriners of Kerbela ARS will sponsor their annual Hamfest at Kerbela Temple, 315 Mimosa Ave., Knoxville TN, 8 a.m.–4 p.m. Admission is $5. Indoor vendor tables are $8 each plus admission of $5. Setup Friday 4 p.m.–8 p.m.; and Saturday 5 a.m.–8 a.m. Overnight security will be provided. Talk-In on 144.83/145.43 or 146.52 simplex. Smoking indoors is permitted in designated area only. Contact *Kerbela Amateur Radio Service, Kerbela Temple A.A.O.N.M.S., 315 Mimosa Ave., SE, Knoxville TN 37901.* 73

Say you saw it in *73!*

VHF and Above Operation

Number 44 on your Feedback card

C. L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119
[clhough@pacbell.net]

Noise and Its Amateur Implications

Noise in its broadest terms is something we are all familiar with. Noise from mechanical devices, electrical devices, and all sorts of things all add up to make noise a part of our everyday life. Noise from the dog at 3 a.m., noise even from our grandchildren at play can really make you wish you could turn down their amplifier and have some peace and quiet. While turning down the noise source is a good idea, it's not possible in the modern world (electronically speaking) that we live in. Unfortunately, we must confront head-on the contributions of noise produced by all the technology that we have become accustomed to using.

The real fight for survival is inside our equipment and in the design of devices to counter this noise problem. While I don't want to go into noise blankers and other receiver noise circuits, I do want to take a slightly different tack and go into identifying the noise sensitivity of receiving systems and preamps in general. What is interesting to note is that all receivers contribute noise to the receiving system, with some better (less noise) than others. This internal noise product is what we are examining in receiving systems, be it a preamp or receiver. We want to identify just what inherent noise each component amplifier part is capable of supporting. Eliminating noise completely is not possible, as all devices make or generate noise as a function of current flow. While other devices try to selectively sort through this noise and pull out real signals, adjusting first stage amplifiers for minimum noise figure produces the best results.

That's the real topic for radio amateurs — pulling very weak signals out of the gobbledygook we all refer to as "noise." I am sure if we listen to noise long enough we can even make a contact with some rare callsign. Humor aside, we all have listened for long times to find weak signals, both real and imaginary, trying to fish a contact out of the noise while searching up and down the band adjusting our antenna and peaking our receiver for best performance.

Noise is what we hear when we unsquelch our handhelds or listen to a high frequency receiver — it's all noise, at least until a real signal hopefully comes roaring through. We can take a signal generator and examine almost any receiver to find out its minimum sensitivity in microvolts and how much gain it gives, but this does not give a true picture of the system performance. What is needed is a measurement of noise figure.

Noise figure is a ratio used to rate each system or component amplifier of a system. The lower the noise figure number you can obtain, the better your system will be able to pick a very weak signal out of the external noise. There is, however, a requirement that the weak signal you expect to find is higher in level than the ambient or external noise. In other words, if the signal you want is on even par with elevators, generators, and automobile ignition systems (to mention a few contributing noise sources), there is not much that will allow you to receive a workable signal. Even the neighbor's Mixmaster can wipe you out with noise and make your receiver unworkable, at least until the cake mix is finished.

Remembering back to my HF days as a Novice, I was always adding on to my HF receivers' adjuncts to improve sensitivity and performance without having test equipment to evaluate just what improvements my system was capable of detecting. In those early days I did not realize that the HF receivers, hot as they were, did not need much improvement as far as noise figure was concerned, as the external noise was so great there was little that could be done to improve the receiver to overcome it. To be able to copy signals that are below this threshold ("signals below the external noise floor"), other special techniques are required.

My first noise meter was a simple diode noise source serial #2, a prototype found at a local surplus store. It was used to evaluate military receivers from 1 to 400 MHz. Or rather, instead of testing them, it was supposed to be used first when the receiver was new to make a noise reference meter reading and record it for maintenance checks. It was then used to test all receivers of a specific type, and at a specific frequency have a meter reading of, say, 5–7 on the reference scale. If it went to a larger number, the receiver was getting numb and needed service. What a neat device for a quick evaluation confidence check of a system receiver, as it did not require extensive calibration. (This was for AM, CW, and SSB receivers only. It will not work for FM.)

Later on, the pursuit for better noise figure (without the capability of measuring it) was hot underway. Operation on 2 meters and above was all the rage. First came the Gonset Communicator (a tube radio) and its RF amp, a 6BQ7 with a NF of 7 dB or so at 2 meters. New improvements came on, as the Nuvistor touted then as sort of a solid state miniature tube (the 6CW4) with a NF of about 3 to 4 dB. To really get the best noise figure at this time, the ultimate at 2 meters was the historic Western Electric 416B gold-plated lighthouse tube. Noise figures in the 1 dB range were at hand, but at a price — that being a supply of pressurized air to prevent the glass seals from cracking from tube heat. Not to mention a high voltage DC power supply for the 416B and its $50 price tag.

Then entered the solid state transistors from Texas Instruments called the TIXM05 and its family of devices that equaled the 416's 1 dB NF and was solid state and about

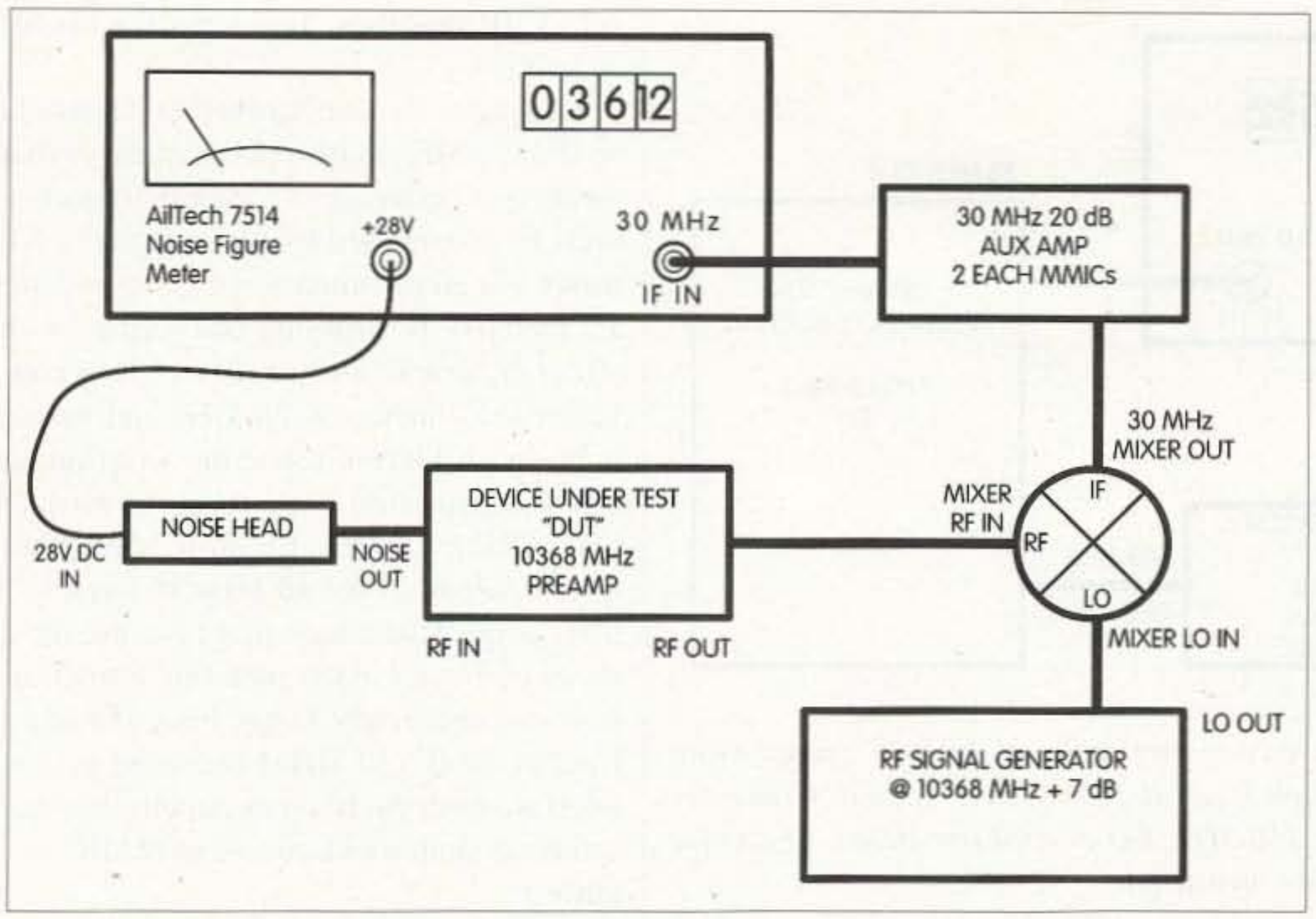

Fig. 1. *Ailtech 7514 noise figure meter connected to noise head. Noise head produces RF noise to input of "DUT" (Device Under Test) preamplifier and is converted with an external signal generator and microwave mixer to 30 MHz, the IF frequency of the 7514 noise figure meter. A small 10 to 20 dB amplifier is required to overcome the loss due to mixing conversion loss. 30 MHz preamp can be constructed with 2 stages of most any MMIC amplifier.*

1/20 of the tube's weight. Believe it or not, while looking through the junk box that I build from, I located several TIXM0 devices still in their original package. What a find — I had forgotten all about them lying in the junk box from the late '60s. (I should start a radio sideshow of old and interesting devices.)

Since in those days science in general exploded, with 1 dB noise figure at 2 meters came improvements holding the NF to below 1 dB but at increasing frequencies with bipolar devices and then GaAsFET devices. Not to just 1 GHz but into the very microwave region that I love to play in today. Obtaining a 1 dB NF preamp at 10 GHz is nothing today with modern FETs. What is left after constructing such a preamplifier or system is the adjusting and measuring that is required to obtain best adjustment and lowest noise figure (NF). What a comparison to the early 2 meter struggling for a modest noise figure with tubes before transistors and FETs.

Just for fun and to demonstrate how good material is today, I bandsawed a Qualcomm 12 GHz Low Noise Amplifier (LNA) out of a major assembly, put isolation capacitors and two coax connectors on the preamp, and took it to the NF measurement at Microwave Update 1999 in Plano, Texas. It measured at 10368 MHz 27 dB gain, and a 2.13 dB NF out the chute with no prior testing or adjusting by me after sawing the unit out of a much larger component. Compare that to my efforts quite a few years ago with tubes and the first transistors, and you can see that we have come a long way as amateurs, and in electronics in general.

What, then, are the noise improvements that need to be made to a preamp or circuits to make them better and allow weaker signals to be received using the same device and circuit such as my amp described for 10 GHz? The procedures are the same for any frequency, be it 1 GHz or 10 GHz. Only construction and circuit size gets smaller and smaller as frequencies increase, making them more difficult to cope with as circuit size diminishes. Tools shift from longnose pliers and wire cutters to tweezers and Xacto knives. Also, it is necessary to employ a noise figure meter to properly evaluate the circuit for best adjustment for lowest noise figure. The noise figure test equipment must be utilized to make this adjustment. While the preamplifier under test in this example exhibits good gain, minor readjustments in device drain current and bias voltage, with small circuit parameter changes in capacitance and inductance, can turn a functioning preamp into an excellent-low-noise-figure preamplifier.

Well, what does this magical device, the noise figure meter, have that is so special? First, it must have a source of noise, a diode noise source that is calibrated to a specific power in dB (rated in dB or called ENR, excess noise) over a specific frequency range. These specifications are usually labeled on individual noise heads. Its power is called Noise Source Excess Noise. One commercial noise head I have came with a Sanders 5400B noise figure meter (military surplus). This noise head is rated at 25.5 dB (ENR) excess noise from 1 MHz to 18 GHz and flat to within ±.75 dB. That's a lot of noise output power, and if you connected the full unattenuated power of this noise head into a somewhat numb 10 GHz or less frequency receiver, it would jump and take notice. The reaction would be the same as putting 100 microvolts from a signal generator into a receiver that is sensitive to 5 microvolts — that's an S-9+++ signal capable of turning any receiver upside down.

To really find out what is going on, we have to attenuate the noise head power to lesser and lesser levels of noise power and see what the receiver's reaction is, and then calculate the difference between the noise head's noise and no noise at the output of the receiver. The output of the IF amplifier or audio output is coupled to the noise figure meter to make this measurement. What is going on is that the NF meter is pulsing DC power at a 1 hertz on/off rate to the diode noise head. This produces a signal of noise pulses alternating between noise on and noise off. The detector circuit in the noise meter measures the difference between noise on and noise off to produce a reading in dB that is expressed as noise figure. In the noise off state, the ambient noise of the system is measured, and this base line value is compared to the noise on reading. This comparison expresses the true noise figure of the device or converter in dB. The lower the number the better the system amplifier. Adjustments to the amplifier can be made at this time to improve the noise figure readings.

Using a noise head with 25.5 ENR means that noise figure of better than 20 dB can be measured. By modern standards this is quite numb for systems up to 24 GHz. What is done to make lower readings of noise figure possible is to attenuate the noise head power to a lesser value in dB with a 10 or 20 dB attenuator. For a 10 dB attenuator 10 to 20 dB NF can be measured; this might be a starting point for first cut alignment. However, for serious measurements an attenuator of 20 dB is used to make a reading of less than a 10 dB NF. While the Sanders 5400B is an early surplus NF meter, it is not capable of stable sub–2 dB measurements. This is still not to scoff at, as it still

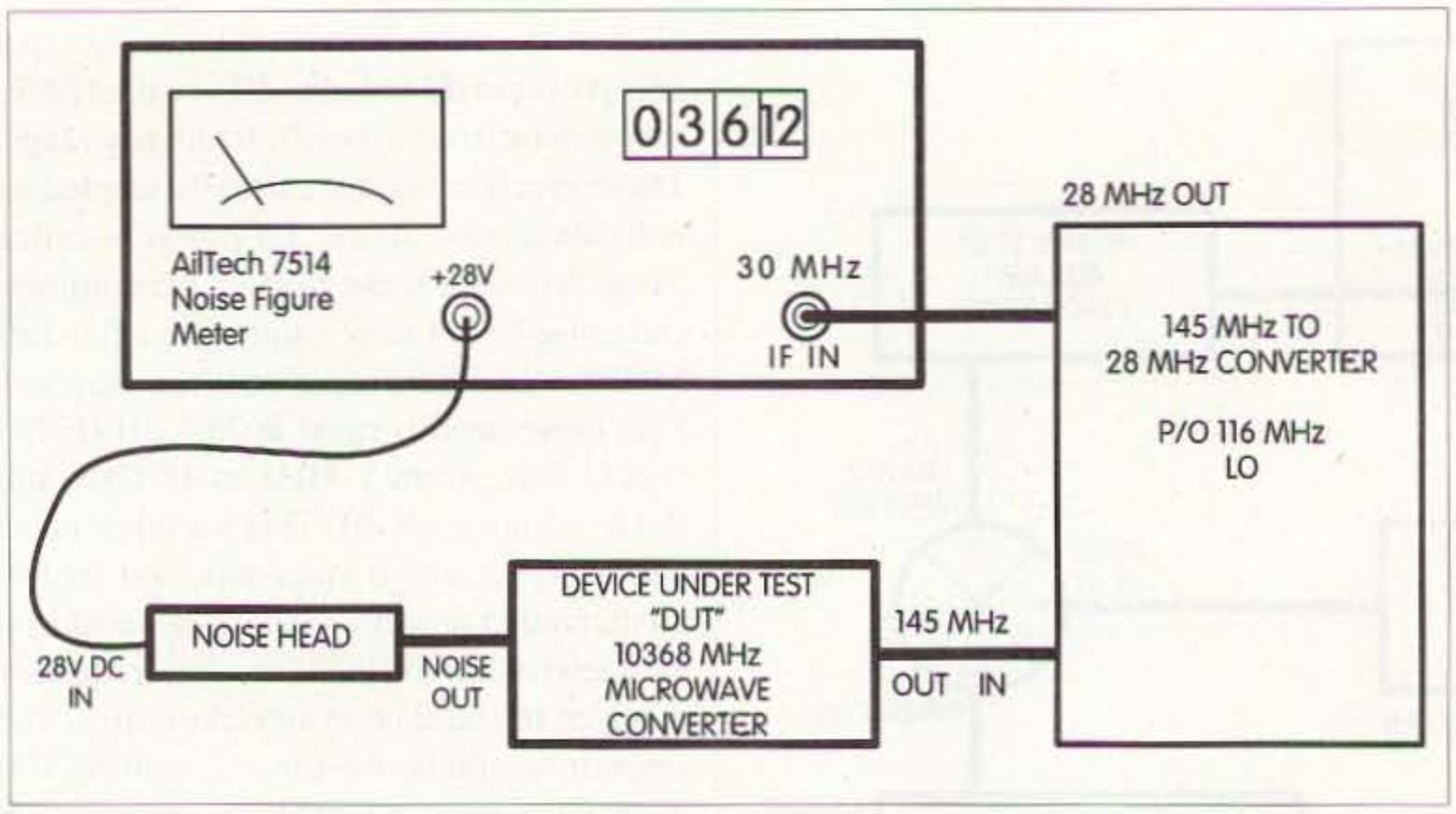

Fig. 2. *Noise figure meter testing a microwave converter with 145 MHz IF output. Gain not required at 30 MHz, as converter has high level at 145 MHz IF output. Converter from 145 MHz–28 MHz uses RF mixer and 116 MHz LO crystal oscillator. The noise figure of the microwave converter is now being measured.*

can provide meaningful measurements and reasonably good results.

The noise head used in this system is not cheap either, as a good noise head to 18 GHz can run from $400 at used surplus dealers to $1300 new. Keep your eyes open, as they can be had at swap meets for $1 after they are separated from their cables and meters. It seems that most external devices, probes and such, seem to migrate in surplus from the devices that they are used with, making them an orphan item possibly available in unexpected places — especially if you can spot a bargain.

While the Sanders NF meter is quite versatile, it accepts IF frequencies from 10 to 300 MHz — or video input from sources such as the speaker audio jack — to a real wideband video output source. While it is versatile in these applications, it falters in the sub–2 dB noise figure measurements. It's kind of like having a Ford or Chevy while wanting a Ferrari. Well, enter the next level: the Ailtech 7510 through 7514 NF meters. I was able to pick up an Ailtech 7514 meter and NF head that allows RF frequencies to be measured from 1 to 12.4 GHz, and NF measurements to sub–1 dB readings. Just what the doctor ordered.

This meter has one liability, as it has only an IF at 30 MHz as its input frequency. That means that a converter for your IF frequency must be constructed to interface to the NF meter. For all my microwave systems, I use a 2 meter IF for transmit and receive with all converters, so all I need is a 1960s converter for 2 meters to 28 MHz and we are in business. I haven't tried the setup yet, as I'm still gathering parts to put it all into play. Using 28 MHz for an IF should not be a problem, as the 30 MHz IF input is 5 MHz wide. That means that I can use the 2 meter converter in the junk box transistorized and near ready-to-go. I have to add a filter at the IF (30 MHz) and some gain to interface with the IF input circuits, but that can be as simple as a couple of MMIC amplifiers.

There is version -09 for the 7514 NF meter that offers selectable IF frequencies for a great variety, but 2 meters is not one of them. Just a simple mixer local oscillator at 116 MHz and IF preamplifier and filter for 30 MHz is all that is required. Nothing special, as the preamp or microwave converter to the 144 MHz frequency range is the main noise figure determining element in the noise figure measurement. The subsequent stages contribute to the overall NF reading but to a much lesser degree than the first stage device.

I am in the process of building and modifying the converter for the NF meter and will let you know how it goes. Right now I am collecting parts and putting together the full system for bench use. We will finish up this topic next month, with great expectations of having the full noise figure system in operation.

Well, that's it for this month. If there are any questions, drop me a note at my E-mail address. Best 73, Chuck WB6IGP. 73

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Low Power Operation

Michael Bryce WB8VGE
SunLight Energy Systems
955 Manchester Ave. SW
North Lawrence OH 44666
[prosolar@sssnet.com]

The Lure of QRP

Well, what did you get this year for Christmas? Another set of finals for the SB220? Well, it's a New Year and a new century and time to change your thinking. Have you ever tried QRP? Just about anyone can chase DX with a 100-watt microprocessor-controlled transceiver. Try it with only two watts! That's the challenge of QRP. There's nothing like working a rare DX station with one watt to sharpen your operating skill. Of course, there's much more to QRP than DXing with low power.

QRP is more a state of mind than some thing you can touch with your fingers. QRP is relative, too. It all depends on how you look at things if you're running QRP or not. Basically, QRP is one of the many "Q" signals. QRP means to reduce your power. You could tell the other station to QRP just as you would say QRS to the same station.

Since QRP really means only to reduce power, you would be correct if you switched from running the SB220 to the 100 watts from the transceiver. And, you could say with a straight face, you're now QRP! So, if you're working a pileup and the DX operator only wants QRP operators to call. Shutting down the SB220 would give you the QRP edge. And once again, you're QRP!

Let's look at this one more time. Let's say you're working the CQ World Wide DX contest, and you're running a kW. By turning the amplifier off, thus dropping your power down to 100 watts — you're now QRP! In fact, let's take this one more step. Suppose the DX station you're listening to says, "QRP only please." Snap! Off goes the amplifier. You're now QRP and you make your contact with 100 watts. That's far from operating with low power. But based on the fact you were running 1000 watts, reducing to 100 watts does in fact make you a QRP station at the time you called!

But, that's not really what QRP means to most hams. In a nutshell, if you say, "I am running QRP," you are sending no more than five watts of RF out to the antenna. Most commercial and kit-based QRP transceivers and transmitters produce two to three watts of RF output. Notice that the power is output and not input. No one really messes with input power; it's what's going out to the antenna that counts.

Most hams have adopted it to identify low power equipment or operation. The Club International (QRP ARCI) has formally adopted the power level of five (5) watts as QRP. This is measured as output power from the transmitter. For really low, low power work, the term "milliwatting" has replaced the aged term of QRPp.

QRP is a great place to make new friends. QRP is a subculture within ham radio. Usually, when I tell someone I'm running QRP, the QSO changes from the usual "rig here is Kenwood and the weather here is warm" to a real conversation with an interested human operator on the other end.

Building your own gear

I've always enjoyed building my own equipment. In fact, that is one of the reasons why I got my ham ticket in the first place. I just happen to like the smell of molten solder! I would dare to guess that most of the operators who enjoy QRP also enjoy building their own rigs. Nothing in the world can beat the feeling of working a station using home-brewed equipment. A QSO with gear you constructed with your own hands will be burnt into your memory for life. The warm fuzzy feeling will last for days after the QSO is over. That's a feeling you don't get when operating the newest

Photo A. *If you like building kits, you will love QRP. Here, a Ten-Tec QRP transceiver kit is laid out and ready for assembly. The little gem has approximately 200 parts, and thus requires around 15 hours for assembly and checkout. Then it is ready to work the world! Now, who could resist such an attractive challenge?! (Photo courtesy of K4TWJ)*

microprocessor-controlled Japanese-made SSB transceiver.

You don't need to be a rocket scientist or an electronics engineer either to build your own rig. In fact, QRP projects are especially suited for the neophyte in home-brew construction. Building a transmitter is relatively easy. Usually, there's a wide tolerance range for parts, and most transmitters are built around straightforward circuits. Sometimes the transmitter is nothing more than a one-transistor oscillator coupled to an antenna. Only a handful of parts are required to produce two watts on most frequencies. You'll be astonished by the amount of DX you can work with just a spoonful of parts.

Because most QRP projects are simple, you usually won't have trouble finding parts for the rig. A well-stocked Radio Shack can supply you with all the parts required for a 75 meter CW transceiver. Companies like Mouser Electronics [958 N. Main, Mansfield TX 76063; telephone (800) 346-6873] and Digi-Key are especially geared to filling small orders. Several hams have started their own companies supplying small parts just to the homebuilder and the QRPer.

You don't like hunting parts to build rigs? Several different companies furnish ready-to-go kits, too. Kits range from the very simple "oner" by the G-QRP club to the ARK-40 from S & S Engineering, the K2 by Electrocraft, and the "1300 series" from Ten-Tec (**Photo A**).

I've never liked working on microcircuits, but for some, the challenge of QRP comes in the form of assembling a transmitter in the smallest possible chassis. I've seen rigs built in pill bottles, Band-Aid boxes, a matchbox or two, and even a Sucrets box.

Most construction projects center on building QRP transmitters. There's nothing stopping you from rolling your own receiver either. The popular direct conversion receiver makes a perfect marriage for a QRP transmitter. A direct conversion receiver is sensitive, as well as easy to build. Or you can go with several of the simpler superhet designs offered in *73* or *QST*. Many of these simpler designs rival the performance of much more complex receivers.

QRP and other frequencies

Alas, QRP is not only for HF use. Special QRP days have been set aside for the OSCAR satellites. Running too much RF on the uplink may damage or shorten the life of the satellite's battery.

Then there's meteor scatter and mountaintopping using low power. It's possible to work numerous states under favorable conditions using 100 mW of RF on 10 GHz. With the newer multiband rigs on the market, you'll be seeing lots of activity on two and six meters SSB and CW. QRP is very much alive on frequencies above 30 MHz. QRP is also alive on the digital modes as well. I've used AMTOR, RTTY, and packet all while running five watts or less. It's amazing how AMTOR can keep a link up and running while squirting only five watts to the antenna.

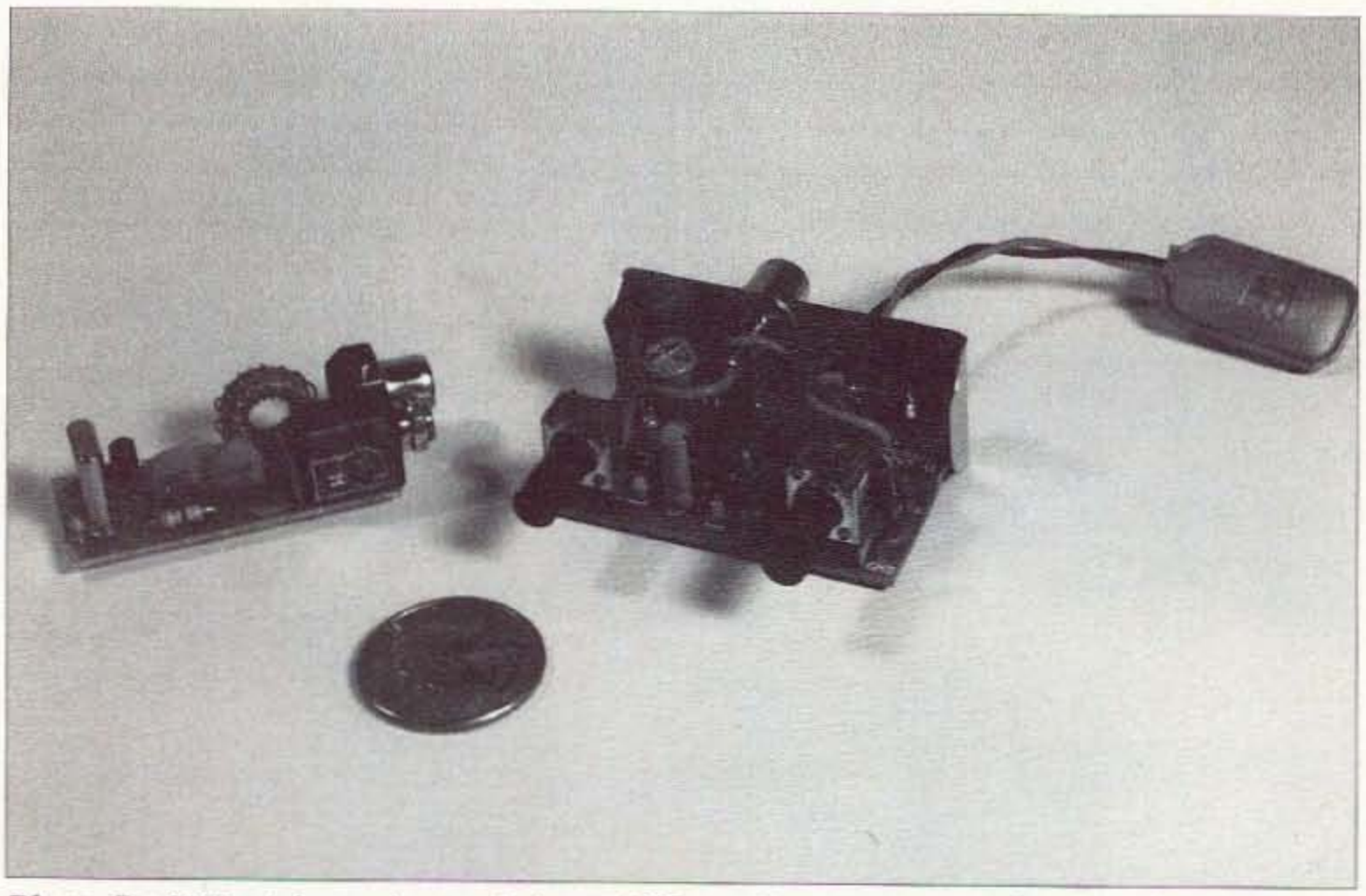

Photo B. *QRP: A home-brewer's haven! Shown here are a couple of weekend projects everyone likes: a Micronaut transmitter available in kit form from K4TWJ (left), and a Micronaut receiver available as a PC board from FAR Circuits (right). Each item can be assembled in a couple of hours, and reflects the "fun of home-brewing" side of QRP.*

QRPing and emergency communications go hand in hand

During a natural disaster, your QRP transceiver may be the only source of communications from the disaster area. During electrical outages, running your ham gear QRP-style takes on a whole new meaning. Running low power is always better than running no power!

Because QRP equipment is normally much smaller in size, its power requirements are easily met with small batteries. A QRP transceiver is ideal for taking ham radio with you. You can easily carry a complete HF rig, with batteries, in a backpack. Hiking, camping, or even whitewater rafting takes on a whole new meaning now that ham radio is aboard. There's also the possibility ham radio may be vital in saving a life or two while you're out camping.

Battery power is all you need for worldwide communications from your home, too. In fact, most QRPers enjoy operating their gear from batteries. Solar power and QRP operation go hand-in-hand to supply all the energy requirements of even the busiest ham.

Getting started in QRP operation

QRP is not always push-button operating! If you're used to making a contact on one call, then an adjustment in thinking may be in order. Anyone can work station after station, many times over, using less than perfect antenna systems with 100 watts. That's not always the case with QRP. Be prepared for some missed calls. You'll also find that the other guy will cut the QSO short once you announce that you're running QRP. I feel personally responsible for making a lot of hams overweight when running QRP. I say I'm QRP and they say, "Have to run to eat now, 73." I guess they are afraid of telling me I am 599 + on their end!

Working All States (WAS) with QRP SSB is a real challenge! But, then again, many, many times, I've been 599 with 1 watt to the antenna. That's part of the thrill of QRP — you never know what will happen.

Running QRP

All you need to try QRP is a transceiver. The only thing you need to know is how you lower your transmit power! Now, don't reduce the power to five watts at once. Drop your power down to half of what you've normally used in the past.

Don't feel like jumping right into the fold of QRP at once? Then get together with

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New Multimode Shareware — RCKRtty

You may be relieved to know you fairly well escaped an exercise in dull reporting. This month, I was determined to visit all the Web sites in "The Chart" and note changes of interest as well as recheck the validity of the addresses. In the midst of this task, something new arrived in the shack.

I had recently checked my E-mail and there, from the PSK31 reflector, was a message about something new to me. It concerned a program written by Walter DL4RCK, named RCKRtty. Anything with RTTY in the name demands immediate attention, so I inserted the address shown in *The Chart* in my browser.

There were some pleasant surprises. I find there are hams looking for a Windows-based program for their MFJ 1278, and here is one to answer the need. There is considerable explanation of the many features of the program. It handles RTTY, PACTOR, AMTOR, PSK31 (in controllers made for the mode), and CW. It performs these magic feats with TNCs by SCS, AEA, KAM, MFJ, and DSPCOM.

The cost is reasonable. The program comes in several flavors, but the basic program sells for about $30. There is a contest version that costs extra. Importantly, I was able to download a copy for evaluation. It is good for 50 sessions, and then the transmit mode is supposed to shut down. In general, the evaluation version is not really crippled for operation in any mode.

Naturally, I downloaded it along with the Word 97 version of the manual. The manual proved to be valuable, even though it didn't come up properly in my Word 6 software. Some do, some don't. It was still readable and is not the same file as the help file in the program. Not fully formatted, the manual is about 60 pages. It would expand a bit if I made it look nice.

Between the manual and the extensive help files, the program was slick and easy to get up and talking to the PK 232MBX. For some programs, that is quite a hurdle. I watched the indicators on the front of the 232, and they responded correctly as I changed from RTTY to PACTOR and CW, so it looked like it was going to be a snap.

With the radio playing a PACTOR tune, I put the program in PACTOR Listen mode and it started parading characters across the monitor just like it was supposed to. This was going entirely too easily. Next came a learning session, as I attempted a connect in PACTOR. I couldn't readily find the box to insert the other station's call. I did soon find, however, that the program would signal the 232 to put the transmitter on the air even if I wasn't ready. Another good sign, but I had to find the cure for lack of a callsign. Later, it became obvious where that callsign belongs. (See **Fig. 1**.)

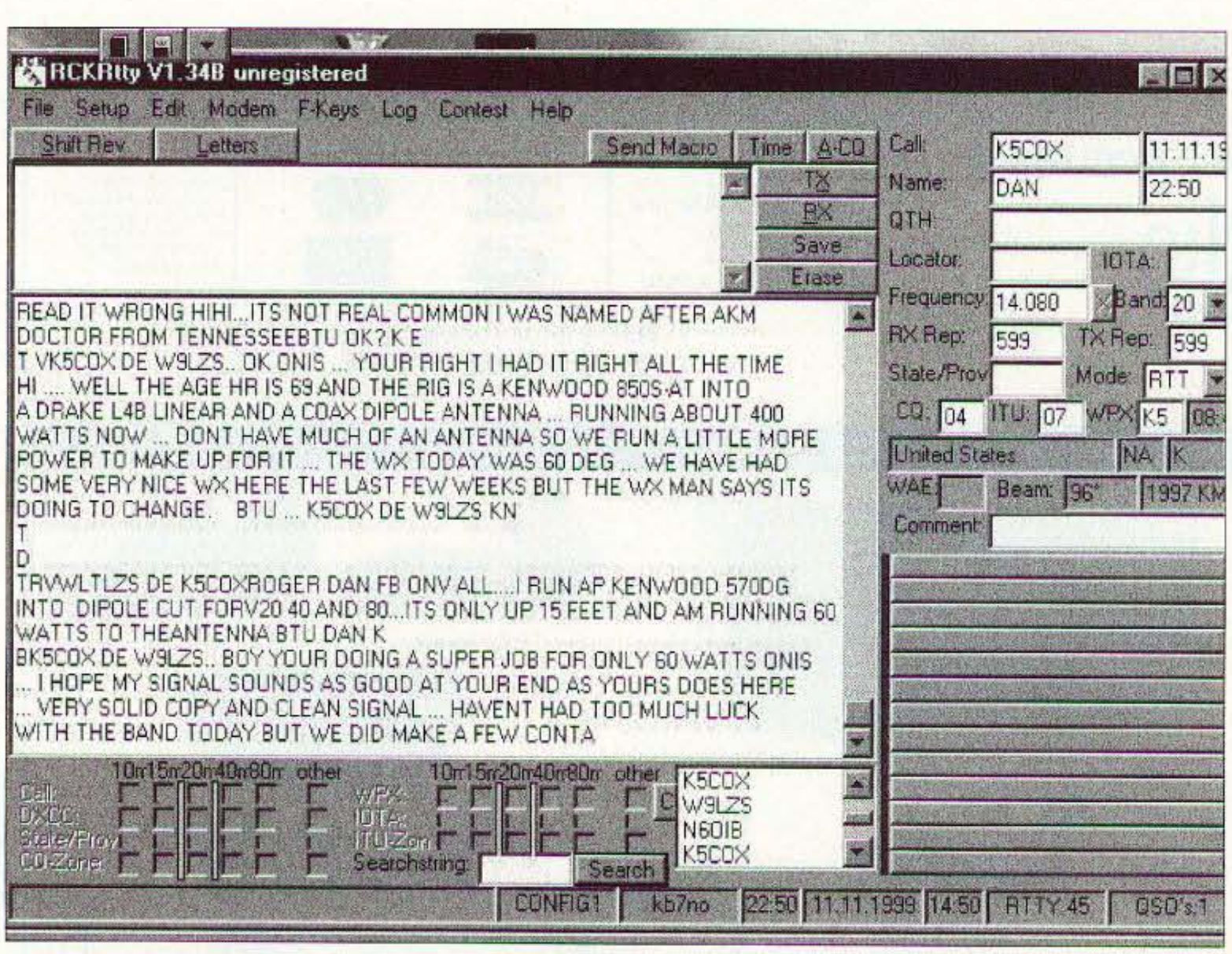

Fig. 1. *RCKRtty screenshot. This is the program "reading the mail" of a RTTY QSO. The blank upper space is for composing the transmit message. It functions about like any other Windows program, with a few unique features. The upper right box has the callsign of the "other" station, which it captures after the "de" in the callsign exchange. Note the box at the bottom with the four callsigns captured the same way. Also, the name in the upper right box was grabbed from the received text! The first box is the necessary one to have a call in for a connect on PACTOR. Also, the Auto-CQ and Connect commands work only when the correct set of F-keys are activated. There is more, and it is fascinating. See the text and take a look for yourself. This is one of the few Windows programs for MFJ (along with the "standards" such as AEA, KAM, and SCS).*

It was getting late in the day and signals were waning, so I tried something else. I gave a listen on RTTY, found the button to reverse the tones, and found good copy in that mode. Since RTTY is a little less fussy about entering the callsign, I thought I would simply try a CQ.

More learning. The CQ is automated and wouldn't be much problem, except I had somehow lost my call from where I had entered it in the program during setup. After reentering the call, it was necessary to reboot the program so the call would stay. Back to the automated CQ. One of the secrets is to have the programmable function keys activated. Among those functions lies the automated CQ.

First QSO

While I was fiddling with this, and it was getting darker outside with the consequent weakening of signal strength, I had gotten to the point that a clumsy CQ was coming forth, albeit in reverse format. And ... it was answered! Magic!

The calling station AAØFT explained that my signal was "upside down." (Again.) It seems that is the default on start-up. I can live with that. I had just discovered the fact at the time George explained it to me.

As you would expect, I told him about this newfound software I was trying out on him. George had not heard of it either, but he had an old MFJ 1278 kicking around that needed software. Could I tell him where I found this magic package? By then, the copy was really garbling. I know that rhymes with warbling, but it is *not the same.*

George gave me his E-mail address. I had him repeat it until I was sure I had it straight, and sent him the information at hand via E-mail. It is strange how I come upon these coincidental circumstances so often when I get on the air. In this case, I had just happened on a piece of software and the first QSO turns out to be someone who has a need for just that package.

A new URL added

There came another revealing experience when George answered my E-mail message. He had already found the site by using the N1RCT Web site. So I took a look. This has references and links to just about everything I can recall seeing, plus a few new ones. It is not strictly a RTTY site as the name implies. You will find information and programs for almost every digital mode, and many sound card applications that are well worth a look-see. The URL is now listed in **Table 1.**

Back to the project

Every now and then a piece of E-mail shows up on my doorstep and I send off an answer without further thought. Specifically, readers want verification on a Web site URL. In those cases, I simply call up the Web site in question and copy and paste the correct address in the E-mail reply with whatever explanation is relevant.

There was nothing wrong with that, until I realized it was time to look down the list of references in **Table 1** that regularly accompanies this column. I wouldn't have considered this if I had not been reading a recent article by Terry Mayhan K7SZL in *QST* (Oct., Nov.) about his latest development, a PACTOR interface that works with PACTOR freeware developed by Tom Sailer.

At that time, I realized that Tom had changed his Web site address. Not too bad a problem as yet. I accessed the old URL address and found a forwarding link to the new address, so the chart wasn't yet telling a lie.

Then it came to me that I wasn't really keeping you, my readers, abreast of the latest happenings. Plus, I wanted to confirm that the original information was still intact on the Web site, which concerns an inexpensive serial modem that allows the use of the HamComm shareware for RTTY. It is still there on the revamped and expanded Web site.

Radio sounds

Plus, Terry has added so much useful information for those wishing to get started in digital hamming on a budget. If you have ever wondered what RTTY, PACTOR, SSTV, or PSK31 sound like, he has wave files of the sounds as you will hear them over the air. When you tune around 14.065–

Source for:	Web address (URL):
Pasokon SSTV programs & hardware	www.ultranet.com/~sstv/lite.html
PSK31 — Free — orig. PSK31 — also Logger	http://aintel.bi.ehu.es/psk31.html
Site with links to PSK31 and Logger 10	www.mysite.com/k5fq
PSKGNR — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm
TAPR — Lots of info	www.tapr.org
TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/
ChromaPIX and ChromaSound DSP software	www.siliconpixels.com
Timewave DSP & AEA products	www.timewave.com
Auto tuner and other kits	www.ldgelectronics.com
XPWare — TNC software with sample DL	www.goodnet.com/~gjohnson/
RCKRtty Windows program with free DL	http://home.t-online.de/home/d14rck/
HF serial modem plans & RTTY software	http://home.att.net/~k7szl/
SV2AGW free Win95 programs	www.forthnet.gr/sv2agw/
Source for BayPac BP-2M	www.tigertronics.com/
BayCom — German site	www.baycom.de/
BayCom 1.5 and Manual.zip in English	www.cs.wvu.edu/~acm/gopher/Software/baycom/
N1RCT site — excellent RTTY ref.	http://www.megalink.net/~n1rct/
Int'l Visual Communication Assn. — nonprofit org. dedicated to SSTV	www.mindspring.com/~sstv/
Creative Services Software	www.cssincorp.com

Table 1. *The infamous chart. Almost everything ...*

14.090, you hear RTTY, PACTOR, and PSK31 — all next to each other, which can be confusing until you get a handle on the sounds of each mode.

I have no real reason to build the PACTOR interface, as I already have the mode available with the PK-232MBX. The thought did cross my mind that it would make another nice portable gadget that I could point to as a do-it-yourself item.

I am still using the original serial modem for RTTY and SSTV that I made from the K7SZL circuitry a year or so ago. Anyway, Terry has made a way for you to get on PACTOR for quite a bit less than a hundred dollar bill. Well worth the look.

Proceeding on to verify other Web site addresses, I stopped by the XPWare URL and found everything pretty much the way I had last remembered. Since I do have a working copy of the program for my AEA PK-232MBX, I checked for upgrades. There are at least a page of changes to the program, with only a few minor changes that apply to my particular usage. Good to know Gary keeps on top of his product, must be time to update.

Another program for MFJ

Since there have been inquiries about software for the MFJ 1278, the Web site reminded me that a DOS program is posted and an evaluation copy available for download. This may be what some of you are looking for.

A look at the TigerTronics page is informative. They still have the original packet and multimode modems in vest-pocket sizes that they build and market under agreement with BayCom. They also have the BayCom version 1.6 software which is a commercial copy of the excellent software developed for packet. The price is $20, and I am sure it works well. I have used the v. 1.4, and it is the program I have come back to when I couldn't get some of the other programs to operate the BayCom modem or its clones.

You will find they have branched out a bit. They are building and marketing an APRS system that sounds very good. It appears to have all the bells and whistles, and you can pick the combination to fit your needs and pocketbook. The original shareware they used to have on the Web site for the multimode modem is no longer available there. I would imagine the help-line calls for items for which they received no revenue played a determining factor in that deletion. However, the overall look of the Web site shows that they have surveyed the needs of the ham community and are working to fill those needs.

In keeping with that thought, TigerTronics has also introduced a line of early warning weather receiving and transmitting equipment and software. This line comes in varying costs and abilities.

Other BayCom freeware

I checked the URL in **Table 1** to see that the BayCom v. 1.5 software was still available. It is. Short story on that: I downloaded it once upon a time and never used it. The 1.4 works well but I couldn't find a site where that freeware version was still available. After a long search, this site came up, so there is a freeware version of the BayCom software still available.

Speaking of the small packet modems, I still have the LDG Electronics clone of the BayCom 1200b packet modem. LDG discontinued that one, but they have other ham equipment of interest. I am using one of the AT-11 tuners, and it does a bang-up job as a mobile application. Looking a little further on the Web site, I found that they are now handling a line of mobile antennas at a very competitive price. And there are other items worth a visit to take a look at, too.

Another PTT circuit for sound card programs

I thought I knew all there was to see on the Silicon Pixels site, but I took a look anyway. They still have the excellent sound card programs for SSTV and DSP, but as I looked, I saw a link to a site with a PTT circuit you can build yourself. It is not a lot unlike the Lectrokit PSKI reviewed in the August issue of *73* magazine.

After thinking about it for a bit, I realized why the ChromaPIX authors had searched out a source for the PTT system. They had published circuitry to cause the automatic PTT, but lacked detailed documentation. This circuit is well documented, and does everything needed for use of their sound board programs as well as for PSK31.

When I followed the link for the PTT circuitry to [http://teleline.terra.es/personal/esteban1/], I found it was primarily in Spanish. That can be a little scary for those of us who are language-challenged. However, the information you want is available in very well written English, with US sources for parts and listed part numbers.

I hadn't looked in on the Pasokon SSTV site for a while. I found that it has been redone not only with some good information on the program, but also with some good motivating material to get you going on SSTV. And the stress is on economy. John Langston has several nice programs and all the information to get you started.

I thought, as I was looking at John's Web site, how the ham sites all have links that usually include each other so that you can get the whole picture about what you are getting into. It all fits together. A great hobby.

If you have questions or comments about this column, please 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

Number 53 on your Feedback card

Joe Moell P.E. KØOV
P. O. Box 2508
Fullerton CA 92837
[Homingin@aol.com]
[http://www.homingin.com]

Foxhunting at Hamcon-99 — and More

The ideal contest for a convention or hamfest is a hidden transmitter hunt (often called a foxhunt). When properly presented, it combines intrigue, education, and good exercise. If the budget permits, there can be valuable prizes, too. More and more convention organizers are following the example of the ARRL Southwestern Division, which has had a radio direction finding (RDF) contest at its annual convention (Hamcon) almost every year for decades.

What attracts hams to conventions and hamfests? Seeing new equipment? Buying and selling at the flea market? Interesting speakers? Yes, all of the above, and more. The food? Nothing great at Dayton, but the Santa Barbara Hamfest tri-tip beef is always a treat.

What about friendly competitions? I remember the great QLF Contests of years past, where everyone howled with laughter as ordinarily highly proficient CW experts tried sending code with their left feet. One local summer 'fest in my area still has a Transformer Toss. Would-be Schwarzeneggers see how far they can heave an old copper-and-iron monster, swinging it by its wires.

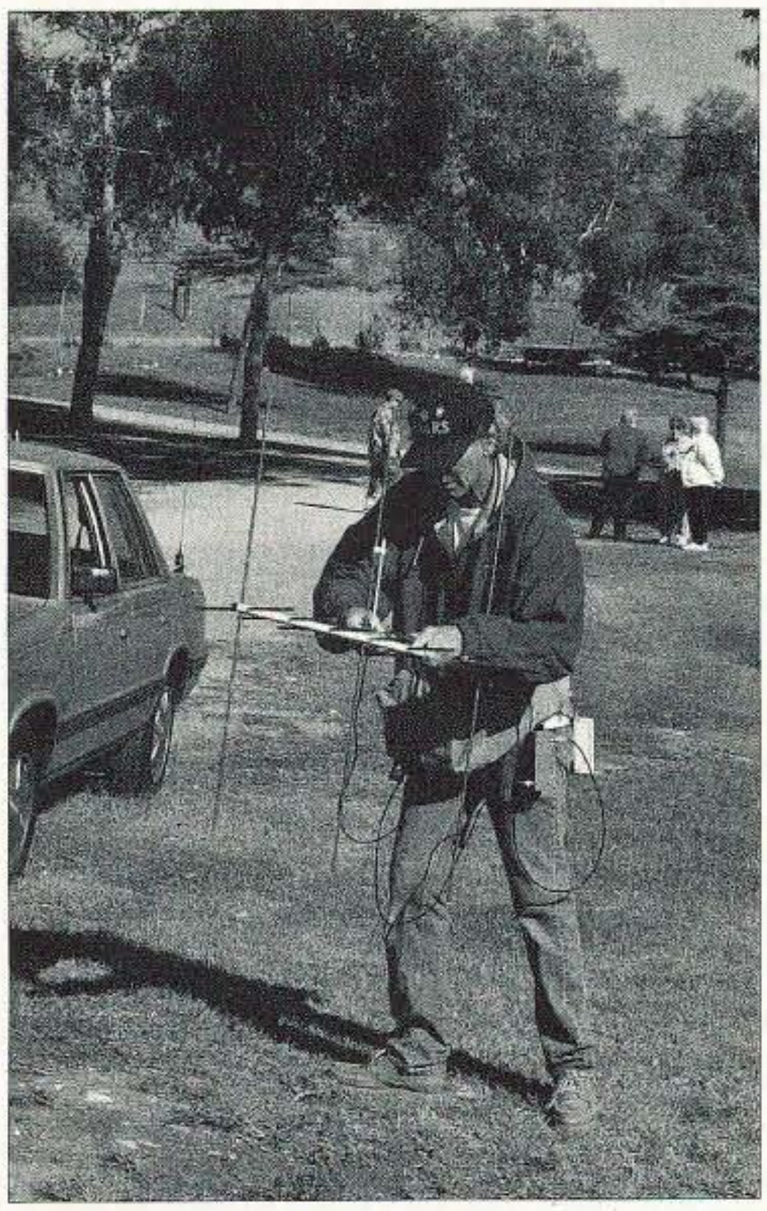

***Photo A.** A lightweight beam, attenuator, and handie-talkie or scanner makes a simple and inexpensive on-foot RDF setup. This dual-band yagi gets bearings on both the two meter fundamental and the third harmonic.*

Who needs cars?

A real winner, though, is a foxhunt. But if satisfying everyone is the goal, a convention's Foxhunt Chairperson faces a dilemma. The hunt has to be hard enough to give a challenge to experienced RDFers, yet simple enough that no one goes away empty-handed, even first-timers. It has to be suitable for the capabilities of young and old, whether physically fit or physically challenged.

All-on-foot hunts are growing in popularity over mobile hunts among hamfest sponsors, for several reasons. All ages can take part, as no driving is required. Everyone stays close by the hamfest site instead of ending up dozens of miles away. Families and friends can watch and cheer. A simple RDF setup such as a small beam, active attenuator, and handie-talkie gives excellent performance (**Photo A**). Hams who fly to the 'fest can hunt without having to outfit a rental car.

Another reason for having on-foot foxhunts at hamfests is to encourage hams (and prospective hams) to learn about international-style foxhunting, sometimes called radio-orienteering or ARDF. Perhaps there is a future ARDF champion waiting to be discovered. With that in mind, the Fullerton Radio Club was eager to take responsibility for the foxhunt at the 1999 ARRL Southwestern Division convention on the first weekend of October. The task of hiding the foxes fell to me.

The best venue for an on-foot foxhunt near the *Queen Mary* (Hamcon-99 location) is Angel's Gate Park in San Pedro. This 130-acre site, formerly Fort MacArthur, includes everything from well-groomed picnic areas to desolate patches of barren ground. Elevation ranges from 120 feet above sea level near the coast to 300 feet at the Marine Exchange. It's the site of United Radio Amateur Club's Field Days, so it wasn't difficult for Jim WA6MZV and Bev WA6TIU Pitman of URAC to get a permit for us to use it.

From 1888 to 1982, this land was full of fortifications and munitions for defense of the vital deep-water harbor of Los Angeles. Its giant mortars and artillery could lob 1500-pound shells 14 miles out to sea during the First World War. Radar and command centers for Nike missiles were housed there for 20 years following the Korean War. All the guns and electronics are gone now, and the extensive network of underground tunnels has mostly collapsed. But many of the gun mounts and ammunition storage bunkers remain. There are countless nooks and crannies, ideal for placing hidden transmitters (**Photo B**).

Fort MacArthur, named after a Civil War Medal of Honor winner who also was a commanding general in the Spanish-American War, is now in the National Register of Historic Places. Portions of the bunkers are now a museum, open to the public on weekends. Mike Taylor of the museum staff was eager to host our foxhunt.

Mike had some clever hiding places to suggest. For instance, one fox ended up in a pile of surplus ammunition cases for sale outside the museum store. Hams are used to foxboxes built into ammo cans, but finding

Continued on page 54

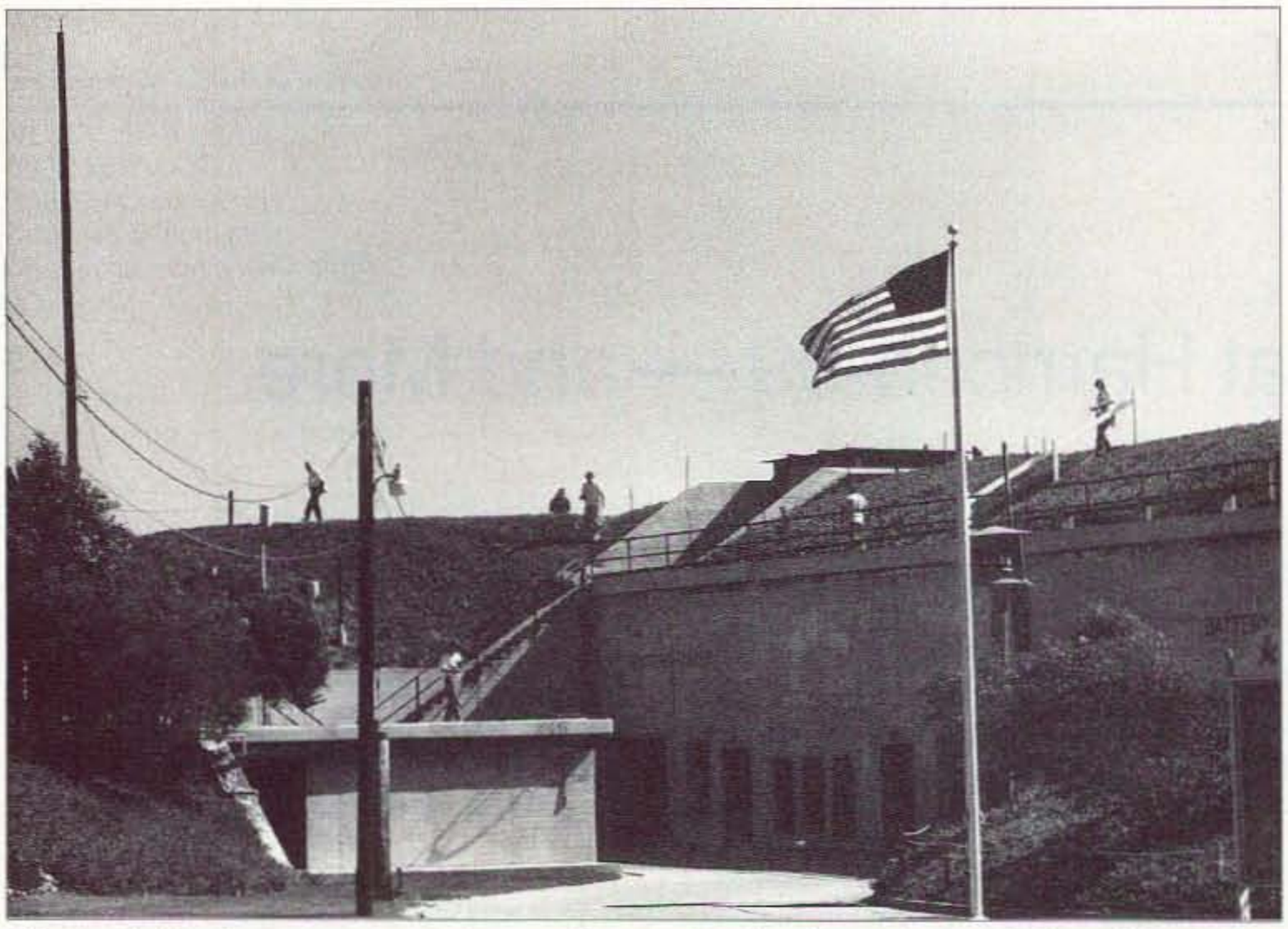

Photo B. *Foxhunters swarmed over Battery Farley-Osgood at old Fort MacArthur. Microtransmitters were out of sight in metalwork atop Battery Farley and in a display of ammunition cans in front of the museum at ground level.*

Photo C. *The museum volunteer in the back seat is actually sitting on a hidden transmitter. No hunters found it.*

HOMING IN

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this one was like looking for one particular egg inside a henhouse.

I had some other ideas for dastardly hiding locations near the museum, and Mike readily obliged. For instance, we put a foxbox out of sight under the back seat of an old jeep that the museum volunteers were driving around the grounds (**Photo C**). An ammo can was already mounted in plain sight between the jeep's front seats (a poor man's glove box), but the T wasn't in there!

Perhaps the sneakiest museum fox was a micro-transmitter in the rucksack on one of the young Army "soldiers" (**Photo D**). Only three sharp-eyed foxhunters noticed the antenna wire sticking a couple of inches out of his pack.

From a hider's standpoint, one of the biggest attractions of the park is Batteries John Barlow and Saxon. Their immense concrete fortifications and rooms are in a two-acre pit, accessible by steep staircases. I had several great fox spots there all picked out. Then, a week before the hunt, a production company moved in to make a movie. Its security force wouldn't let anyone approach the pit, even with a permit, so we had to declare that area off limits. Fortunately, no filming was taking place on hunt day, or we might have had to stay out of the entire north section of the park because of their noise concerns.

Livin' la vida ROCA

There is no perfect time period for a convention foxhunt. Our Hamcon is primarily a two-day event, Saturday and Sunday. Having the hunt on Saturday would eliminate the opportunity to have a day to promote the event. There are too many other competing activities on Saturday, anyway. That's why Hamcon foxhunts are traditionally on Sunday afternoon, right after the grand prize drawing. There are always a few no-shows, as people change their plans overnight and some out-of-towners decide to head for home early.

All day Saturday, members of Fullerton Radio Club staffed the sign-up table and explained the basics of foxhunting to interested visitors. The Foxhunt Forum at 10 a.m. drew a good crowd. After reviewing the sign-ups Saturday evening, we decided to divide the individual competitors into three divisions: Juniors (age 18 and under), Prime (ages 19 to 49), and Masters (age 50 and up). There was also a separate team division for newcomers who felt unprepared for solo hunting, and to accommodate the handicapped (**Photo E**). Only two persons could be on a team. A team could carry only one RDF set.

Worldwide standard radio-orienteering rules, as prescribed by the International Amateur Radio Union (IARU), aren't suitable for casual hamfest hunts. IARU requires five transmitters in a very large forest, all on the same frequency and on-air in rotating sequence for one minute each at a time. The transmitters must be stationary, with a prominent orienteering flag nearby. Contestants are started at intervals and timed individually.

For walking/running hamfest hunts, it's better to have more transmitters, more frequencies, more frequent transmissions, and more outrageous fox locations. This is similar to an event called the "ARDF Technical Session" in Asia. Some hams in the USA call it "Radio-Orienteering in a Compact Area" (ROCA). "Homing In" for February

1999 has the story of a 6-fox ROCA in the San Francisco Bay Area and "Homing In" for September 1999 details the 16-fox event at the 1999 Dayton Hamvention.

In a ROCA, the emphasis is on RDF skill, not athletic ability. You win by finding the most transmitters within a fixed time period. An hour and a half is about right. It's long enough to maximize the foxhunting fun, without being so long as to be beyond some hunters' endurances. Everyone starts at the same time.

Each Hamcon-99 foxbox or antenna had a tag, about half the size of a stamp, with a unique 3-digit control number. Sometimes — the rucksack fox for example — the tag was the only part of the fox that was visible. Before the starting horn sounded, each competitor was given a slip of paper on which to write the control numbers as they were found. The paper had a list of all foxes, a description of their sounds, and their frequencies. To get credit, the correct control number had to be written on the correct transmitter line.

I was concerned that most hunters would simply start at the top of the list and go after the first fox they could hear, resulting in a pack of hunters playing "follow the leader." To spread them out, I made several versions of the frequency slip, each with foxes listed in different order.

A ROCA record

My goal was to have 21 radio foxes on the air at start time. Clarke Harris WB6ADC and Mike Obermeier KD6SNE loaned a total of four, and the rest were mine. One was dead-on-arrival at the park and a couple of others didn't last for the full hunt time, but the remaining 18 were more than enough to challenge the 21 hunters from all over southern California. Eleven hunted as individuals, while the rest chose to be in the two-person Team Division.

Six foxes were on or within 10 kHz of the southern California coordinated T-hunt frequency (146.565 MHz). Hunters didn't know it, but they were all physically close too, within about a 900-foot-diameter circle near the start/finish area in front of the museum. Since half of these six transmitted continuously and the rest intermittently, the QRM should have made them the hardest to identify and track down. Nevertheless, most hunters spent much of the hunt period on these six foxes. All but three hunters found at least one of them.

The rest of the transmitters were each on separate frequencies throughout the two-meter band. That made RDFing for them easier, but there was plenty of legwork needed to get there. Those foxboxes were widely scattered throughout the park, including the southwest, southeast, and northeast corner areas.

Just to make it more interesting, there were some decoy (nontransmitting) devices and tags out there. WB6ADC's toy soldier radio/phone with flashing LED and antenna tag got lots of attention as it lay in a guard shack. One competitor decided that it was transmitting on 146.565 MHz. But as the others figured out, its only emissions were on lightwave frequencies. Many folks carefully examined the ammunition can with antenna next to a vintage artillery gun on display, but it didn't fool anyone for long.

In IARU-rules hunts, a good topographical map is a necessity, to plan an efficient 5-fox route and avoid getting lost in the woods. Since Angel's Gate Park is fairly open land, a map isn't needed. But I made one up and handed it out anyway. Most hunters ignored

Photo D. *A micro-T was in this rucksack of the "soldier" in the center. Only three hunters identified it. Clarke Harris WB6ADC at left is suspicious.*

Photo E. *Working together, Dennis Schwendtner WB6OBB (left) and Marvin Johnston KE6HTS found the most foxes. Despite his blindness, WB6OBB has been foxhunting for two decades.*

Photo F. *This commercial quad provides great sensitivity and directivity, but I'll bet it got heavier and heavier as the hunt went on.*

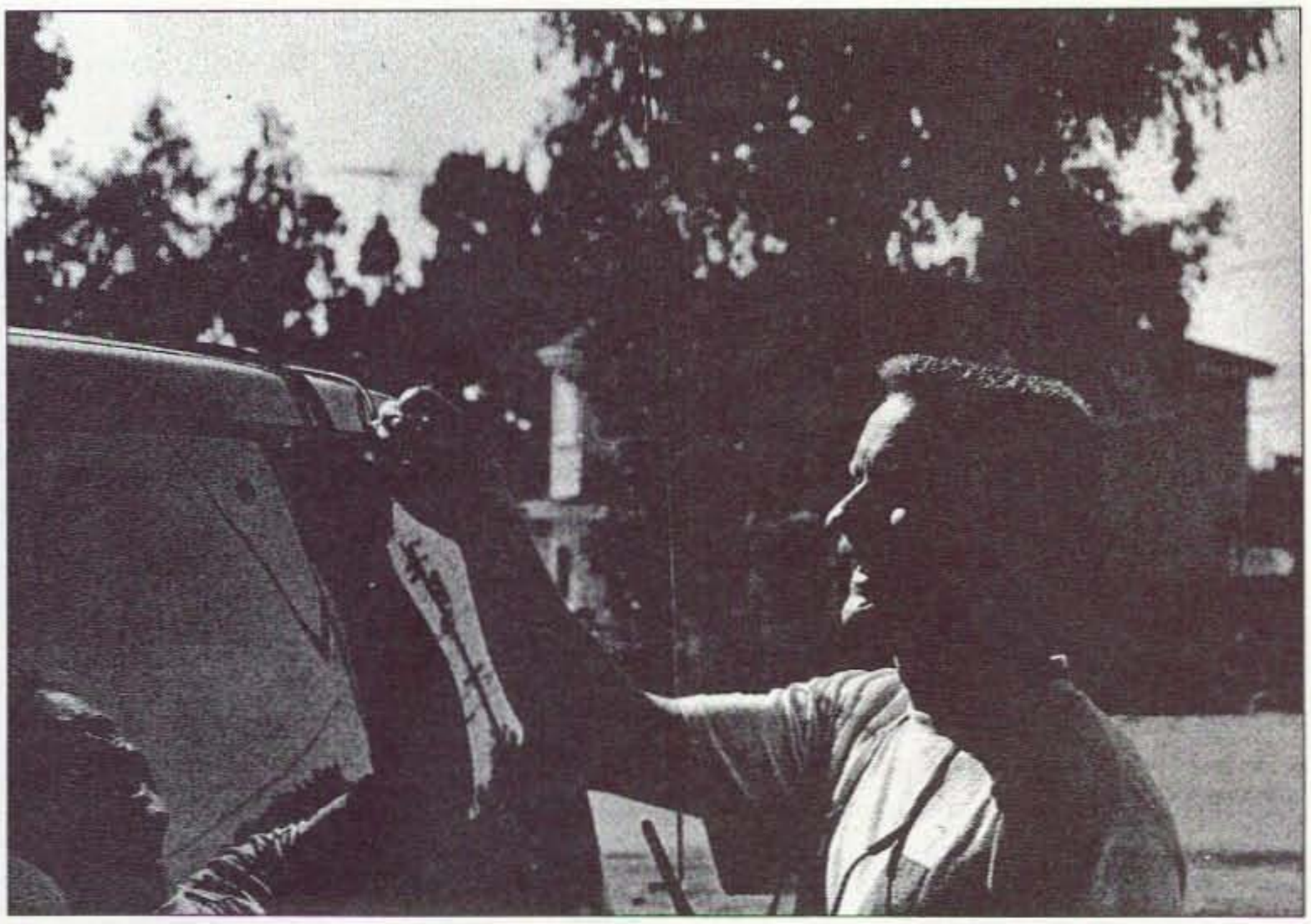

Photo G. *To get credit for one of the foxes, you had to identify which of the 11 antennas on my van was radiating. This hunter is working on the problem with a miniature RF "sniffer."*

it and took off after the foxes they could hear. But a few used it to practice for upcoming formal ARDF events, marking their bearings carefully and planning strategy. The map was certainly useful to me, as my secret marked copy made it much easier to round up all the foxboxes after the hunt was over!

I don't think any two of the hunters' RDF setups were alike. A few were large and heavy (**Photo F**). Some beginners used only their handhelds and the body-shielding technique to get directivity. Quite a few carried the beam/attenuator/HT setup mentioned above.

The micro-T atop Battery Farley-Osgood with "Ringing Phone" audio was the one found by the most competitors (eleven). Two of the transmitters were underground. One was buried under vegetation on a slope. The other dangled by a chain from a grate covering one of the fort's water storage cisterns. Each of them was found by only one hunter.

Nobody wrote down the right control number for the transmitter in my van. There were tags on all eleven of the van's antennas, so the choice wasn't easy for those without good "sniffing" gear (**Photo G**).

Hamcon's budget was tight this year, so the usual big cash prizes were not available. Fortunately, our club was able to obtain plenty of inexpensive merchandise donations for the prize raffle. Every individual and team received one raffle ticket for each correct control number on their slips. In addition, first place in each division received a small cash prize.

Everybody who stayed for the entire hunt found at least one of the transmitters. Nobody was shut out. I think that everyone went home with at least one prize from the raffle table.

The main goal for Hamcon/Foxhunt-99 was for it to challenge the experts while encouraging the beginners. From the participant feedback after the raffle, it was evident that we succeeded. Several first-timers later sent E-mails thanking the club for hosting this event.

Does this inspire you to include foxhunting at your own club's next convention or outdoor event? The cold weather months are an ideal time to build up some foxboxes and RDF gear, so let's get going. Visit the "Homing In" Web site for information on the basics of foxhunting and fox hiding. I want to hear how the sport is taking hold in your area, so please send your hunt reports and stories to my E-mail or postal address. 73

Number 57 on your Feedback card

Amateur Radio Via Satellites

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

You Can Make Hamsat Contacts *Now*

Using the resources of our amateur radio satellites can be one of the most enjoyable and exciting ham radio activities you may ever experience. Do you remember your first ham radio contact? Your first "via hamsat" can be just as exhilarating! Many hams who have sampled typical ham activities like VHF-FM repeaters, shortwave communications, packet, amateur television, etc., have found satellite chasing as a new, high-tech medium in which to pursue their favorite modes.

When OSCAR-1 (Orbiting Satellite Carrying Amateur Radio) was launched in 1961, very few hams had the gear to listen for its two-meter CW downlink. Later, when hamsats were designed to be crossband linear repeaters in the sky, the gear to work them was still a bit exotic. Multimode VHF and UHF transceivers were expensive. Since then, the radios necessary for satellite operations have become common and some of the satellites have been designed to be easier to work.

It is possible to make contacts via satellite with a decent dual-band, FM handie-talkie. It's been done thousands of times. The most popular satellite for newcomers, or those with FM-only VHF/UHF stations, is AMRAD-OSCAR-27. AMRAD stands for the Amateur Radio Research and Development Corporation, a technology-oriented ham radio club located in the Virginia suburbs around Washington DC. A-O-27 is also known as the commercial satellite EYESAT-1. Confused? This microsat-based satellite was actually built by the Interferometrics Corporation of Chantilly, Virginia. The original purpose of the satellite was to provide a demonstration platform for commercial store-and-forward digital communications. The ham radio portion of the spacecraft from AMRAD is an integral part of this versatile system, and has become enormously popular.

An easy sat for communications: A-O-27

AMRAD-OSCAR-27 is a single-channel, FM crossband repeater. Although it was not built by AMSAT (The Radio Amateur Satellite Corporation), it is based directly on the microsat spaceframe that was developed years before for AMSAT-OSCAR-16 and others. A-O-27 circles the world in a circular orbit at 800 kilometers once every 100.8 minutes. The satellite is a 22-pound cube just over 8 inches on a side. It was launched on September 25, 1993, from Kourou, French Guiana, on an Ariane 4 rocket (mission V59), as part of the ASAP (Ariane Structure for Auxiliary Payloads). Other passengers on this flight included the main payload, SPOT-3, and other small ASAP satellites including HealthSat-2, PoSAT-1, KITSAT-2, and ITAMSAT.

Finding A-O-27

Knowing when and where to find A-O-27 is the main challenge that stops many amateurs from initially trying (and using!) OSCAR satellites. The popular solution is using a home computer for the tracking process.

To convince your computer to track satellites, you will need software. You can find many varieties on the Internet. You won't even have to search or go far. There are many freeware and shareware programs

Photo A. *Chuck Duey KIØAG at a ham convention in Austin, Texas, not only listens to A-O-27, but makes several voice contacts using only portable equipment.*

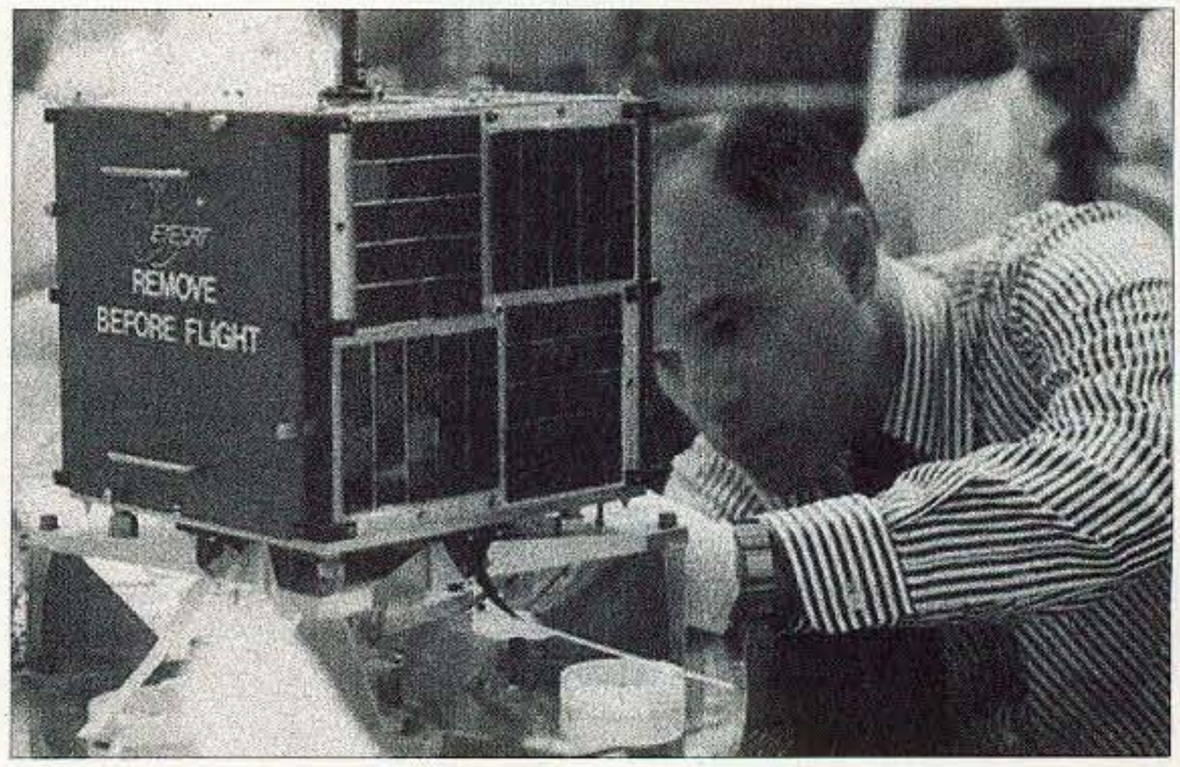

Photo B. *AMRAD-OSCAR-27, a.k.a. EYESAT-1, just before launch in 1993. (AMSAT-UK photo)*

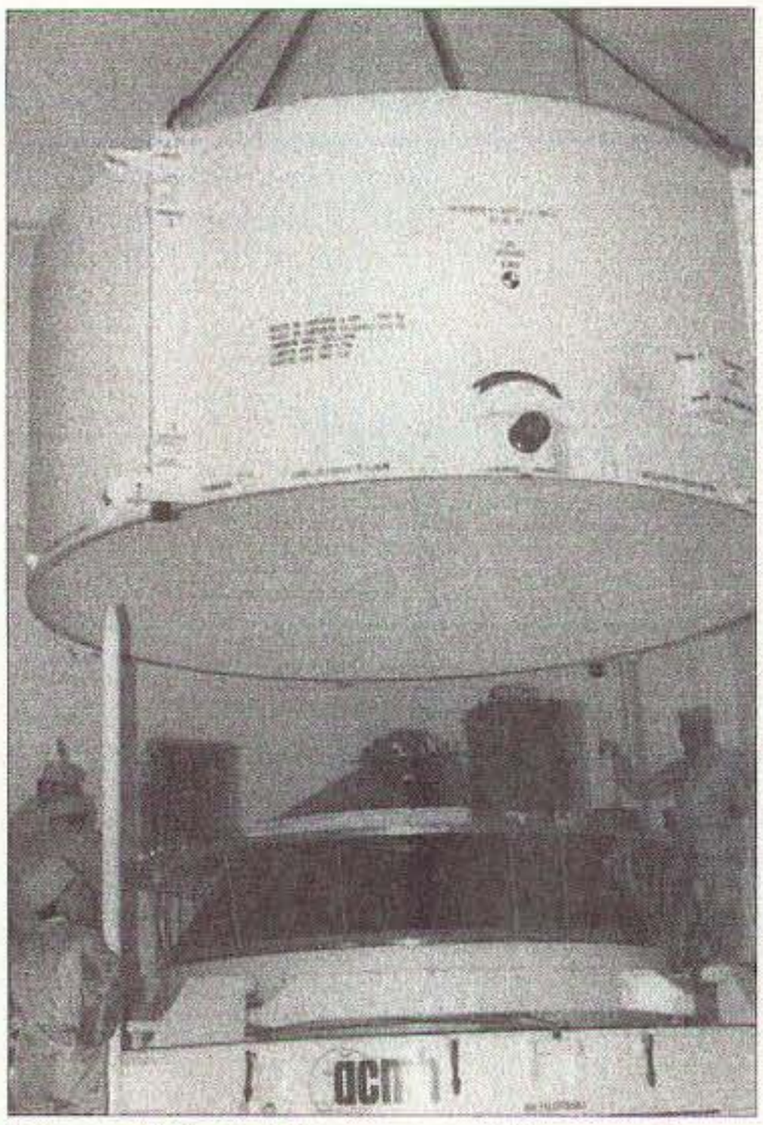

Photo C. *A-O-27 was one of five small satellites on the Ariane ASAP (Ariane Structure for Auxiliary Payloads) that went to orbit with SPOT-3.*

available from AMSAT. Just go to the URL (Universal Resource Locator) [http://www.amsat.org]. They have MS-DOS,

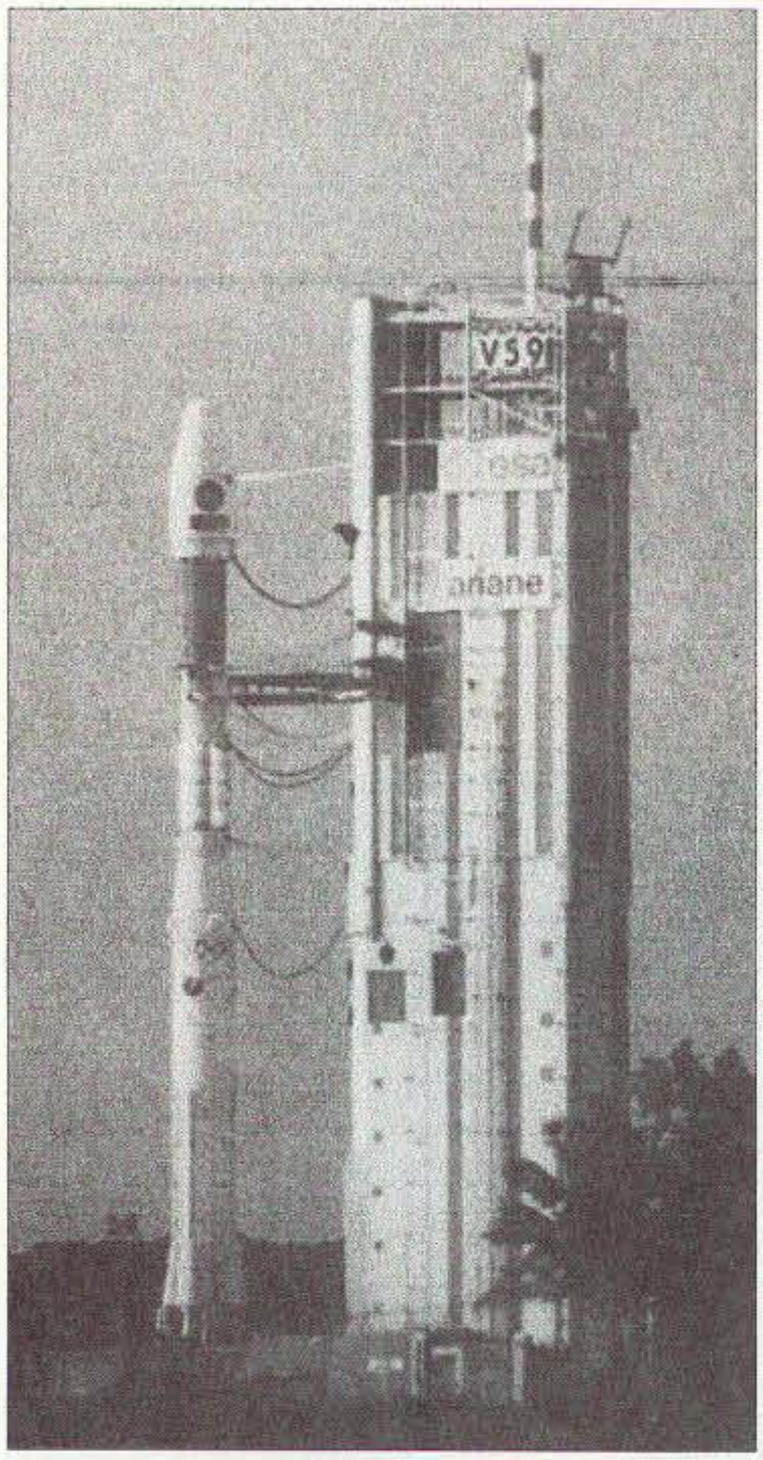

Photo D. *A-O-27 was launched by an Ariane 4 rocket from Kourou, French Guiana, on September 26, 1993.*

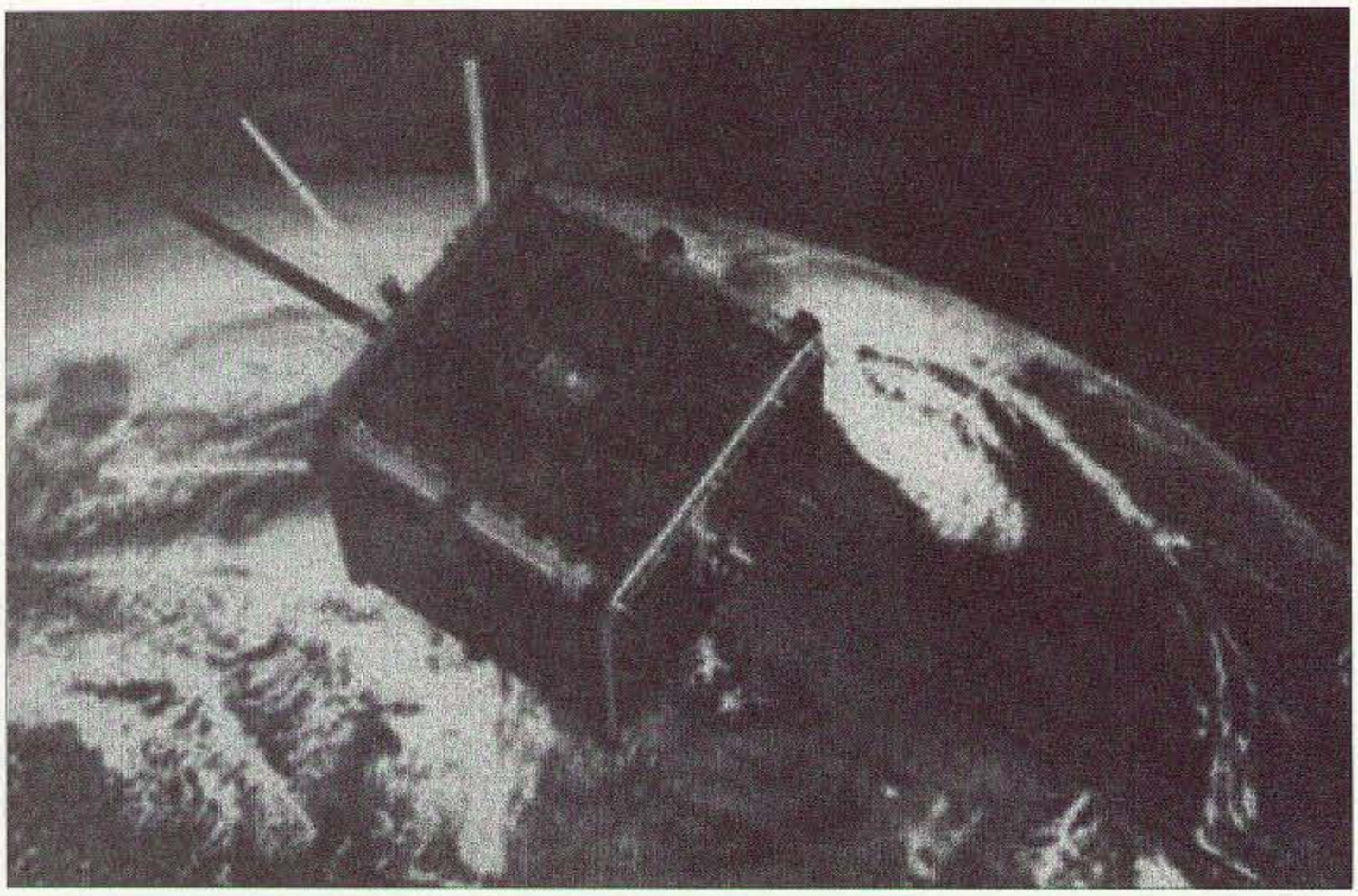

Photo E. *A-O-27 was designed for a 5–6 year lifetime. We're into the seventh year and going strong.*

Windows, Linux, Macintosh, Psion, HP-48, and even TRS-80 Model 100 satellite tracking programs. Your new satellite-tracking software will require current orbital data to provide accurate results. AMSAT's Web site has that, too. Follow the instructions with the software, and you'll be tracking in no time.

After you have the software properly running, you will discover that A-O-27 is above your horizon four to six times a day between the local hours of 8 a.m. and noon, and 8 p.m. and midnight. There are two to three morning passes and two to three evening passes. This is because A-O-27 is in a "sun synchronous" orbit. It comes by about the same time every day due to the characteristics of the orbit. The satellite is only ON for the morning passes. The A-O-27 ground-control stations set the satellite to be active for specific periods of time only when it is illuminated and the batteries are charging. Good power management may be part of the reason A-O-27 is doing so well after many active years in space.

Working A-O-27

The FM uplink frequency is 145.850 MHz. The FM downlink is on 436.797 MHz. Unlike a typical terrestrial repeater, the apparent frequencies change during the course of a pass. This is caused by Doppler shift. When the satellite is approaching you, the downlink will appear to be as much as 9 kHz high. When the satellite is at its closest point, with respect to you, the signal will be centered on 436.797 MHz. As the satellite travels away, the apparent frequency can be as much as 9 kHz low. Most FM-only UHF transceivers, HTs, and scanners won't tune in 1-kHz increments. This isn't a problem, since the signal is FM, and a few kHz won't hamper the intelligibility of the signal. Before a pass begins, set the radio or scanner to 436.805 MHz. During the pass, tune down in 5-kHz increments to get the best reception.

The effect on the two-meter uplink is only one-third as much. For most operations, adjusting the uplink frequency is not necessary. Just set the two-meter transmit frequency to 145.850 MHz and leave it. The satellite's receiver is sufficiently broad to accept uplinks that are 2 to 3 kHz off.

If you are using a simple whip antenna on a dual-band HT, you can hear A-O-27 best by moving the antenna around for optimum reception. This is always true for a beam, and helps with any antenna due to the constantly changing orientation of the satellite with respect to ground stations.

When received signals sound respectable, the HT antenna will also be optimized for your uplink. If you get into the satellite's receiver, you will be able to hear the downlink at the same time. This can cause feedback if you have a full-duplex radio (capable of receiving on one band while transmitting on the other) and are not using an earphone.

Avoid this! If you can't get into the satellite, you don't have enough power, or you are trying to get in during an active weekend, or both. First-timers have their best results on quiet weekday passes. Most A-O-27 operators want newcomers to succeed. It means more folks to talk to and more grid squares to collect.

Most successful handie-talkie stations

have five watts for the two-meter uplink and a small dual-band beam, but, with some skill and practice, a number of excellent contacts have been achieved with only whip antennas, too. Start listening and experimenting now, and make sure you know your grid square. It's become a standard part of the exchange.

Finding out more about A-O-27

In addition to the information and links available from AMSAT's Web site, there are some really good books and publications for hamsat enthusiasts. My favorite reference is the 370-page *The Radio Amateur's Satellite Handbook* by Marty Davidoff K2UBC. It's published by the American Radio Relay League for $22. An inexpensive publication from AMSAT, *How to Use the Amateur Radio Satellites* gives a snapshot of the characteristics and operation of every currently available hamsat. Both publications (and many others) are available from AMSAT at (301) 589-6062. AMSAT also publishes a bi-monthly publication, *The AMSAT Journal,* for AMSAT members. If you have questions about AMSAT membership or publications, call the number above or send E-mail to [martha@amsat.org]. I'll see you on A-O-27! 73

Letters

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that the FCC has never had, does not now have, and never will have any loan programs. But I asked the question anyway, and here is the answer from Danny Rittenberry: "Thank you for contacting the Federal Communications Commission (FCC). Unfortunately, the FCC has no loan programs."

Is there any doubt that we have been hornswoggled?

I have instructed my attorney to start proceedings for either a class action lawsuit or the seeking of a court injunction to stop the FCC and the rest of the government from their cheap scam. I'll keep you posted — thanks for your support.

Gregg is absolutely right. The FCC has no damned business demanding our SSNs, and the ARRL made a gross mistake in supporting the FCC on this. — Wayne. 73

New Millennium Wish List

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talk coast-to-coast (plus a bit farther at times) via AO-27 (**Photo D**). If you like exciting activities, you'll love AO-27!

SO-35

This relatively new OSCAR also carries an FM repeater, and it too can be accessed using a hand-held talkie or a low power and full duplex FM mobile transceiver. Its uplink frequency is 436.300 MHz and its downlink 145.825 MHz, but these can be changed for some very interesting activities. SO-35 can also be configured as a single frequency parrot repeater receiving for 8 seconds and then retransmitting what it copied during the following 8 seconds. As this article is being written, SO-35 is expected to be released for regular use any day. Monitor the AMSAT Net on 14.282 MHz Sundays at 1900 GMT for the latest news, and check Andy MacAllister W5ACM's "Hamsats" column for more guidance.

RS-13

This low-orbiting Russian sat receives on 15 meters and relays signals on 10 — a mode "KA" operation. Typically, you can operate RS-13 using no more than 50 watts of uplink power to a vertical or dipole antenna while receiving its downlinked signals in a similar way. You can even operate through RS-13 while mobile. Again, more will be forthcoming here in *73*.

Rig users' nets

These nets are great if you're devoted to collecting or restoring classic gear or want to stay abreast of the latest in accessories and modifications for a new or existing rig. The frequency and time listings for the Kenwood and Yaesu nets, incidentally, were missing from my log notes. Please send if you have.

Conclusion

I hope you now have a better idea about these hot topics in today's ham radio. Not to be forgotten in the new *73* will also be coverage of such other popular interest areas as fox hunting (ARDFing — see Joe Moell KØOV's "Homing In"), microwaves (Chuck Houghton WB6IGP's "Above and Beyond"), antennas, new products, and of course *73*'s long-time staple, great construction projects.

There is something for everyone in this new millennium's amateur radio, regardless of license class, age, gear, or budget. Go for it! 73

Secrets of Transmission Lines

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around the twinlead. This makes a capacitor. See whether you can find a location along the twinlead where you can make the line impedance match or flatten out on the generator side. Try the same trick with a 600-ohm termination.

Conclusion

Next time, we will conclude the series and present some computer programs suited to transmission line work and impedance matching, as well as have a general discussion on which circuits are appropriate for which impedances. 73

On the Go

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Because of this, it is often preferable to not have CTCSS activated on a repeater. Of course, if there are two repeaters on the same frequency located near each other, that is another story. Many times, when you hear a particular repeater you can be pretty certain that you can hit it. At other times, the path may be only in one direction, so you can hear a repeater and not hit it or even be solidly into a particular repeater without hearing it.

Try it!

The bottom line is that ten meter FM is a great aspect of the hobby. It is possible to work the world with a minimum of equipment and effort. With the repeater frequencies standardized, picking a frequency is almost automatic. Contacts are often short, to allow many hams to get in on the action. The biggest problem? Sometimes those who

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PROPAGATION

Number 60 on your Feedback card

Jim Gray W1XU/7
210 E. Chateau
Payson AZ 85541
[jimpeg@netzone.com]

Happy New Year!

As you can see from the calendar, January will provide everything from Good (G) to Very Poor (VP) radio propagation conditions on the HF bands.

Briefly, you may expect seasonally good (G) propagation from January 1-10, but conditions are expected to deteriorate for the next three weeks, ranging from only Fair (F) to Very Poor (VP).

The worst days are anticipated January 14–16, 23–25, and 28–30, when a disturbed magnetic field and ionospheric storms are likely. Severe signal fading and even short-lived communications "blackouts" over polar propagation paths may be expected on HF bands above 40 meters. Prepare for other geophysical effects, such as severe winter weather in the northern hemisphere, during (P) and (VP) periods.

The best advice is to *be prepared* with emergency power, food, water, and warm clothing, and continue to monitor WWV at eighteen minutes after any hour for the latest reports of Solar Flux, BA, and BK indices.

The 80-75 and 40-30 meter bands should provide some good, low-noise activity in the US, Canada, and South/Central America, but DX will depend on a relatively quiet magnetic field. On the poor days, however, don't despair, since transequatorial skip and over-the-poles signals will be present. The polar paths will be weak and full of echoes, whereas the transequatorial path will provide stronger signals, sometimes even on poor days.

The 160 meter band ought to be good for much of the month, so watch the calendar for the good and fair days. The 20/18 meter and 15/12 meter bands will suffer the most along with 10 meters this month, so don't expect miracles. Perhaps in February we'll see some improvement, and March ought to get us back on the road to good worldwide DX conditions on all bands. Let's wait and see.

Remember to check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch.

February

Seasonal effects: February is a transition month between December's winter solstice (shortest days and least ionization in the northern hemisphere) and the spring equinox in March when equal hours of daylight and darkness occur and propagation is considered to be the best of the year.

Therefore, you can expect February to provide at least a week and maybe two of excellent long-haul DX propagation on the HF bands, but you will have to pick and choose the best days (G) from the accompanying calendar.

Sunspot cycle effects: As we approach the anticipated maximum solar activity of Cycle 23, propagation conditions on the HF bands will also improve, and these — coupled with improved seasonal ionization — should provide a good month for DX chasers.

The calendar indicates that the first and third weeks of the month will be more favorable, with Good (G) conditions outweighing the less favorable Fair (F) or Poor (P) ones shown for the second and fourth weeks.

This is a Leap Year, and you can see that the extra day, February 29th, will be a good one.

January 2000

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

February notes: The bands shown are likely to represent the highest frequency available to the desired areas at the time shown. Work from there to a lower fre-

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15					20	20	15	15			15
ARGENTINA	15	15	15	20/40	20/40						10	10
AUSTRALIA	15	15			20	20/40	20	20				
CENTRAL AM.	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
ENGLAND	40	40	40/30	40/30	40/30			10	10	15	20	40
HAWAII	15	15	20		40							15
INDIA	15	20			20							
JAPAN	15					20	20	15	15			15
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
PHILIPPINES	20						15			15	15	
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
RUSSIA (C.I.S.)							20	15	20	20		
SOUTH AFRICA		40		20	20			15	15	15		
WEST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10

CENTRAL UNITED STATES TO:

ALASKA	15	15				40	20	20	20			
ARGENTINA	10	15	20/40	20/40							15	10
AUSTRALIA	15	15	15	20	20/40	20/40	20	20			15	
CENTRAL AM.	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
ENGLAND							20	15	10	15	20	
HAWAII	15	15	15	20	20/40	20/40			20			15
INDIA	15	20	20	20								
JAPAN	15	15				40	20	20	20			
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
PHILIPPINES	15		20	20			20	20	15	15		
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
RUSSIA (C.I.S.)										20	20	
SOUTH AFRICA			40	20					15	20		

WESTERN UNITED STATES TO:

ALASKA	15			20	20	20	20/40		20	15		15
ARGENTINA	10	15	15	15	20		20	20				10
AUSTRALIA	10	10	15	15	20	20	20/40	20	20			
CENTRAL AM.	15	15	20/40	20/40	20/40	20		15			10	10
ENGLAND									20	15	20	
HAWAII	10	15	15	20	20/40	20/40	20	20			15	10
INDIA			15					20		15		
JAPAN	15			20	20	20	20/40		20	15		15
MEXICO	15	15	20/40	20/40	20/40	20		15			10	10
PHILIPPINES					20	20	20	20	15	15		
PUERTO RICO	15	15	20/40	20/40	20/40	20		15			10	10
RUSSIA (C.I.S.)								20	20	20		
SOUTH AFRICA				20	20				20	15		
EAST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10

Table 1. *January Band-Time-Country chart.*

February 2000						
SUN	MON	TUE	WED	THU	FRI	SAT
		1 G	2 G	3 G	4 G-F	5 F
6 F	7 F	8 F-P	9 F-P	10 P-F	11 P-F	12 F-G
13 G	14 G-F	15 F-G	16 G	17 G	18 G	19 G
20 G	21 G-F	22 F	23 F-P	24 F-P	25 F-P	26 P-F
27 P-F	28 F-G	29 G				

quency band when the higher frequency band is not open. Shaded areas = rare, and only on a "good" day. Blank spaces mean the path is not workable at that time. *15/10/20; **10/15/20.

Band-by-band conditions for January and February

10–12 meters

You can expect good band openings to the east toward Europe in the morning hours, with propagation slowly moving west and south toward South America, the Pacific, and Asia during the later afternoon hours.

Short-skip openings between 1,000 and 2,500 miles should occur on good days.

15–17 meters

On the good days, there should be excellent DX to many areas of the world, especially the southern hemisphere during the daytime hours. Signals will peak to the northeast and Europe before noon and to other areas in the afternoon. Regular short-skip openings beyond 1,000 miles are likely on all good days.

20 meters

Dawn to dark (and beyond) DX openings can be expected on good days. Peak signal strengths are anticipated an hour or two after sunrise and again in the late afternoon and early evening hours. On the best days, the band should remain open during the night, particularly to the southern hemisphere. Short skip will extend from 500 to 2,500 miles.

30–40 meters

From sundown through the hours of darkness until sunrise you will find good DX openings to most areas of the world, particularly to the southern hemisphere. At night, short skip will extend beyond 700 miles, and during the day from 100 to 1000 miles. Remember that thunderstorms will begin to present themselves during daylight hours in some areas of the world, bringing static that could limit communications. You'll just have to work your way around them spatially and temporally.

80–160 meters

As spring approaches, these two bands tend to become quite noisy again, and the normally good nighttime DX openings will begin to be masked by static.

Nevertheless, you can work a lot of choice DX if you pick and choose our times of operation. During hours of darkness, 80 meters will provide some good DX.

Short-skip daytime openings on 80 meters can be found out to distances of 300 miles or so, and beyond 2,000 miles at night. There will be NO daytime openings on 160 meters, but DX to many areas of the world will occur during the night, with occasional short-skip openings between about 1,000 and 2,000 miles.

It is necessary to plan frequencies and times of operation to maximize the existing possibilities for successful DXing. The calendars will be helpful, but careful listening at ALL times is necessary. I also recommend listening to bands above and below the listed ones in the charts at the indicated times, as well as an hour or so before and after the indicated times. Also be aware that half-hour periods surrounding the transition from daylight to dark in your area can provide some unexpectedly strong signals and openings on ALL bands.

DX is always where and when you find it, but YOU must do the work. 73 and good DX, W1XU/7. 73

EASTERN UNITED STATES TO:												
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20		20	20		20	20		10		15
ARGENTINA	15/20	40/20	40/20	40/20					10	10	10	15
AUSTRALIA	10/15	20/15			20	40	20	20	10/15		20	10/15
CENTRAL AM.	15	20	20	80		40		10	10	10	10	10
ENGLAND	40	40/80	40/80	40/80	40			10/15	10/15	15	20	40
HAWAII	15/10	20	20	20	20	40	40		15/10			15/10
INDIA		20	20				20	15				
JAPAN	15	20		20	20		20	20		10		15
MEXICO	15	20	20	80		40		10	10	10	10	10
PHILIPPINES	15						20	20	10/15			
PUERTO RICO	15	20	20	80		40		10	10	10	10	10
RUSSIA (C.I.S.)							15/20	10/15	15/20			
SOUTH AFRICA	20	40							10	10	15/20	20
WEST COAST	15/20	20/15	15	40	40	40			20/10	10	10	10
CENTRAL UNITED STATES TO:												
ALASKA	10/15	15/20			20			20				
ARGENTINA	20	20	20	20	20					10	15/10	15/10
AUSTRALIA	10					40	40	20	20/10	15	15	15
CENTRAL AM.	20	20	80/20	80/40	40	40		15/10	15/10	15/10	15/10	15
ENGLAND	40	10/40	10/40	10/40				10/15	10/15	15/20	15/20	20
HAWAII	15/10	20	20	20	40/20	40/20	40	20		15		15/10
INDIA	20	15	20				20	20				
JAPAN	10/15	15/20			20			20				
MEXICO	20	20	10/20	10/20	40	40		15/10	15/10	15/10	15/10	15
PHILIPPINES	10	20/15							20	20		
PUERTO RICO	20	20	10/30	10/20	40	40		15/10	15/10	15/10	15/10	15
RUSSIA (C.I.S.)	*	40	40	20	20			15	10	20		
SOUTH AFRICA	20	40/20							10	10/15	15	15
WESTERN UNITED STATES TO:												
ALASKA	*	*					40	40			20	20/15
ARGENTINA	10	15	20	40/20	40/20	20				15	10	10
AUSTRALIA	10	20	20				40			15		
CENTRAL AM.	20	30/40	30/40	40/80	40/80	40			20/15	10	10	15
ENGLAND				40	40	20			10/20	10/15	20	20
HAWAII	15	15/30	15/30	20		40	40			15	10	10
INDIA		30/15	20						20			
JAPAN	**	**					40	40			20	15/20
MEXICO	20	30/40	30/40	40/80	40/80	40			20/15	10	10	15
PHILIPPINES	10	15							20	20	20	15
PUERTO RICO	20	30/40	30/40	40/80	40/80	40			20/15	10	10	15
RUSSIA (C.I.S.)				40	20	20			15	20	*	
SOUTH AFRICA	20	20	20							10	10/15	15
EAST COAST	15/30	15/30	15	40	40	40			20/15	15/10	*	*

Table 2. *February Band-Time-Country chart.*

On the Go

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speak a second or third language may have the advantage!

Right now we are at the best time in the solar cycle to get into a new area such as ten meter FM. The sunspot cycle is improving and ten is starting to open up more frequently. We should have many months of continuing improvement before it even peaks, so there should be ample opportunity to enjoy this mode and band. The manufacturers know this and there are a number of exciting new rigs just coming out (see the review of the Alinco DR-M03 in this issue). Let me hear about your experiences in this exciting area of ham radio! 73

QRP

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some friends on the 10-meter band. It's a lot of fun to see how low you can really reduce your power before you're into the noise. Although ten meters is a great band with which to work the locals on ground wave, it can produce some fantastic results at times. The ten-meter band is a QRP operator's delight! The popular New Jersey FB40 transmitter kit proves it is possible to transmit coast to coast with 40 milliwatts! That's less power than the dial lights consume in most transceivers. Now, just in case you're not familiar with the New Jersey fireball transmitters, they will be featured in an upcoming column. They operate in the ten-meter band. Simply key the VCC line and you're on the air. They run about 30 milliwatts (!) of RF output.

You'll find a lot of QRP activity on 40 meters around 7.040 and on 30 meters at 10.106. Reduce your power down to 3 or 4 watts and jump right in!

QRP operators hop around the bands a lot. You really need to change bands to see if there are any openings. Ten meters is a strange band. One minute it's dead and the next it's open worldwide.

If you want to make a large number of QRP contacts quick, then work the contests! To the other guy, you're a good source of points. Even if you're "not in the test," just hand out the reports and exchanges. Some of the QSO parties are the best place to work stations. I know I've heard guys calling "CQ OHIO QSO" party for hours just looking for a contact. Jump right in there with your call at two watts on SSB. You'll be heard, I guarantee it!

Efficiency is the key to QRP

I know you've heard it before, about the guy who works DX with a set of old bedsprings. Well, that's not going to cut it with QRP operation. You need the best antenna system you can muster up. Don't get me wrong — you don't need an antenna farm containing enough aluminum to build a B-52 to operate QRP successfully, but it wouldn't hurt either!

Antennas are placed as high in the air as possible. Only the best quality feedline is used between rig and antenna. Resonant antennas instead of trapped multiband antennas provide the QRPer with improved efficiency. Anything you can do to increase efficiency will improve your chances of making a solid QSO.

We're right in the middle of winter. It's a great time to check out low power operation on 80-meter CW. There's nothing like coming home from work when it's cold and dark, then firing up the QRP rig for some contacts. When it's so cold that the snow crunches under your feet, that's a great signal that the lower bands will be humming tonight! What better way to play ham radio than to drop the power down and dig out stations running low power just like you!

The solar flux is only getting better and better, so many of the higher HF bands such as 15 and 10 meters are staying open longer. Ten is a great band for SSB and a great place to start running QRP! I'll be looking for you on 10-meter CW! 73

NEVER SAY DIE

continued from page 38

didn't have a bachelor's degree. Advanced degrees seem to only affect teacher's salaries, not their ability to teach, which seems to go down proportionately with their so-called education.

If you want to get a good idea of what is really going on in our ed schools, please go to the library and read Rita Kramer's *Ed School Follies*. And then stop believing the crap the NEA is constantly drumming into us about the need for better teacher training, more teachers, higher salaries, and so on. Not one bit of that is true.

Under the present union system incompetent teachers aren't fired, just transferred — much like pedophile priests.

What's the answer? If you can find a politician who will push to close all college education departments, eliminate tenure, and allow school choice, get out there and elect him. Or her.

More Fluorides

In a paper sent to me by Roger Masters of Dartmouth College, I found the results of an extensive study of what happens to people who drink water which has been fluoridated.

Fluorine, as you probably know, is one of the most active elements known, so it should be no surprise that when it is added to our water supply, it attacks the pipes and the pipes' lead solder joints. The amount of lead this adds to the water supply is significant enough such that the study showed a children's IQ difference of five points between fluoridated water and nonfluoridated.

The study also showed that there is a consistent ten point IQ deficit when children are bottlefed instead of breastfed. This just confirms many other studies which have shown the same deficit.

A 15 point IQ loss can make the difference between a college acceptance and a high school dropout.

And those are just two easily controlled factors that will determine a child's IQ for life. I've discussed several others in my past editorials, and I'll try to put all of these together into a book to help new parents avoid turning their budding geniuses into morons through an ignorance of what's involved.

Genes vs. IQ

One of the booklets I have available is my recommended classical music *100 CD Library* ($5). Anyway, apropos of geniuses, I got to thinking about symphonies, which are generally considered to be the heart of classical music. How many symphonies do you think have been written that are worth listening to more than once? Or even once, for that matter? Unless you are a classical music expert, you probably think there probably are hundreds. So I sat down and made a quick list. I came up with fewer than three dozen hits! And most of them were written in the 19th century, with just a few in the early part of the 20th. Nothing of even the slightest note has been written since.

The same thing applies to all the rest of classical music, including operas.

So what's gone wrong? Where are the musical geniuses of a hundred years ago? Where are the artists, sculptors, the inventors, and even the writers? What's happened? What's gone wrong?

There are three things that have changed which I'm convinced have contributed to this loss of geniuses. One has to do with several changes in the way we treat babies, both pre-natally and in early childhood. One has to do with our public school system, which has been intentionally designed to dumb us down. And the third has to do with poisons that have become popular in the last hundred years.

We've done quite a job on ourselves, really. A hundred years ago, Alzheimer's was unknown, cancer was an extreme rarity, and so on. But that was before we were buried in sugar, pasteurized milk, breakfast cereal, pop tarts, Danish, ice cream, and TV dinners. That was even before hot dogs, hamburgers, fries, and shakes.

Maybe you've read about the recent research which has shown that breastfed babies have an average 8 to 10 point IQ lead on bottlefed babies. That's been widely published.

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Wise Up!

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

.....Wayne

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

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

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

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. $5 (10)

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

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (20)

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

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

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before December 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack, or even Y2K? 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 method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham 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 code (using my system). This should only take two or three days. $5 (42)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (43)

Wayne Talks Not at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (50)

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

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Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (71)

Grist II: 50 more choice non-ham editorials from before 1997. $5 (72)

1997 Editorials: 148 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, Flight 800, the Oklahoma City bombing, more Moon madness, and so on. $10 (74)

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

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

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Stuff I didn't write, but you need:

NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. $25 (90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (91)

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

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Barter 'n' Buy

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

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

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

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

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

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

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

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NEVER SAY DIE

continued from page 62

When I get some time, I'll put all of the ways I've discovered for parents to raise their children's IQs into one book. From my viewpoint, any parent who does not make a major effort to increase their baby's intelligence is guilty of permanently maiming their child. It's like cutting off a hand or a foot. It's child abuse.

How much of an IQ increase is possible? If parents do the right things at the right developmental times for their children, I'm talking about a 40 to 50 point IQ increase! I'm talking a potential generation of geniuses. I'm talking about a possible revolution in all of the arts, sciences, and engineering.

My frustration is that I now have this information, which is scientifically backed up, but I don't know how I can get it to new parents. Oh, I could talk about it on the Art Bell Show, but his listeners are mostly retired people who don't sleep very well at night, plus some long haul truck drivers. And my *73* readers are mostly hams in their 60s. I need to reach teenagers and 20-somethings.

Please advise. 73

The New Approach to HF Radio!

The Kachina 505DSP Computer Controlled Transceiver

Features:

- Works with any Computer Running Windows 3.1, 95 or NT
- Covers all Amateur HF Bands plus General Coverage Receiver
- IF Stage 16/24 Bit Digital Signal Processing (DSP)
- II DSP Bandpass Filter Widths from 100 Hz to 3.5 kHz (6 kHz in AM Mode)
- Band Activity Display with "Point and Click" Frequency Tuning
- On-screen Antenna "Smith" Chart, Logging Software and Help Menus
- Automatic Frequency Calibration from WWV or Other External Standard
- "Snapshot" Keys for Instant Recall of Frequencies and Settings
- Optional Internal Antenna Tuner

The Kachina 505DSP Computer Controlled HF Transceiver After twenty years of building commercial transceivers in Arizona, Kachina has decided the time is right for a new approach to amateur radio. The Kachina 505DSP is nothing short of a revolution in HF transceivers.

Why Use Knobs if You Have Windows? The old-fashioned front panel has become too cluttered to be useful. Too many knobs, too many buttons. Kachina's 505DSP transceiver connects to your computer's serial port and is completely controlled under Windows™. With optional cables, the radio may be remotely located up to 75 feet away from your computer. Imagine combining a state-of-the-art DSP transceiver with the processing power and graphics capabilities of your PC and you'll soon wonder why all radios aren't designed this way. Why settle for a tiny LCD display when your computer monitor can simultaneously show band activity, antenna impedance, heat sink temperature, SWR, forward and/or reflected power and a host of other information?

16/24 Bit DSP/DDS Performance In addition to 100% computer control, the Kachina 505DSP offers exceptional 16/24 bit DSP/DDS performance. IF stage DSP, "brick-wall" digital filtering, adaptive notch filters and digital noise reduction, combined with low in-band IMD and high signal-to-noise ratio, produce an excellent sounding receiver. Sophisticated DSP technology achieves performance levels unimaginable in the analog world. The transmitter also benefits from precise 16/24 bit processing. Excellent carrier and opposite-sideband suppression is obtained using superior phasing-method algorithms. The RF compressor will add *lots* of punch to your transmitted signal without adding lots of bandwidth, and the TX equalizer will allow you to tailor your transmitted audio for more highs or lows.

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American-made and designed, and able to stand on its own against the world's best, the 505DSP is bound to set the standard for all that follow. But don't take our word for it. Visit our website at http://www.kachina-az.com for detailed specifications, to download a demo version of our control software, or to see a current list of Kachina dealers displaying demonstration models in their showrooms.

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NEW!

TM-D700A DATA COMMUNICATOR 144/440MHz FM Dual Bander

Conspicuous with its extra-large amber & black display, Kenwood's new TM-D700A is fully equipped to make the most of the exciting opportunities offered by the Kenwood Skycommand System, SSTV, GPS and APRS® –the Automatic Packet/ Position Reporting System that is rapidly gaining popularity worldwide. This mobile transceiver with built-in TNC offers a wide range of data communications options, including simple packet operation using the AX.25 protocol. You can also send and receive SSTV images using Kenwood's VC-H1. Ham radio is truly entering a new era.

APRS® (Automatic Packet/Position Reporting System)

- **Position/directional data**
  With an NMEA-0183 compatible GPS receiver you can transmit position data for automatic calculation of distance, current speed and heading. Last 4 digits can be masked for position ambiguity. Manual input of latitude/longitude is also possible.
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  Transmission of position data can be accompanied by a choice of programmable status text (up to 28 characters), position comments (15 settings), icons and bulletins. For added messaging flexibility, individual alpha messages (up to 64 characters) can also be sent.
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  Store received APRS® data in up to 40 station reports.
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- **BCON TX interval (0.2/0.5/1/2/3/5/10/20/30 min.)**
- **Packet path selection for Digipeat**
- **Weather station & PHG data reception**
- **Digipeat station and DIGI function capability**
- **Auto Message Reply**
- **Audible APRS® message receive (call sign) notification (requires VS-3)**
- **Waypoint position data output**

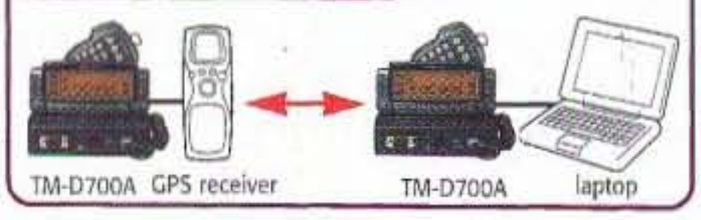
FEATURES

◗ Full Dual-band operation: VHF x VHF/ VHF x UHF/UHF x UHF ◗ Wide-band receive: 118–524, 800–1300 MHz (excluding cellular blocked + frequencies) ◗ Detached panel (extension cable and panel holder supplied) with extra-large (188 x 54 dots) backlit LCD and multifunction key display (reversible) ◗ Improved key operation announcement with optional VS-3 voice synthesizer ◗ Built-in 1200/9600bps TNC compliant with AX.25 protocol and KISS mode ◗ Simplified packet monitoring ◗ SSTV functions with Fast FM for transmission of images in just 14 secs (approx.) and dual receive for voice and image transmissions (two frequencies simultaneously) ◗ 200 memory channels with 8-character memory name input ◗ Up to 10 programmable memory scan banks ◗ Easy-to-use menu system similar to the TH-D7A ◗ Built-in DCS (Digital Code Squelch) and CTCSS encode and decode ◗ CTCSS tone frequency scan ◗ DCS code scan ◗ 9600bps PC-based packet communications for chat, BBS ◗ Kenwood Skycommand System (KSS) II for remote control of fixed HF transceiver (TS-570S/D(G) or TS-870S) ◗ DX packet cluster monitoring ◗ Cross-band repeater ◗ Wireless remote controller ◗ 1750Hz tone burst ◗ D-sub 9 pin terminal (for PCs) ◗ GPS input terminal (NMEA-0183) ◗ Visual band scope ◗ Mute function ◗ Memory control program available via Internet access ◗ New backlit microphone with alphanumeric message input.

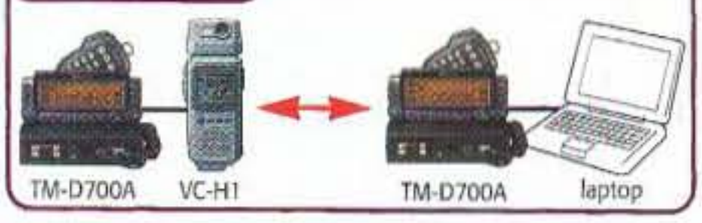
NOTICE:

The TM-D700A has not been approved by the F.C.C. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the F.C.C. has been obtained. Pending approval in December, 1999.

Example A: with GPS receiver & laptop



Example B: with VC-H1



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