ICD 08241

Amateur Radio

CQ

SERVING AMATEUR RADIO SINCE 1945

FEBRUARY 1997

In This Issue:

- The Sunspot Cycle: First Signs of Improvement
- The Full-Wave Loop Sky-Wire Antenna
- Antennas In, Over, and Around Treetops
- Beverage Antennas – There's More To Them Than Meets The Eye
- The End of AMSAT OSCAR 13
- W1FB Tries Double Sideband QRP
- W1ICP Revisits Antenna Efficiency

On the cover:
Austin Reagal, N4WW
Apopka, FL

U.S. $3.5

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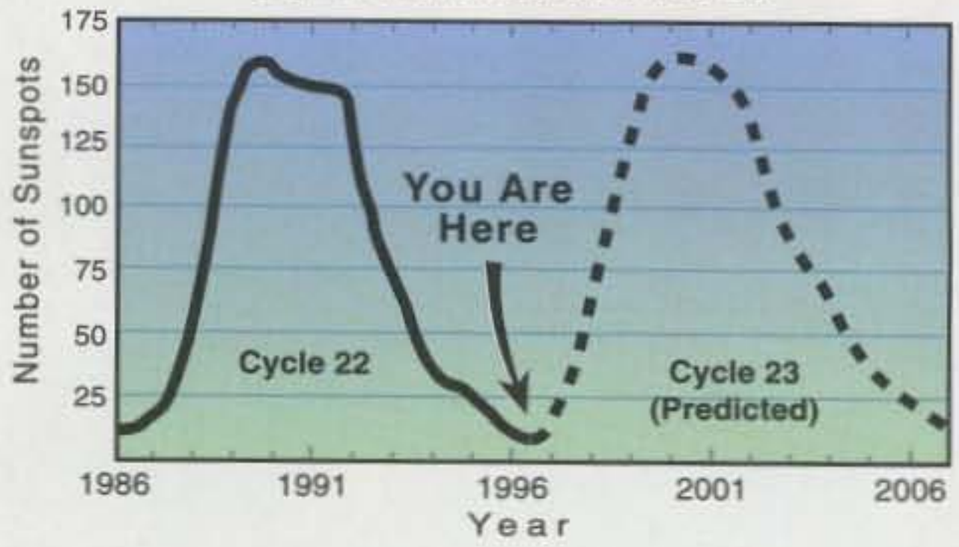
THE RADIO AMATEUR'S JOURNAL

R7000

10, 12, 15, 17, 20, 30, 40 Meter

The cold winter of low sunspots is thawing. The solar flux will soon begin it's steady climb. Cycle 23 begins Now - and Now is the time to start your station upgrades. As each month passes, DX will find it's way from 20 to 17 to 15 to 12 to 10 meters. Don't miss the action. The best operating conditions are just ahead.

SOLAR CYCLES 22 AND 23



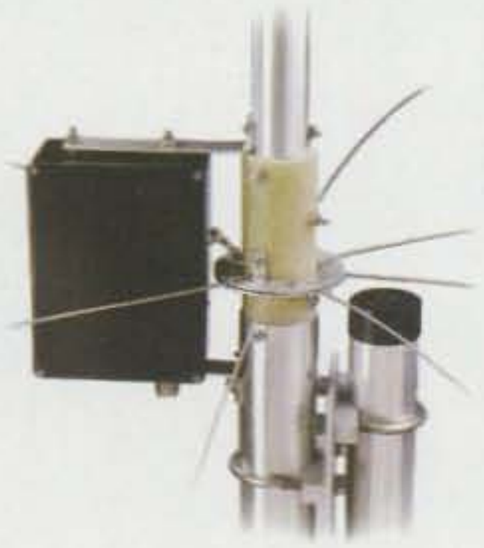
AL6063 Cover Design
The cover completes the LC circuit of the trap. The beauty is in the simplicity; these elegant trap covers make stable capacitance and higher power handling possible.

Controlled Inductance Traps
Cushcraft holds the trap inductance within close tolerance so there's less tuning and outstanding in-weather performance.

All Materials
are either stainless steel, aluminum, or high impact plastic.

Double Wall Tubing
makes up the lower three sections. This 0.116 inches of wall insures top performance in winds up to 80 mph.

Mounting Hardware
is extra rugged and makes installation easy on any 1-3/4" to 2-1/8" OD mast.



• EXPANDABLE TO 80M
Transform your R7000 into a R7000+ by adding 80 meters with the R80 kit (trap, tubing, guy & ground wire)

• RELIABLE
New trap design is stable in all conditions

• EASY INSTALLATION
For typical use, tuning is not needed after installation

• AUTO BAND CHANGING
To any band from 10 through 40m (80m with R80 kit)

• SLIM SILHOUETTE
Gain favor of family and neighbors with the slim, smooth profile of our new trap design.

Be ready for the coming sunspot cycle!

SPECIFICATIONS
FREQUENCY
10, 12, 15, 17, 20, 30, 40 M
(80 M with optional add-on)
HEIGHT
R7000 - 24 feet (7.3 M)
R7000+ - 32 feet (9.8 M)

"I bought the R7000 specifically for our Barren Islands IOTA trip. It worked FANTASTIC. I think it is one of, if not the, best built antennas I've ever seen. We experienced 75 mph winds on the island and we kind of expected the antenna to buckle in the wind ... it didn't. Amazing!" N6IV/KL7

"What a fantastic DXpedition antenna. Tnx for a quality product." NL7TB

If you'd like to know more about the R7000 and R7000+, check it out at http://www.cushcraft.com. We'll even show you what's inside the black box and tell you how it works. Or get an R7000 brochure from your dealer anywhere in the world, hamsales@cushcraft.com, or by contacting our ham sales department.

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Looking for what's new in Amateur Radio?

LOOK TO ALINCO!

COOL NEW PRODUCTS THAT ARE FUN, AFFORDABLE AND DEPENDABLE.

■ **DJ-S41T** A full-featured 70 cm HT for less than $150! Pivot antenna and rugged design make it ideal for pocket or purse. Uses 3 AA batteries, has 21 memories, CTCSS, many programmable features and a great line of accessories. Work repeaters, simplex or cross-band links, there's no end to the fun!

■ **DR-605T**

Who said a full-featured, dual band mobile has to be expensive? 100 memories, CTCSS + European Tone Bursts, cross-band repeat, built-in duplexer, MARS/CAP capability, 9600 packet port, clone function and more at a very affordable price! Easy to operate, clean design. Perfect companion to the DJ-S41T (above).

■ **DR-140T** Alinco's newest 2 meter mobile, packed with features at a very low price! Alphanumeric display (up to 7 characters), 51 memory channels, CTCSS + European tone bursts, scanning functions, cloning capability, MARS/CAP capability and more, with dependable Alinco quality.

■ **DM-1350 Regulated DC Power supply**

Power your radios, accessories (including laptop computer or cellular phone), or test bench with a versatile performer. Three styles of output terminals: binding post, spring clip and cigar lighter port. Variable voltage output knob (1~14 VDC), forced air cooling and short circuit protection. Meters included at no extra cost. Solid value for your station at an Alinco price!

■ **DX-70TH HF+6 Meter Transceiver with 100 watts output**

The DX-70T is already a legendary performer, now it's joined by the DX-70TH, featuring more power for 6 meter users. 100 memories, CTCSS for 6 & 10 meter FM repeaters, detachable face for remote mounting, general coverage receiver, narrow filter, speech processor, multi-function control and much more.

■ **EDX-2 Automatic antenna tuner**

Plugs directly into Alinco DX-70 radios, usable with other HF units. Matches 160 - 10 meters (minimum 40 foot wire antenna required for 160 meter use). Perfect for mobile, base, portable or marine installations and areas where space is restricted. An outstanding value at less than $350!

Simple ■ Clean ■ Dependable

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Specifications are subject to change without notice or obligation. Performance specifications only apply to amateur bands. Permits required for MARS/CAP use. Prices mentioned are MSRP. Dealer prices may vary

CQ Amateur Radio

FEBRUARY 1997 VOL. 53, NO. 2

page 16

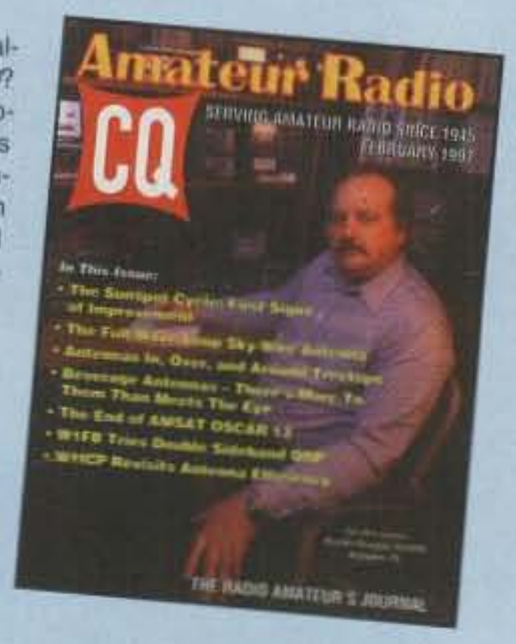
page 20

page 56

Features

Departments

ON THE COVER: Could it be? Is that really Dennis Franz of "NYPD Blue" fame on the cover of *CQ*? No, it's really look-alike Austin Reagal, N4WW, of Apopka, FL, a suburb of Orlando. In the real world Austin is an emergency room physician, which, in this writer's opinion, qualifies him as a real-life hero in his own right. Austin is a bit less active from his home QTH now than he had been in the past, when he'd been a regular hard-charger in the CQ WW DX Contest as a multi-single. More recently, his contesting has been done from various spots throughout the Caribbean, the most recent of which was at HH2B along with KØLUZ and N4SZ for the WW CW Test last November, racking up 8500 QSO's. Among his other ham achievements, Austin counts DXCC Honor Roll at 300+ on 80-10, 250+ countries confirmed on 160, and over 70 so far on 6 meters. Anyone for 10-band DXCC? (Photo by Larry Mulvehill, WB2ZPI)



World's First HF Rig with CW Auto Tune and DSP Built-in

NEW! HF + 6M Version

Kenwood makes Digital Signal Processing technology available to everyone with the all-new TS-570D and TS-570S. Imagine a DSP radio that you can operate in the shack, the car, or on a remote DX island. These are the first DSP rigs that meet the needs of today's HF operator within a budget. From the first moment that you hear the incredibly clear and powerful audio and operate the new, common-sense ergonomic design, you will realize the TS-570D or TS-570S is the HF rig built for you.

The TS-570D and TS-570S offer the world's first CW AUTO TUNE feature which enables automatic zero-beating for CW operation. The RCP-2 Radio Control Program also allows the HF operator to design and program multiple radios with custom settings while conveniently saving them to a PC file for future use. Advanced Kenwood design and features coupled with traditional Kenwood HF performance make the TS-570D/570S a masterpiece that you can proudly operate. If you have been waiting for a new DSP HF radio with performance at an affordable price, wait no more.

Large LCD display features a 4-stage dimmer while the **7-digit alphanumeric sub-display** provides menu mode guidance, split frequency display and digital filter selection options. Easy-to-read **S/PWR/COMP/SWR/ALC** meters and an operating guidance feature help to greatly simplify operation.

16-bit DSP technology delivers superb audio quality on both transmit and receive. **Noise reduction** (line enhancer method and SPAC), **audio equalization** (voice/transmit equalizer and speech processor), **slope tuning** and **automatic IF filter bandwidth selections** can be operated with a touch of a button.

Power output can be set between 5 ~ 100 watts in 5 watt increments. 5 watt setting is ideal for QRP operation.

Preset auto antenna tuner with 18 sub-bands from 1.8 MHz - 30 MHz and memory for both antenna ports.

10-key direct frequency entry

World's first CW Auto Tune enables automatic zero-beating for CW operation.

Quick memory provides five channels for on-the-fly frequency control: **M.IN** stores data, **MR** recalls it.

Electronic keyer provides speed settings of between 0 and 100 wpm and dual key inputs on the back – one for the paddle and one for the key.

Menu system offers 46 types of functions to assist novice thru extra class operators.

A wealth of scanning capabilities enhance operability. Scan speed is variable and can be set for time-based or carrier-based resume. Scanning can work across channels, groups of 10 channels, all except locked out channels, or it can be programmed to scan a frequency range between two channels.

• Mobile/fixed station size (10-5/8 x 3-3/4 x 10-11/16 in) • Heavy-duty design • CW message memories
• CW reverse mode • Full break-in and semi break-in • High-speed 57600 bps PC control • Dedicated packet port

TS-570D / TS-570S

HF Transceiver **HF + 6M Transceiver**

"New"

On 6M too!
- √ **DSP**
- √ **100 Watts**
- √ **Preset Auto Antenna Tuner**

With a half century of engineering and design experience to draw upon, Kenwood is changing the future of HF communications technology. High quality TX-RX audio reproduction with extremely effective DSP interference reduction delivers pleasing performance to your ear and over the air. You will also enjoy the large, easy-to-read LCD display with a built-in on-screen operator guidance system for simple operation. Features like 10-key direct frequency entry with new "soft-touch" keys, auto-antenna tuner, 100 to 5 watt for QRP operation, variable scanning speed, built-in CW keyer, ANT 1-ANT 2 ports, IF shift control, RS-232C com-port, 100 memory channels, CW reverse, optional VS-3 voice synthesizer and DRU-3A digital recording unit make the TS-570D or TS-570S the radio for you.

ISO 9002
Meets ISO Manufacturing Quality System

The TS-570S 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.

RCP-2 software allows you to build different radios on screen and save all your functions and settings to a file for future use.

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ZERO BIAS

AN EDITORIAL

Some time ago I received a disturbing letter from an old friend. His remarks, which I felt were uncalled for, created in me a sense of anger and umbrage. Besides grumbling to myself, I immediately began forming a reply in my head that was nasty, cutting, vicious, and most important, unnecessarily cruel. In a brief moment of temperance, I decided to wait a day or two and think things over. In actuality, I waited almost two weeks to form what I really wanted to say before I composed and mailed the letter. To me, a letter is still a personal thing, with subjective qualities beyond the *prima facie* message written thereon. There is a human quality coupled with the deliberate actions of writing, envelope sealing, placing a stamp on the envelope, and going to a mailbox. There is also the time involved for the letter to arrive at its destination, and further time if a reply is generated.

Letter writing for a lot of people these days is an anachronism. Amateurs especially have taken to e-mail as a primary source of quickly disseminating information. There is a definite novelty to the immediacy of e-mail, which includes copying 30 other people who may or may not care about the information. It's physically possible and easy, so let's do it. The keyboard has replaced the more traditional "soapbox" for pontificating on everything under the sun. One of the worst offenses these days is to be caught in the position of not having an e-mail address. This person has the temerity to slow down the stream of consciousness thoughts of everyone else. With some people I know, this creates a sense of anger at being thwarted in their ability to reach someone easily and from the comfort of their own home. The anger is really a form of frustration in that the person now has to resort to a telephone, fax machine, postal service, personal visit, or as an extreme measure, rely on amateur radio to reach someone. Let's not forget telephone answering machines either. However, these "modes" are not as fast, or inexpensive, and require that the originator physically do some work to achieve communication or at least to get something off their collective chests.

It doesn't take a genius to see the phenomenal attraction of the Internet and e-mail. It's now, it's immediate, and it involves very little, if any, effort to expound, expand, and immerse yourself in just about everything . . . all at the same time, which is now. More and more amateur activities are conducted via these modes, which probably has freed up a tremendous amount of spectrum space. I can see where it can and does satisfy a great number of needs, especially in business where information has to be exchanged rapidly to meet deadlines. Most of what I've seen with regard to amateur radio would have been better composed as a letter. The person originating the message would have had to think about what he wanted to say, organize it to get a point across, put it on paper, and physically send it. Obviously, this would and does cut down on the number of letters sent.

Since most amateurs are competitive, it probably won't be long before there is a new award program built around e-mail: the most messages originated in a given time, the most messages received, and so on. We could form an advisory committee to look into adding "E" endorsements for CQDX and WAZ and special categories for our contest program. This could go a long way toward heightening the existing frenzy and volume of e-mail.

I suspect, from what I've seen, that a great number of users just want to get something off their chests, and they therefore fire off the first thing that enters their minds, which means blocking off their internal editing and censoring. That "send button" has a hair trigger, with no safety. It just goes. On the other end you can have a person or organization receiving possibly hundreds of messages per day. Does that fact create the obligation on the part of the receiver to actually read them all, since most were probably unsolicited? Does that also create the obligation to respond to each and every message? Where does the time to do all of this come from? What if a person turns on his computer, sees that there are X number of messages waiting, then simply decides to delete them all without reading one? I don't have the answers for the above questions, but I pose them just the same.

I guess that my perception of e-mail has changed to the point where I can almost equate it with my telephone answering machine at home. I can arrive home, check the machine, and find that I have X messages. Some simply will be "clicks," which can indicate a telephone solicitor who can't waste time with a machine. Some might even be people who refuse to "talk" to a machine. One or two might be a recorded telephone solicitation to make my life better by selling me stock, cleaning my chimney, putting blacktop on my driveway, or refinancing my home. One or two might actually be from people I know, although what they want to say may not be timely or critical. Very rarely will it be something that I have to respond to at that moment.

While the technology is certainly there to be used and enhanced, the facility, ease, and speed seem to satisfy both intellectual and scientific curiosity, while introducing a few content problems. It just seems that the brain doesn't engage as fast, nor does selectivity operate at all. I think that the question becomes, "If I had to hand-write this, address an envelope, put a stamp on it, and walk it to the local post office, would I still send it?" The second obvious question is, "Would I do it 30 more times to copy others?"

This Month

Antennas in February? Why not? It should be cold enough with enough miserable weather to make this the ideal conditions for amateurs to work on their antennas. We've got some great ideas for improving your antenna farm that shouldn't keep you outside for more than a few hours. Try to dress warm and plan ahead. If you missed out on *CQ*'s WW 160 Meter CW Contest last month, there are still a few weeks to get something up for the SSB half at the end of this month.

Norm Van Raay, WA3RTY, who handled our USA-CA Award and Awards Column, has decided to retire. As of this writing (late December) we are checking applications for the job and still seeking others to give us a pool from which to select. Norm has done a great job over the years. We will miss him.

Those of you who have followed my great travails over the years with antenna cables and lightning protection probably thought that you were finally through hearing about it. Well, on my end yes, but I wanted to share someone else's great idea with you. I was going through the January issue of our sister publication, *CQ Contest,* and came across an article by Steve Sacco, KC2X. Steve's idea involves the use of an aluminum truck box which he mounts on a concrete slab next to his house. Anyway, the idea is simple, neat, easy to duplicate, and very, very clever. Check out the article. It's great source material for ideas.

In spite of the protestations and highly charged emotionality within amateur radio today, things will change dramatically in the years to come. There is very little today that an amateur licensed 40 years ago could possibly relate to in the '50s. Be that as it may, I'm still having a great time with the hobby and I'm looking forward to some new projects in 1997. I'm also looking forward to better sunspot numbers and better band conditions.

I'm also looking ahead to being in Miami for the big Miami Hamfest, the start of our traveling season. I haven't been to a flea-market in some time, and I'm starting to get edgy. If you don't show up, shame on you. But then again, there will be more great stuff for me.

73, Alan, K2EEK

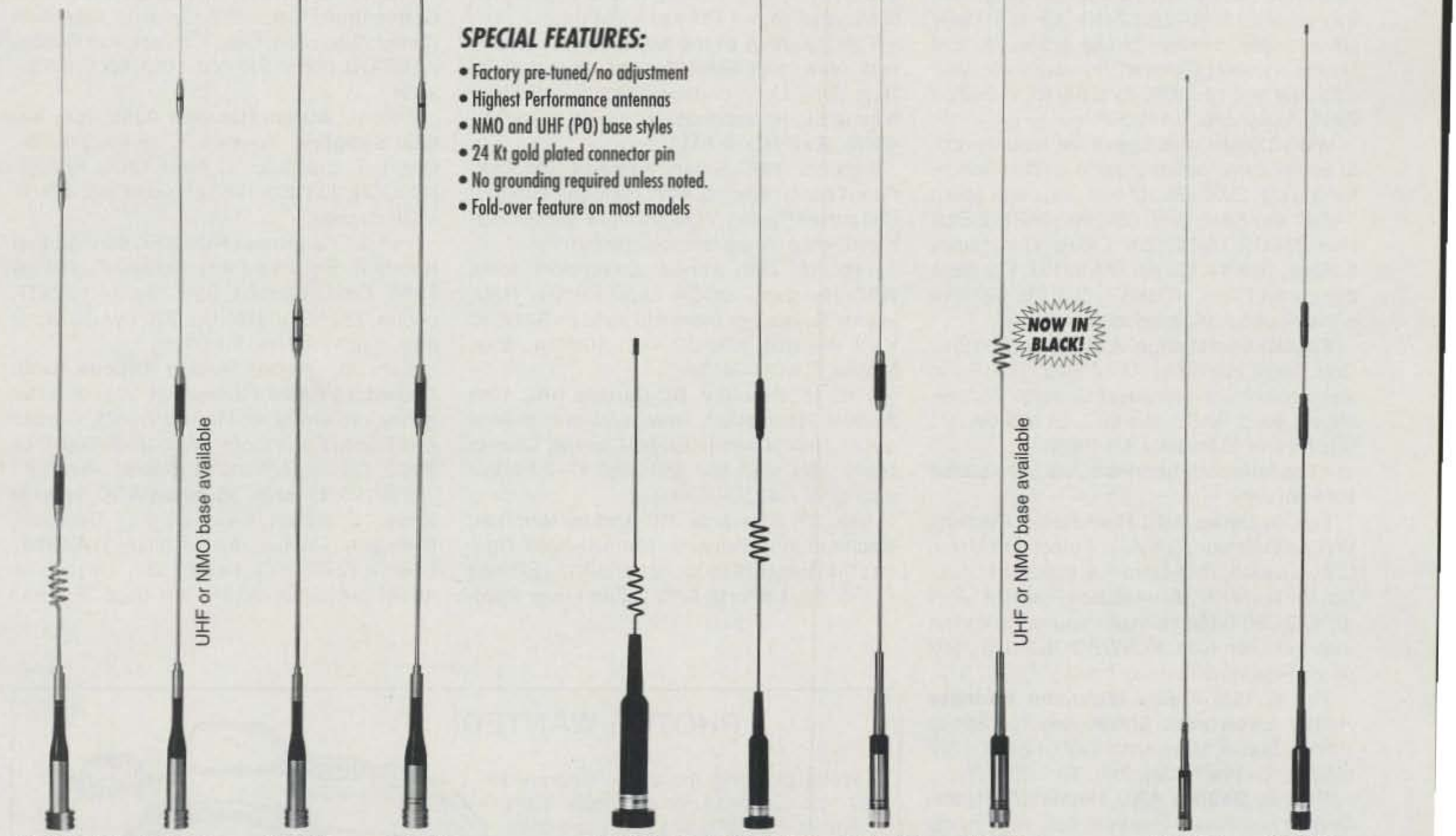
DIAMOND'S STATE-OF-THE-ART VHF/UHF MOBILE ANTENNAS—MAXIMUM PERFORMANCE WITHOUT COMPROMISE!

You've seen the rest...now own the BEST!

DIAMOND ANTENNA

SPECIAL FEATURES:

- Factory pre-tuned/no adjustment
- Highest Performance antennas
- NMO and UHF (PO) base styles
- 24 Kt gold plated connector pin
- No grounding required unless noted.
- Fold-over feature on most models



SG7200NMO | SG7500 SG7500NMO | SG2000 | SG7900 | NR72BNMO | NR73BNMO | NR770R | NR770H NR770HB | CR214S | CR320A

MODEL	BAND	GAIN (dBd.)	WATTS	CONN.	HT. IN.	ELEMENT PHASING
NR72BNMO[6]	2m/70cm	2.15	100	NMO	13.8	1/4λ, 1/2λ
NR73BNMO	2m/70cm	2.15/5.3	100	NMO	33.5	1/2λ, 1-5/8λ
NR770SA[6]	2m/70cm	2.15/2.15	100	UHF	16.9	1/4λ, 1/2λ
NR770HA[7]	2m/70cm	3.0/5.5	200	UHF	40.2	1/2λ, 2-5/8λ
NR770HNMO[8]	2m/70cm	3.0/5.5	200	NMO	38.2	1/2λ, 2-5/8λ
NR770RA	2m/70cm	3.0/5.5	200	UHF	38.6	1/2λ, 2-5/8λ
NR790A*	2m/70cm	4.5/7.2	120	UHF	57.5	6/8λ, 3-5/8λ
SG7000[6]	2m/70cm	2.15/3.8	100	UHF	18.5	1/4λ, 6/8λ
SG7200NMO	2m/70cm	3.2/5.7	150	NMO	36.6	1/2λ, 2-5/8λ
SG7500A	2m/70cm	3.5/6.0	150	UHF	40.6	1/2λ, 2-5/8λ
SG7500NMO	2m/70cm	3.5/6.0	150	NMO	41.0	1/2λ, 2-5/8λ

1/4λ antennas rated in dBi.

MODEL	BAND	GAIN (dBd.)	WATTS	CONN.	HT. IN.	ELEMENT PHASING
SG7900*	2m/70cm	5.0/7.6	150	UHF	62.2	7/8λ, 3-5/8λ
SG2000*	2m	5.2	150	UHF	62.6	7/8λ
SG6000NMO[6,9]	6m	2.1	150	NMO	39	1/4λ
NR140A	1-1/4m	3.8	100	UHF	36.2	5/8λ
NR124	23cm	8.4	100	N	25	4-5/8λ
CR214S[6]	2m/1-1/4m	2.15/3.4	120	UHF	37	1/2λ, 5/8λ
CR224A*[6]	2m/1-1/4m	5.0/6.0	150	UHF	68.5	7/8λ, 2-5/8λ
CR320A[6]	2m/1-1/4m/ 70cm	2.15/3.8/ 5.5	200/ 200/100	UHF	37.4	1/4λ, 1/2λ, 2-5/8λ
CR627B[6,9] CR627BNMO[6,9]	6m/2m/ 70cm	2.1/4.5/ 5.5	120 200/100	UHF NMO	60	1/4λ, 1/2+1/4λ/ 2-5/8λ
NR2000NA	2m/70cm/ 23cm	3.15/6.3/ 9.7	100	N	39	1/2λ, 2-5/8λ 5-5/8λ

* Not recommended for Magnet Mount
[6] Grounding required.
[7] NR770HB same specifications but in black finish.
[8] NR770HBNMO same specifications but in black finish.
[9] 50MHz antennas adjustable

FOLD-OVER

Patented One-Touch Fold-over Feature
(Not available on NR72BNMO, NR73BNMO or NR770SA.)

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ANNOUNCEMENTS

• The following Special Events are to take place during February:

KB2YCT, from Nutley, New Jersey; for Jerzy Popieluszko, Spark Plug for Solidarity Labor Movement, Poland; Robert D. Grant United labor ARA; 1200–2300Z Feb. 22 on 28.420. For certificate QSL to RDGUL ARA, P.O. Box 716, Nutley, NJ 07110-0716.

K4EC, from Alexandria, Virginia; to commemorate George Washington's birthday; Mt. Vernon ARC; 1600–2200Z Feb. 15–16 in lower General 80–15 meter phone subbands and Novice 10 meter subband. For certificate send QSL and 9 × 12 SASE to MVARC, P.O. Box 7234, Alexandria, VA 22307.

WW5C, from Oasis State Park, New Mexico; to demonstrate amateur radio at Boy Scouts family Day; 2000–2300Z Feb. 22, on or about 14.240 and 7.240 MHz. QSL with SASE to East New Mexico ARC, c/o Clovis Community College, Box 94, Clovis, NM 88101. For more info contact Terri, KC5KKY, 505-769-2237, or e-mail <asplundm@3lefties.com>.

K8LOD, from Marquette, Michigan; 200 Sled Dog Race; Hiawatha ARC; Feb. 14–16 (no times given); 20–80 meters General. For certificate send SASE and QSL to N8BGA, 21 Smith Lane, Marquette, MI 49855.

• The following hamfests, etc., are slated for February:

Feb. 5, **Dallas ARC Ham Radio Auction**, Wyatt's Cafeteria, corner of Forest and Marsh Lanes, Dallas, Texas (preview at 6:30 PM, auction starts at 7 PM). Contact Bob Peters, K1JNN/5, 972-288-0484 (e-mail <soundimp@intex.net>) or Glen Kitto, KC5WBQ, 972-383-7507 (e-mail <gkitto@teleteam.com>).

Feb. 8, **16th Annual Midwinter Madness Hobby Electronics Show**, National Sports Center, Blaine, Minnesota. Call 612-537-1722 for info. (Exams Friday, Feb. 7.)

Feb. 8, **DeSoto ARC Hamfest/Tailgate**, DeSoto Fair/Rodeo Grounds, Arcadia, Florida. Call Doug, KN4YT, 941-494-5070, or Harry, K4LU, 941-494-4390.

Feb. 8, **Milton, Florida ARC Free Tailgater**, Carpenter's Park, milton, Florida. Contact Mark McAnally, KE4QKN, 904-626-7686 or e-mail <ke4qkn@aol.com>.

Feb. 8, **Michigan Antique Radio Club Swapmeet**, Armenian Hall, Dearborn, Michigan (8 AM to noon). Call 517-349-7187.

Feb. 8, **24th Annual Charleston, South Carolina Hamfest & Computer Show**, Stall High School, Charleston, South Carolina. Contact Jenny Myers, WA4NGV, 803-747-2324 (e-mail <brycemyers@aol.com>). (Exams walk-in 12 noon; for more info contact Ed, KC4OOZ, 803-871-4368.)

Feb. 9, **Mansfield, Ohio Mid*Winter Hamfest/Computer Show**, Richland County Fairgrounds, Mansfield, Ohio. Contact Pat Ackerman, N8YOB, 63 N. Ilinois Ave., Mansfield, OH 44905, or call 419-589-7133 after 1 PM EST.

Feb. 14–16, **Orlando HamCation Show & Computer Show**, Central Florida Fairgrounds, Orlando, Florida. Contact Orlando HamCation, P.O. Box 547811, Orlando, FL 32854 (e-mail <kd4jqr@aol> or web page <www.cycat.con/users/oarc>).

Feb. 15, **Harrisburg, Pennsylvania ARC Winter Hamfest**, Oberlin Fire Hall, Oberlin, Pennsylvania. Contact HRARC 717-232-6087. (Exams 9 AM.)

Feb. 15, **Cherryland ARC 24th Annual Swap-n-Shop**, Conception Middle School, Traverse City, Michigan. Contact Joe, W8TVT, 616-947-8555, or Chuck, W8SGR, 616-946-5312. (Exams at 1 PM and 4 PM.)

Feb. 15, **ARA of the Southern Tier Hamfest**, New York State Armory, Horseheads, New York. Contact Jack Slocum, 410 Shelbourne St., Horseheads, NY 14845 (607-739-4866). (Exams at 9 AM.)

Feb. 15, **1997 Salem, Oregon HamFair**, Polk County Fairgrounds, Rickreal, Oregon. Call James Pardey, WA7ZAJ, 503-651-3216 or e-mail <http://www.teleport.com/~n7ifj>.

Feb. 16, **26th Annual Davenport, Iowa ARC Hamfest**, QCCA Expo Center, Rock Island, Illinois. For more info send an SASE to Kent Williams, K9UQI, 4245 10th St., East Moline, IL 61244-4154.

Feb. 16, **Burnaby, BC Canada ARC 10th Annual Fleamarket**, New Westminster Armouries, New Westminster, BC Canada. Contact Harry, VE7HNC, 604-530-3962 (7–9 PM) or packet VE7ABC@VE7KIT.

Feb. 22, **Bismarck 7th Annual Hamfest**, Radisson Inn, Bismarck, North Dakota. Contact Tim Rasset, NØSDB, 701-663-620. (Exams.)

Feb. 22, **LaPorte ARC Cabin Fever Hamfest**, LaPorte Civic Center, LaPorte, Indiana. Contact John, N9ROH, @ LPARC, P.O. Box 30, LaPorte, IN 46352.

Feb. 22, **Northern Vermont Winter Hamfest**, Milton High School, Milton, Vermont. Contact W1SJ, 802-879-6589 (e-mail <wb2jsj@vbi.champlain.edu>; web site <http://www.together.net/~fflynn/milton.html>). (Exams 9 and 2 PM; comercial exams 2 PM.)

Feb. 22–23, **ARRL 1997 Great Lakes Div. Convention**, Cincinnati Gardens Exhibition Center, Cincinnati, Ohio. Contact Stan Cohen, WD8QDQ, phone 513-531-1011, fax 513-531-3834.

Feb. 16, **Aurora Repeater Assn. 15th Annual Swapfest**, Adams County Fairgrounds, Brighton, Colorado. Contact Chris Knauer, KB9CCR, 303-403-1883 or e-mail <cknauer@skywarn.org>.

Feb. 23, **Cuyahoga Falls ARC 43rd Annual Hamfest**, Emidio's Party Center, Cuyahoga Falls, Ohio. Contact Bob Recny, N8SQT, phone 330-864-5810; fax 330-864-5879; e-mail <hamfest@neo.lrun.com>.

Feb. 23, **Greater Boston Antique Radio Collectors Radio Fleamarket**, Westford Regency Inn, Westford, Massachusetts. Contact Lisa Friedrichs, Antique Radio Classified, P.O. Box 2, Carlisle, MA 01741 (508-371-0512).

Feb. 23, **Livonia, Michigan ARC Swap 'n Shop**, Dearborn Civic Center, Dearborn, Michigan. Contact Neil Coffin, WA8GWL, Livonia ARC, P.O. Box 51532, Livonia, MI 48151 (SASE), or call 313-261-5486. (Exams.)

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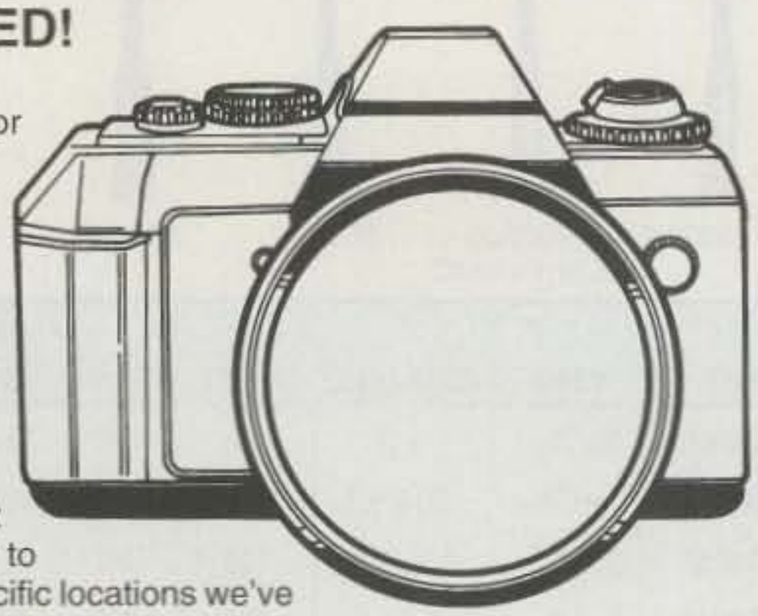

We're planning the travel itinerary for 1997 for *CQ* Staff Photographer Larry Mulvehill, WB2ZPI, and could use some input from our readers. As you know, Larry shoots all the covers for our publications *CQ, CQ VHF,* and *Popular Communications,* as well as the 15 photos for the annual *CQ* Amateur Radio Calendar. That's 51 shots used each year. Since a major part of the expense of generating these photos is travel, we like Larry to put together a few large "swings" each year to various parts of North America to visit specific locations we've been tipped-off about by readers. That's where you come in.

If you know of a particularly photogenic setting that you feel might lend itself to a good cover or a calendar shot, why not let us know about it! It might be a great antenna installation, or a neat mobile setup, an interesting shack, or even a busy electronic workbench with work in progress. How about an interesting Police, Fire Department, Public Service, Scanning, Shortwave Listening, Military Communication, or Broadcasting setting? Don't be shy about recommending your own setup, either! If you think you've got a suggestion that can lend itself to a great amateur radio photo, let us know. If you can provide a snapshot or two for reference, great. If a snapshot isn't available, a short verbal description will help.

Send your ideas and snapshots to Larry Mulvehill, WB2ZPI, at 32 Comanche Drive, Oceanport, NJ 07757. Larry will decide if your suggestion fits in with our needs and his schedule. If you'd like your snapshots returned, please include an SASE. The sole reward for your help will be the gratitude of your fellow readers, and of Larry, who will have the opportunity to make about a hundred new radio friends again this year. Be sure to include information about how Larry can get in touch with you.

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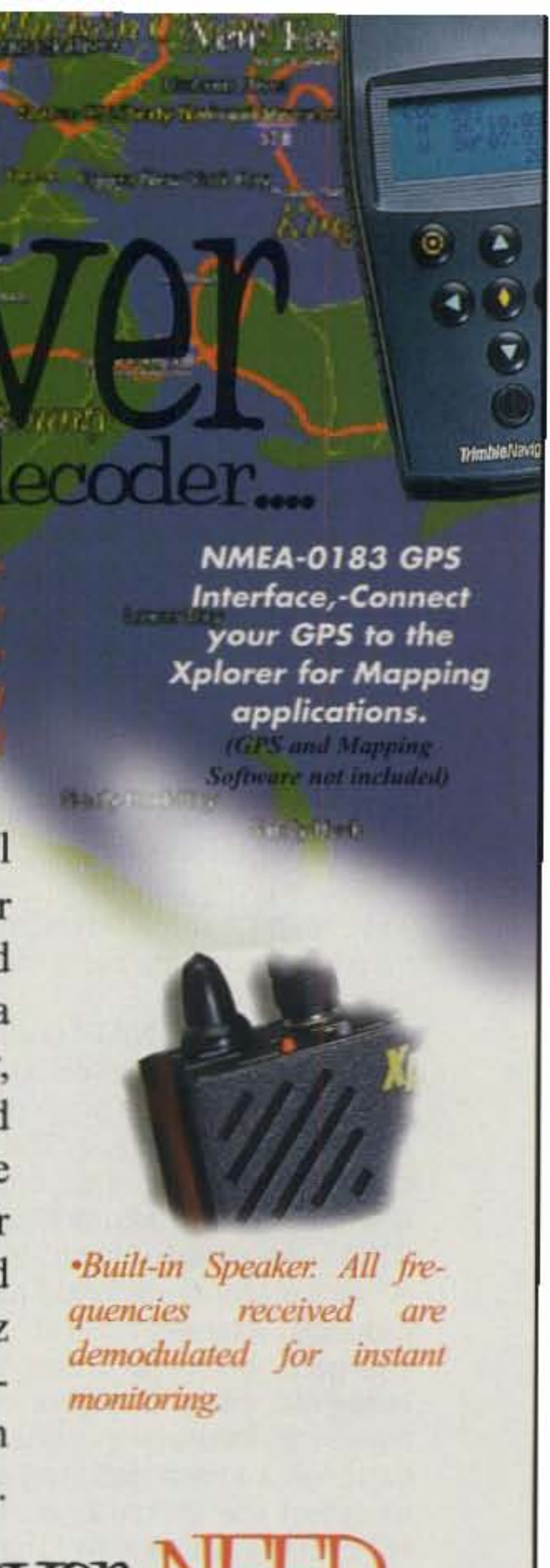

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OUR READERS SAY

Make An Educated Choice

Editor, *CQ:*

I'm writing this letter to inform your readers about making educated choices when buying batteries for their hand-held radios. Some claims for Nickel-Metal Hydride (NiMH) batteries may tend to be misleading and promise far more than can be delivered. I base the following statements on research drawn from Sanyo—"Sealed Type Nickel-Metal Hydride Batteries, Engineering Handbook"; Panasonic—"Nickel-Metal Hydride Batteries, Technical Handbook 96/7"; Cadex—"Strengthening the Weakest Link, The Importance of Battery Maintenance."

A. NiMH batteries typically have one third to one half the cycle life of NiCd batteries.

B. A number of NiMH batteries that are currently being supplied to the amateur market today are not properly engineered to prevent overcharging. They also will not charge properly in chargers supplied by prominent manufacturers such as Yaesu, ICOM, Kenwood, Alinco, and Standard. All of the aforementioned manufacturers produce excellent NiCd type battery chargers, both rapid and trickle types. However, these chargers charge at too high a rate for the proper charging of NiMH batteries and are definitely not designed to detect the critical end of charge that NiMH batteries require. Therefore, overcharging NiMH batteries is quite possible and premature battery failure can be expected. In many cases this will cause excessive heat and pressure build-up in the battery, which can cause venting and may result in caustic electrolytic materials being emitted from the battery.

C. NiMH batteries do not perform well when they are repeatedly discharged at greater than a (1C) rate. All hand-held transceivers today, when transmitting, draw at least 1300 to 1500 mA to produce a 5 watt output. Most of the NiMH batteries that are supplied to the amateur market today have a rated capacity of 650 mAH to 1200 mAH, clearly below service requirements.

D. Both NiMH and NiCd batteries will demonstrate voltage depression. However, in reality, both chemistries when charged with the proper battery charger will rarely demonstrate this phenomenon.

I suggest that your readers contact the manufacturers of their hand-held radios to confirm what I have presented.

Jeffrey A. Weitzman
CEO/President, W&W Associates
Hicksville, NY

A VIP for A Few Days

Editor, *CQ:*

I am honored to have been included in the elite group of hams who have appeared on the cover of *CQ* in recent months. I received many calls and messages, both local and foreign, from friends and relatives who were surprised to see me on the November 1996 cover.

My good friend of many years, Per, LA3FL, Chief Radio Officer on the luxury cruise ship *M.S. Crystal Symphony,* purchased a copy of the issue during a port stop in Aruba. Per visited us here in North Carolina over the weekend after Thanksgiving on his way to a two month vacation at his home in Norway. Per said he had not paid any attention to the cover photo until he had a chance to look at the magazine later aboard ship. Then he did a double take. Hi!

All of the attention from friends and relatives made me feel like a VIP for a few days. The feeling soon passed. Hi!

Thanks again for the honor.

Dave Kennedy, N4SU
King, NC

(We're planning the travel itinerary for 1997 for CQ *Staff Photographer Larry Mulvehill, WB2ZPI, and could use some input from our readers. As you know, Larry shoots all the covers for our publications* CQ, CQ VHF, *and* Popular Communications, *as well as the 15 photos for the annual* CQ Amateur Radio Calendar. *That's 51 shots used each year. Since a major part of the expense of generating these photos is travel, we like Larry to put together a few large "swings" each year to various parts of North America to visit specific locations we've been tipped-off about by readers. If you know of a particularly photogenic setting that you feel might lend itself to a good cover or a calendar shot, why not let us know about it! It might be a great antenna installation, or a neat mobile setup, an interesting shack, or even a busy electronic workbench with work in progress. If you can provide a snapshot or two for reference, great. If a snapshot isn't available, a short verbal description will help.*

Send your ideas and snapshots to Larry Mulvehill, WB2ZPI, at 32 Comanche Dr., Oceanport, NJ 07757. Larry will decide if your suggestion fits in with our needs and his schedule. If you'd like your snapshot returned, include an SASE. Be sure to include information about how Larry can get in touch with you. The sole reward for your help will be the gratitude of your fellow readers, and of Larry, who will have the opportunity to make about a hundred new radio friends again this year.—ed.)

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What goes around comes around, which in this instance means a good, reliable circular antenna that will help you work DX.

The Full-Wave Loop Sky-Wire Antenna

BY LEW OZIMEK*, N2OZ

During a recent CQ WW DX SSB Contest I hit the optimum in frustration because of my inability to make contacts. I maintain a very modest station and don't expect to overwhelm the air waves, but that performance was the pits! I knew that the bottom of the sunspot cycle had reared its ugly head and that the sunspot monster was voraciously devouring radio signals whenever tantalizing contacts were available, but other stations were making contacts, not me. The final blow came when I heard Malta (9HØDX), a country that has eluded me to date, and I could not make contact. The station's ability to knock off contact after contact in the USA very, very quickly left me completely and utterly frustrated. It was painfully obvious that I must make improvements, especially in my antenna system.

First let me describe my setup. I used a two-wire antenna strung up in the trees fed by open-wire feed lines. The antenna was intended to be a V-Beam, but in fact, it probably was closer to a "Real McCoy Dipole" as described by Lew McCoy, W1ICP, in many of his articles. Each leg was 136 feet long, with one leg reasonably straight and the other bent in several places to fit available trees and space. The second element resembled half of the letter M rather than a dipole or "V" leg. I have no idea what the radiation pattern might have been and doubt whether there are any computer programs available which could generate a model of that antenna. In all fairness, however, I must admit that the antenna, and others similar in design, have given me excellent performance in the past. It was the "now" that had me down.

After my failure to get Malta, I turned off my rig and went out into the woods behind my home and tore down the antenna. Strangely, I found that my "folded" leg was not attached to the high tree I originally had used. It was tied to a small tree five feet off the ground and its effective length was cut in half because it was folded back upon itself. That was enough to destroy whatever limited capability I originally had. (I have not solved the mystery of the change in antenna mounting, but I do have my suspicions.) This experience emphasized the importance of checking your station setup and the performance of each piece of gear, whenever you suspect degradation.

Following my antenna annihilation, if I can call it that, I was left with two pieces of wire, insulators, and feed lines, but not with a usable antenna. Quick action was needed. I turned to the treasure trove of antenna books I have collected over the years (and stored away almost forgotten): *The Antenna Handbook*, published by the ARRL, and two books published by CQ Communications—*Lew McCoy on Antennas,* and *The W6SAI's HF Antenna Handbook*. These constitute a veritable cornucopia of antenna theory, designs, ideas, and concepts with plenty of practical suggestions and guidance. This combination of references offered me many antenna possibilities. I felt like a little boy again with my nose pressed against a candy store show-case studying each piece of candy. Which one of those tantalizing gems should I taste?

Incidentally, I have self-imposed restrictions on antenna installations—namely, no tower, use available trees for supports, wire antennas with multi-band capability if possible, and a preference for open-wire feed line. These do limit my choices, but do not preclude the establishment of an effective antenna system. The resultant antenna(s), based on these guidelines, may not be capable of matching the performance of the "big guns," but should be effective for my method off operating.

Each candidate antenna offered different advantages and called for unique mounting and installation requirements, varying heights, and special real estate or space needs. My first thought was that it would be a cinch to make a choice. After all, I did have a reasonable chunk of land and plenty of trees to use as supports. Many of the trees are over 60 feet tall, which should cover any height requirement.

I first surveyed the area around my house and constructed a diagram of my potential "antenna farm," with approximate dimensions. The plan view showed the location of the house and all trees, shrubbery, etc., which might be involved. Special note was made of the location of all power lines to ensure that I would not violate a basic safety rule: **Do not run wire or feeds over power lines.** Another restriction which limited my choices was not to run lines over the top of my house; just the thought of climbing up on my roof gives me the shakes.

I made a template of some candidate antennas and overlaid them on my plan. After considerable shuffling of templates, I found that I was in trouble. I had too many antenna supports (trees) and not enough free space. The best reasonably clear straight line available ran about 55 feet, and too many antennas needed straight runs which far exceeded that. One design I looked at longingly was the N4PC Multiband Loop[1], but it required a 72 foot phasing line connecting two opposite corners of a rec-

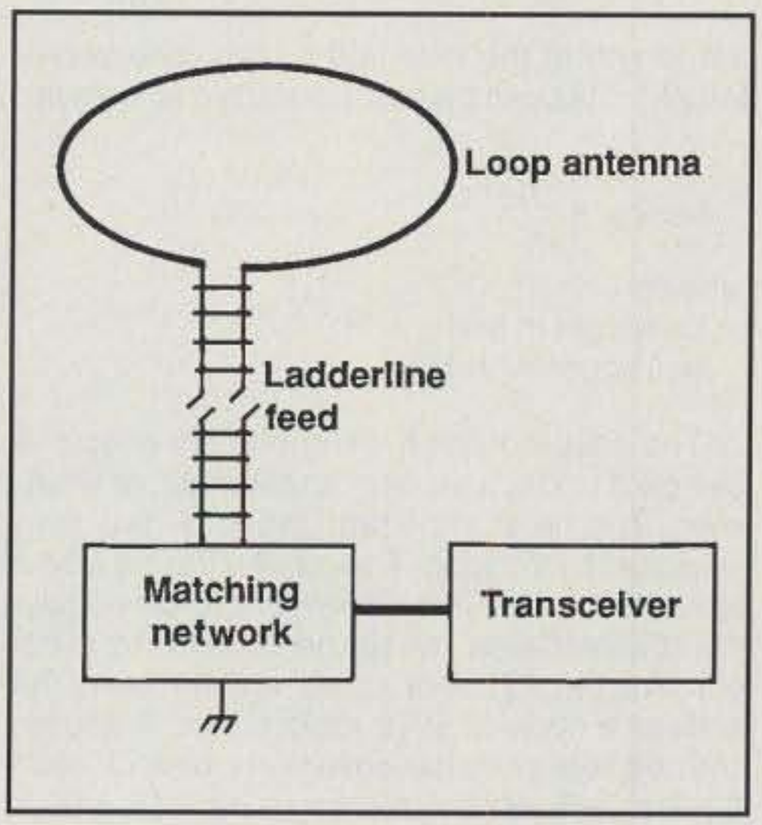

Fig. 1– A Full-wave loop antenna operating as a vertical with top-hat loading.

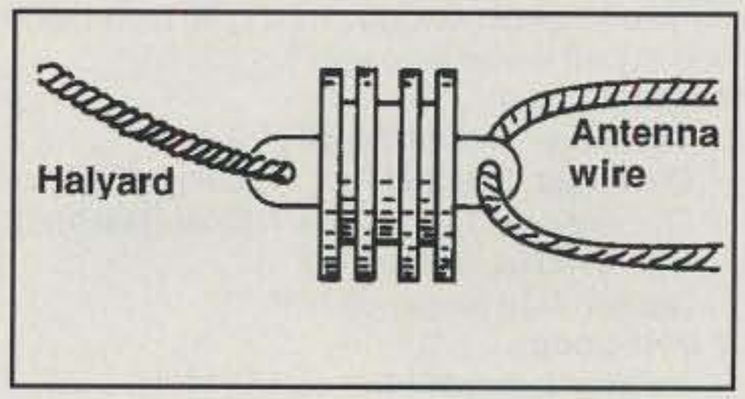

Fig. 2– Free-floating insulator.

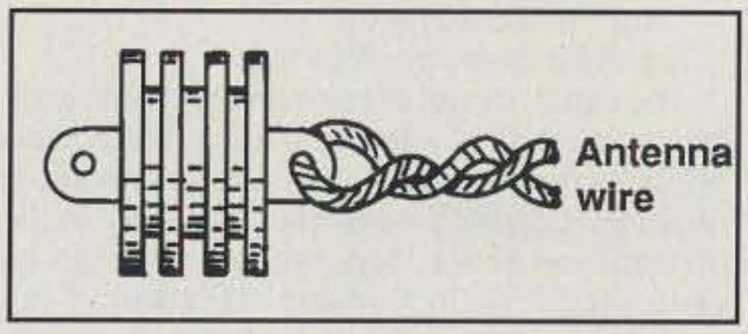

Fig. 3– Antenna twisted around the end of the insulator. If this occurs, free float is destroyed.

*37 Dolphin Lane, Northport, NY 11768

tangle. I could not find an acceptable clear straight run to satisfy that requirement.

While going through this exercise, I suddenly realized why my recent attempts to install wire antennas were getting more difficult. When I first moved into this house, I was able to install two V-Beams perpendicular to each other without any difficulty. Trying to do the same thing 34 years later just didn't work. I hadn't realized how much my trees had grown in height and how they had filled in with branches. The original open areas and clear paths were long gone. It's hard for me to understand why it took so long for that basic fact to enter my brain.

After more study I decided that the Loop Sky-Wire was the most promising design. What intrigued me was that the design covered a full-wave horizontal loop with excellent multi-band capability. It can be mounted as low as 20 feet above the ground, but is best at a height of 40 feet. In addition, it is more broad-band than a dipole and much more efficient.

The basic dimensions for the 80 meter loop and the 40 meter loop are:

3.5 MHz Loop

Total loop circumference 272 feet
Coverage: 3.5–28 MHz, including 10 MHz
Operates on 1.8 MHz as vertical (see text)
Circle radius 43 feet (or)
Square side length 68 feet

7 MHz Loop

Total loop circumference 142 feet
Coverage: 7–28 MHz, including 10 MHz
Operates on 3.5 MHz as vertical (see text)
Circle radius 23 feet (or)
Square side length 35.5 feet

The actual length of each antenna is not critical; a variation of a few feet will not adversely affect performance. No pruning or tuning is required. Copper wire is normally used in the construction of the loop, but any wire can be used, including Copperweld and covered zip-cord or lamp cord. It can be fed with coaxial cable or open wire, and no baluns or choke coils are needed. For coax feed most users prefer RG-58, RG-59, or RG-62, because RG-8 and RG-11 are too cumbersome. The SWR of this loop generally will not exceed 3 to 1. Of course, my preference was open-wire, and I found that the open-wire feed worked very well with this antenna.

Design Characteristics

The fundamental frequency of the antenna is the length of the wire in the loop (one wavelength). This can be calculated by the formula:

$$L_{TOTAL} = \frac{1005}{f}$$

where:
L= length in feet
f= frequency in MHz

The shape of the final loop is not critical. It can be a circle, a square, a rectangle, or whatever. The most important aspect is the area enclosed by the loop. *The greater the enclosed area, the better the performance.* Obviously, the greatest area would be covered by a circle. For the 272 foot antenna (80 meter) the area of a circle is 5809 square feet. A square with 68 feet per side covers an area of 4624 square feet, while a rectangle 80 × 56 × 80 × 56 covers 4480 square feet. The area of the circle is approximately 30% larger than the rectangle, a significant difference. Installation of a circular antenna requires an infinite number of support points, which is not practical. Most installations, then, would utilize a four-support rectangle of some sort. With four supports, the objective should be to try to create a square or the closest thing to a square. It is possible to improve performance by adding additional supports. Each such added support creates another side to the figure. Five supports produces a pentagon, six a hexagon, etc. Each additional side increases the enclosed area and improves performance. The closer you get to a circle the better (I can't repeat that enough.).

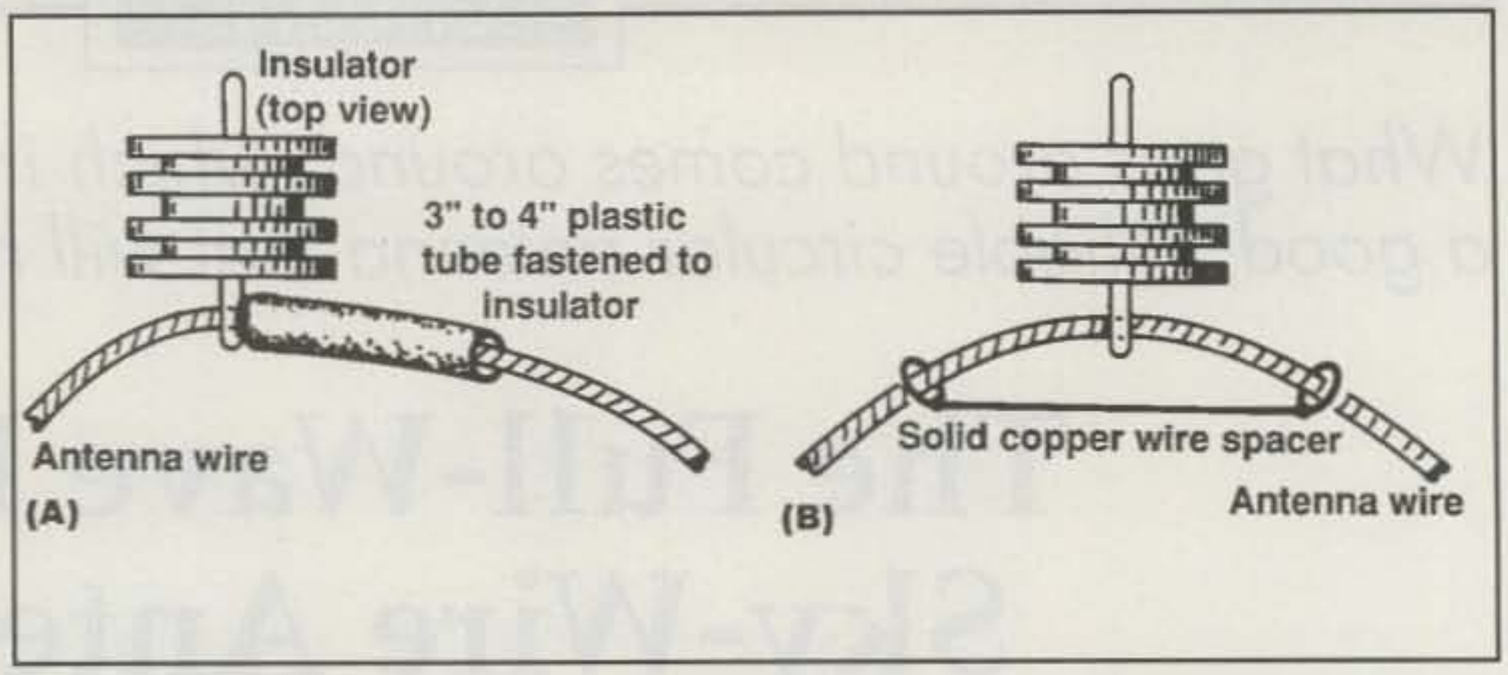

Fig. 4– Two solutions to the twisting problem: (A) Fasten 3 to 4 inch plastic tube (such as PVC) to the insulator. Antenna wire is fed through the tube and insulator. (B) Prepare a heavy wire spacer a shown. Solder the loops and feed the antenna through the loops and insulator. Space between loops is 3 to 4 inches.

Operation of the 3.5 MHz loop on 1.8 MHz and the 7 MHz loop on 3.5 MHz is accomplished by keeping the feed as vertical as possible from the shack to the antenna. Both feed lines of the open-wire line (or center conductor and shield of Coax) are connected together and fed to the transmitter through a matching network against a good ground (see fig. 1). The result is a vertical antenna with top-hat loading. In actuality, all bands can be covered in the vertical mode, but the best performance will occur when operating as a horizontal loop.

Construction

I prepared a length of white line (white for visibility) equal to the planned length of the antenna—272 feet. Using the site plan as a guide, I laid out the line on the ground in the approximate shape of the loop. This identified each potential point of support—one for each turn. I ended up with six acceptable support points, which when connected formed an approximate hexagon. It is a very irregular hexagon with some sides as long as 70 feet and some as short as 30 feet. I did not concern myself with the final configuration. I only tried to enclose the largest area and still feed the antenna reasonably close to my shack.

At each of the selected feed points, I installed a halyard to support the antenna corners. I know most amateurs use a sling-shot to launch halyards over tree limbs. This technique has two problems for me: (1) sling-shots are not legally sold in New York; and (2) every time I tried to use one, I could not get the lead weight high enough into the air. As a result I turned to my trusty surf fishing rod with 1 ounce or 2 ounce lead weights and mono-filament line. After a little practice, I found that I could place the line over an acceptable limb, not always on the first try. At least four of my lines are higher that 55 feet, and two are about 45 feet. That fishing rod can really flip a lead sinker a long distance, and the mono-filament easily hauled up the Dacron rope I used for halyards.

For my installation I used 14-gauge Flex-Weave™ 168-strand copper wire distributed by Radioware (see ads in *CQ*). This wire is also available in 12-gauge. It is very flexible and easy to use (it can even be tied into knots).

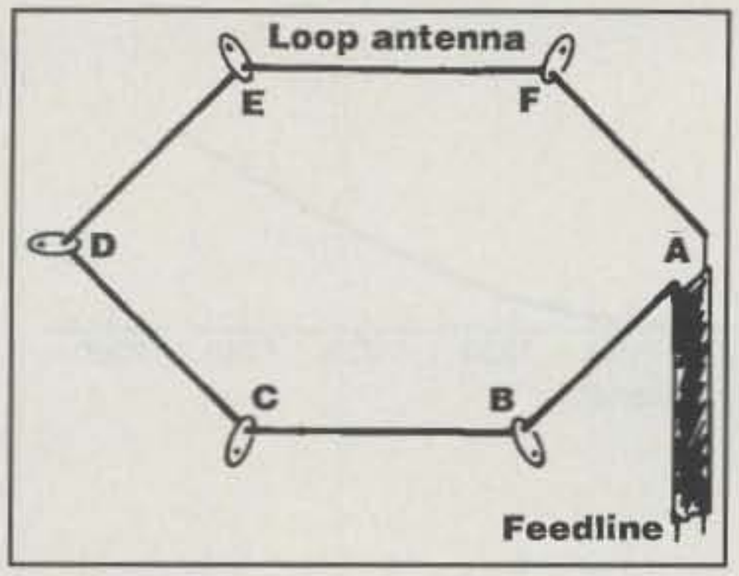

Fig. 5– The final configuration of the loop antenna in the approximate shape of a hexagon. Support insulators are located at points B, C, D, E, and F. A special center support insulator is at point A.

Despite the manufacturer's claim that it will not kink, I did find that it will kink if handled carelessly. These kinks were easy to straighten, however, and a little care soon eliminated that problem. I threaded sufficient wire through insulators and kept each of the insulators free to float on the wire (see fig. 2) to allow the antenna to be pulled taut once it was elevated. Note that wire and feeds were not yet soldered together. Weaving the antenna under and between trees would have been impossible if the ends of the loop were connected. It would have been great to have a helicopter available which could drop an assembled antenna into place from above, or if I had an open area large enough to lay out a pre-assembled antenna and still have supports available on its perimeter. Maybe some lucky reader will have such a space. The installation then would be a snap.

I started at the approximate center of the loop and attached the center insulator to the halyard. It was only partially elevated pending completion of the loop. Incidentally, I found one problem with the Flex-Weave™ at this point. The wire I used twisted around the end of the insulator, destroying the free-float capability. After a little thought, I found an effective way to deal with the problem (figs. 3 and 4 show the problem and present two solutions). I then moved alternately from side to side around the perimeter of the loop, fastening insulators to the halyards as appropriate and partially hauling the antenna into the air. I left full slack at points D and E of fig. 5, the two support points opposite the feed point. I then soldered the ladder line to the antenna wires. The ladder line is supported by a commercial center insulator specifically designed to secure ladder line to wire antennas. A number of excellent products for this purpose are available in the commercial marketplace, or one can be home brewed using plastic material.[2,3]

Hauling the antenna into place was the final step. I found it necessary to move from point to point, back and forth, raising each element separately as much as possible. I did find that branches interfered with the easy elevation of the antenna at some points despite my preplanning. This forced me to place guide lines (Dacron rope) over some of the sides of the hexagon so that the wire could be pulled clear of branches as the antenna was being raised. It is a good idea to install such guide lines while the antenna is on the ground; they can be removed when the installation is complete or retained for possible future adjustment of the antenna. Once the antenna was up, I added a counter-weight to three of the halyards to compensate for any movement in the trees which might place a strain on the antenna itself.

The feed line is supported at several points to prevent unnecessary movement. Excessive whipping of the feed (such as that caused by wind) can cause weakening and ultimately result in breakage. I found that electric fence stand-offs provide excellent support for ladder line (these stand-offs are also available from Rdioware).

Getting feed line from the antenna to the shack has proven troublesome to many amateurs. Years ago I replaced a window pane near my rig with a 1/4 inch thick sheet of plastic. Two feed-through insulators mounted through the plastic pane provide a means of easily connecting the inside and outside feed lines together. I have used this method for years without ever having a problem.

Performance Check

I connected the feed lines to the transceiver via my antenna tuner and checked my ability to load the antenna. I easily achieved an SWR of 1.0 on all bands. Logging the tuner settings permitted movement back and forth between bands quickly. I next checked the SWR broadband characteristics for each of the bands. The resulting data is plotted in fig. 6. This data was taken by selecting a point approximately in the center of a band and adjusting the tuner for a SWR of 1.0. Readings were then taken at frequencies above and below the starting point, to the ends of that band. Each band was separately tuned for optimum performance, but once the initial setting was made, no additional changes were made.

Eighty and 40 meters show a peak in tuning and will require minor adjustment while moving up and down in frequency, but the span between SWR readings of 2.0 is quite acceptable. As the frequency increases, the coverage is flatter and flatter. On 10 meters the data show very flat response even if the curve is a little "snaky." Notice how flat 17 and 15 meters plotted. Remember this data was taken with a ladder-line as the feed. Different numbers will result if coax is used.

I decided that actual on-the-air results would provide real-world performance of this antenna. All of the simulations and computer predictions would be meaningless if they could not be supported by actual data. I was concerned, however, about getting meaningful DX test data in view of the low (nonexistent?) sunspot level. After thinking about it for a while, I concluded that poor propagation conditions would actually provide a very effective test of the antenna. To make it tougher, I decided to concentrate in the 20 meter phone band (a very competitive arena) with a touch, if possible, in one other band. In addition, all testing would be done using an ICOM IC-735 barefoot. Under these conditions the following DX contacts were made over a relatively short period of time (no contests): PZ1DR Suriname, DL1JGP Germany, LZ5VJ Bulgaria, 7X2LS Algeria, GIØKOW No. Ireland (5×9 +20), XE3VD Mexico, IK2DIA Italy, LA3PU Norway, CT1GQ Portugal, OD5MM Lebanon, HB9ADD Switzerland, ET3BT Ethiopia, V51GB Namibia, OA4QV Peru, S54ZZ Slovenia, 9H1RB Malta,

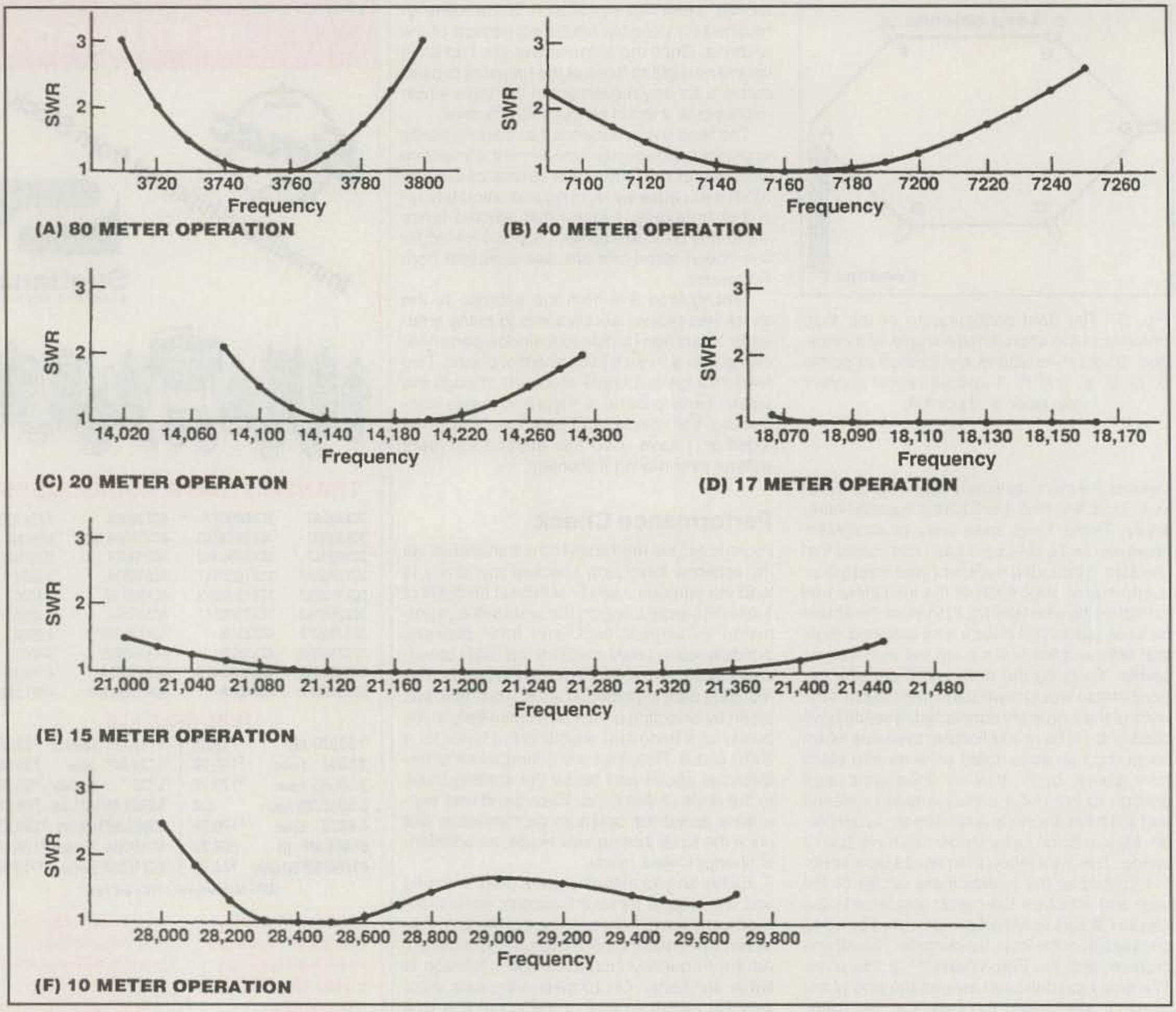

Fig. 6– Eighty meter full-wave loop antenna band-width in terms of SWR in the feed line.

YW1A Venezuela, Z32XX Macedonia, ZA1AJ Albania, EA1UX Spain, A61AN United Arab Emirates, 9A3KQ Croatia, JW5NM Svalbard, PA3GIO Netherlands, OM9AJP Czechoslovakia, G5RR England, UR4MZL Ukraine, SP9AYB Poland, EW3EE Belarus, 9Y4LF Trinidad, YU1AVA Yugoslavia, J37LF Grenada (17m), EA8BYR Canary Islands (17m), 6Y5DA Jamaica, GU3EJL Guernsey, VO1TX Newfoundland, OE6EEG Austria, TU2DP Ivory Coast, GW3XCR Wales, HK5LEX Colombia (17m), 4N4L Bosnia/Herzegovina, TJ1RA Cameroon (17m), SM3JLA Sweden, LY2BTA Lithuania, ZD7CTO St. Helena, J73HW Dominica, WL7MA Alaska, HG1P Hungary, KP4DLM Puerto Rico, YO4GAB Romania, KG4MN Guantanamo Bay, OHØ/SMØIHR Aland Island, OX3KV Greenland, 9K2KO Kuwait, ON4AEK Belgium, 8R1AK Guyana, C53HG Gambia, CYØAA Sable Island, HR1JPT Honduras, A71DX Qatar, PY4AH Brazil, GMØLYM Scotland, YN1XC Nicaragua, KG4MN/KP2 Virgin Islands, CO8LY Cuba, 5N7YZC Nigeria (17m), P43DJ Aruba.

Countries were repeated, but only the first contact made was listed. Note that I got Malta, the elusive country that started me on this exercise. These contacts alone are two thirds of the way to DXCC! Overall it was a very satisfactory and pleasing performance; the distances covered were excellent, and the radiation patterns good. I rate this antenna as a "keeper." It is inexpensive, relatively easy to install, and effective. With it in place, I am now looking forward to an improvement in the sunspot cycle, which happily will be here soon.

Post Script

I relied on the SWR readings provided by my Heath Antenna Tuner model SA 2060A to tune the antenna system. It seemed appropriate to determine how effectively the tuner matched the system (the lowest SWR reading doesn't necessarily provide the best transfer of power to the antenna). I inserted an Omega System Inc. Extended Range Antenna Noise Bridge (Model TE7-02) between the receiver and the tuner. The noise bridge was set at 50 ohms and the antenna tuner was adjusted for the best noise null in the receiver. On 20 and 17 meters the noise null setting was essentially the same as the lowest SWR setting of the tuner. On 15 and 10 meters a slight adjustment was needed to make the readings match. This gave me a sense of confidence in the ability of the antenna tuner to adequately adjust the system and to provide meaningful data. The slight adjustment on the highest bands was not severe enough to invalidate the data.

A special word of caution is necessary. This antenna, because of its height and effectiveness, can be an attractive target for lightning. Provide proper protection at all times, including grounding the antenna when it is not in use. I never leave my antenna connected to the rig if there is any danger of lightning or if I will be away for any period of time. ■

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1. Paul D. Carr, N4PC, "The Full-Wave 80 Meter Loop Antenna—Revisited," *CQ*, August 1990.

2. Doug DeMaw, W1FB, "The Joys and Sorrows of Ladder Line," *CQ*, April 1993.

3. Steve Ford, WB8IMY, "The Lure of the Ladder Line," *QST*, December 1993.

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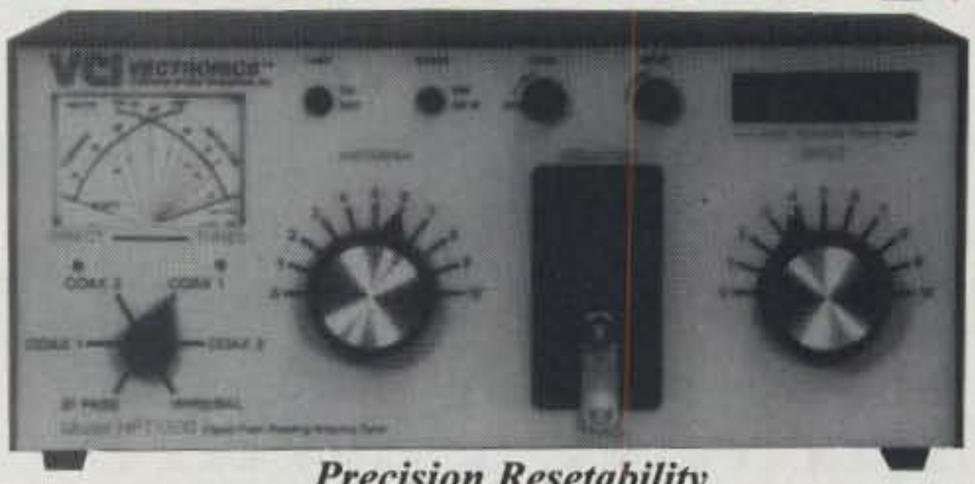

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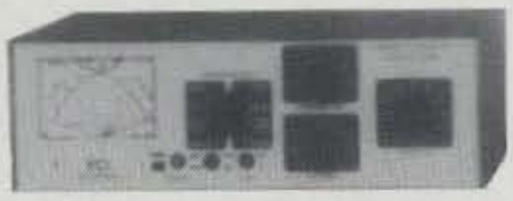

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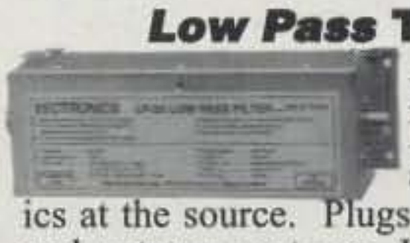

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Sometimes in the quest for pure scientific research (not really as an excuse for collecting) you are "forced" literally to amass a number of keys. However, each key, it can be rationalized, adds to the sum total of scientific knowledge.

Ergonomic Improvement and Adjustment of The Vibroplex Iambic Paddle

BY JEFFREY A. WOLF*, M.D., WA6DAL

There is something about the classic appearance of Vibroplex telegraph keys that resonates within my deepest emotional centers. I just can't get over how fabulous they look.

When I got my Novice ticket back in 1958, at the tender age of 12, I swore that someday I'd own a genuine "bug." Understand this had little to do with the code's mystique or any great desire to possess superhuman CW proficiency. No, it was the device itself that I lusted after—the magnificent, chromed Vibroplex Deluxe semi-automatic in all its shimmering glory, crowned by that tiny red jewel atop the gleaming yoke (okay, plastic, but in those days I thought it really was *the* jewel).

I passed my General class exam in 1960 (I think, as those records have disappeared over the years), and almost immediately blew all my savings (about $50, if I remember right) on the object of my dreams. It took a long time to master the tricky springs and oscillating lever, but despite an ongoing love/hate relationship with CW, I worked at it until I became remarkably competent.

Many years elapsed, most of them unfortunately finding me inactive in amateur radio as college, medical school, marriage, and raising a family took precedence. Still, in 1972 I was once again lured back into active hamdom. I built the Heathkit SB-303/401 combination and got back on the air mostly on SSB. Unpacking the venerable Vibroplex one day, however, I sensed those almost, but not quite, forgotten primal urges once again overtaking reason. Soon I was back at it. I passed my Advanced in 1977, but after getting my upgraded ticket, more years went by with only sporadic activity.

In the summer of 1989 my then eleven-year-old daughter became interested in amateur radio. We spent warm evenings in July and August reading the books and practicing code. In the process, I got motivated to upgrade. In September Laura passed her Novice exam and I my Extra.

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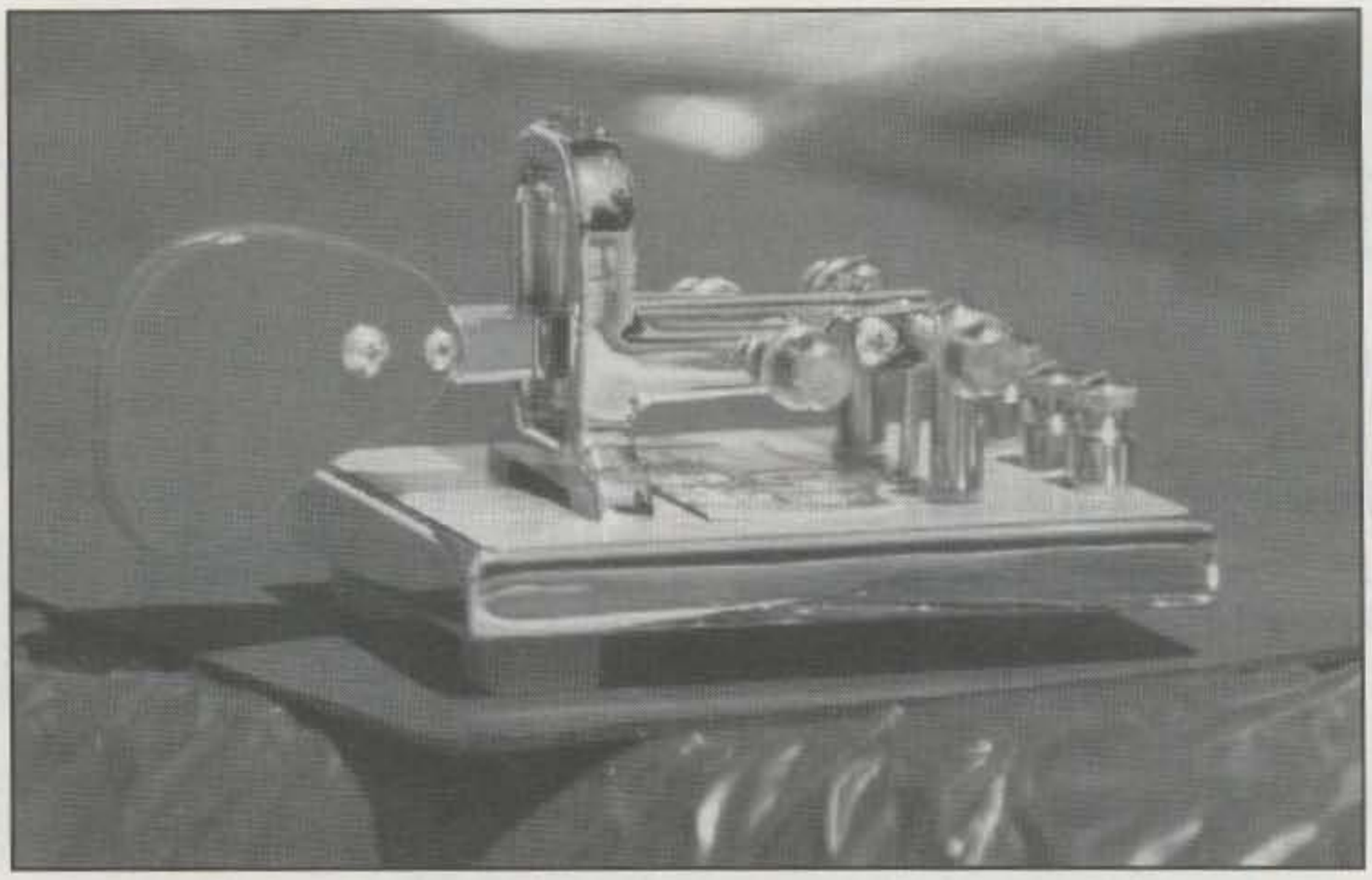

Years of research have paid off handsomely in creating a totally customized approach to CW.

While working up my code speed, I discovered iambic keying. Following the advice of some local CW gurus, I bought a Bencher iambic paddle. It's a magnificent device—a work of art, really—and I soon found that electronic keying was so much easier than using the bug. With some (but not much) regret, I shelved the old Vibroplex.

Sometime in the weeks following the acquisition of the Bencher, I came across a photo of the Vibroplex Iambic in a magazine ad. Well, in truth, I had known that it existed, but I'd never really paid much attention to it before. Now I looked more carefully. Yes, it had the Vibroplex family resemblance, and with my "bug" stored away, I felt those old stirrings again. Off I went to the local amateur radio emporium, and soon the little beauty was mine—a Vibroplex Deluxe Iambic with two little red jewels (I still don't want to believe they're just plastic!) on top. I couldn't wait to get it on the air.

As soon as I had sent my first string of Vs, however, I knew something was wrong. Yes, it was a gorgeous piece of art, just as was my bug, but it wasn't ergonomically right, and no matter how much I struggled, I couldn't seem to get comfortable with it or get it adjusted properly. I began to think that I'd been spoiled by the Bencher. The problem, as I soon realized, was more complex.

The first component of my difficulty was one about which I've also heard others complain. The paddles are set quite high up from the desk surface, forcing the user to cock the wrist upward and into a position which I find uncomfortable for long periods of use.

As a first solution I propped up my arm on a cushion. That was aesthetically unpleasing and still didn't seem to make things quite right, so the next step was to try to lower the Vibroplex. I removed its rubber feet and replaced them with shorter ones—the adhesive type

available in most hardware stores. The difference was visible, but there was insufficient ergonomic benefit. I therefore abandoned the key and went back to my trusty Bencher, which by now was really growing on me.

At the Dayton Hamvention in April 1994 I stumbled upon another magnificent piece of work—the Schurr Profi iambic. Blowing my budget, I bought it and found it was as comfortable to send with as the Bencher, its finger pieces being positioned perfectly for my small hand and wrist. Now I was really frustrated over what I saw as the shortcomings of my beautiful Vibroplex.

Finally, and in great desperation, I wrote to Vibroplex (just before the company's change of ownership) with my concerns, suggesting a redesign of the plastic fingerpieces. I waited many weeks and got no answer. As a result, I decided to take matters into my own hands (literally) and do my redesign of the fingerpieces, a design that would fix the problem but remain true to the spirit and style of the Vibroplex.

A trip to a local plastics supplier yielded some free scrap stock in various colors. I doodled some designs on paper and tinkered with them on my computer, finally settling on a sort of art-deco boomerang shape. I transferred the pattern to the scrap plastic, cut two identical pieces, drilled holes for the screws, did some final shaping and sanding, and then buffed my work to a high-gloss shine. The prototype pieces were a start, but weren't quite right. Well, after a few more tries with some subtle shape modifications I finally got what I wanted. The red plastic is an almost a perfect color match to the stock red handles supplied by Vibroplex, and I think the essential Vibroplex look has not been adversely compromised. In fact, I think it's an improvement, but then I'm biased. The photograph shows the modifications applied to a second paddle, this one a Vibroplex Presentation Iambic.

The new fingerpieces and shorter feet totally resolved my ergonomic problems with the unit. With this problem finally laid to rest, however, I realized that I still was dissatisfied with the feel of the key. In speaking with several others familiar with the Vibroplex Iambic, I heard a similar story. What then was the problem?

One evening as I sat moping about my unrequited love for the beautiful but frustrating contraption on the desk in front of me, I decided to start from the ground up to try once more to get the thing optimized. What I learned in the ensuing few minutes totally transformed my feelings and convinced me that the Vibroplex Iambic is a true gem, easily able to hold its own against any iambic paddle on the market. The big problem, I came to realize, was that I just didn't know how to set up the unit properly. Here is the definitive poop on how to do it for any of you who may be struggling as I was.

It will be a lot easier to do this if you've got the unit in front of you, so go get it now. Don't plug it into your keyer just yet, though. First look at the base of the yoke assembly (Vibroplex calls it the "mainframe"). Projecting forward, just behind the Vibroplex nameplate, you will find two small setscrews. Loosen them. Next turn over the unit and find the two recessed lower trunion screws. These are located between the two flathead Phillips screws that hold the mainframe to the base. Adjust each screw so that the right and left lever bars move freely from side to side, but have no up and down ("seesaw") play. Don't overtighten the screws or you will restrict free lateral keying movement. When all seems right, tighten the setscrews and recheck. Readjust as necessary until it's right, as this is the most critical adjustment you will make.

The rest is easy. Set moderate spring tension against both levers to be sure that the paddle's contacts are held apart. Then plug the unit into your keyer and set the contact spacing on each side to fit your own particular taste. My personal preference is to set minimal contact spacing for hair-trigger operation. The contacts are backed off only until contact is just broken. Finally, set the spring tension as desired. I leave it at a minimum. While it may take a bit of tinkering to get it exactly right, your Vibroplex now should be tailored optimally for your own unique fist. The round locknuts will hold your settings reliably when firmly snugged. I find the key's feel to be both distinctive and satisfying, and I urge you not to let anyone else alter your setup once you've locked it in. It's unique and you should be its absolute master.

In summary, redesigned fingerpieces, shorter feet, and proper adjustment have transformed mere static beauty into a functional knockout. I'm back on the air with my Vibroplex, happy and comfortable at last, and with the knowledge that perhaps I've even improved the breed a bit. I've now modified a total of three Vibroplex Iambics, each of which has become a star performer. One, my original deluxe, now sports modified fingerpieces in translucent blue and was a major hit among the CW *cognoscenti* at our local club's Field Day event this year.

For anyone else who is troubled with the ergonomics of the Vibroplex Iambic, I recommend studying the photograph and then using your own imagination for a custom, personal solution. Feel free to contact me for advice, help, or comments, and please send me a photograph of any changes you make. 73 es hpy CW! ■

In some ways we worry about efficiency all the time. We worry about fuel efficiency in our car, about how much power our exciter puts out, or even about the output power of an amplifier. The strongest link in an amateur station is the antenna, and it's also the weakest in terms of where we can lose power. W1ICP fills us in on how to focus our attention on antenna efficiency.

Antenna Efficiency One More Time

BY LEW McCOY*, W1ICP

Some time ago I wrote an article on the importance of antenna efficiency, a topic I cover periodically. Since that article, I have lectured a number of times at conventions and clubs on the same subject. I was sort of amazed at the number of amateurs who never think about this basic fact concerning all antennas—and I do mean all antennas, of all types and all frequencies. Because of this, I felt it was worthwhile to approach the subject again.

To define antenna efficiency is quite simple. Efficiency is simply the ratio of power you put into an antenna versus what you get out of it. Every antenna has a resonant point or frequency. The feed point of an antenna, where you attach your feedline, has a property called the *impedance* of the antenna. At resonance, and that is all we are concerned with in this article, there are two properties—radiation resistance and ohmic resistance. These are both expressed in ohms.

Radiation resistance is not a real resistance, but a term applied to the feedpoint to designate the amount of power that is fed to and radiated by the antenna. Ohmic resistance, however, is a real resistance that dissipates power as heat, and that is our problem and what really defines antenna efficiency.

One thing that emphasized the importance of this subject is the constant argument about quad versus Yagi when compared on the basis of gain and performance. Although I am using an antenna similar to a Yagi, since I first was licensed back in 1946 I have always been partial to the quad antenna.

Just a little history is in order here. Just after becoming licensed, I quickly became a DX hound—and I do mean "Hound" with a capital H. Most of my DXing was on 10 meters, although I did keep DX skeds on 20 meters CW. A couple of the local amateurs had 3-element 10 meter Yagis (including me), and we held out on the band edge of 10 meters. The U.S. edge in those days was 28,500 kilocycles; yes, we called them kilocycles at that time. Our gang had high power, and we thought we owned 28,500 as our DX frequency. The DX usually came on below 28,500 and then listened from that frequency up, which of course meant that the strongest signal on 28,500 was the first to work the DX.

This was fine for yours truly until one day when another station started taking over the frequency. That station was about 100 miles away in Indiana, while our gang was in the south Chicago area. It turned out that the station was owned by Clarence Moore, W9LZX, and he was using a beam nobody had ever hear of before. It was called a quad.

Maybe all of you have heard of Clarence by now, but if not here is a brief history. Clarence was an engineer who worked for a religious station in Quito, Ecuador. His amateur call down there was HC1JB. The station was located over 10,000 feet up in the mountains. At first Clarence used a Yagi-type beam, but when they put power into the antenna, corona took over and actually burned off the ends of the Yagi elements. Clarence (and he personally told me this story) scratched his head and realized that with a high-Q antenna such as a Yagi, tremendous voltages would develop and at that high altitude the Yagi literally would burn up. He was running 10,000 watts! He thus tried a full-wavelength loop antenna, because he calculated that he would not have the voltage/corona problems. He proved to be correct, and he also decided to add a full-wave reflector element. And so the quad was born.

Clarence came back to the States and was extremely enthusiastic about his new antenna. He obtained a patent on the antenna, but for some reason in those days the radio fraternity never took to the antenna. It was only shortly after this that I went to work at the ARRL, and I asked George Grammer, who was the technical director, what he thought of the antenna. George sort of passed it off. The League did test a single-element loop for gain over a half-wavelength dipole and found that it had 1.8 dB gain, but they just left the subject with a brief mention in those early *Handbooks*. I was convinced, however, that this was a very good directional beam, so I built a three-element job which I used in Granby, Connecticut and thereby managed to stay on top of the DX heap.

So much for some of the early history. The quad was vilified by many amateurs because in those early days bamboo spreaders were commonly used and they had a bad habit of deteriorating in weather. However, with fiberglass that is no longer true and has not been true for many years. The quad is just as rugged as any Yagi. Proof? A good example is the quad of Dean Battishill, W5LEJ. Dean originally had a Cubex quad that was put up over 40 years ago. This original Cubex had bamboo spreaders. They later had a kit where one could cover the bamboo with fiberglass, and even later they provided a kit of fiberglass spreaders. Dean had that antenna up for well over 40 years. And keep this in mind that this was at 6000 feet above sea level—almost smack on the continental divide. Do we have winds up at this altitude? You bet! We clocked 70 mile an hour winds just the other day!

So let's get to antenna efficiency. What is it all about? As I have written, the feedpoint of an antenna has two properties at resonance—radiation resistance and ohmic resistance. Radiation resistance is the term applied to the impedance that is the useful resistance in that any power fed to this resistance is what permits the antenna to radiate and get us all those 40 over 9 reports. The ohmic resistance is the loss resistance. Any of the impedance of the antenna that is ohmic resistance can be expressed as a heat loss. It is a loss of the RF power going into the antenna. In other words, if we put 100 watts into an impedance that is 3 ohms radiation and 3 ohms ohmic, we are going to get only 50 watts useful power; the other 50 watts is lost power. We can convert this to decibel gain very easily. Three dB loss is half power loss, so it is easy to assume that if we had a Yagi with a design gain of 6 dB but with this 3 dB power loss, it would mean that our antenna has only a real 3 dB gain!

The beam that I use has been up for several years, and its performance is excellent. However, recently I did notice that for some reason it was not performing quite as well. I con-

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e-mail: mccoy@zianet.com

vinced a friend of mine to climb my tower. I ran 1500 watts key down into the antenna for a period of time and then turned off the rig. I had my friend climb the tower and touch the driven element to see if there was any heat. He actually burned his hand!

Needless to say, I brought down the antenna and examined all the hardware and tubing connections. I noted that they had become cruddy over the years, as I should have realized. I completely reworked all the fittings and cleaned up everything, and the beam is back up and really working—proof of the pudding and all those sorts of things!

How many amateurs buy a beam, put it up, and are very impressed with its initial performance? After a year or so, however, the beam just doesn't seem to cut the pileups as it did when it was new. The reason should be obvious. In my antenna, which had five elements plus phasing hardware, I had scores of connections. I am only guessing here, as there was no good way to accurately measure the loss across a single fitting. As a guesstimate, though, let's say a measely one tenth of an ohm for each fitting. Add up all those losses, and we would be looking at 3 or 4 ohms against a 6 or 8 ohm impedance.Therefore, I know with great certainty that I was losing at least half my power. After all, my buddy burned his hand on the darn thing!

This brings us to quads versus Yagis. The Yagi is inherently a very low feed impedance antenna. The normal close-spaced Yagi has an impedance of 3 to 5 ohms. (Don't say, "Oh no; it's 50 ohms." It is 50 ohms feed because of matching arrangements; its basic impedance is relatively low. And actually with the matching network in, add more ohmic losses!) Wider element spacing increases the impedance, but not enough that the antenna can be used without a matching network. In this case, I am discussing a single-band Yagi. When we go to a trap Yagi, we are now looking at an antenna that can have exceptional losses simply because of all the trap wiring and connections, particularly if the antenna has been up in the weather for any great length of time. In any case, and this is the bottom line, any of the Yagi antennas or trap Yagis are going to have a low feedpoint impedance. Any of the computer programs that calculate feed impedance will bear out this statement.

Let's look at a quad antenna from an efficiency standpoint. A single full-wavelength loop, a quad element, has a radiation resistance on the order of 100 ohms, while the ohmic resistance is the actual resistance of the size and type of wire used. No. 12 copper wire runs about 1.5 ohms per thousand feet. A 20 meter quad loop is approximately 60 feet, which would be only a small fraction of an ohm. While this doesn't exactly define ohmic losses in a quad, we know for all practical purposes the ohmic losses in a quad are zilch.

So if you are looking to have an efficient antenna system, there are certain things you must do. Having been around amateur radio as long as I have, I realize that I am not going to change the argument of quads versus Yagis very much. At the very least, however, take down your antenna occasionally and clean up the connections. Following is a list of precautionary measures:

1. Periodically take down your Yagi-type antenna and clean all connections to reduce ohmic losses.

2. Always solder any antenna connections, particularly wire antennas.

3. Don't just be lazy and twist leads of wire together for a connection. Clean the metal and solder the leads. It only takes days for unsoldered connections to corrode and resistance to sky rocket.

4. All these things apply to VHF and UHF antennas as well as HF antennas.

I always remember the first day I arrived at ARRL Headquarters. I had loaded all my gear into my car and driven from south central Missouri across country to West Hartford, Connecticut. I arrived on a Sunday, and I had been told by my new boss, Ed Handy (the very famous F. E. Handy, W1BDI) that I should come to his house and he would help me get located. I did and was welcomed by Ed.

Naturally, being an amateur radio operator I asked to see his station. He took me up to his shack and showed me his equipment. Most of it was pretty old even by those days' standards, but Ed was from Maine, an old hard-line Yankee, and I'm sure he coined the expression "If it works don't change it."

Ed had an old HRO receiver and worked strictly CW. I didn't see any mics around. Now get this: Ed wrote the first *ARRL Handbook*. In fact, it was called *Handy's Handy Handbook*. (I still have an original.) In any event, Ed told me that for some reason his signal on 80 meters seemed to be getting weaker and he didn't know why. Meanwhile, I was looking around his shack at all the wires, etc., and I noticed that his open-wire feeders went under the windowsill to the outside. However, where they went out, the leads were twisted together, not soldered, and they were actually green from corrosion. I asked Ed if he had an ohmmeter, which he produced, and I measured the ohmic resistance across those corroded connections. The reading was so darn high—resistance high—I almost was afraid to show him. In any case, we cleaned up the contacts and soldered them, and his signal really improved. I actually got a raise—but only after about six months!

The moral is, check your antenna connections and the antenna itself. Who knows? You might improve your signal 10 percent, or 20 percent, or even 50 percent. If you have corroded, green connections, I'll make that 99 percent. And the bottom line here is quite clear: It all goes to prove that QRP really does work. Think about it! ■

N3CBW describes a part of the world with which most of us are not too familiar, except for its prefix. The Republic of Georgia is going through remarkable changes along with a growing interest in amateur radio.

4L—The Republic of Georgia

BY H. B. MUTTER*, N3CBW

Amateur radio operators of the Republic of Georgia, as well as most of its other citizens, are experiencing economic and political problems in getting ready for the 21st century. However, if they are anything like their forebearers, they will not only survive, they will be a loud voice heard worldwide.

The Republic of Georgia, formerly the Georgian Soviet Socialist Republic, is an ancient land the history of which is replete with efforts at survival. Its current, modern-day history mirrors its past. Georgians are a hearty breed, though, and their struggle to enter the 21st century will be noteworthy.

Georgia lies at the crossroads between Eastern Europe and Middle Asia. It borders on the Black Sea, and in Greek mythology the "golden fleece" was found there. Georgian neighbors are Armenia, Azerbaijan, Turkey, and Russia. It is mostly a mountainous country located in the Caucasian range.

Georgian history dates back to at least the 6th century BC, and Christianity was introduced in the 4th century AD. Centuries of beating back one or another invader made the Georgians experienced fighters and survivors. They resisted the Byzantine and Persian Empires and later Arabs and Seljuk Turks, but not without loss of some of their original territory and ethnic makeup.

The original capital city was Mtskheta, but was changed to Tbilisi in the 12th century. The city was destroyed by Mongol invaders a century later, and thereafter the country was ruled in turn by Iran and then the Ottoman Empire until the mid-18th century. Thereafter, another Georgian kingdom developed, but facing continued Turkish invasions, they had to look to Russia for protection in 1783. Ultimately, Russia swallowed its ward in 1801, when it incorporated Georgia into the Russian Empire. Following the Russian revolution of 1918, Georgia once again proclaimed its independence. However, its freedom was denied when it was occupied by the Soviets in 1921. In 1922 it was made part of the USSR.

Georgia survived Soviet history as a haven for communist vacationers. Georgian Black Sea seashore resorts of Sukhumi and Batumi were famous. The capital city of Tbilisi, known to Europeans as Tfilis, was a picture-postcard city with moderate climate and scenic environment. Georgian climate ranges from humid subtropical in the coastal lowlands to dry and cool in the mountains.

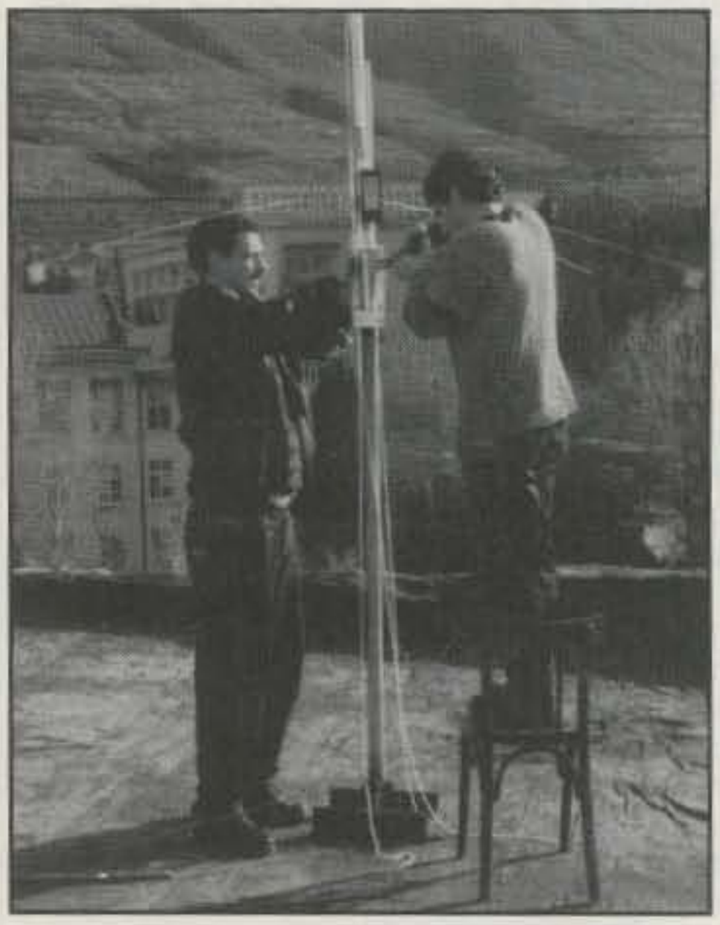
*13805 Town Line Road, Silver Spring, MD 20906

Here is the author's wife, Tamara, with the Deputy Chief of Mission, U.S. Embassy at Tbilisi, Republic of Georgia.

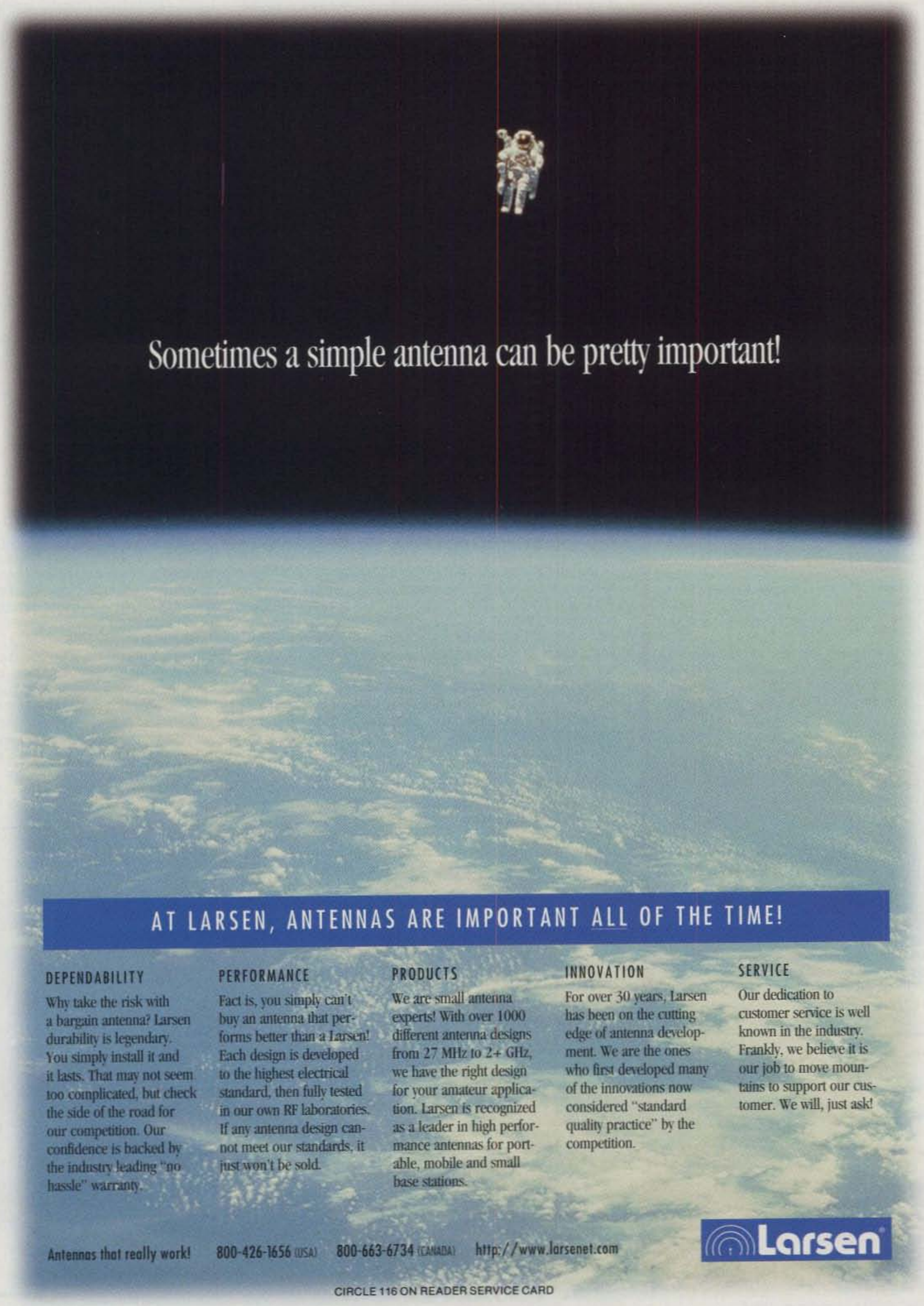
Through the centuries Georgians have preserved their separate, distinct language found nowhere else in the world. Their cultural heritage found, for example, in their artistic expressions is also unique as is their history of religious tolerance. Churches, synagogues, and mosques flourished side by side for years. Even communist rule could not destroy this tradition. But again, Georgia experienced its continuing saga of turmoil.

Upon the demise of communist rule, Georgia declared its independence from Russia in April 1991 and elected a president. However, the Georgian autonomous regions of South Ossetian and Abkhazia with a predominantly Moslem makeup broke away. A military council deposed the presidential regime in early 1992 with military force that devastated the center part of Tbilisi. A war also started against the breakaway regions.

In late 1992 a new president, Eduard Shevardnadze, former Soviet Foreign Minister, and a parliament were elected. As a result of the independence movement and regional strife, connections with Russia were severed in many



Amiran, 4L4AK, on the left with a friend, help put the finishing touches on the R7000 installation the day I delivered it.



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The author is shown in front, with Vachtang, 4L8A, on his left and Shalva, 4L4AK, on his right.

economic ways. Georgia collapsed. Although the government has made "peace" with Russia, which at least has ended the regional war, the Georgian relationship with Russia remains to be seen.

During their recent hard times humanitarian aid was supplied by the United States and Western Europe. The infrastructure of the country meanwhile is in desperate straits. For most parts of Tbilisi water and electricity are not dependable. This past April-May I was lecturing at two Georgian institutes on behalf of the USIA. During my visit I had to make do with little heat and little water during a very cool springtime. I measured the temperature by the number of layers of clothing I had on. By the first of May, however, thankfully summertime showed up.

On the plus side, the currency (Lari) has been stabilized with the help of the International Monetary Fund under strict conditions. Everything is now available in stores or marketplaces, but at European prices. Wages are very, very low, if you can find work, and pensioners are barely getting by. A recent agreement involving the United States and Russia has secured an oil pipeline route through Georgia from the Caspian Sea to the Black Sea. This, it is hoped, will help bring economic recovery. Continued political independence now remains the real question.

I have been visiting Georgia since 1991. It started out as an escape from Moscow weather. My first trip was with a friend of mine from Moscow State University, where I had been giving some lectures. He took me to Tbilisi for some R&R. We had four great days there, and as a bonus we had a charming tour guide, Tamara, who later became my wife. In any event, through Tamara I met her brother, Sergo Kalandadze, who is a paraplegic. While working in Siberia as an engineer, Sergo's car fell into a large hole where a road should have been. He was found by a motorcyclist who took him aboard the motorcycle for a harrowing 30 mile trip to a hospital. His spinal injuries are permanent. I immediately saw him as a candidate for amateur radio. I knew it would make a difference in his life. I also needed an excuse to come back to see his sister!

As we remember, under the Soviet system radio amateurs from Georgia were licensed under the UF6 callsign. With independence came the change to their own 4L callsign. There aren't too many amateurs in Georgia. Most of them are located in Tbilisi. In the past I believe I only had one contact from the States with a Georgian amateur—Mero, 4L4MM, on SSB.

Because of my lack of contact with Georgia, I enlisted the help of my amateur friends in Moscow to help get Sergo started in amateur radio. I had been active in amateur radio in the former Soviet Union for many years and had many amateur friends. During the Soviet period of *Perestroika* and *Glasnost*, amateurs in Russia demanded more operating rights, etc., and I was able to report their success.[1] Moscow

This is Sergo, 4L1BW, the author's brother-in-law, at the operating position.

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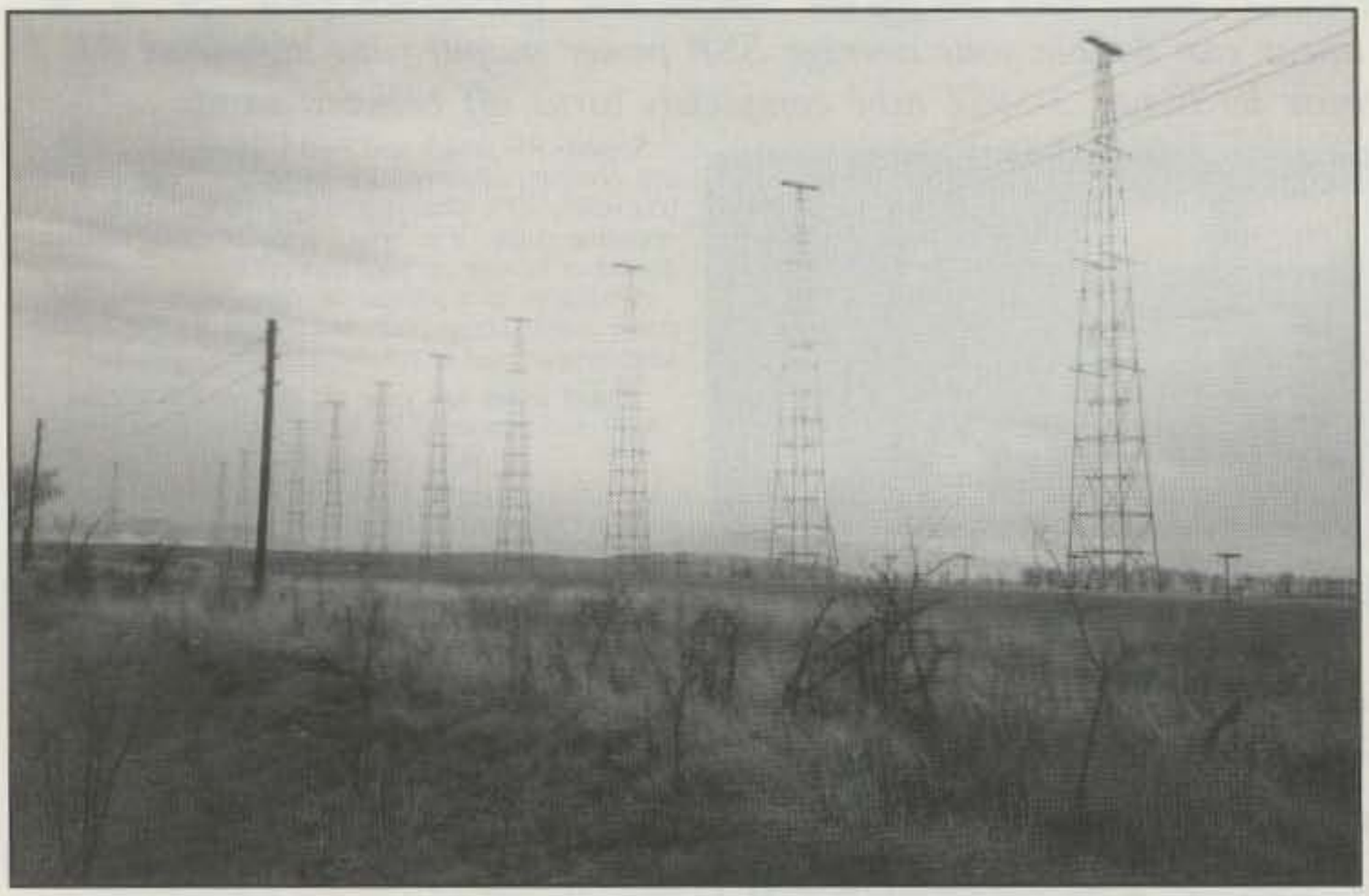

No, these towers are not for electrical power distribution, but are a small part of the former Soviet antenna farm near Dusheti. Each set of two towers supports high-gain HF curtain dipole arrays. Due to the weather, the wires are obscured in this view.

amateurs provided me with a transceiver and also gave me the name of Alex Teimurazov, 4L5A, as a leading and active amateur in Tbilisi who was sure to help. Indeed he did! I delivered the radio and a Russian book explaining amateur radio to Sergo, and with Alex's help a dipole antenna was quickly erected on the roof of his eight-floor apartment building. Sergo began to listen and learn. My belief in amateur radio and Sergo was rewarded. For handicapped or home-bound persons, amateur radio is truly a window to the world. It certainly gave more meaning to Sergo's life and took away the despondency of his situation. Meanwhile, I married his sister and we went back to the United States.

By 1993 Sergo had become licensed as 4L1BW. I gave him a G5RV Jr. antenna to continue his advancement in the amateur radio world. By this time he also had become acquainted with many of the amateurs in Georgia. They flocked to his aid, and his radio shack became a focal point for Georgian amateurs. In 1994 I gave Sergo a Kenwood TS-440S, and he made me feel as if I had delivered manna from heaven. He became a "big gun" this year when I delivered to him a Cushcraft R7000 antenna. It certainly was the first R7000 in his part of the world and works great. Unfortunately, Sergo suffers from persistent serious infections not helped by the problems in Georgia, and he recently survived a gallbladder operation by the skin of his teeth.[2] Nevertheless, he tries his best to guard the amateur frequencies for traffic to Georgia, unless there is no electricity.

Since I lived with Sergo (and his lovely, devoted wife, Ira, and his mother), I got to meet many Tbilisi amateurs. I helped get their first packet radio BBS operational in Georgia and the Caucasian region. I brought a laptop computer and Baycom modem for Sergo, and we got it working on HF. Then we assisted Vachtang Mumladze, 4L8A, in getting the first Georgian BBS up and running. This was my second experience with originating packet operations in the former Soviet Union. Along with my friend Bob Curry, KC3VO, we had the first packet DXpedition in the Soviet Union, operating with the special callsign 4J6X (see *CQ*, January 1992, p. 32).

Sergo was 4L8A's first official BBS customer, and I, as 4L/N3CBW, was the second. At this time the BBS is having trouble finding forwarding stations, but try working 4L1BW or 4L8A @4L8A.Tbl.Ga.Eu. They will get a big thrill out of it, and say hello from me. I also met Shalva Beridze, 4L1BR, who has the distinction of being the first RTTY operator in Tbilisi. Both he and Amiran Kirvalidze, 4L4AK, erected the Cushcraft R7000 for Sergo on the very day I brought it.

Despite predominately homebrew radios and antennas and the often lack of electricity and other hardships, Georgian amateurs are very active and looking for you. Please be patient about QSLs. Mail to Georgia is an iffy proposition at best and also the Georgian post office is not working too well. Moreover, there is no QSL bureau in Georgia operational as of this writing. If I can be of help, please let me know.

In addition to meeting amateur radio operators, I got a chance to meet some "big guns" in commercial radio. While in Georgia this year I aided George Jacobs, W3ASK, Propagation Editor of *CQ*, to conclude a radio consulting contract with a privatized former government agency that operates one of the largest antenna farms I have ever seen. I was given the distinction of being the first Westerner to not only see but photograph over 700 acres of radio antennas formerly used by the Soviet Union for broadcasting as well as for jamming Western stations during the cold war.

All in all I have to say that Georgian amateur and other radio operations were certainly of great interest to me, but I think that helping Sergo come back into life was my greatest satisfaction. Amateurs throughout the world know what I am talking about. Finally, I would be remiss if I did not give credit to my wife, Tamara, for helping me find and understand Georgia and its people and heritage.

Footnotes

1. See my article "Liberty Erupts for Radio Hams in Soviet Union," *The Blade* (Toledo, Ohio), January 1, 1989, Section B.

2. Sergo is in *desperate* need of a period of treatment and recuperation in a sanitary environment outside Georgia. If anyone knows of any humanitarian help in this regard, please contact the author. ■

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The Radio Shack HTX-212 2 Meter Transceiver

BY LEW McCOY*, W1ICP

Radio Shack's HTX-212 is a very neat base-station type transceiver. It measures 1⅝"H × 5⁹⁄₁₆"W × 6³⁄₁₆"D and weighs 20 ounces. Frequency coverage is 136 to 174 MHz on receive and 144.6 to 148.0 MHz on transmit. Frequency steps are in increments of 5, 10, 12.5, 20, 25, 50, or 100 kHz.

The receiver has two intermediate frequencies—one at 21.4 MHz and the other at 455 kHz. Sensitivity is rated at 12 dB sinad at 0.25 uV, and in our tests it showed up slightly better than the 0.25 uV. Squelch sensitivity is rated at 0.1 uV threshold and holds "tight" at 10 dB above threshold. Spurious and adjacent channel rejection is better than 60 dB.

We tested the unit for intermod and found it clean. Our tests were near Franklin Mountain in El Paso and South Mountain in Phoenix. Both of these locations are loaded with VHF and UHF stations, and the HTX-212 handled the situations with ease. I might add that it is very easy to test equipment such as this in the laboratory, but the real proof of the pudding is on location.

For the transmitter, there are two power levels available: 10 watts for low and 45 watts for high. Maximum deviation is 5 kHz. Spurious and harmonic emissions are down at least 60 dB.

Microphone sensitivity is 4 mV RMS. CTCSS tone deviation is 0.75 kHz and DTMF tone deviation is 3.5 kHz. Power drain is rated at 9 amps for 45 watts output and 7 amps for 10 watts.

There are many features in the transceiver. There are 31 memory channels available. One of these channels (channel 1) lets you set the HTX-212 to periodically check the stored memory channel for activity. You can individually program repeater offsets for each channel, plus there is a manually controlled offset for other repeaters.

Subaudible tones for transmit and receive are also included for closed systems.

Another feature is extended band coverage from 136 to 174 MHz for MARS, and CAP frequencies—both transmit and receive. The unit also has dual VFOs for use as needed.

The HTX-212 has an extremely well-detailed instruction manual (43 pages) which is easy to read and follow. Complete circuit diagrams are included. I usually mention such information at the end of a review, but this is worth pointing out here and now. Radio Shack includes a complete product guarantee for one year from date of purchase. If there is a problem, just return the unit to any Radio Shack store for repair.

So how does the HTX-212 work? I was pleased with the performance and reports. The liquid-crystal display is clear and easy to read (see fig. 1, which illustrates most of the functions on the display).

The Radio Shack HTX-212 two meter transceiver.

The unit is list-priced at $349.99 and is distributed by Radio Shack, a division of The Tandy Corporation, Fort Worth, Texas 76102.

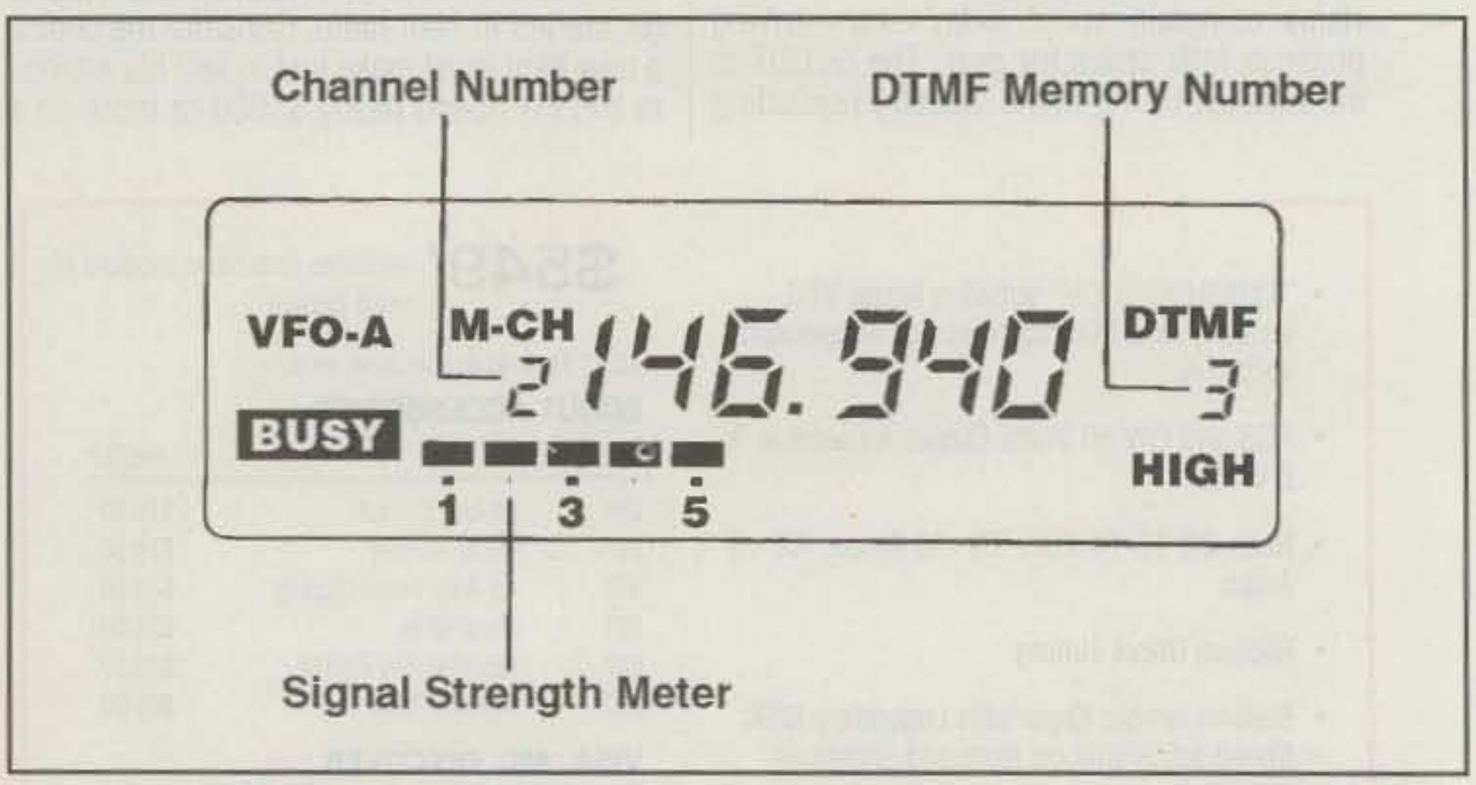

Fig. 1– This illustration of the display panel of the HTX-212 two meter transceiver was taken from the instruction manual.

Technical Editor, CQ, 1500 West Idaho Street, Silver City, NM 88061

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You don't have to be an aeronautical engineer in order to make things fly through the air. AD4UA explains several methods for giving your antennas wings.

Antennas In, Over, and Around Treetops

BY HERBERT L. FOSTER*, AD4UA

Some people tell us that mankind came down from the treetops long ago. However that may be, today the amateur portion of mankind seems bent on going back to the trees. Trees offer a standing invitation to get an antenna up there, and schemes without number have been devised to accomplish this.

One of the most ambitious plans yet worked out featured a giant slingshot claimed to have reached the tops of 150 foot trees. It was published in an April issue of *CQ*, and presented a picture of the designer, N6HR, operating the affair with a smile on his face as big as the rising sun. One is tempted to suggest this to NASA as a possible first stage. Hi!

I've had good results using a crossbow pistol, which appears at fleamarkets and is also offered by mail. It comes in two sizes, one listed as having a 45 pound pull, and a larger one rated at 90 pounds. Both models are useful in this operation. I made a bolt, which is what crossbow people call the arrow, from 1/4 inch aluminum rod, and a heavier one from the same size of cold rolled steel. I sawed off a piece about 8 inches long and drilled a 1/16 inch hole crosswise about 1/16 inch from one end, which became the rear end of the bolt. I used a 30 pound test nylon kite line, since this is the most limp, curl-free line I've found. Then all burrs and rough edges were filed smooth, and the device was ready for a test.

If you tie a length of kite line through the hole in the rear end of the bolt and place the bolt in the crossbow, it's only necessary to lay the line in wide loops on the ground directly in front of you. The bow-line knot is a very good way to tie the line to the bolt. It's much better than a square knot, which comes to mind first with many people. Estimate the height of the tree, and have about twice this length of line ready. Tie the far end of the line to something heavy, cock the crossbow, and let 'er rip, aiming over the top of the tree. Off she goes, into the wild blue yonder, towing your line behind.

Right here, let it be said that neither this nor any other scheme for the airborne route is going to work well in a wind of any sizeable amount. It's really annoying to see your projectile sail straight and true right over the top of the target tree only to see the line blown far and wide off to one side. It would be better to QRX for a day that's a little more calm.

Another point to consider is how open the terrain may be on the other side of the tree in question. In most cases, you need to be able to walk around to the far side of the tree and pull on the line. First, of course, you've attached your antenna to the line, which becomes a messenger line. Then you can pull away on the messenger and watch as your antenna mounts upward into the branches.

Once I fired a line over a pine tree about 50 feet high. My aim was good, and the line went right where I wanted it. However, the bolt came down to earth in the midst of a tangle of brush. Picking up a machete, I started through the mini-jungle after the end of the line feeling like Frank Buck of "Bring 'Em Back Alive" fame. After considerable hacking of brush, I reached the objective, but it was a lot of work. Look for something with a relatively clear spot on the far side, if such a place can be found.

*3020 Pennsylvania Street, Melbourne, FL 32904-9063

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Game Tracker® attached to a compound bow. It's the black cylinder just below the archer's hand.

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My slingshot with Game Tracker® attached.

If you use an insulated wire, you can have it lie amid the branches of a tree and work just about as well as if it were out in the clear, hanging free of any contact with a branch. The wire should also be fairly flexible for easy pulling. Good results have been reported using enameled copper magnet wire. In the small sizes, say about #22, this wire has the advantage of being almost invisible. This can be a big factor in the picture if stealth is your aim.

If you have no such worries about being discovered, a heavier wire will be less apt to break with the movement of branches in the wind. A wire that's heavy enough to be fairly sturdy, black enough to not be readily visible, and insulated, as well as flexible, is sold by the foot in any well-stocked hardware store. Look for #14 stranded wire. You can get it in almost any color you wish, including black.

If rolling your own is not your cup of tea, and if you prefer to use something that's ready made, you can look through the Antennas West catalog. You'll see their ads in *CQ*. They use wire such as this, and better, among other things, and the work is all done.

Great success is also possible with a slingshot of more modest proportions than the monster N6HR dreamed up. One that I like has a bar sticking out in front that helps in aiming the shot. The trick here is to use a projectile light enough to tow your line to the desired height, yet heavy enough to fall easily to the ground. A light weight can tow your messenger high, yet get tangled in the branches and be very inaccessible. As in so many other areas of human endeavor, it's a trade-off. You juggle height attained against getting the weight down within reach on the other side of the tree.

A delta wing kite. This one has a 6 foot wingspread and it can lift a couple of pounds into the air in a modest breeze.

There's a sinker used by fishermen called an "egg" sinker. It's shaped much like a football, with a hole through the long axis. You can put a bare copper wire, about #12, through this hole, and fashion an eye at each end using long-nose pliers. The shape of the sinker, with an eye at either end for tying on a line, is ideal for use in a slingshot. Try a 6 ounce weight if there's a lot of tangled foliage in the way. A lighter weight—say, a 2 ounce sinker—works well in more open growth. It will carry a line to greater heights, but can easily get stalled in the branches. It's a good idea to paint the sinker with a bright color to enable you to find it more easily. Aluminum paint works well.

The method of attaching the messenger line to the sinker and arranging it for easy towing is another point to consider. I made a reel, fastening it to a PVC pipe which I poked into the ground. The idea was that the projectile would pull the line off the reel as it soared into the blue. It worked fairly well, although I found it also worked about as well to simply lay the line loose in wide circles on the ground in front of me. A reel with better bearings might have been the answer.

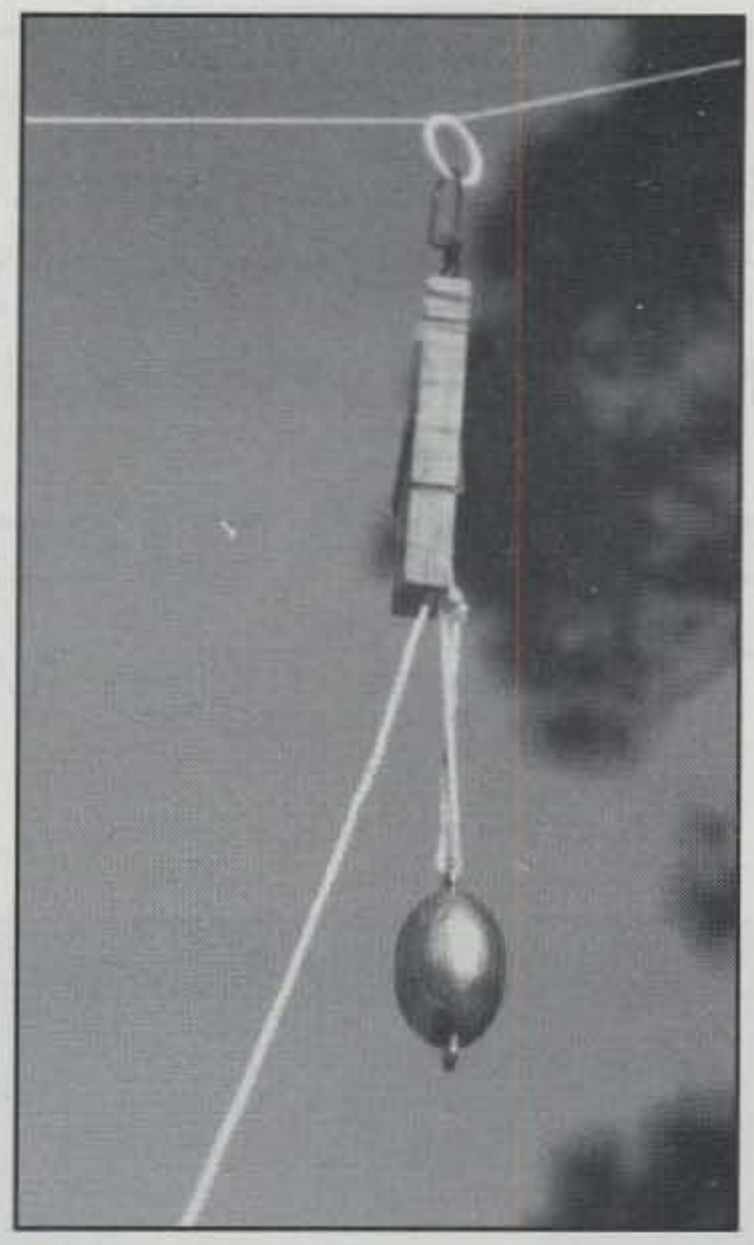
There's still a better way, though. You can go to almost any hunting-goods store and buy a gadget known as Game Tracker®. This is a copyrighted name, and any salesman in such a store will know about it. It consists of a very light-weight line packaged in a cylindrical container. The end of the line appears at one end and pulls out easily from the coiled line within the tube. At the other end of the tube there's a threaded hole which screws onto a machine bolt built into many bows that deer hunters use. You can also buy a special mounting bolt that can be used to mount the tracker to almost any launching device, including a slingshot. A short threaded bolt is included with Game Tracker®, and this also can help in fashioning a mount. Some ingenuity can really pay off here.

Many deer hunters use a compound bow, and most of these are fitted with a Game Tracker® mounting bolt. In use, an arrow shot by the hunter pulls the line after it, and the hunter uses this to lead him to his target. The device also can be used to get a wire into a tree, which is a purpose the inventor probably didn't think of. Archers fasten the line to the arrow just behind the head, and the act of pulling the line doesn't cause the arrow to go off course. The weight of the line won't give your sinker any trouble either.

My slingshot, as already mentioned, has a rod about 6 inches long attached just below the top, where the missle comes forth when fired. This is provided to help in aiming the shot. It also offers a convenient place to mount the Game Tracker®. You can hang it below this rod, using a hose clamp, with the business end to the front. The projectile you shoot will pull the line from the package with no trouble at all, and your antenna project is on the way. You can also cut the front sight from the rod and attach the abovementioned short bolt that's included with Game Tracker® in its place. One method, and the way I did it, is to place a coupling for 1/2 inch copper pipe over the shortened rod, insert the bolt into this coupling, and fill the space inside it with a gap-filling epoxy paste.

Next consider a kite as a means of lofting a wire into the blue. This method, being an exception to the rule about not doing anything in a wind, is quite effective when all the prerequi-

A wood clothespin with a snap swivel attached. Use a pop rivet through the eye of the swivel and the side of the pin.



Here is a clothespin and ring arrangement ready to carry a nylon twine messenger line over a treetop.

sites are met, but has some iron-clad conditions that must be satisfied.

For openers, you need a kite that will fly steadily and go up easily in a modest breeze while pulling a little weight. Such a kite is a delta wing. A model with a 4 to 6 foot wingspread can be found in most toy shops or any good kite store. The box kite is a real workhorse and will lift great weights. However, it can be tricky to handle. A delta wing is a good flier and is much easier to control. Next you must be able to position yourself upwind of the target tree. It helps a lot if you can get somebody to help.

Having obtained a kite, an antenna, and a helper, take a short break and visit a fabric store where they sell small plastic rings about a half inch in diameter by the bag of a dozen or so. You'll want a couple of these rings and a wood spring-type clothespin. A snap swivel such as is used by fishermen is the last item you'll need.

Now here's how the kite trick works. Get the kite flying and let it go up about 100 feet or so. The winds are a little more steady as a rule as you get up above the ground a bit. Your kite then will offer a nice, steady sky hook.

You might ask your helper to hold the kite line while you attach the plastic ring to the messenger line. You can do this easily by forming a small loop in the line, passing this through the ring, and then looping it back over the ring. It's a lot easier to do this than to explain the motions. With very little experimenting you'll figure it out. Fasten your wood spring-type clothespin, with the snap swivel, to the plastic ring.

Now take the end of the messenger line that will be used to pull your antenna, with an egg sinker attached, and put it in the jaws of the clothespin. Let the sinker hang free.

Either you or your helper should let the kite climb, carrying the sinker and your messenger line, until the sinker is higher than the target tree. A delta wing kite, when the line is held fast, not letting the kite take any more, will swim forward to a point almost directly overhead. With the weight at the desired height—that is, higher than the target tree—let out a little line. The kite will now move down wind, carrying your sinker and messenger line over the tree. When the sinker has been taken well clear of the tree, you or your helper, whoever has been handling the messenger line, should now give a sharp jerk. This will yank the line free of the clothes-pin, and the sinker will fall to the ground on the far side of the tree. All that remains is to walk around to where the sinker is (it might be buried in the ground, but the line will lead you to it) and pull up your antenna.

So there you have a few ways of raising an antenna into the treetops. There are other ways to be sure, but these are methods I know about. Almost any small kid who spots you engaged in something like this will be eager to help. Be sure to let such a youngster get in on the act. It's a good way to make friends and help amateur radio with an infusion of new blood. Be prepared to answer questions, though. You'll get some good ones.

Once a boy was helping me put a 40 meter antenna into a maple tree which was surrounded by a lot of almost virgin forest. He was a big help in chasing the line and pulling. After we were finished, in an effort to hook him into amateur radio I said, "I'm going to use this to talk to a guy in Florida." Since we were in New York, I thought this might pique his interest. However, this boy, age about nine years, gave me an odd look. He asked, "You went to all this work just to talk to a guy in Florida?" Hi! ■

Looking for a good weekend project? If you like to operate on 160 and 80 meters, this one is tailored for you. It's simple to build, inexpensive, and can add years to the life of your rig.

Beverage Antennas

There's More To Them Than Meets The Eye

BY GARY R. NICHOLS*, KD9SV

The "Beverage" antenna is probably the best DX antenna ever invented for use on the 80 and 160 meter amateur bands. The low noise and directive characteristics make it a must for the serious DXer on those bands, especially during low sunspot years.

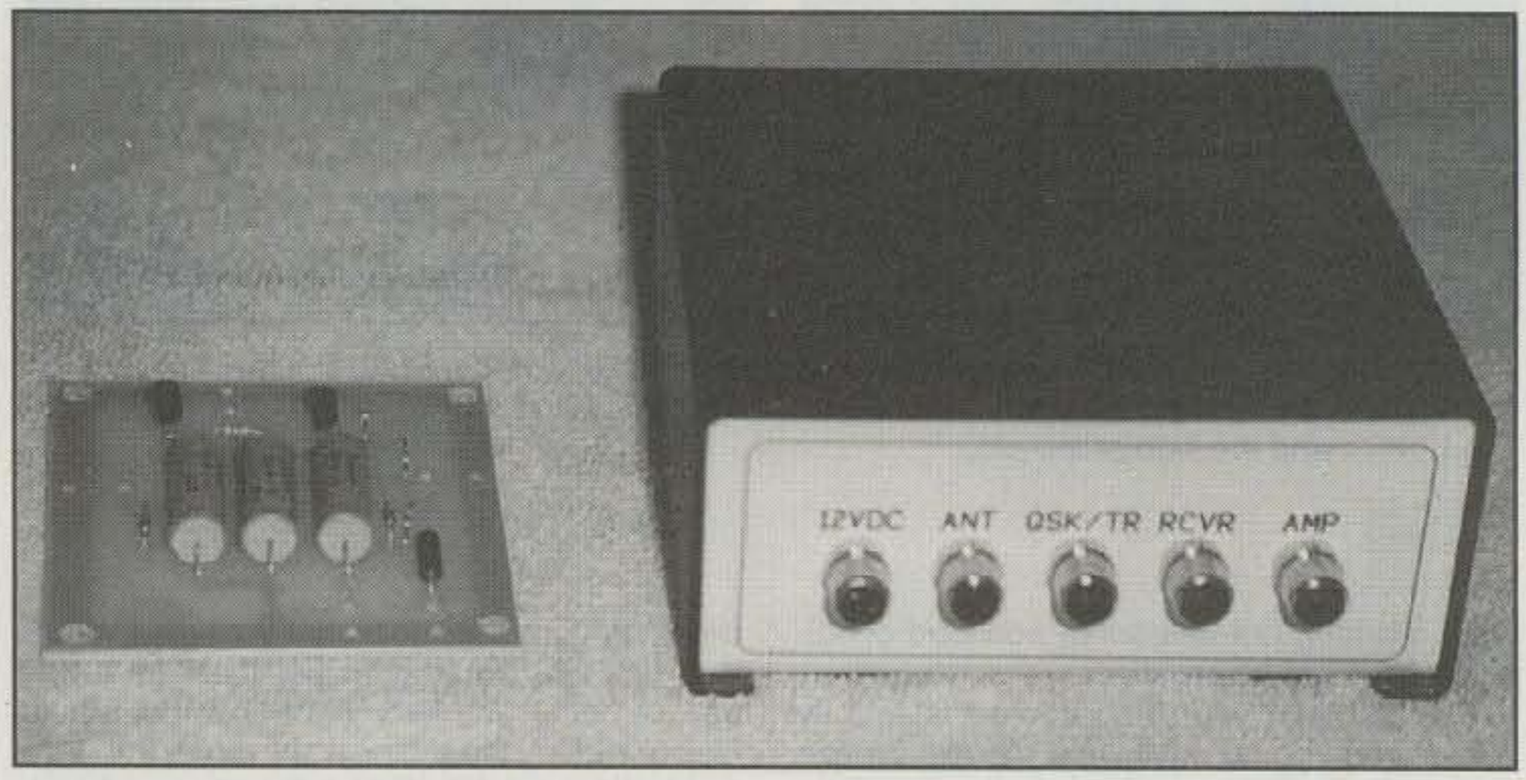
There are, however, several real dangers to your transceiver which result from energy getting back into the radio through the auxiliary antenna input on the back panel of your transceiver. That input is "unprotected" on almost all makes of amateur radio equipment. How do you know if your rig is protected or not? That is a very good question. To answer that question, trace the receive or auxiliary antenna input on your schematic diagram starting from the back-panel phono jack. If that signal line does *not* go through a set of relay contacts (or transistor switch) which are either open during transmit or grounded, the auxiliary input during transmit is unprotected.

What happens during transmit is very similar to a public address system when the microphone gain is too high and feedback causes an ear-piercing squeal. Your front end is subject to "self destruct" from the feedback loop that occurs during transmit from excessive RF energy coupling back through the receive antenna. This can happen whether using loops, beverages, or whatever type of antenna you may be using. This is not a problem when receiving on your transmit antenna, since it is disconnected from the receiver section of the transceiver and protected by a T/R relay.

How likely you are to have this problem depends on both the distance the receive antenna is from your transmit antenna, and the power level being transmitted. Naturally, the higher the power the greater the danger.

John, K9UWA, got me interested in 160 meters several years ago, and I got "hooked" on working DX on that band. Without beverage or other low-noise-type antennas, working DX from the mid-west was a rare occurrence. However with good receiving antennas I have been able to do quite well, even this far from the coast. In fact, I was able to win Zone 4 in the 160 Meter SSB Contest in 1990, 1991, and 1992 in the single operator category. My transceiver is a Ten-Tec Corsair II, and my first experience with RF feedback showed up in several ways:

*4100 Fahlsing Rd., Woodburn, IN 46797



This view shows the completed board outside of a suitable cabinet. This is the rear of the cabinet showing the connecting jacks.

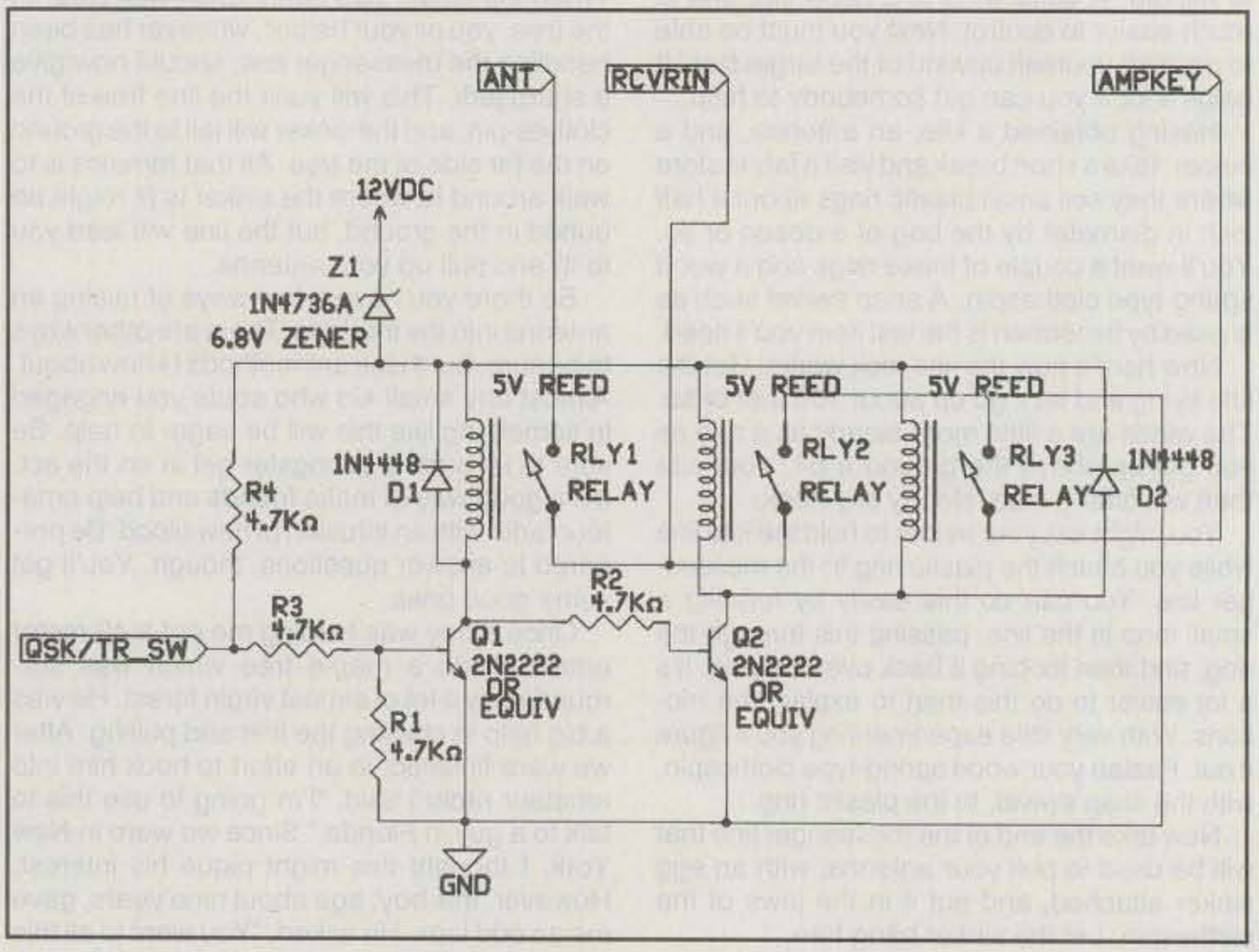


Fig. 1– Schematic diagram for the front-end saver.

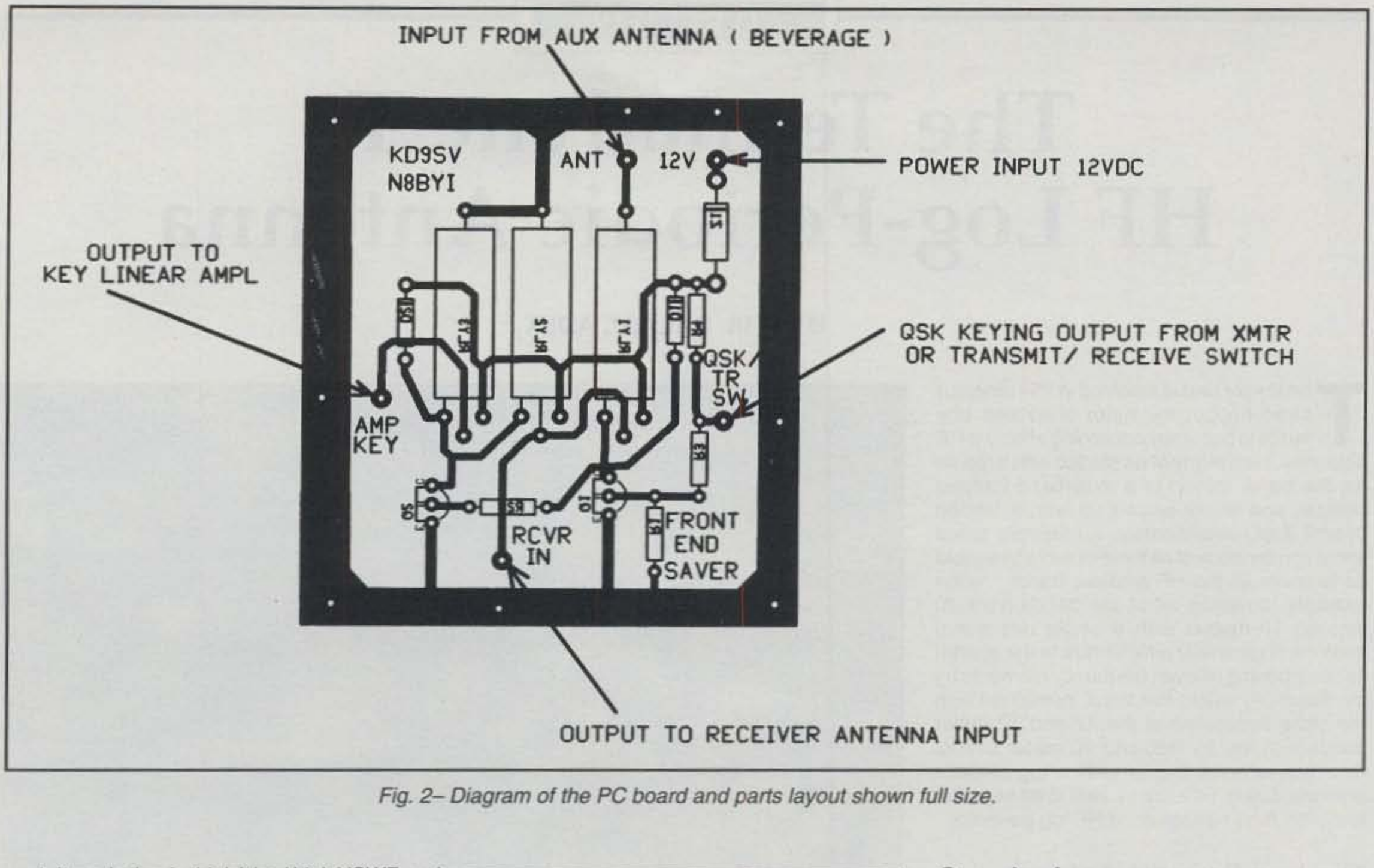


Fig. 2– Diagram of the PC board and parts layout shown full size.

1. It made the rig think it had high VSWR and tripped the power supply.

2. When on SSB on 1840, I was also reported to be loud on other frequencies in the band.

3. The phantom VSWR effect causes difficulty in loading of my linear amplifier.

4. Power output from the linear amplifier was reduced.

There may be other symptoms caused by this problem I am not aware of yet. However, if any of these symptoms occur, switching receive back to the transmit antenna will make the problem go away.

Now back to John, K9UWA. After burning up his ICOM 765 for the second time, John asked me to come up with something that would prevent it from happening again. I designed a simple circuit using two 5 VDC reed relays and two transistors that could be connected external to the radio and that would do the job. He also wanted a "bypass switch" that would enable switching out the protection circuit in the event of a relay failure during a contest. During a rearrangement of equipment the "bypass" switch accidentally got switched, and you guessed it—burn-out number three.

Not only is it a huge inconvenience to be without your rig for several weeks when you have to ship it back to the manufacturer for repair, but it can also be quite expensive.

Chuck, N8BYI, and I got together and designed a new, improved circuit that will work with any radio. It is QSK compatible and will key any linear amplifier that requires a pull-down, and all of the connections can be made without having to open up the radio. Only 12 VDC is required, and it is available on the rear panel of most modern transceivers.

How does the protection circuit work? It disconnects the receive antenna during transmit, shorts the antenna input to ground, provides a keying relay for a linear amplifier, and permits QSK operation with a non-QSK amplifier. In addition, it is easy to install, all connections are external to the rig, it requires only 12 VDC at 40 ma, replacement components are available at Radio Shack, and it prevents RF from entering the rig via AUX antenna input.

Parts List
D1, D2—1N4448
Q1, Q2—2N2222
R1–4—4.7K
RLY1–3—SPST 5 volt reed relay
Z1—1N4736A, 6.8 volt

Conclusion

This small circuit can prevent RF from "smoking" the receiver front end of all transceivers. This includes most Ten-Tec, ICOM, Kenwood, and Yaesu rigs, and should be of particular interest to 80 and 160 meter operators

Editor's Note

The author advises us that this project is available in three forms from C&S Engineering, 9229 Goldenrod Dr., Fort Wayne, IN 46835 (219-485-1458). It is available as a kit ($22.95), as a completed board ($29.95), and as a finished unit in a cabinet ($49.95). ■

The Tennadyne T5 HF Log-Periodic Antenna

BY PHIL SALAS*, AD5X

The longer one is involved in this amateur radio hobby, the more obsessed one tends to become concerning effective HF antennas. How many of us started with a dipole on one band, moved to a multi-band trapped vertical, and finally wound up with a triband beam? And, unfortunately, it generally takes some combination of all three or more to enable us to cover all the HF amateur bands. As an example, covering all of the bands from 20 through 10 meters with a single directional antenna is generally difficult due to the electrical lengthening of lower frequency elements by the inductors within the traps, combined with the close separation of the 17 and 12 meter bands with the 20, 15, and 10 meter bands. One way around this is with a log-periodic antenna. Enter Tennadyne with their series of low-cost, high-performance HF log periodics.

The Log-Periodic Antenna

There is no need for me to go into detail on the theory of log-periodic antennas. If you are interested, quite a bit of information is available in the *ARRL Antenna Manual* and many other publications. Sufffice it to say, LPs are essentially broadband directive arrays that give effectively constant SWR, gain, and front-to-back ratio over the designed frequency range. Log-periodic antennas also tend to be extremely efficient (close to 100%), because no traps or other finite-Q reactive components are used in the antennas.

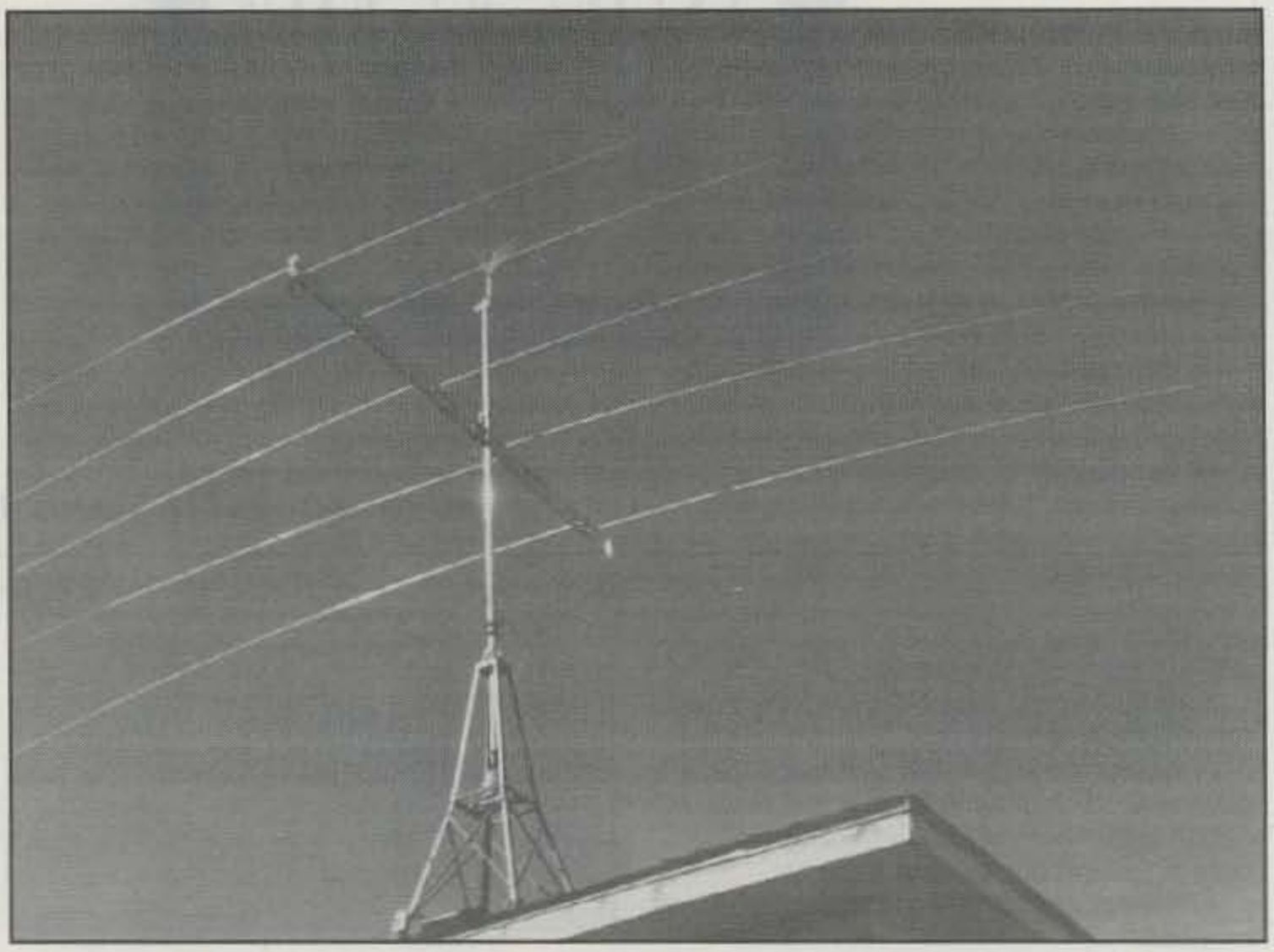
The Tennadyne LPs

Tennadyne offers six different HF legal-limit LPs to suit any installation. All the Tennadyne LPs use full-size elements (longest element is 38 feet). Table I gives the characteristics of the different models.

In my case, I was looking for an antenna that could easily be mounted on the mast of my Create 6 foot roof tower. As can be seen from the table, the smallest antenna sold by Tennadyne is their T5. This antenna appeared to be small enough and light enough to be easily handled by one person (me). All that I seemed to be giving up over the longer boom models was SWR and a little bit of gain (0.5–1.8 dB). The T5 antenna seemed to fit my needs perfectly. A phone call and five days of waiting resulted in the T5 being delivered to my door. With Texas tax and COD charges added, my total delivered price was $362.

The T5 arrived in a 5.5" × 5.5" × 6' carton. There were quite a few parts in this box. The T5 consists of 56 separate aluminum tubes, plus two spacers, a boom insulator, six U-bolts, and lots of screws, nuts, bolts, and washers.

*1517 Creekside Drive, Richardson, TX 75081



A close-up view of the Tennadyne T5 HF log periodic antenna on top of the author's Create CR18 roof tower.

The reason why there are so many tubes is that Tennadyne tapers their antenna elements down to 1/4 inch diameter. The last 48 inches of every element is 1/4 inch tubing. The multiple short tubing sections permit tapering without sagging and keep the wind load and weight down. Also, the elements tend to be springy and give with the wind, also helping to keep the wind load down. The aluminum tubes are 6061-T6 unpolished tubes. All hardware is stainless steel, and all the nuts are self-locking ny-loks.

Putting It Together

While the number of parts seems to be overwhelming at first, the actual assembly is pretty straightforward and goes fairly fast. The first task is to properly arrange the booms. Four 2 inch diameter 6 foot long tubes are used for the 12 foot long double boom (this allows for very rigid boom construction without a support truss). A boom splice is inserted into two of the tubes. To secure the boom splice, two 1/8 inch holes must be drilled through the booms into the boom splices and secured with stainless steel screws. The boom splices are not secured to the remaining two boom pieces until near the end of the assembly.

Next the elements are assembled. All tubes are premeasured and drilled, so you just need to put in the stainless-steel screws that hold each of the tubing sections together. The ele-

	T5	T6	T7	T8	T10	T12
Elements	5	6	7	8	10	12
Gain (dBd)	4.5	5.0	5.6	5.8	6.1	6.3
F/B Ratio (dB)	14-24	14-24	14-24	15-24	15-25	15-24
Boom Length	12 ft.	12 ft.	18 ft.	18 ft.	24 ft.	30 ft.
Max. SWR	2.1	1.9	1.8	1.7	1.6	1.5
Weight (lbs.)	26	29	37	40	50	61
Wind Area	5.1	6.1	7	8	10	12
Price (ppd.)	$335	$365	$470	$510	$630	$770

Table I– Characteristics of the six high-frequency, legal-limit log periodics offered by Tennadyne.

ments are then inserted into the appropriate boom sections and fastened in place. All Tennadyne booms are drilled such that the elements slide through holes in the booms and are then bolted in place with a stainless-steel bolt which passes through the element and one side of the boom. No clamps or rivets are used.

Next the booms are placed on top of each other, separated by the boom spacers, and secured in place with bolts into the boom spacers. Finally holes are drilled in the remaining two boom sections through the boom splices to securely fasten the boom sections together. The only thing remaining is to attach the mast mount, attach your coax feed with a coiled coax balun, and then put up the antenna.

In my case, I modified the instructions somewhat, as I wanted to attach the elements after I carried the boom up onto my roof. I first assembled the elements minus the first, or largest, section of each element. I inserted only the first section of each element into the double boom. This made for a very compact boom assembly which was easy to carry up to my roof. Once on the roof, I moved the boom assembly near the base of the roof tower and completed the assembly of the elements to the boom. With a weight of only 26 pounds, I was able to easily lift the completed antenna and attach it to the mast on the roof tower. With the help of KB5VOD, I was able to easily slide the T5 up to its final height on the mast (total height above ground of 35 feet) and secure it in place. All in all, I spent about four hours assembling the T5.

Testing . . . Testing . . . 1-2-3

Once the T5 was up, I connected my MFJ-259 SWR Analyzer to the coax at the base of the roof tower and measured the following characteristics:

Freq. (MHz)	14.2	18.11	21.2	24.93	28.5
SWR	2.0	1.1	2.0	1.7	1.2

This is pretty close to the 2.1 SWR "nominal maximum" promised by Tennadyne on the T5 data sheet. Depending on the type and length of your coax cable, the SWR in your shack probably will be a little lower due to cable loss. I personally prefer to use 9913 coax. It has half the loss of RG-213, is lighter, is easier to solder connectors to, and only costs a nickel or so a foot more than RG-213 (with some careful looking through the *CQ* ads). In my installation I have about 100 feet of 9913, which is essentially lossless below 10 meters. In all cases I could obtain full output with both an FT-990 and IC-706 without the need for an antenna tuner.

For those perfectionists who demand a perfect match at their transmitter, these SWRs are easily within the matching range of the internal tuners built into most rigs today. However, if your transmitter puts out full power without the tuner, there is no need to use the tuner. The SWR varied over the total frequency range as shown in Table II. The maximum SWR never exceeded 2.1:1.

Next I measured the front-to-back and front-to-side ratios with the help of K5HW, whose station is about 1/2 mile from mine. While K5HW transmitted a 5 watt carrier, I rotated the T5 and took S-meter readings. These obviously are far from precision readings, as they were taken on a standard S-meter (FT-990). I have no idea how accurate and "logarithmically linear" the S-meter is, nor do I know how well the S-meter accuracy tracks from band to band. I also "eye-

	Max*	Min	Max	Min	Max	Min	Max	Min	Max	Min
Freq (MHz)	14.0	14.99	16.13	18.14	19.8	22.66	25.0	26.17	27.1	28.3
SWR	2.1	1.1	2.1	1.1	2.1	1.1	1.7	1.6	1.7	1.1

**T5 lower bandwidth end. SWR increases continuously below 14 MHz.*

Table II– SWR varied over the total frequency range as shown here. The maximum SWR never exceeded 2.1:1.

balled" the S-meter to try to interpolate between marks on the meter.

Finally, while I can see K5HW's antenna directly from my antenna, there is a significant amount of ground clutter (such as houses, power lines, etc.) all around us, which also can cause incorrect readings due to reflections. You really need a decent antenna range and a calibrated receiver to measure these parameters accurately.As you can see, though, the T5 certainly does act like a directional antenna!

	20m	17m	15m	12m	10m
F/B (dB)	15	12	14	17	15
F/S (dB)	20	27	32	33	35

I couldn't really measure gain, as I would need a reference dipole on each band. However, Tennadyne has their own antenna range complete with reference dipoles, and I have no reason to disbelieve their 4.5 dBd numbers.

Improvements

I have a few minor criticisms of the T5. First, I believe that Tennadyne should drill the holes necessary to couple the boom sections together. This wasn't that big a deal; however, all the other holes were drilled. Second, the boom holes for the elements are pretty much a friction fit. I had to use a round file to slightly enlarge two of the holes on one boom section before I could insert the associated two elements. Again not a big deal, as this only took me a minute or so (the holes were *almost* big enough). Finally, one of the illustrations in the instructions for my T5 showed a shorting element at the rear of the LP. However, no shorting stub was provided, and it was not covered in the written instruction steps. Tennadyne says this shorting stub is not really necessary on the T5, but they will be providing it in the future. This just caused a little confusion on my part. I did make a shorting stub per verbal instructions from Tennadyne.

Conclusion

I've spent many hours actually using the T5. I am extremely pleased with the antenna. It works at least as well as a commercial triband three-element beam and a 17/12 meter rotatable trap dipole I previously had in the same location. Plus, I also now have an antenna with gain and F/B on 17 and 12 meters—and all with a single coax feed! Of course, this is highly subjective and involves operation at different times with different stations.

Finally, the T5 is much less obtrusive than a trapped Yagi due to the smaller diameter elements of the T5 (no need for large elements to support traps). And even though the rear element is much longer than a triband beam (38 feet versus 26 feet), the front element is much shorter. The T5 looks more like an oversized TV antenna than anything else. The first thing my XYL (N5UPT) said when she saw the T5 on the roof was "That's a definite improvement!"

The T5 antenna is available from Tennadyne Corporation, HCR 81, Box 347A Junction, TX 76849 (915-446-4510 Tel/Fax). ■

Here is the T5 out of the box prior to actual assembly, which was pretty straightforward and went fairly quickly.

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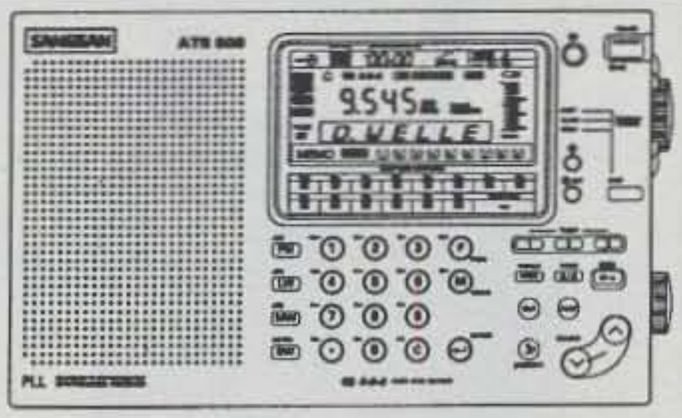
Shortwave Radio



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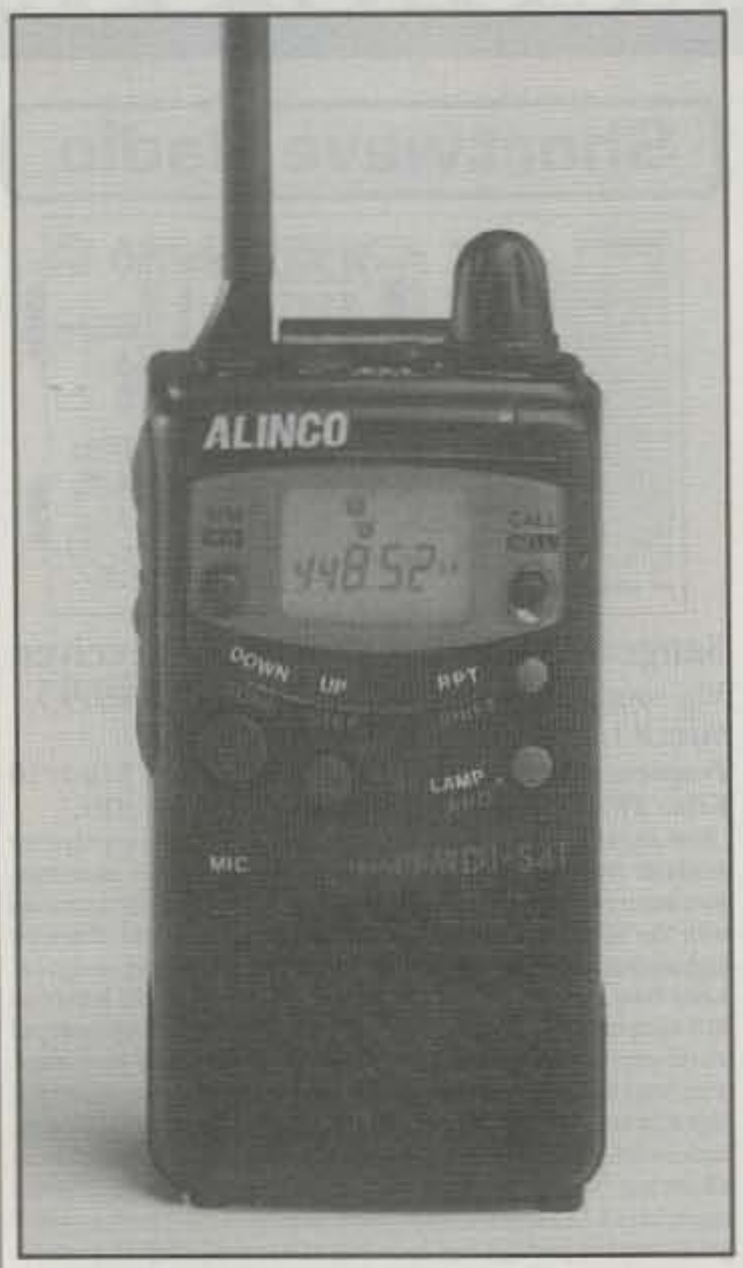

The Alinco Introduces DJ-S41T "Pocket Size" HT

The DJ-S41T, a handy-talkie (HT) transceiver, is designed to operate on the 70 cm (440 MHz) band. The new HT features a pivoting "swing up" antenna that allows the radio to remain compact in a pocket without detaching the antenna. Other features include: 50 CTCSS tones, battery save function, large illuminated display, adjustable offset (to 15.995 MHz), adjustable tuning steps, pager "alert" alarm, hi/low transmit power setting, and programmable auto power off feature. The DJ-S41T comes with a belt clip and carry strap.

Alinco also has a list of options available for the transceiver, which includes a traditional speaker mic, cigarette-lighter external power cord, VOX-operated tie-pin microphone, VOX-operated headset, and more. For further information, contact Alinco Electronics, Inc., 438 Amapola Ave., Ste. #130, Torrance, CA 90501 (phone 310-618-8616; fax 310-618-8758), or circle number 101 on the reader service card.

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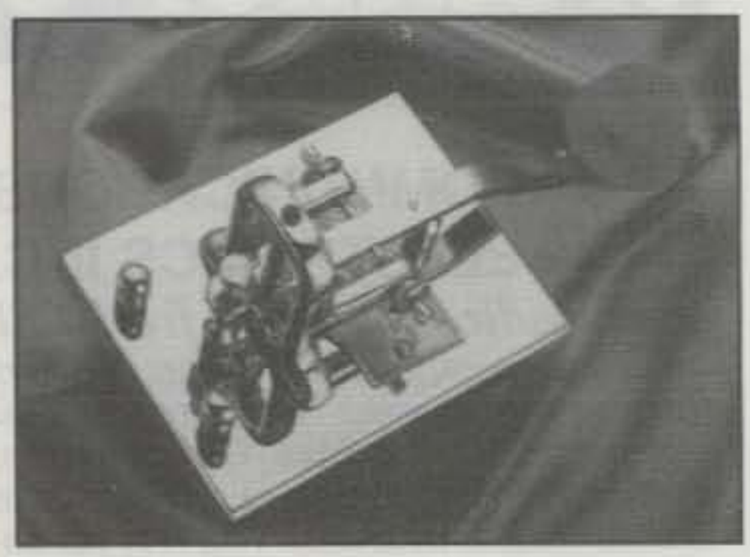
For the first time in their 100+ year history, Vibroplex has a straight key in its key line. The Straight Key features include a heavy solid steel base that anchors the Straight Key to the operating position; a pivoting lever arm; a stainless steel tension spring that allows complete control of the tension; and the famous brass Vibroplex logo plate with a serial number pinned to the top of the base with stainless steel pins. The Straight Key has a smooth mechanical action and a heavy steel base. It has three possible adjustments. The first controls the pivoting of the contact lever from loose to stiff; the second is the contact post spacing which sets the total action of the contact lever; and the third



sets the spacing of the key lever, allowing the operator to control the "feel" of the Straight Key.

For more information, contact The Vibroplex Co., Inc., 11 Midtown Park E., Mobile, AL 36606-4141 (phone 334-478-8873; fax 334-476-0465; or call toll-free 1-800-840-8873 for orders), or circle number 102 on the reader service card.

Analyzer III® and Analyzer IV From W & W Associates

W & W Associates has introduced a professional battery maintenance system that will charge and analyze nickel-cadmium, nickel metal hydride, lead acid, and certain lithium ion chemistries. It automatically identifies batteries with open cells, shorted cells, batteries with reversed cells, and batteries that no longer meet minimum capacity levels. Other features include single button operation, four independent charge rates (300, 600, 700, and 1000 ma) that do not require computer or operator interface; and eight independent discharge rates (200, 300, 400, 500, 700, 800, 900, and 1000 ma), all of which are cup or adapter selected and do not require computer or operator interface.

The three station unit measures 11.5"L × 3.5"H × 8"W and weighs 5 pounds. The six station unit measures 23"L × 3.5"H × 8"W and weighs 10 pounds. For more information, contact W&W Associates, 800 South Broadway, Hicksville, NY 11801 (800-221-0732; in NY State 516-942-0011; fax 516-942-1944; e-mail <w-wassoc@ix.netcom.com>; or visit the Web site at <http://www.wwassociates.com>), or circle number 103 on the reader service card.

Communications Specialists TE-64D Tone Encoder

Communications Specialists, Inc. has introduced an upgraded version of their TE-64D tone encoder. The multi-purpose CTCSS/Burst

tone unit now displays the actual tone frequency on a four-digit LED display. The self-contained, fully enclosed encoder provides all EIA CTCSS tones from 67.0 Hz to 203.5 Hz, plus all common burst tones from 1600 to 2550 Hz in 50 Hz increments. A front dial rotary switch provides tone selection. The unit operates on 6–16 VDC (can be modified up to 30 VDC) and measures 5.25" × 3.3" × 1.7". Frequency accuracy is .1 Hz for sub-audible and 1 Hz for audible tones. The digital display portion of the TE-64D can be added to an existing TE-64 with the TE-64D-MOD kit; or you may return your TE-64 for free factory installation.

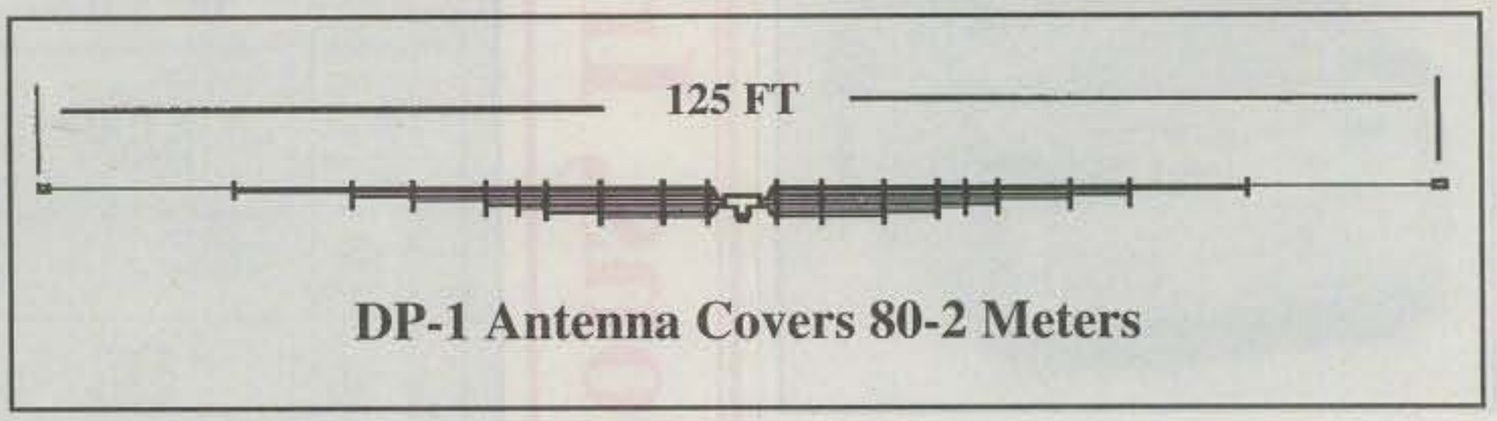
For more information, contact Communications Specialists, Inc., 426 West Taft Avenue, Orange, CA 92665-4296 (International phone 714-998-3021, fax 714-974-3420; USA and Canada phone 800-854-0547, fax 800-850-0547), or circle number 104 on the reader service card.

RF Applications Match Alert™

Match Alert™ from RF Applications, Inc. was designed to offer protection for HF transmitting systems. The microprocessor-based Match Alert monitors VSWR and provides a visual and electrical alarm if a preset VSWR level is exceeded. Eight different levels are dip-switch selectable, and an LED is provided to indicate when RF is being detected. Match Alert covers 1.8 to 30 MHz and is rated at 3000 watts, but has been tested to 5000 watts. The unit is housed in a cast aluminum enclosure measuring approximately 3" × 4" × 5" and requires 11–16 VDC. A Form-C relay contact rated at 1 amp is available via a 3 ft wire harness.

List price of the Match Alert is $129.95. For more information, contact RF Applications, Inc., 9310 Little Mountain Road, Mentor, OH 44060 (phone 1-800-423-7252; international 1-216-974-1961; fax 1-216-974-9506; internet at <http://www.rfapps.com>; e-mail <sales@rfapps.com>), or circle number 105 on the reader service card.

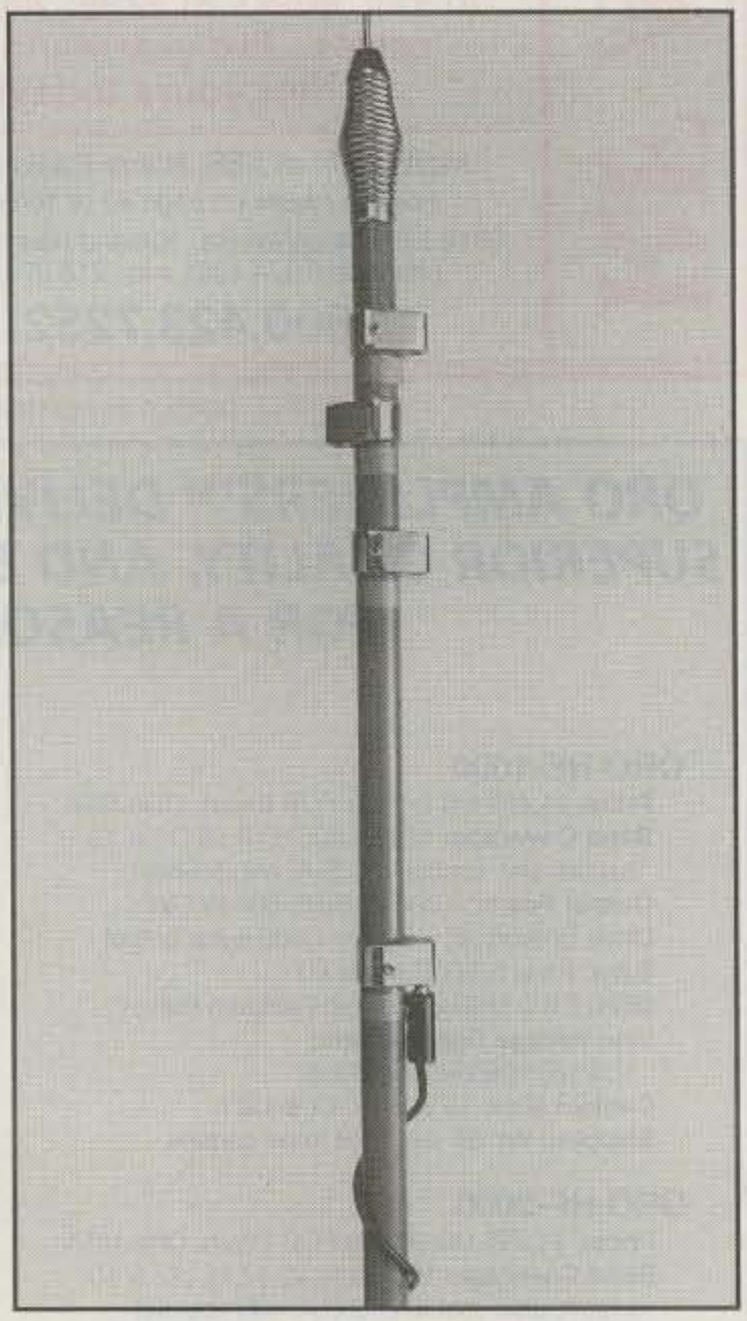
Dynamic Electronics DP-1 Multiband HF/VHF Antenna



The DP-1 from Dynamic Electronics is a multiband antenna for HF and VHF. It covers 80, 75, 40, 30, 20, 17, 15, 12, 11, 10, 6, and 2 meters, and is 125 feet long with a maximum width of 2 ft. The 8 dipole elements are made from #14 insulated stranded wire and are separated by PVC spacers. An SO-239 socket is used to accept a standard PL-259 coaxial cable connector. An inverted Vee type installation is recommended with supports at the center and ends. The DP-1 is priced at $129 plus $6.00 shipping to U.S. and Canada.

The DP-2 covers 40, 30, 20, 17, 15, 12, 11, 10, 6, and 2 meters and is 65 ft. long with a maximum width of 2 ft. It is priced at $110 plus $6.00 shipping U.S. and Canada.

For more information, contact Dynamic Electronics Inc., P.O. Box 896, Hartsells, AL 35640 (phone 205-773-2758; fax 205-773-7295; web <http://www.hsv.tis.net/~dei>), or circle number 108 on the reader service card.



Palomar Engineers Slimline Mobile Antenna

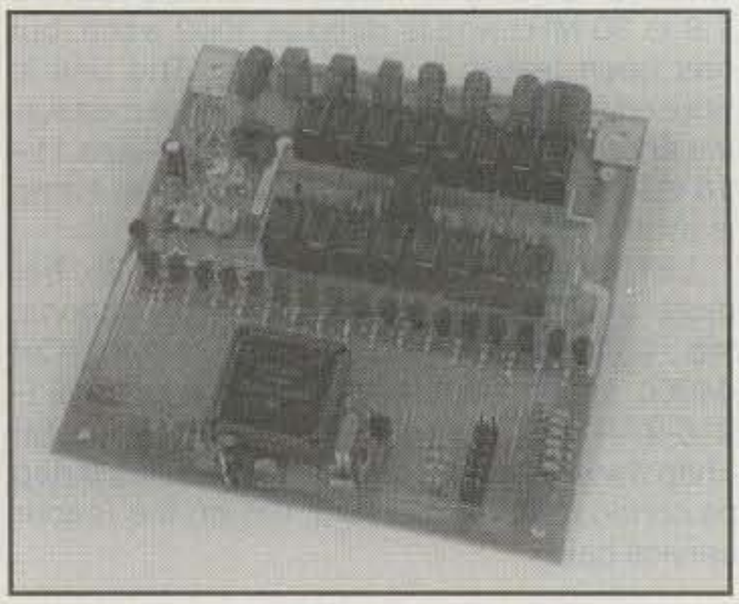
Palomar Engineers has announced a slimline mobile antenna (Model AN-7) for the 75, 40, 20, 15, 10, 6, and 2 meter bands. The fiberglass base section is 4 ft. long with a spring protected 3 ft. whip on top. Band changing is by selecting taps on the helical base coil. The coil is wound on the 1 in. diameter fiberglass rod and covered with three coats of dark green polyurethane. The tap covers are chrome plated. Developed by Antronic, a major South African manufacturer of amateur and commercial antennas, the AN-7 has been in use in South Africa for years, and is now available in the U.S. for the first time.

The complete antenna weighs 2 lbs. and presents a very small wind-loading area. It is priced at $249.95 and is available from Palomar Engineers, P.O. Box 462222, Escondido, CA 92029 (telephone 619-747-3343; fax 619-747-3346; e-mail <75353.2175@compuserve.com>), or circle number 106 on the reader service card.

QRP Automatic Antenna Tuner Kit From LDG Electronics

The LDG Electronics QRP Automatic Antenna Tuner Kit is a high-efficiency, microprocessor-controlled, switched "L" network designed to work with dipoles, verticals, inverted Vees, beams, or any coax-fed antenna in the 1.8–30.0 MHz range. Its small size (4.4" × 4.3" × 0.6") and weight (4.2 oz.) make it suitable for installing in existing QRP transmitters. The inductance range of 0–20 µH and capacitance range of 0–2700 pF will tune most 6–800 ohm loads using 0.1–10 watts input. Tuning time is 0–3 seconds (1.5 sec. average). Power requirements are 11–14 volts DC at 10–190 ma (75 ma average).

The QRP tuner kit retails for $100 plus $6.00 shipping inthe U.S. (Quantity discounts for clubs and dealers are available.) For more information, contact LDG Electronics, 1445 Parran Road, St. Leonard, MD 20685 (phone 410-586-2177; fax 410-586-8475; e-mail <ldg@radix.net; web site <http://www.radix.net/~ldg>), or circle number 107 on the reader service card.



Kenwood TS-570D DSP HF Transceiver

The TS-570D Digital Signal Processing HF radio offers the first CW Auto Tune feature which eliminates VFO adjustments during CW operation. It also has a radio control program (RCP) that will be available for operators to design and program multiple radios with custom saettings while conventionally saving them to a file for future use. Features of the TS-570D include a large LCD display, 16-bit DSP technology, power output which can be set between 5~100 watts in 5 watt increments, preset auto antenna tuner, 10-key direct frequency entry, menu system that offers 46 types of functions, five channel quick memory, CW message memories, CW reverse mode, full and semi break-in, 57600 bps PC control, dedicated packet port, and more.

The unit measures $10^{5}/_{8}$" × $3^{3}/_{4}$" × $10^{11}/_{16}$", making it well suited to use in the shack, car, or on a DXpedition. For more information, contact Kenwood Communications Corp., Amateur Radio Products Group, 2201 E. Dominguez Street, Long Beach, CA 90801-5745 (310-639-4200), or circle number 109 on the reader service card.

SGC Power-Clear Add-On ADSP Unit

PowerClear can be used with any non-DSP transceiver (HF or VHF/UHF) or other audio device to improve audio quality and noise, and interference reduction. Features include: compact size (3.75" × 6.05"); flexible audio input/output connections (two input jacks for both low impedance [8 or 16 ohms] or high impedance [600 ohms] audio); full operator control (operator-controlled tailoring of the low-, center-, and high-cut audio filters); bright red and green LEDs; multi-function DSP filters; and more.

Retail price of PowerClear is $395. For more information or the name of the nearest dealer, contact SGC, SCG Building, 13737 SE 26th St., Bellevue, WA 98005 (1-800-259-7331), or circle number 111 on the reader service card.

Communication Microphones From Shure Brothers

Five offerings within Shure's line of communication microphones meet a variety of needs ranging from paging and mobile FM applications to dispatch and amateur radio use. Two base station microphones are included in the expanded line. The 550T base station mic is an omnidirectional dynamic device equipped with a built-in preamplifier. Designed to serve as a universal replacement mic, the 550T's Modulink system facilitates compatibility with a number of common five-conductor, shielded coil-cord cables. The 450 Series II base station mic features high output, tailored response, and an omnidirectional pickup; it can be quickly converted to monitor/transmit switching with an optional split-bar conversion kit.

Three hand-held models are available: the 527A dynamic microphone for amateur radio use, mobile FM transmission, and high-impedance paging systems; the 596LB (successor to the 6LB) dynamic, low impedance unit for voice communication with an operating range of 200–5000 Hz; and the omnidirectional 596T which is outfitted with its own transistorized amplifier and suited for both mobile and fixed installations.

Suggested retail prices of the units is as follows: Model 550T $86.50, Model 450 Series II $105.25, Model 527A $59.15, Model 596LB $29.00, and Model 596T $35.00. For more information, contact Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60202 (847-367-8187), or circle number 110 on the reader service card.

The S.E.M. Mark-II QRM Eliminator

BY DOUG DeMAW*, W1FB

Man-made electrical noise is the bane of most amateurs who operate in the MF and HF bands. Until now there has been no reasonable solution to the problem caused by power-line noise, or noise generated by household appliances. Although modern receivers have built-in noise blankers, few of them are truly effective in reducing or eliminating this frustrating form of interference. These same blankers cause loud signals to sound distorted, and strong off-frequency signals exhibit the characteristics of splatter, which seem to spread across the band. A different approach to noise reduction is needed. S.E.M. on the Isle of Man has provided a solution to this nagging problem with its Mark-II black box.

Engineers have known for decades that the most effective way to reduce or eliminate man-made noise is at the noise source. If this is not practicable, the next best approach is to eliminate the noise before it reaches the receiver, after it arrives at the antenna. The S.E.M. Mark-II is designed to operate between the feed line and the receiver input port. The principle of operation is to sample the noise with the main station antenna and also with a smaller sense antenna. The noise energy is processed within the Mark-II so that one of the noise sources becomes 180 degrees out of phase with the other one. This causes noise cancellation.

The S.E.M. QRM Eliminator.

Performance

I confess that when the product was sent to me by the *CQ* staff I was skeptical about the manufacturer's performance claims. I tended to regard the 2¼" × 2¼" × 6" black box as just another electronic nostrum. It was not until a 10 dB over S9 raucous, ragged power-line noise appeared that I learned how effective the noise canceler is. The noise literally blanked all signals from 160 through 10 meters. I actuated the Mark-II and adjusted the gain and phasing controls until I completely nulled out the noise. The S-meter reading on my FT-1000MP dropped to zero! There was only a slight reduction in the levels of the desired signals—less than an S-unit. Noise reduction up to 50 dB is possible with the Mark-II. To add to my joy and amazement, I noted that none of the signals sounded distorted after the noise was removed. I was able also to cancel an S8 atmospheric "white noise" before daylight on 160 meters. TV birdie buzz can also be removed with this unit.

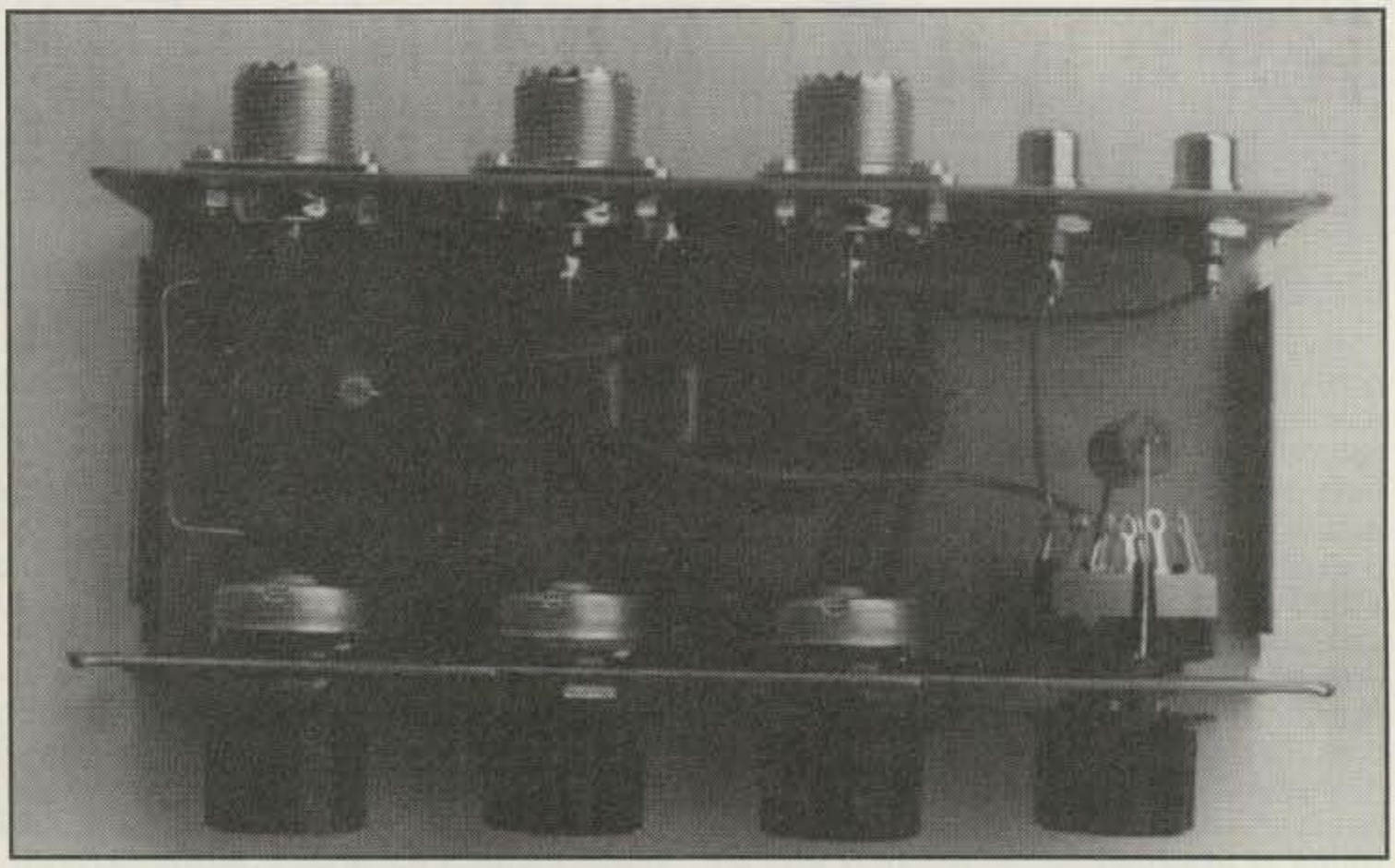
Mark-II Operation

The noise canceler requires +12 volts for operation. It is installed between the 50 ohm feed line and the input of the receiver or the output of the transceiver. It will safely accommodate up to 200 watts of RF pass-through power. The box has two relays that are controlled (grounded) by the transceiver T-R relay. These relays bypass the Mark-II during transmit periods.

A sense antenna must also be connected to the unit. This can be any 30 foot or greater length of wire (the higher the operating frequency the shorter the wire needs to be). I used my 2 meter Ringo Ranger system as the sense antenna by ungrounding the shield braid and connecting the Mark-II to the center conductor of the coaxial feed line. This worked nicely from 160 through 10 meters.

Adjustment of the Mark-II involves altering the settings of the GAIN and PHASING controls (3) that are located on the front panel of the box. The procedure is similar to that of adjusting a Transmatch for minimum reflected power. In this case, the operator observes the S-meter and adjusts the noise canceler for minimum meter deflection. The unit is turned off when line noise is not a problem. The ON-OFF switch bypasses the Mark-II.

It is necessary to tune the receiver to a nearby frequency where no signal is present when adjusting the controls. This makes it easier to observe the noise reduction and prevents the user from attenuating the desired signal.The



Interior view of the QRM Eliminator.

*P.O. Box 250, Luther, MI 49656

Mark-II is somewhat "frequency conscious," even though it has no tuned circuits. Readjustment is necessary when changing bands, or when making large frequency excursions within a band. This is particularly true when operating at 1.8 or 3.5 MHz.

Summary Comments

Current drain for the Mark-II is on the order of 150 ma. It contains (along with a few capacitors, diodes, and resistors) two unmarked JFETs, two unidentified bipolar transistors, two DIP relays, and one LED. The active components account for the current taken by the device. A +12 V wall transformer is suitable for powering the Mark-II. The manufacturer does not provide a schematic diagram of the circuit. This will make servicing difficult. Furthermore, the PC board is supported without standoff posts by means of the lugs on the three potentiometers, plus the leads that go to the three SO-239 jacks on the rear panel. This arrangement would require dismantling the unit in order to get to the bottom side of the PC board.

The cabinet and panels are black. White silkscreened lettering identifies the control functions. The Mark-II operates from 100 kHz to 60 MHz. It is sold factory direct for 98.5 British pounds, which equates to approximately $153 U.S. Information about this and other S.E.M. products may be obtained by writing to Paul Crapper, S.E.M., 8 Fort William St., Douglas, Isle of Man; phone (0624) 662131. Phone orders are accepted for credit-card sales and same-day shipping is available. ■

CIRCLE 20 ON READER SERVICE CARD

BY IRWIN MATH, WA2NDM

MATH'S NOTES

WHAT'S NEW AND HOW TO USE IT

A Primer on Optical Communications—Part II

Last month we looked at a simple intensity-modulated, analog light-wave transmitter as well as some basic LED driving principles. Now we will examine ways to convert the simple circuit into a practical audio (speech) transmitter.

For reference purposes fig. 1 is the circuit of the basic intensity modulated transmitter presented last month. As you will remember, the input required (for full modulation) was a 1 volt rms or 2.8 volts peak-to-peak 1 kHz sine wave. In addition we learned how to adjust the circuit for proper operation by using an oscilloscope to measure the voltage across the 10 ohm resistor at the test point. Since the current flowing through the 10 ohm resistor at the test point. Since the current flowing through the 10 ohm resistor is the same as the current flowing through the transmitting LED (they are in series), we saw that whatever voltage was measured across the resistor was a good approximation of how the light output of the LED was varying.

To convert this circuit to a line-level audio transmitter, all that is necessary is to add a 600 ohm load termination as shown in fig. 2. Note that the combined input impedance of the bias network and the added load resistor works out to be 600 ohms. If this is your requirement, be certain to monitor the test point while adjusting R1 (with audio present) to be certain that the LED is not overdriven. As was also indicated last month, a reading of 0.2 volts with no signal, and 0.4 volts peak-to-peak across the test point with maximum input signal (and no clipping) is the correct setting for most common indicator-type LEDs.

A frequency response sweep of the circuit (using the test point as the output reference point) will show that the bandwidth is far in excess of that required for speech. As a result of this wide bandwidth the transmitter will provide excellent quality audio. If the bandwidth of the circuit proves to be too wide for your purposes, a simple low-pass filter of the type shown in fig. 3 can easily be added. This filter will cause the input to begin to roll off at approximately 5 kHz, still perfectly acceptable for excellent audio. Obviously, you can change the roll-off to suit your specific needs.

If a microphone input is desired, the op-amp based preamplifier circuit of fig. 4 will amplify the output of most common microphones by a factor of from 1 to 100. This should result in a suitable level for properly driving the transmitter. You may have to "play" with the input resistor load value to properly match the microphone you plan to use, but the circuit should be fairly easy to get going. Again, with the microphone connected and the test point monitored, adjust R1 so that the LED is not overdriven on speech peaks. When everything looks proper on the scope, you can use your solar battery receiver to check on audio quality and general operation.

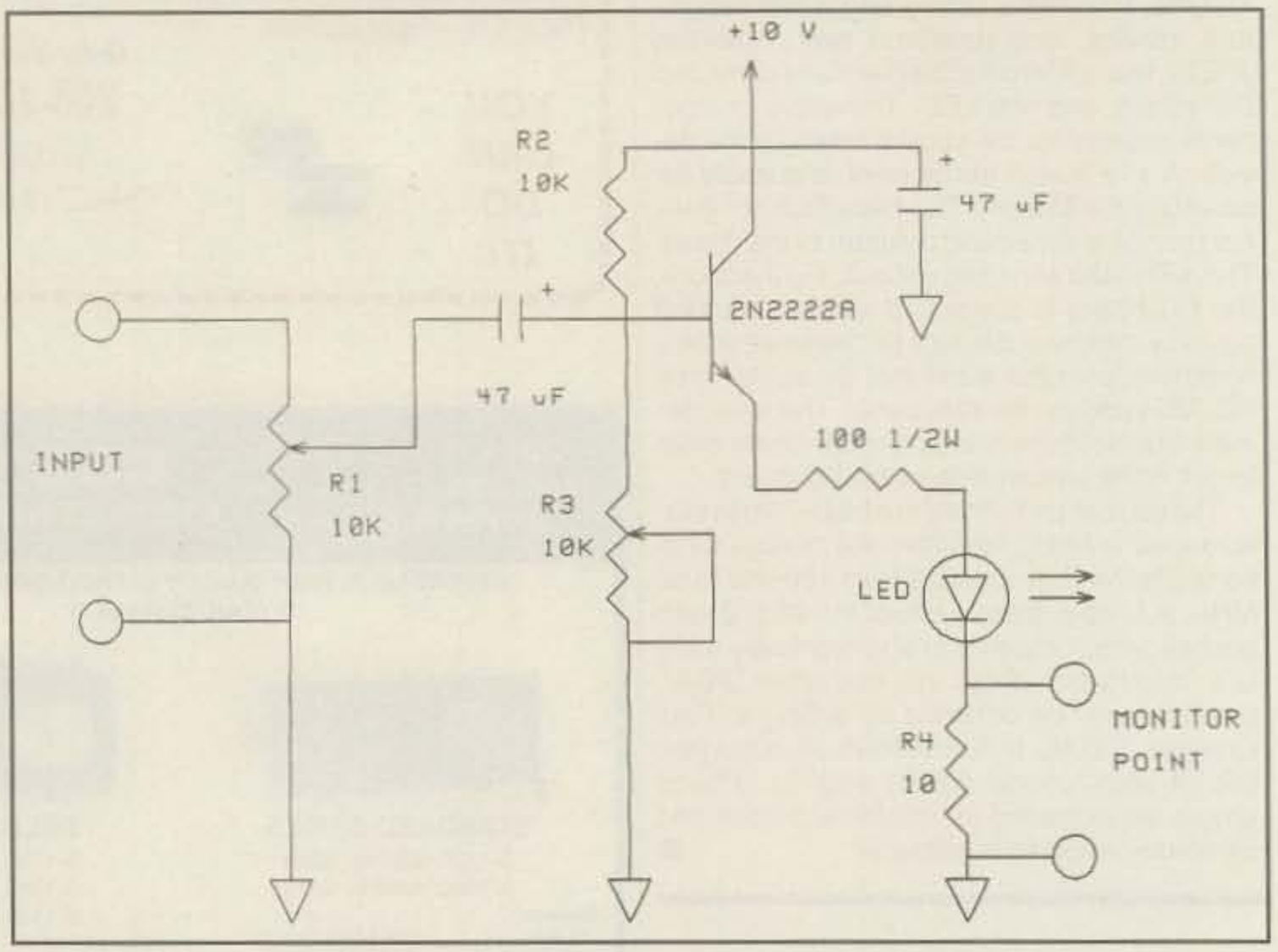


Fig. 1– A simple intensity-modulated optical transmitter.

We have now built a simple AM optical transmitter that is capable of driving most LEDs. In the original example we used a high output, visible red indicator LED. This type of device is suitable for short-range experimentation, but for longer ranges higher output power LEDs or

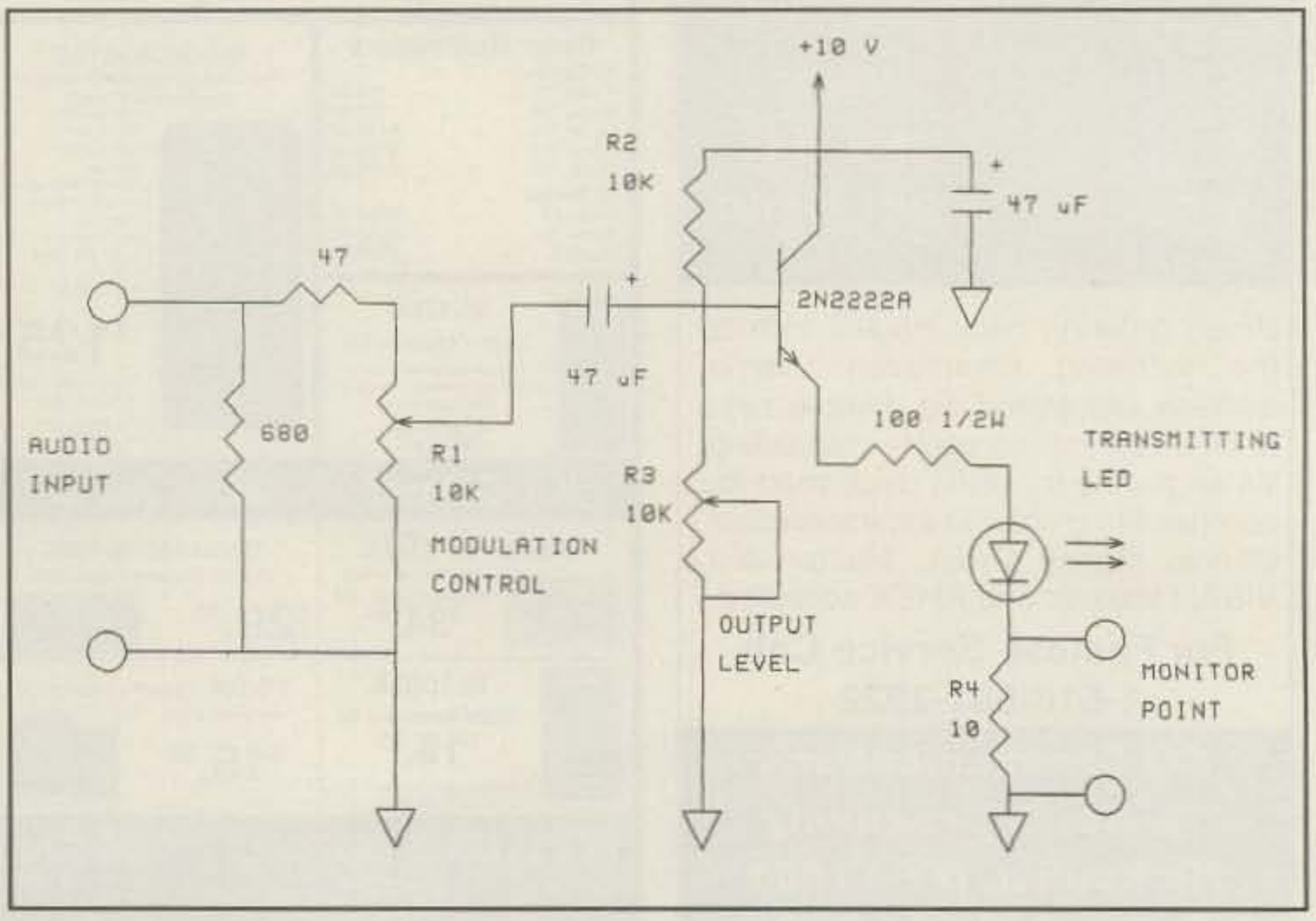


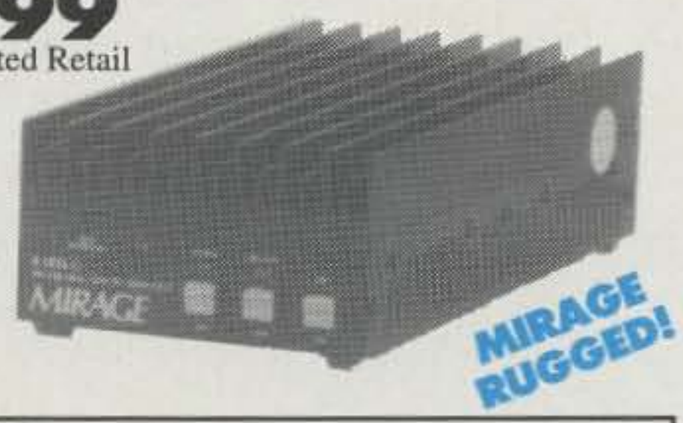
Fig. 2– A line-level audio optical transmitter (analog).

c/o CQ magazine

MIRAGE...160 Watts on 2 Meters!

Turn your mobile, base or handheld into 160 Watt powerhouses and talk further, longer, clearer . . . All modes: FM, SSB, CW . . . Superb GaAsFET preamp . . . Overdrive, high SWR, Over-temperature protection . . . Remote controllable . . .

B-5016-G
$299
Suggested Retail



Power Curve -- typical B-5016-G output power								
Watts Out	*130*	*135*	*140*	*145*	*150*	*155*	*160*	*165*
Watts In	*20*	*25*	*30*	*35*	*40*	*45*	*50*	*55*

The MIRAGE B-5016-G gives you 160 watts of brute power for 50 watts input on all modes -- FM, SSB or CW!

Ideal for 20 to 60 watt 2 Meter mobile or base. *Power Curve* chart shows typical output power.

Hear weak signals -- low noise GaAsFET preamp gives you excellent 0.6 dB noise figure. Select 15 or 20 dB gain.

B-5016-G has legendary ruggedness. *We know of one that has been in constant use since 1979!*

Heavy-duty heatsink spans entire length of cabinet -- prevents overheating. Power transistors protected by MIRAGE's *Therm-O-Guard*™.

Fully protected from high SWR and excessive input power. Has warning LED.

Has smooth adjustable Transmit/Receive switching with remote external keying.

RC-1B, $45, Remote Control. On/Off, preamp On/Off, selects SSB/FM. With 18-ft cable.

Draws 17-22 amps at 13.8 VDC. 12x3x5½ in.

More 160 Watt, 2 Meter Amplifiers . . .

B-2516-G, $299. For 10 to 35 watt mobile or base stations. 160 watts out for 25 watts in.

B-1016-G, $379. MIRAGE's most popular *dual purpose* HT *or* mobile/base amplifier. 160 watts out/10 W in. For 0.2-15 watt transceivers.

B-1016-G Great for ICOM IC-706!

B-215-G, $379. MIRAGE's most popular *handheld* amp. 150 watts out/2 watts in; 160 watts out/3½ W in. For 0.25 to 5 watt handhelds.

100 Watts for 2 Meter HTs

B-310-G
$199
Suggested Retail
MIRAGE RUGGED!

Power Curve -- typical B-310-G output power							
Watts Out	*25*	*50*	*75*	*95*	*100*	*100+*	*100+*
Watts In	*¼*	*½*	*1*	*2*	*4*	*6*	*8*

- *100 Watts out with all handhelds up to 8 watts*
- *All modes: FM, SSB, CW*
- *Great for ICOM IC-706*
- *15 dB low noise GaAsFET preamp*
- *Reverse polarity protection/SWR Protection*
- *FREE mobile bracket* • *Auto T/R switch*
- *FREE handheld BNC to B-310-G cable*
- *Ultra-compact 4¾x1¾x7¾ inches, 2½ pounds*
- *One year MIRAGE warranty*

***Boost** your 2 Meter handheld to 100 Watts!*

Ultra-compact all mode B-310-G amp is perfect for *all* handhelds up to 8 watts and multimode SSB/CW /FM 2 Meter rigs. *Great for ICOM IC-706!*

35 Watts for 2 Meter HTs

B-34-G
$99
Suggested Retail

Power Curve -- typical B-34-G output power								
Watts Out	*18*	*30*	*33*	*35+*	*35+*	*35+*	*35+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*

- *35 Watts Output on 2 Meters*
- *All modes: FM, SSB, CW*
- *18 dB GaAsFET preamp*
- *Reverse polarity protection*
- *Includes mobile bracket*
- *Auto RF sense T/R switch*
- *Custom heatsink, runs cool*
- *Works with handhelds up to 8 watts*
- *One year MIRAGE warranty*

MIRAGE RUGGED!

35 watts, FM only . . . $79

B-34, $79. 35 watts out for 2 watts in. Like B-34-G, FM only, less preamp, mobile bracket. 3⅛x1¾x4¼ inches.

MIRAGE Dual Band 144/440 MHz Amp

BD-35
$199
Suggested Retail

MIRAGE RUGGED

Power Curve -- typical BD-35 output power							
Watts Out (2Meters)	*30*	*40*	*45*	*45+*	*45+*	*45+*	*45+*
Watts Out (440 MHz)	*16*	*26*	*32*	*35+*	*35+*	*35+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*

- *45 Watts on 2 Meters/35W on 440 MHz*
- *Auto Band Selection* • *Auto T/R switch*
- *Full Duplex Operation* • *5x1¾x5 inches*
- *FREE mobile bracket* • *"On Air" LEDs*
- *Single Connector for dual band radios and antennas*
- *Reverse polarity protection*
- *Works with all FM handhelds to 7 watts*
- *One year MIRAGE warranty*

Add this Mirage *dual band* amp and boost your handheld to a *powerful* mobile or base -- 45 watts on 2 Meters or 35 watts on 440 MHz! **Mirage's** exclusive *FullDuplexAmp*™ lets you talk on one band and listen on the other band at the same time -- *just like a telephone conversatio*
(Requires compatible HT).

6 Meter Amplifier (50-54 MHz)

FCC Type Accepted

The A-1015-G, $389, is the *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 watts out for 10 in. For 1 to 15 watt transceivers.

70cm Amplifiers (420-450 MHz)

D-3010-N, $365, -- 100 W out/30 in. For 5 to 45 watt *mobile/base*. **D-1010-N, $395**, 100 W out/10 in. *Dual purpose* -- for handhelds or mobile/base. **D-26-N, $269**, 60 W out/2 in, for *handhelds*.

Amateur TV Amps

Industry standard ATV amps -- **D-1010-ATVN, $414**, 82 watts PEP out / 10 in. **D-100-ATVN, $414**, 82 watts PEP out/2 in. (without sync compression).

Remote Control Head for Amps

RC-1, $45, remote controls most MIRAGE amps. Power On/Off, preamp On/Off, switch for SSB/FM. 18 foot cable (longer available). 1¾x3¾x2½ inches.

Repeater Amps

11 models -- continuous duty all modeFM/SSB/CW repeater amps for 6, 2, 1 1/4 Meters, 70cm, 450 MHz ATV.

Low noise GaAsFET preamps

KP-1

KP-2

High gain *ultra low noise* GaAsFET preamps for receiving weak signals. Selectable gain prevents receiver intermod. 15 to 22 dB gain. Less than 0.8 dB noise figure. Automatic RF switching up to 160 Watts. **Choose** In-*Shack* model or *Mast-Mount* (includes remote control) model to reduce loss. Rugged die-cast enclosure.

Frequency (MHz)	*In Shack $139*	*Mast Mount $195*
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

1¼ Meter Amps (223-225 MHz)

Choose from 10 models -- 20 to 220 watts out for 2 to 50 watts in, $129 to $655.

Commercial Amps ($199 to $395

FCC Type Accepted

Commercial amps for 150 - 174, 450-470 MHz and VHF marine bands, 70 -130 watts ou

Accurate SWR/Wattmeters

Read SWR directly andForward/ Reverse, Peak/Average power. Remote Coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

One Year Mirage Warranty

Call your dealer for your best price!
Nearest Dealer/Free Catalog: 800-647-1800

http://www.mirageamp.com

Technical: 601-323-8287 Fax: 601-323-655

MIRAGE
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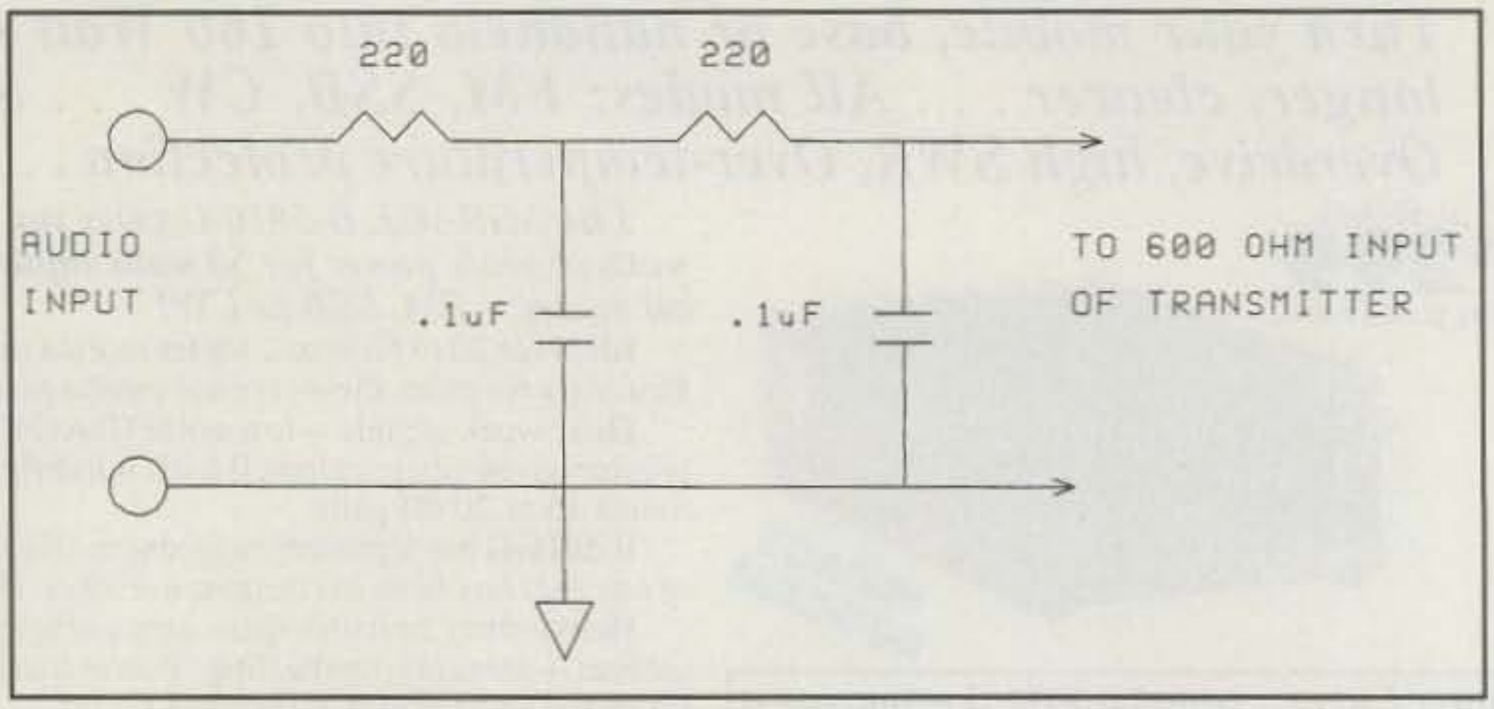

Fig. 3– A simple low-pass audio filter.

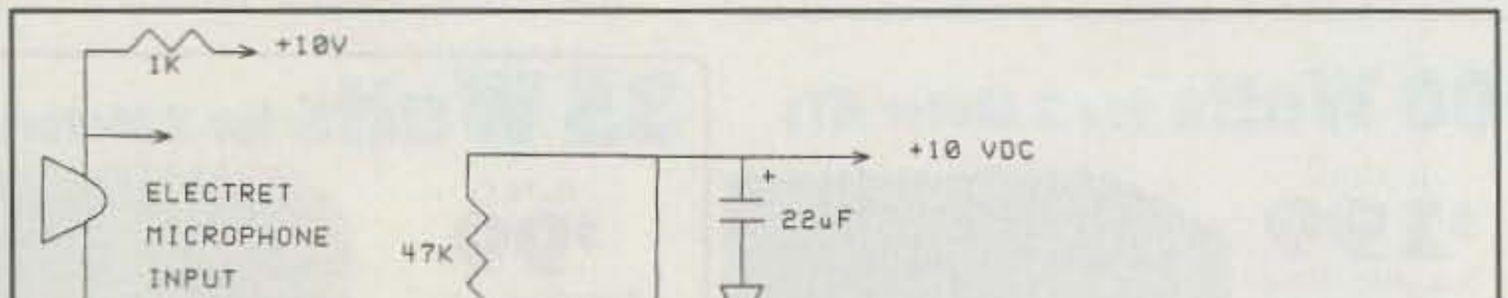

Fig. 4– A microphone preamp for an optical transmitter.

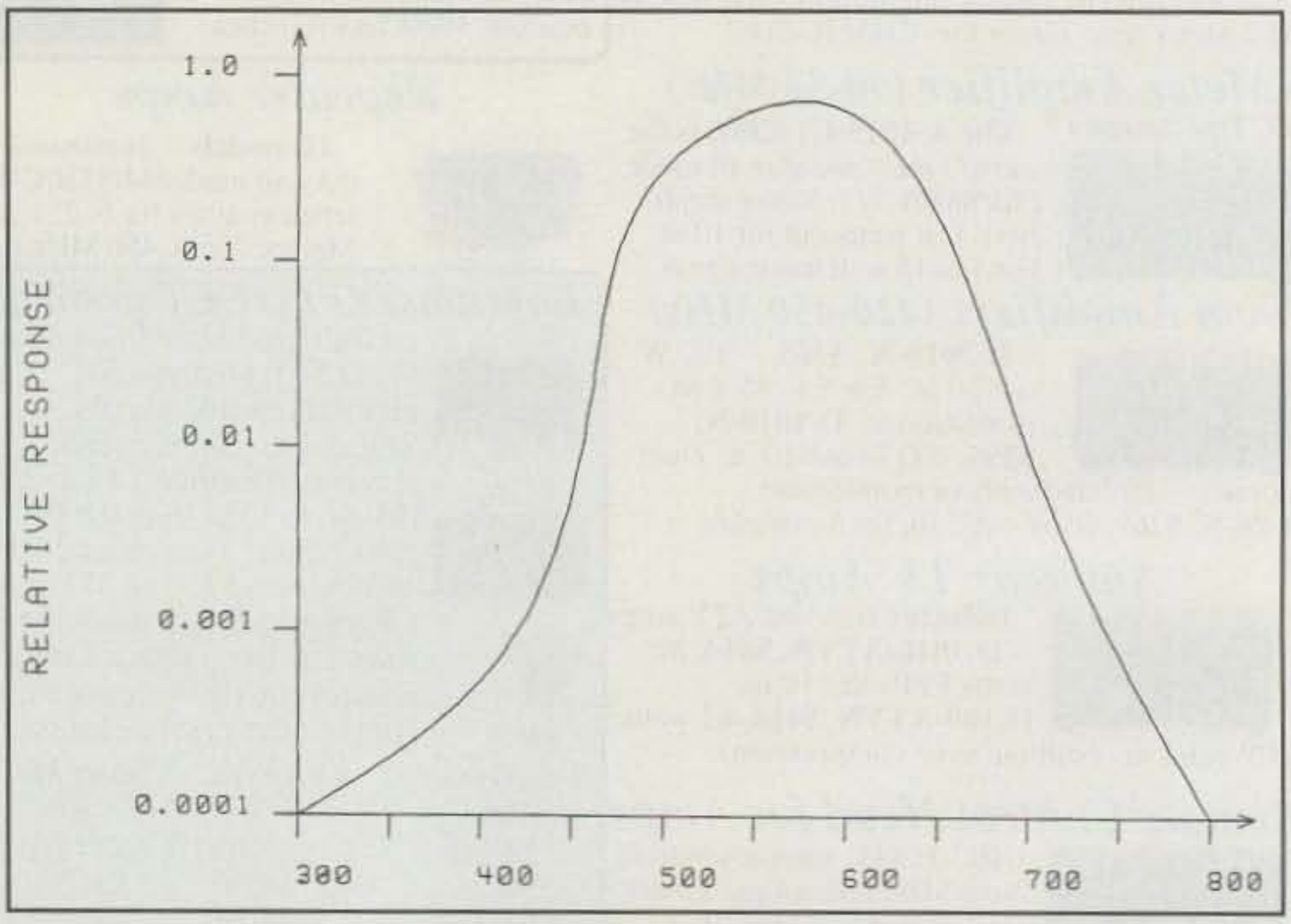

Fig. 5– Rough response of human vision.

even multiple LEDs will be required. If you choose to use an LED with higher power ratings, you can readjust the quiescent operating point (with no signal present) by means of R3. You should always set the level slightly below the maximum recommended operating current for the LED you plan to use as long as the average value of curent will not exceed the LED's rating. If you need more than 50 ma, lower the value of the 100 ohm 1/2 watt resistor. Don't try to drive more than 100 ma with the 2N2222A, however, as it will dissipate more power than it is designed to handle. For safety you might even wish to clip a heatsink to the case of the transistor if you have one handy. If you want to drive more than 100 ma, you will have to change the transistor to one with a higher power dissipation rating. Some practical ways to mount the transmitting LED for actual "radio communications-type operation" will be covered in our installment on "optical antennas."

A Little Theory

The indicator LED in our preliminary circuit operates at a wavelength of around 650 nanometers (650×10^{-9} meters), or visible red. Expressed in frequency, by the way, this is about 460,000 GHz—a bit beyond the microwave region to be sure! This wavelength is easy to use, since it falls within the range of human vision. However, more efficient LEDs, at other wavelengths that are not visible, can also be used with far better results, as we will see. For a point of reference, fig. 5 is an approximate curve of the response of the human eye in the area just above (ultra-violet) and just below (infra-red) the range of human vision. In terms of color, the 650 nanometer and longer wavelengths appear as red, while the 400 nanometer and shorter wavelengths appear as violet. The other colors fall between these two extremes as follows: red, orange, yellow, green, blue, indigo, and violet.

The criteria by which the ideal wavelength is actually chosen is based on two requirements: the amount of output power desired and the optical transparency (clarity) of the transmission media used. Without going into too much technical detail, scientists have determined that the earth's atmosphere presents the greatest transparence (or the least amount of attenuation) to light in the infra-red region between 850 and 1000 nanometers. Fortunately, this is also the region where high-power LEDs can easily be manufactured, so there is plenty of opportunity for experimentation. In terms of output power, the rule here is "the more the merrier." Any thoughts of QRP operation in an optical communications system should be left to your TV's remote control. The wavelength of 850 nanometers, by the way, is also one of the wavelengths used in fiber optic transmission systems, as it is a "window" of low loss in the glass commonly used for such fibers.

Next month we will look at a companion receiver for our transmitter which should enable us to actually get on the air. In the fourth part of this series we will look at several optical gain "antenna" designs.

73, Irwin, WA2NDM

BY KARL T. THURBER, JR., W8FX

ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

February Fun!

Okay, so February may not be so much a "fun" month, at least not for readers in the northern climes. However, we're writing this from our Alabama QTH, where the winters aren't so bad (usually). In any case, we'll have fun this month with our regular antennas column happenings. We'll begin our survey this month with a look at some software.

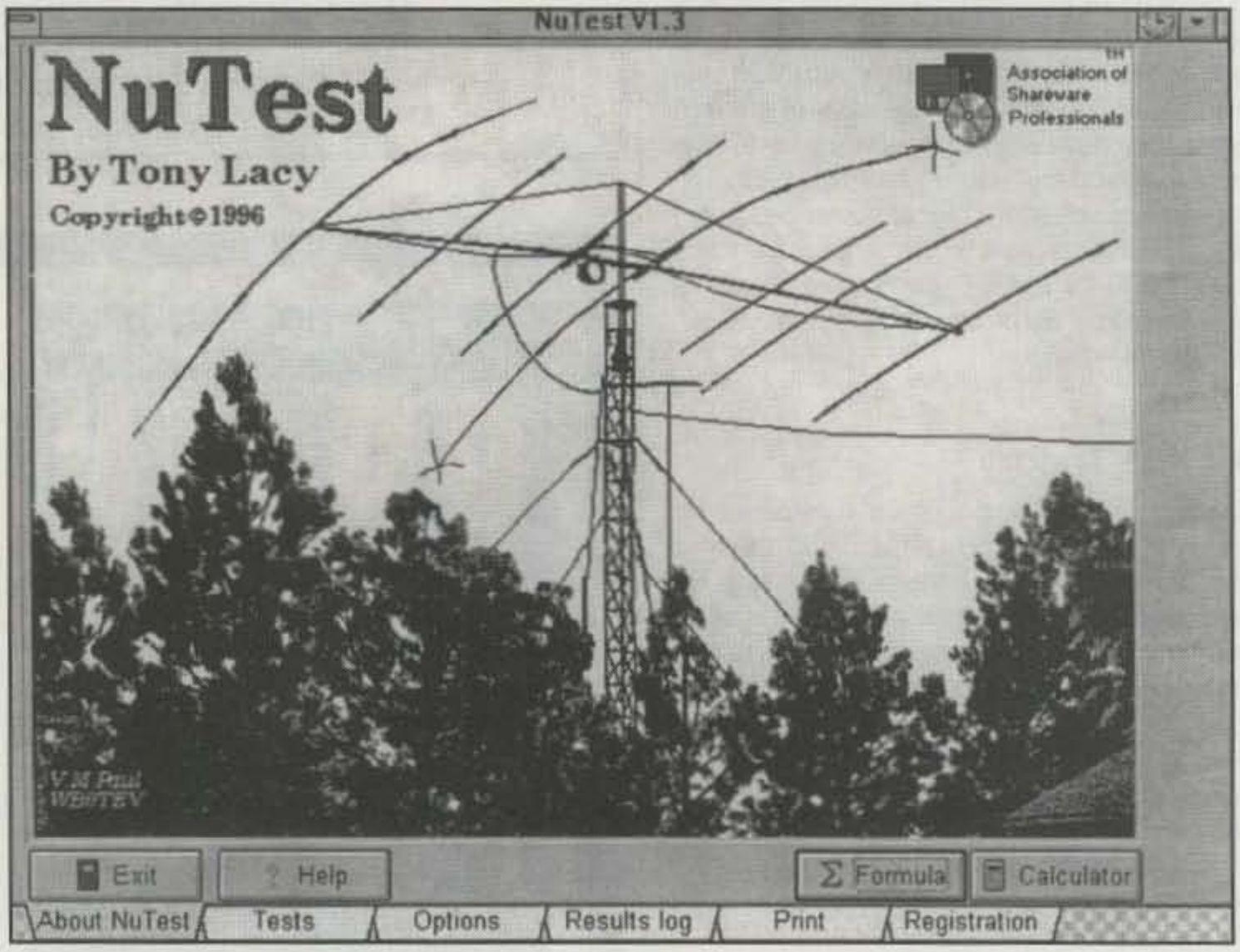

Fig. 1– NuTest, by Tony Lacy, G4AUD, is a very well executed exam preparation program that follows in the wake of his previous Morse code program, NuMorse. NuTest, designed to help you practice for all the FCC amateur radio exams, has explanations for the answers in the FCC question pools, contains the entire FCC Part 97 rules, and has useful formulas for all exam elements. (See the text of this month's column for more details.)

Software Notes

NEC-Win Pro. Last July we discussed Paragon Technology's NEC-Win Basic for Windows, which combines the NEC2 "core" with an intuitive Windows interface and a pricetag of less than $100. As we noted, its capabilities include data entry in spreadsheet fashion, defaults for wire diameter, graphical ground plane selection, real-time antenna rotation using a mouse, zoom and pan of the antenna structure, and overlay of multiple antenna patterns. Other features include comparison of multiple antenna files, 3-D surface pattern plots, custom printing of 2-D and 3-D patterns, and more.

In response to complaints that the program lacked some of the requisite power that some antenna modelers require, Paragon Technology developed the more powerful NEC-Win Pro. The new program maintains the simple interface found in NEC-Win Basic while radically extending the earlier program's power.

Some NEC-Win Pro features include full NEC2 support with graphical entry for all commands; an antenna geometry viewer under Windows that also views currents, sources, loads, and transmission lines; click-on wire identification and highlighting; a 3-D antenna pattern viewer that lets you view the pattern and antenna simultaneously; expanded polar plotting; rectangular plotting for viewing SWR, currents, and radiation patterns; Smith Charts for examining SWR vs. frequency; and considerably more.

NEC-Win Pro is $425. It's available from Paragon Technology, Inc., 3006 Research Drive, Suite A1, State College, PA 16803 (814-234-3335).

NuTest V1.30. In December 1995 we highlighted a very capable, Windows-based Morse code practice program called NuMorse, written by Tony Lacy, G4AUD. As we pointed out, the $25 shareware program sports many sophisticated features. These include code output via a sound card, PC speaker, port, or even a flashing semaphore window; a variety of character sources (random stream, disk file, or keyboard); configurable drill modes; QSO generation; performance statistics; and an adaptive speed mode.

Other features offered by the program include log files, prosigns and Farnsworth code, mixing of speech within source files, code character filters, and saving of parameters to disk.

Now Tony has introduced an equally capable Windows-based exam preparation program, NuTest (see fig. 1). Its purpose is to help people practice for the FCC written exams at all levels. A complete learning package, it has explanations for all of the answers in the FCC question pools, and it contains the entire FCC Part 97 rules as searchable online help files. The program can set on-screen tests, or you can just browse the question pools; the printed tests the program generates have a format that's similar to "the real thing."

Tony also distributes NuTest as shareware. It's available on CompuServe in the HamNet Forum (GO HAMNET), or you can download it from <http://ourworld.compuserve.com/homepages/Tony_Lacy>. His Web site also offers NuTest screen shots and frequently asked questions (FAQs) about the program and its operation.

The NuTest registration fee depends on license class and ranges from $14.95 to $45 (for "unlocking" all classes). You can register NuTest (and NuMorse) on CompuServe, charging the fee to your CompuServe account; to do so, GO SWREG. You also can register using a credit card by calling 1-800-699-6395.

Contact A. Lacy, G4AUD, 58 Bilbrook Road, Codsall, Wolverhampton, WV8 1ER, United Kingdom. His e-mail address is <100030.157@compuserve.com>.

LogSat Professional for Windows Update. Originally in the January 1995 column, we highlighted an early version of LogSat, a multipurpose, satellite-oriented Windows program designed by Roberto Franceschetti, IK8SQI. His then-shareware program concentrated primarily on the real-time tracking of satellites orbiting the earth. It also kept a logbook and callbook, analyzed antennas, and did other interesting things. Later the program "went commercial," being offered as a slick, regularly marketed software package by LogSat Software. We featured V5.0 in October 1995.

Some LogSat features, several of which have been refined and enhanced in the new V5.1 (fig. 2), include multitasking, real-time satellite tracking; five high-resolution global map projections with zoom in-and-out capability; personal logbook and callbook management; Kansas City Tracker rotor interface support; both single- and multi-satellite passes; interactive sound tracking and response; ability to set computer system time by telephone with the U.S. Naval Observatory (USNO); and more. To our surprise, we found some 965 satellites in the program's built-in database.

The program also offers several types of antenna pattern analysis and 3-D antenna radiation diagrams. For example, you can draw graphs of antenna gain and input impedance in a given frequency or length range. You also

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can draw graphs of the electric field and attenuation factor for ground-wave propagation over the earth or diffracted around the earth.

LogSat Pro is priced at $49.95 plus $3.50 s/h from LogSat Software Corp., 425 S. Chickasaw Trail, Suite 103, Orlando, FL 32825 (1-800-350-3871). A demo disk is available, or you can download a demo version of LogSat at <http://www.logsat.com>. The site also has current Keplerian Elements, or "keps," available for download. They are used to update satellite tracking programs such as LogSat Pro to accurately calculate satellites' positions in space.

MicroHelp Zip. We're no stranger to MicroHelp, having featured three versions of their UnInstaller™ utility program in the February and May 1994 and December 1995 columns. The UnInstaller programs, to recall, help with the sometimes nasty details of "cleaning out" unwanted Windows 3.x and Windows 95 programs. While the versions we worked with were 16-bit, now the firm offers in one package both a full 32-bit Windows 95 version and a 16-bit version—all for an estimated retail price of $39.95. (Yes, you still can make good use of a deinstall routine even under Windows 95.)

Now MicroHelp has introduced MicroHelp Zip, a compression product that lets both Windows 95 and Windows 3.x users zip and unzip files in just one step (fig. 3). The program takes a fast and easy approach to file archiving and compression, which often is confusing to users not familiar with archiving. Its ability to manage multiple formats and its built-in file management tool make it a boon to serious Internet users. It's designed to go head-to-head with popular competitors such as PKZIP®, WinZip, and Zip-It.

The program makes it convenient to access downloaded files quickly. With it you can view, edit, and even run downloads without unzipping the archive. Unlike many other file compression programs that take you through a long series of dialogs to zip and unzip files, MicroHelp Zip combines a slick drag-and-drop interface with a built-in file manager. You can create archives yourself and add files to or extract files from archives, all within the program.

Key features of MicroHelp Zip include full compatibility with PKZIP® file archives, the built-in file management tool, support for other file archives (TAR and LZH), support for Internet UUEncode and UUDecode files, file search capabilities, creation of self-extracting archives, file viewer support, the ability to easily create large archives spanning multiple disks, and the capability to view and even run downloads without unzipping them. Impressive features, indeed.

I found MicroHelp Zip to be a very easy-to-use product, one which places a great deal of "archiving power" in the hands of even the novice user. The ability to easily create large zips across multiple disks (handy for backups) is a very nice to have feature. However, as one familiar with file zipping, I still prefer the power of the shareware WinZip from Nico Mak Computing, although I must admit that MicroHelp Zip is a snap to use.

MicroHelp Zip has an estimated retail price of $29.95. It's available from MicroHelp, Inc., 4211 J.V.L. Industrial Park Dr. NE, Marietta, GA 30066 (1-800-777-3322). You can download a 30-day trial version of MicroHelp Zip from their Web site at <http://www.microhelp.com>.

Books

The W6SAI HF Antenna Handbook. Bill Orr, W6SAI, has for years enjoyed a well-deserved reputation as an HF antenna guru. He's the author of hundreds of antenna articles and columns, as well as several books. In fact, Bill was our predecessor as *CQ*'s Antennas Editor until February 1980, when he moved to *Ham Radio* magazine to continue his column there. Bill has been back in *CQ* with his entertaining and far-ranging monthly "Radio Fundamentals" column for several years.

Bill's latest book is appropriately entitled *The W6SAI HF Antenna Handbook.* While just under 200 pages, it's not the massive, all-inclusive tome that is the *ARRL Antenna Book*, with its detailed theory and diagrams. Instead the new book is a thoroughly practical, no-nonsense text for any HF antenna enthusiast—even beginners. Its ten chapters are packed with dozens of inexpensive and workable antenna projects.

The book guides you through the construction of a variety of antennas, including single-wires; multiband and off-center-fed dipoles; transmitting and receiving loops; and several types of beams, including both Yagis and quads. A whole chapter is devoted to simple "top-band" (160 meter) antennas.

Other valuable information found in the book's ten chapters includes "a quick look at coax, ground loss, antenna height, SWR, radi-

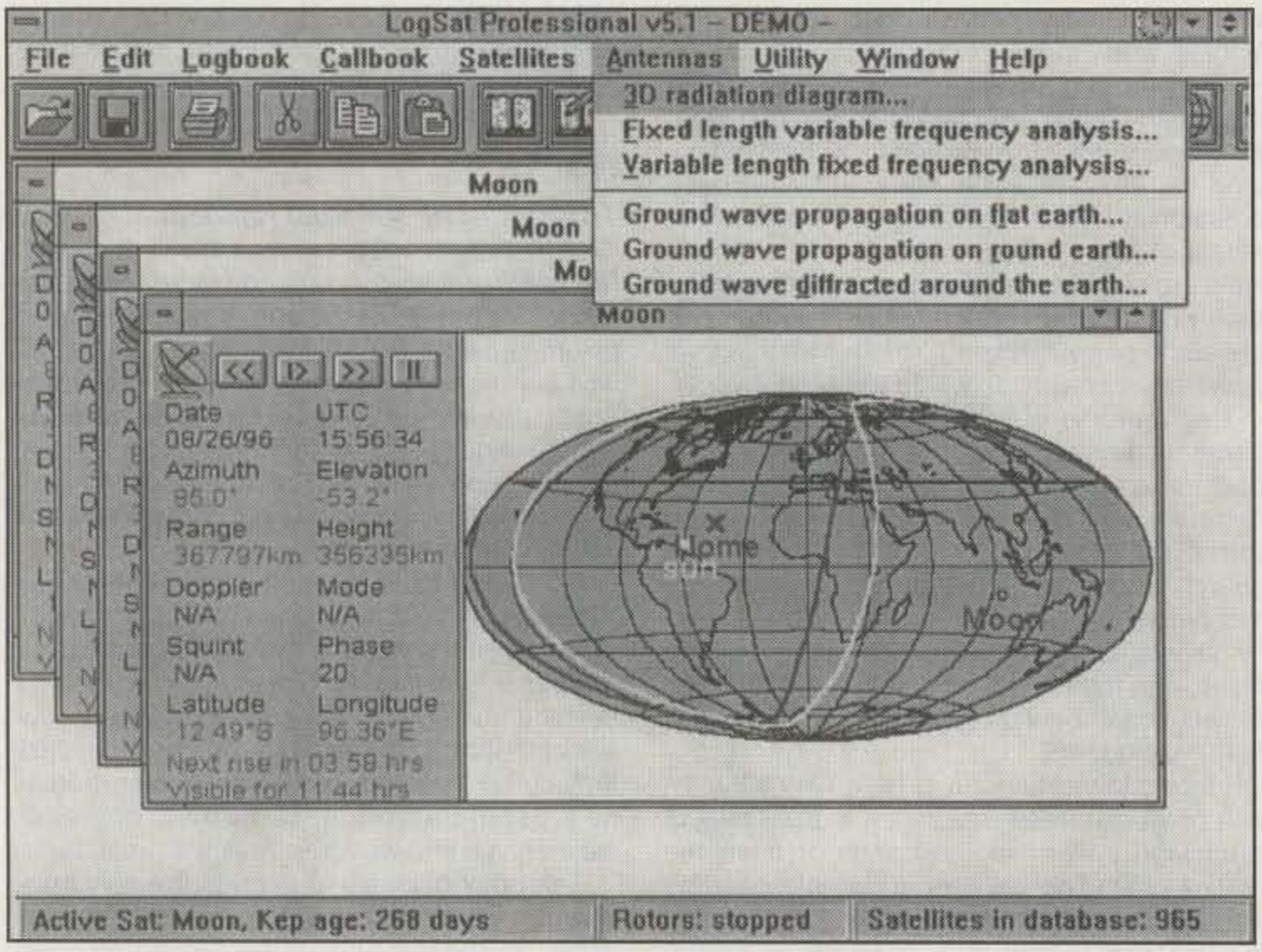


Fig. 2– LogSat Pro is a multipurpose, Windows-based satellite program developed by a joint American-Italian team of engineers. The program concentrates primarily on the real-time tracking of satellites orbiting the earth. But it also keeps a logbook and callbook, analyzes antennas, and does several other neat things. It's offered by LogSat Software Corporation. We featured the previous V5.0 in October 1995; here's a V5.1 screen.

ation resistance (and all that jazz)"; feedlines; antenna tuners, baluns, and matching devices; antenna analysis programs (and how they work); and antenna instrumentation (SWR bridges, antenna analysts, antenna analyzers, and the like).

Bill's latest opus is from CQ Communications, Inc., 76 N. Broadway, Hicksville, NY 11801 (516-681-2922). It is $19.95 plus $4 s/h.

Interference Handbook. As it turns out, Bill Orr also served as editor of William R. Nelson's relatively little-known book on locating and curing radio frequency interference (RFI) of all types, the *Interference Handbook*. The 250-page book, originally published in 1981 and reprinted in 1993, was unknown to me until I undertook research for an article on RFI for another publication. It's indeed a gem if you're unlucky enough to suffer from a serious case of RFI. Sources of interference are discussed, along with techniques used to locate them and the right suppression circuits to use.

Written in a casual, fairly nontechnical style, the book talks to a variety of RFI topics. These include working with the public; safety precautions; analyzing amateur radio, CB, and power-line RFI problems; interference to stereo systems and telephone equipment; and home, business, and industrial sources of RFI. The book includes several interesting case histories of difficult RFI problems, along with their solutions. It's particularly strong in its treatment of power-line interference and RFI from nonlinear rectification, both of which can be serious problems.

The book is published at $13.95 by Radio Amateur Callbook, P.O. Box 2013, Lakewood, NJ 08701 (908-905-2961). It's also available from the ARRL and others.

Radio Frequency Interference: How to Find It and Fix It. Written by a number of RFI experts and edited by the ARRL's Ed Hare, KA1CV, and Robert Schetgen, KU7G, the 250+ page book is filled with ways to solve both common and uncommon RFI problems. The book takes the approach that while interference problems are challenging, they also are curable. And the cure can be effected cooperatively, while at the same time keeping the peace in your neighborhood.

The 1991 ARRL book is a solid and comprehensive reference with 16 well-organized chapters. The opening chapters explain how to locate help, resolve conflicts, and locate interacting equipment. Subsequent chapters discuss RFI problems and cures for a variety of electronic systems, including transmitters, TV sets, VCRs, telephones, stereos and other audio equipment, power lines, computers, and automobiles. The book also includes explanations of RFI regulations and standards and ARRL RFI reporting forms.

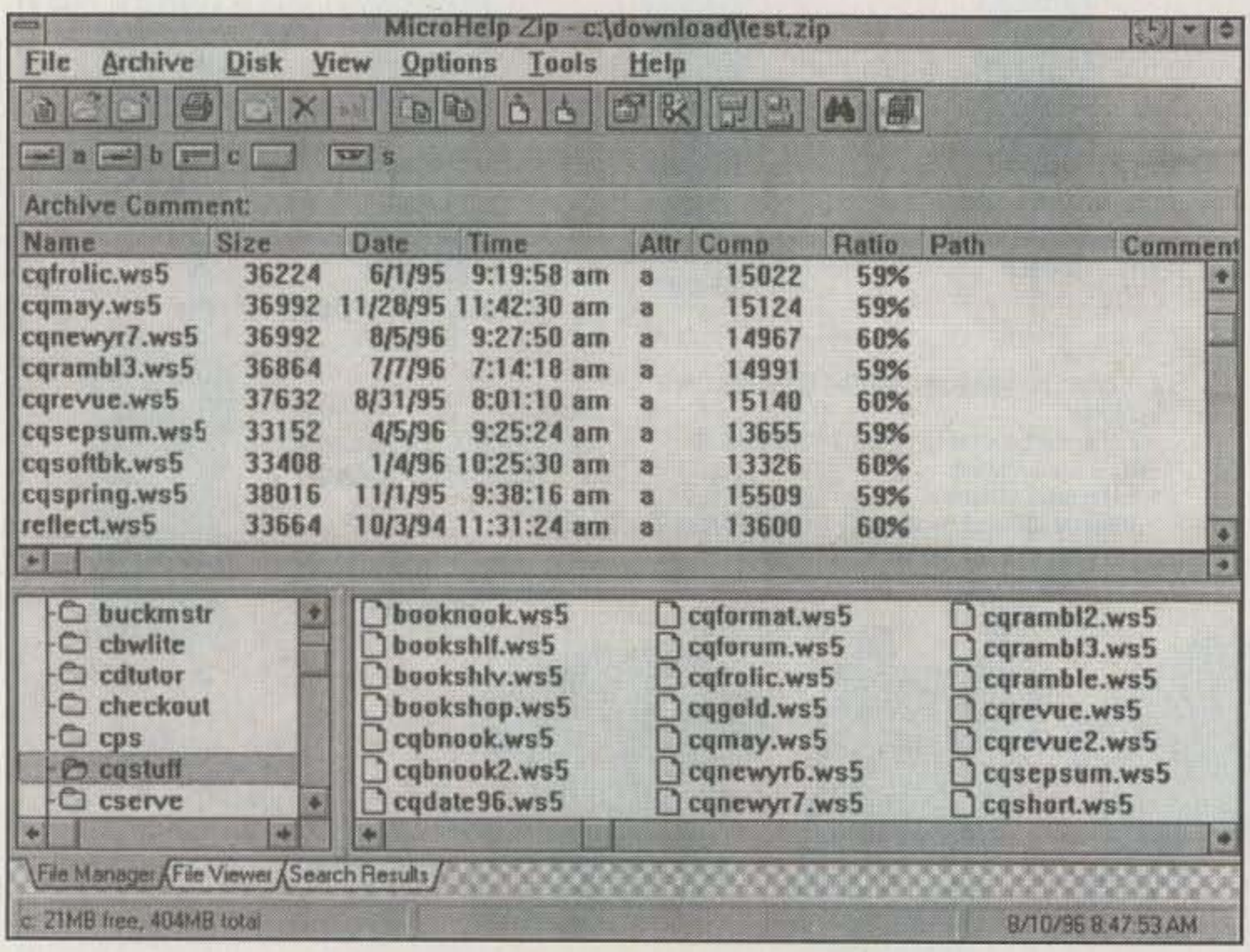
The book is published at $18 by the American Radio Relay League, Inc., 225 Main St., Newington, CT 06111 (860-594-0200; Internet <ltardette@arrl.org> or <http://www.arrl.org/>.

The World Wide Web for Busy People. The last book we'd like to mention is another in the very useful "Busy People" series of computer books from Osborne/McGraw-Hill.

In several recent columns we highlighted some of the books in the series that have crossed our desk. With the publication of the series, the publisher has addressed an important trend—that of busy users who are increasingly dependent on their PCs but don't have the time to become immersed in all the high-tech details. The books in the "Busy People" series assume you're intelligent and literate, but you don't have the time to learn as you would like. As such, they're enterprisingly billed as "the books to use when there's no time to lose."

Are you still intimidated by the World Wide Web and how to hop aboard? One of the latest books in the series, *The World Wide Web for Busy People,* by Stephen L. Nelson, deals with this issue. It asserts that even those with little time to spare can use the Web productively. The book helps you dive in with quick tutorials on the basics, including overviews of hardware and software requirements, installing and using a Web browser, using search engines, downloading files, and saving content.

Importantly, the author discusses the best ways to make time-effective use of the Web,



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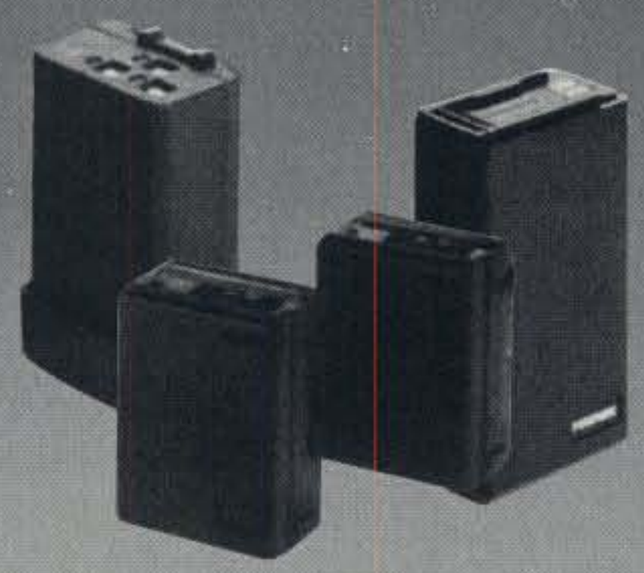

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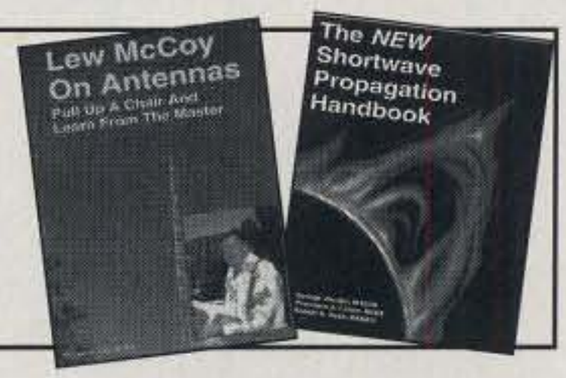

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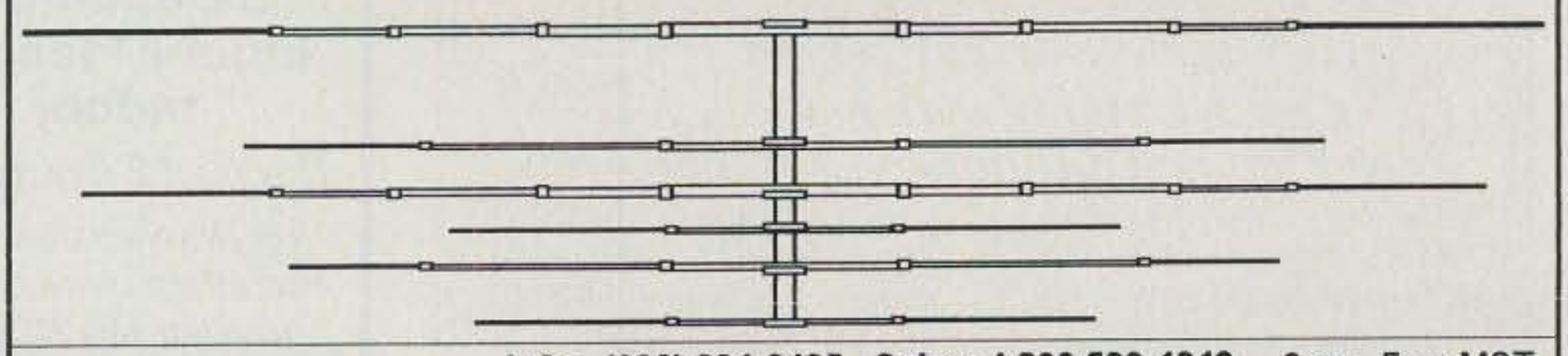

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from joining online newsgroups to building a personal Web site. Like the other books in the series, the book incorporates several unique timesaving features that are called Fast Forwards, Shortcuts, Habits and Strategies, Definitions, and Cautions.

The Web book is $22.95. It's published by Osborne/McGraw-Hill, 2600 Tenth Street, Berkeley, CA 94710 (1-800-822-8158; Internet <http://www.osborne.com>.

Short Bursts

AMSAT Phase 3D Happenings. The under-construction Phase 3D international satellite is envisioned as a replacement for the ill-fated OSCAR 13. It's the largest and most advanced amateur satellite ever built, being aimed at reducing the cost and complexity of satellite-capable amateur stations. It also adds significant, new frequency and data format choices.

We highlighted many details of Phase 3D in several columns, so we won't repeat them. The satellite is an international project, with work being done in Germany, South Africa, Finland, Slovenia, Hungary, the Czech Republic, Belgium, Japan, and other countries in addition to the United States. Assembly, checkout, and integration are taking place in Orlando, Florida.

Unfortunately, the project has had some setbacks. As you probably know, the first flight test of the Ariane 5 launch vehicle was destroyed by ground command just 40 seconds into the flight, last June 4, as it was launched from the European Space Agency's French Guiana launch facility. The command destruction was required because the rocket appeared to be veering off course. While no amateur radio satellites were aboard, the disaster upset the future launch schedule, to say the least.

The Phase 3D spacecraft now is manifested on a subsequent Ariane flight, probably in the first six months of 1997. While we don't know just when, launch could occur as early as February. *(Thanks to Keith Baker, KB1SF, for the AMSAT info—ed.)*

For more details on the launch schedule and other AMSAT doings, check out their revamped Web page. It contains a complete set of fact sheets about AMSAT, news releases, downloadable software, and late-breaking Phase 3D info. You'll find it at <http://www.amsat.org>.

Letters

Once more we're just about out of space. Before wrapping it up this month, however, we'd like to acknowledge just a few of the folks who have written, faxed, e-mailed, phoned, or otherwise corresponded with your columnist over the past several months. A tip of the hat goes to Don Bell, KI5YT; Tony Lacy, G4AUD; Gary Smith, KC4LKW; Dennis Rumbley, KS4UO; Shel Shallon, W6EL; and Keith Baker, KB1SF. Thanks, gang.

Looking Back Five

Okay, so now you know what the column is like for February 1997. But what was "hot" in February 1992? That column was "Antenna Notes, Part IV." Turning first to antennas, we discussed flagpole and vent-pipe antennas, including Tice Electronics, Sabre Communications, and Forbes Group offerings; the W6OAL Olde Antenna Lab; Ham-Pro Yagi monobanders for 20 meters through 70 cm; the Gene Hansen SUPERTENNA, a five-band HF mobile whip antenna; the Nevada VHF/UHF WB1300 Discone from EDCO; the Mini Delta low-band driven triangle antennas from Delta Antenna Products; and a new safety belt from the ONV Safety Belt Co.

Software-wise we covered YAGIMAX 3.0, an antenna analysis program from Lew Gordon, K4VX; the QSO Comp-Troller® Kenwood control interface from QSO Software; the Ham Radio Logging Software for Dbase™ Users, from Steven L. Smith, KG5VK; Reminders! 3.0, a DOS-based pop-up personal information manager and organizer; the Power Disk DOS disk utility from Multisoft Corp.; and The Norton AntiVirus from Symantec Corp.

We also examined Label Logic, packages of handy silk-screened vinyl labels for computer component labeling, from AMT Communications; and RCMA, the Radio Communications Monitoring Association, devoted to two-way monitoring and scanning.

Wrap-Up

That's all for this time, gang. Next time more Antennas and Accessories topics of current interest. See you then.

Overheard: If something you're reading is unintelligible gibberish, it probably was written by a lawyer, a technical writer, an academic, a politician, or a computer programmer.

73, Karl, W8FX

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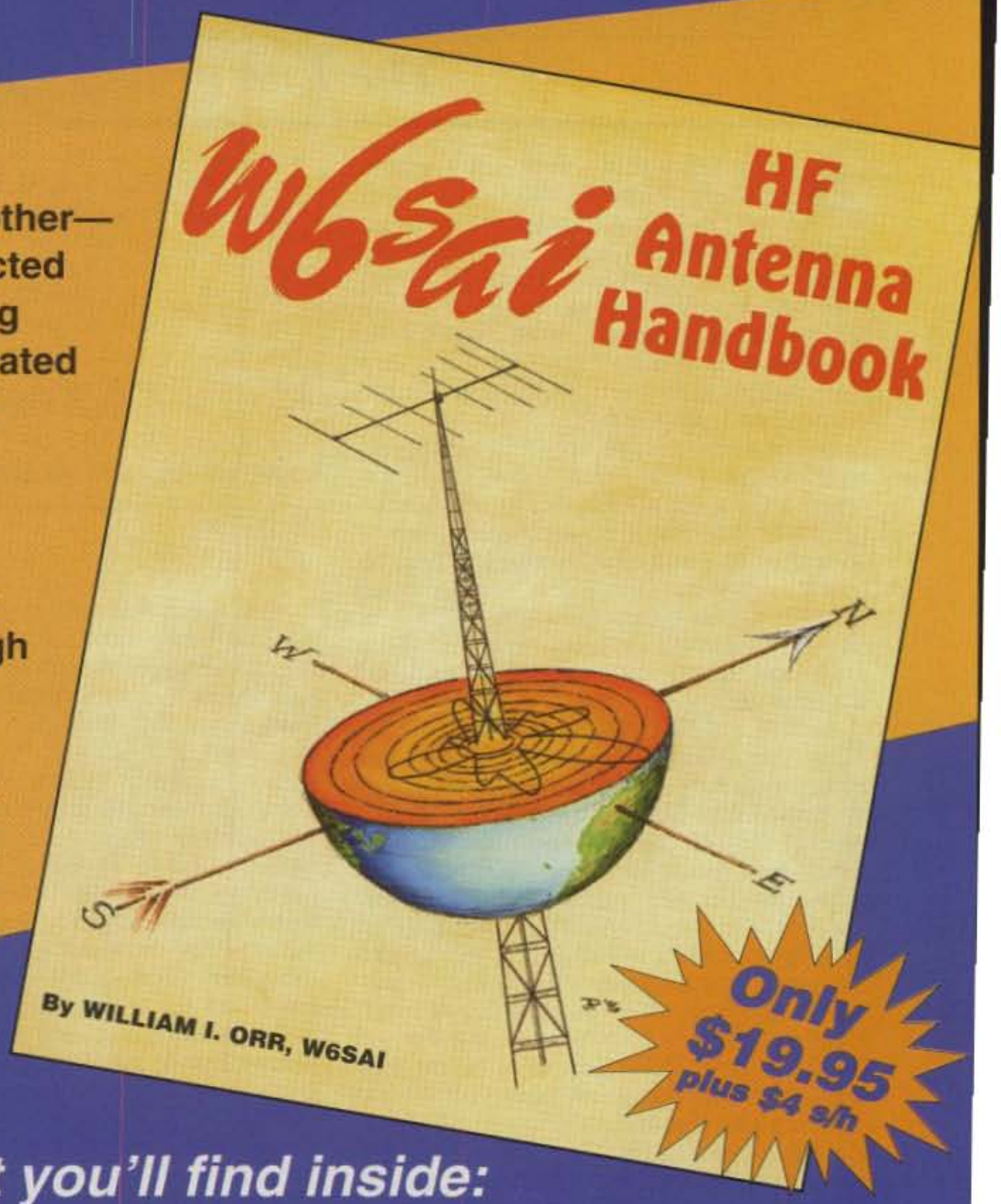

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BY JOE LYNCH, N6CL

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The End of AMSAT OSCAR 13

After a nearly 8½ year odyssey around the Earth, AMSAT-OSCAR 13 re-entered the Earth's atmosphere on 5 December. Its loss leaves a gap in amateur radio space communications that hopefully will be filled later this year with the launch of Phase 3D. The following supplies more details of the history and the end of OSCAR 13. It is from a press release from the Radio Amateur Satellite Corporation (AMSAT).

On December 5, 1996, apparently at approximately 0900 UTC, AMSAT OSCAR-13 reentered the Earth's atmosphere and burned up. OSCAR-13 was successfully launched on June 15, 1988 into a highly elliptical orbit on board the first test flight of the new European ARIANE 4 rocket. Over the years OSCAR-13 has enabled direct radio contacts among the worldwide community of nearly two million radio amateurs.

AMSAT OSCAR-13 had been constructed within four years by an international project group under the leadership of Dr. Karl Meinzer of AMSAT-DL. During its operational period AMSAT OSCAR-13 was monitored and controlled by a group of ground stations in Germany, the United Kingdom, Australia, New Zealand, and the U.S.

Upon its re-entry, AMSAT OSCAR-13 had a lifespan of over eight years. Originally the mission was conceived to last only seven years. Overheating of the satellite due to air friction in the upper atmosphere resulted in the destruction of the solar panels on November 24 and the consequent interruption of all radio links. Amateurs were still making use of the satellite's Mode B transponder as late as about 2300 UTC November 23. Prior to this the on-board monitoring system had transmitted much data relating to the satellite's behavior in the upper atmosphere to ground stations for evaluation.

When asked about the cause of AO-13's demise, Dr. Thomas Clark, W3IWI, commented that "the decay of the orbit was caused by the gravitational attraction of the Sun and the Moon. The elliptical orbit was stretched so that the satellite gradually approached the Earth, which lies at one of the two focal points of the ellipse. This phenomenon motivated AMSAT to develop new analytical and computational methods to allow long-term predictions for future satellites on similar, highly elliptical orbits."

Dr. Clark further emphasized that "the underlying cause of the AO-13 'crash' was *not* atmospheric drag. AO-13 was intentionally put into a high eccentricity 'Molniya' orbit with an eccentricity ~0.7. Such orbits are unstable because of the gravitational effects of the Sun and Moon. Just like the tides in the ocean, the satellite is 'nudged' gently by the Sun and Moon twice per orbit."

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VHF PLUS CALENDAR

Feb. 2	Poor EME conditions.
Feb. 7	New Moon.
Feb. 8	Moon Perigee.
Feb. 9	Very Good EME conditions.
Feb. 14	First quarter Moon.
Feb. 16	Poor EME conditions.
Feb. 22	Full Moon.
Feb. 23	Moderate EME conditions.
Feb. 25	Moon Apogee.

**EME conditions courtesy W5LUU.*

ANS notes that both Drs. Clark and Kudielka, as well a James Miller, G3RUH, made very accurate predictions of the end of AO-13 long before the event actually took place. Dr. Clark's July 1990 prediction, done in collaboration with Dr. Erricos C. Pavlis, called for reentry sometime on 5 December 1996.

In response to questions regarding the possibility of the same fate befalling the next AMSAT satellite, Phase 3-D, as G3RUH has indicated, its orbit has been calculated using these new methods and it has been determined that it will be more stable over the long term. In addition, Phase 3-D will carry a long lifetime low-thrust arc-jet propulsion system intended to be used to correct any orbital perturbations which might occur. Phase 3-D is scheduled to be launched into space during the first half of 1997 as apparently the only satellite payload for the second test flight of the new ARIANE 5 launcher.

ANS thanks Peter Guelzow, DB2OS; James Miller, G3RUH; Viktor W. Kudielka, OE1VKW; and Tom Clark, W3IWI, for the information used in preparing this bulletin.

Leonids—Great Shower!

Last November I wrote that there was the possibility of a very good meteor show during the *Leonids*. From your comment on the Internet, it appears that several of you did have success. What follows is a selection of comments which appeared on the VHF reflector: "Very nice NW path this year. Just completed 30 second burn with N7EIJ between CN85 & DM04." . . . **N6ENU** (DM04). "DM43, DM42, and DM67. All worked within 45 minutes! Even 144.200 MHz was hopping." . . . **WB5OMF** (CM98). "Thanks to AA7A and N7WS. Very solid QSOs. State number seven. Some of the burns went on for 45 seconds or more. Seems most everyone got a hunk of the action. Lots of QRM, but good QRM." . . . **K6ZX** (CN82).

"This was my first attempt with the *Leonids*, but definetely not the last. After the very disappointing *Perseids*, I could really use a break. Had two skeds: NØKM, DM67 completed in about 90 seconds. N7STU, DM07 took 13 minutes, but it was a good 25 sec. burn. I then tailended N7MWV to work WB9AJZ from CM87.

Richardt, OZ3JSR, holds on to the equipment. It was a very windy day. (All photos by OZ9ZI.)

On that same burn WA6LHD called me, but due to my clumsiness we did not complete. But not to worry, because about an hour later I was listening in on N7STU and K7ND (CN87). When 'STU started to come in I jumped to 144.200 MHz called a quick CQ and there was WA6LHD (CM88). After exchanging reports, and wondering how long this burn was going to last, we discussed the Middle-East peace process, Bosnia, and some social issues. Then N7STU showed up, and we worked again. Later I heard that he already worked four stations from Seattle, wrote them neatly in the log, shaded his new grids on the map, then came up to '200 to look around. That's all on one burn. This monster was at least 90 seconds—maybe close to 2 minutes. Generally burns seem to be few and far between, but when they come they sure last and give strong signals." . . . **VE3GBA/7** (CN88).

"It appears the *Leonids* is shaping up quite nicely. I haven't run this shower before so I don't have a basis for comparison, but it is certainly better than expected. Rocks were few and far between, but when they fell they fell big. Completed three of seven skeds (mostly on single burns) and made four random contacts between 1400–1830 UTC [on the day of the peak]: VE3GBA/7 (CN88) 25 second burn. After completing the contact and filling out the log, I decided I should do a clean legal ID. Gabor was still there and came back once again and we exchanged 73's on a second burn, KD7TS (CN87). Fifteen plus second burn. K7ND (CN87); 60 second + burn. I then worked KD7TS (again), K7CW, and N7MWV (all CN87) when they jumped in on Jim's tails. Jumped up to .200 and work VE3GBA again. I heard him calling CQ for about 30 seconds longer. Most of the activity was N/S, but I did hear AA7A (DM43), and a couple of locals

Vincent, F10IH, active from Trehøje, Mols.

report working CO, AZ, and NM." . . . **N7STU** (DM07).

"Only made one 2 meter schedule—should have made more. Burns were far apart but nice and long Sunday morning. East/west conditions seemed good. Sked: N7MWV 15:14 UTC. Random: WA6LHD 15:36; W6KH 15:36; K5UR 17:10; KB5IUA 17:13. All of the above QSOs were made on burns that must have lasted at least a minute. WA6LHD and W6KH were worked off the back of the antenna. At times 6 meters was wide open Sunday morning local time. It was open in many directions with loud sigs. NØXX was in for 10 minutes or so with a S9+ signal. Some kind of enhanced Es?" . . . **KØGU** (DN70).

"I made 5 schedules on 2 meters (from 0800 UTC on) for the *Leonids* shower last Sunday morning, and none of them was successful. Nevertheless worked K5YY, EM26, as random MS QSO, on the call frequency! The burn lasted for more than 30 seconds, enough to tune him (we were near, but not in the same frequency) and had an almost normal exchange. That was the first (and last) station heard in the whole day on 2 meters. Heard another station on 6 meters, EM79, but couldn't copy the callsign. Please remember that my native language is Spanish and sometimes it is really hard to copy fast English, Hi! CU the next time." . . . **CO2OJ**.

Bjarne, OZ1UM, during the long DX QSO on 47 GHz to Spodsbjerg, Sealand.

"Spent most of Sunday morning (11/18/96) messing around on 6 and 2 playing meteor scatter. Not too many short burns on random. Most were loooonnnnggggg. Setup here is 16 LBX at 55 ft., with 150 watts on 2m, and 150w with 9 ele on 6 meters. Log summary: 1608 UTC: K7ICW, DM26, 6m; WA7JTM, DM33, 6m; KD6HZF, DM14, 6m; 1616 AA7A, DM43, 2m. This was a good long one, with several other stations. WA7JTM, DM33, 2m in NCAL also working others in Arizona area; WA7YWM, DM44, 2m; 1627 K5RHR, DM65, 6m; N6KN, DM03, 6m backscatter; 1628 KE6NJK, DM04, 6m backscatter; 1710 N7MWV, CN87, 2m, *very long* again.; couple others worked on my sked freq; VE3GBA/7, CN88, 2m same burn; 1728, K7ICW, DM26, 6m; Al was in almost constantly for 1½ hours; 1739, and W7FI, CN87, 6m short and weak. Radio was turned on at 1600. So I missed anything earlier, but peak seemed to be 1600– 1630 and slid off after that." . . . **WB9AJZ/6** (CM87).

"Worked Mark, KMØA, in EM48 tonight on 2 meter scatter (from FN65) about 45–50 wpm CW. At 0408, November 17. He was in for 4 or 5 sequences *solid* (but under S1) and a few scattered before *and* after the actual QSO. What a blast! This is roughly 2100 kms from here! I *love* CW MS. More of you guys should try it. I wonder if we could have made it on SSB? Hmmm, doubt it. Thanks for the new state and grid, Mark! That was a real *blast*! I noted quite a few good rocks (visually) about 1/2 hour after our contact. Some W2/W3 6 meter beacons were screaming in for *minutes* at a time, but everyone was either asleep and/or on HF doing the CQSS thing. Partials with N8HJZ(?) and K2SMN on 144.200 SSB, so at least two other night owls were up. VE1PZ in FN85 was also awakened from a deep slumber by K2SMN! (That's what you get for leaving the rig on, Doug.) WØMTK beacon on 50 MHz was in to CN85 for a good 10 minutes this AM." . . . **VE9AA** (FN65).

"From 1400–1415 approximately at the same time worked N6ENU on a long burn on 144.163 at 1415. Funny thing is worked NØKM at 1416 yesterday at 1416 on a similar long burn! Dependable rocks or cosmic dust?" . . . **N7EIJ** (CN85).

"I am new to 6 meters, having just gotten on about a month ago. Just completed my first meteor scatter QSO (*with WB4AXQ in EM64. —Thanks, Robert.)* I can see where this stuff is *addicting*! What a hoot. Some good E-skip followed from this end (EN61) to the Mid-Atlantic states with big signals coming in for about 45 minutes. Racked up some new grids and states. Then the band went completely dead, like someone threw a switch. I just wonder why I haven't discovered 6 meters years ago! Guess this really is the 'magic band.'" . . . **NA9N** (EN61).

Danish Microwave Activity Week

The following is from Steen Gruby, OZ9ZI: "We have finished DMAW week (15–20 June 1996) once again, and this time with so many impressions that it is difficult to get to grips with the results. "Preparations were made to be QRV on 10, 24, 47, 76, and 145 GHz. The weather for the week did not seem to be on our side or, put another way, it was typical Danish spring weather which did not at all promise high re-

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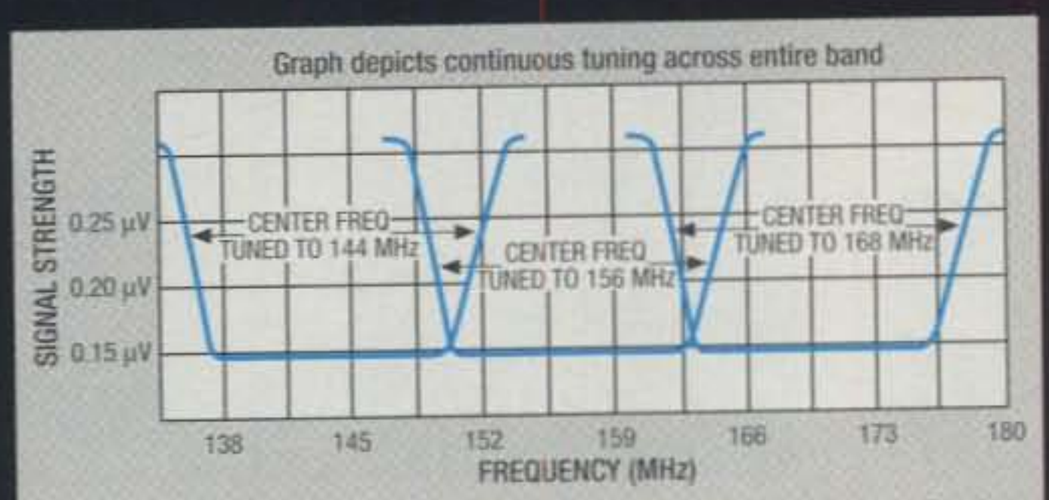

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Jurgen, DCØDA, making the first-time DX QSO from LA to OZ.

sults. Nevertheless, it was to be the DMAW with the highest results in terms of QSO.

"Another reason for the fine results can be attributed to the fact that this year it was possible to finish the DF9LN OCXOs which we began last year but were not able to finish for DMAW 1995. With them built into our equipment, we have achieved exceptional frequency stability and frequency precision, which we previously could only dream about. Now it is possible on all bands to set the agreed frequency and be sure that the other party can be found within the receiver's passband.

"In fact, we now only have the direction of the antenna as a variable parameter, which has greatly increased the connection reliability. As an additional benefit, the new oscillator has also given a purer injection signal, which definitely has a beneficial effect on the properties of the receiver and on the transmitter's transmitted spectrum.

"For the record, here is an overview of the results achieved at previous years' Danish Microwave Activity Weeks:

"**10 GHz ATV:** 208 km OZ1UM - OZ9ZI 1994 (Danish record with this type of modulation; first connection OZ1UM - OZ3VC 1994). **10 GHz:** 385 km OZ6TX - LA/OZ4PV 1993 (Danish record 1044 km OZ1UM - G4KEU 1994). **24 GHz:** 227 km OZ1UM - OZ/DB6NT 1990 (Danish record; first OZ-OZ connection OZ/DF9LN - OZ/DB6NT 1990; Danish record 227 km OZ1UM - OZ/DB6NT 1990; first OZ-SM connection OZ/DF9LN - SM6HYG 1991; first OZ-LA connection OZ/DF9LN - LA/OZ9ZI 1995). **47 GHz:** 84 km OZ1UM - OZ/DF9LN 1992 (Danish record; first OZ-OZ connection OZ/DB6NT - OZ/DCØDA 1991). **76 GHz:** 11 km OZ1UM - OZ/DB6NT 1994 (Danish record; first OZ-OZ connection OZ/DF9LN - OZ9ZI 1991). **145 GHz:** 9 km OZ1UM - OZ/DB6NT 1995 (first OZ-OZ connection OZ/DB6NT - OZ9ZI 1993; Danish and world record 11 km OZ1UM - OZ9ZI 1994). **241 GHz:** 0.5 km OZ/DB6NT - OZ/DF9LN (Danish record).

"This year's results. **10 GHz:** Virtually all stations made connection with one another on 10 GHz on Saturday 15 June. The signal strengths were moderate, the greatest being in the direction east-west. The following stations reported contacts: SM/OZ1JLA - OZ/F1OIH 150 km; OZ/DB6NT - OZ/F1OIH 180 km; OZ2LLP - LA/DCØDA 360 km; OZ2FF - LA/DCØDA 361 km; and ODX: OZ1UM - LA/DCØDA 366 km.

"On 16 June there were moderate signals at the scheduled start at 1 PM, but they became better during the day. In the direction LA (Verdens Ende), conditions reached a peak at approximately 6 PM, but remained good for the other stations fairly constantly in the direction east-west long into the evening. The following stations reported contacts: SM/OZ1JLA - OZ/F1OIH 150 km; OZ/DB6NT - OZ/F1OIH 180 km; OZ2LLP - LA/DCØDA 360 km; OZ2FF - LA/DCØDA 361 km; OZ1UM - LA/DCØDA 366 km; and ODX: OZ6TX - LA/DCØDA 385 km.

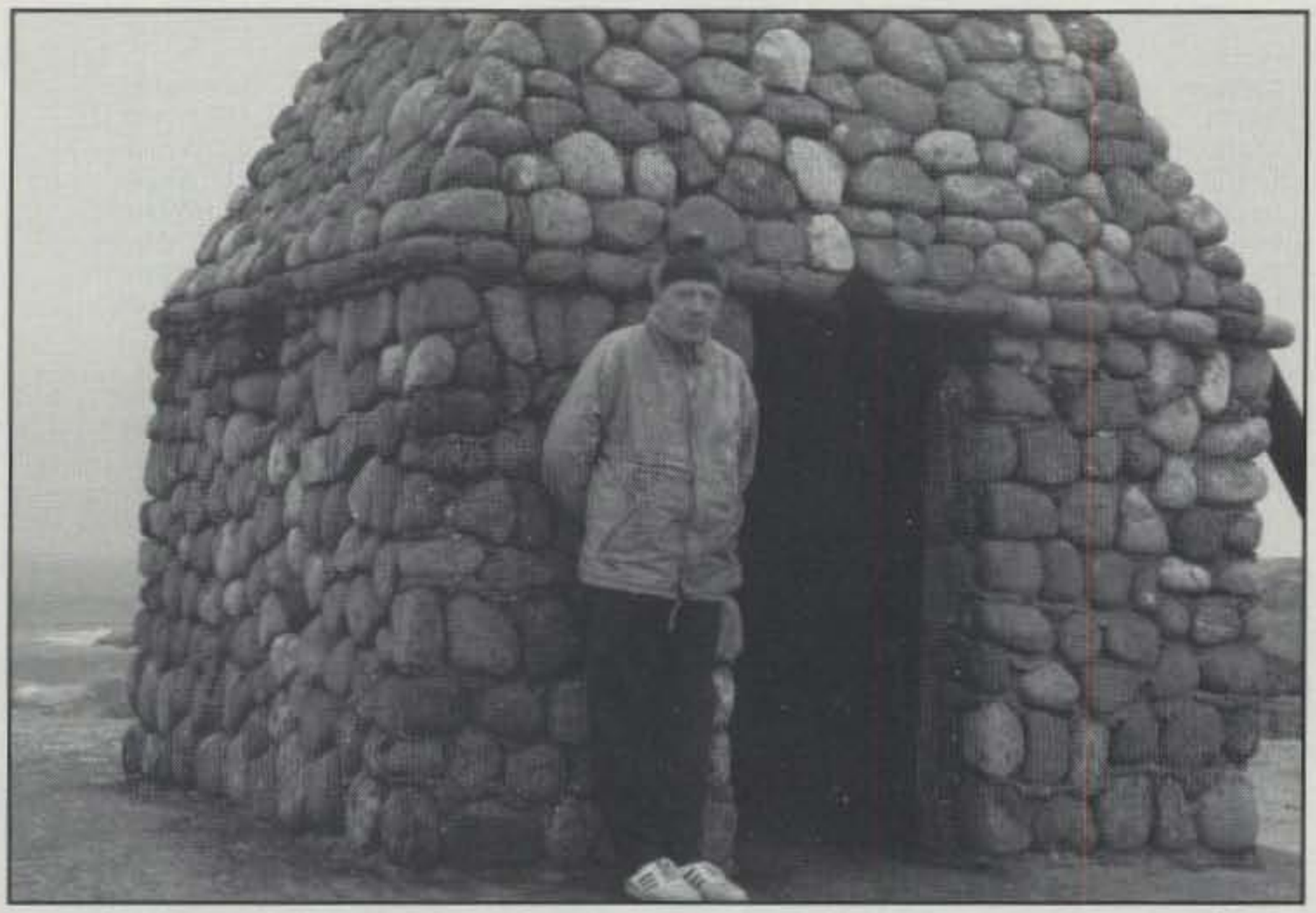
"On 17 June the conditions were not very good. In Norway the wind was 15 m/s from the south and it was pouring with rain. Nevertheless, it was possible to make connections between all active positions. ODX: OZ2FF - LA/OZ9ZI 361 km, a connection which sounded like aurora on account of the rain.

"**24 GHz:** On Saturday 15 June, the conditions on 24 GHz were not so bad at all despite the moderate conditions on 10 GHz. ODX: LA/DCØDA - OZ/DB6NT 162 km.

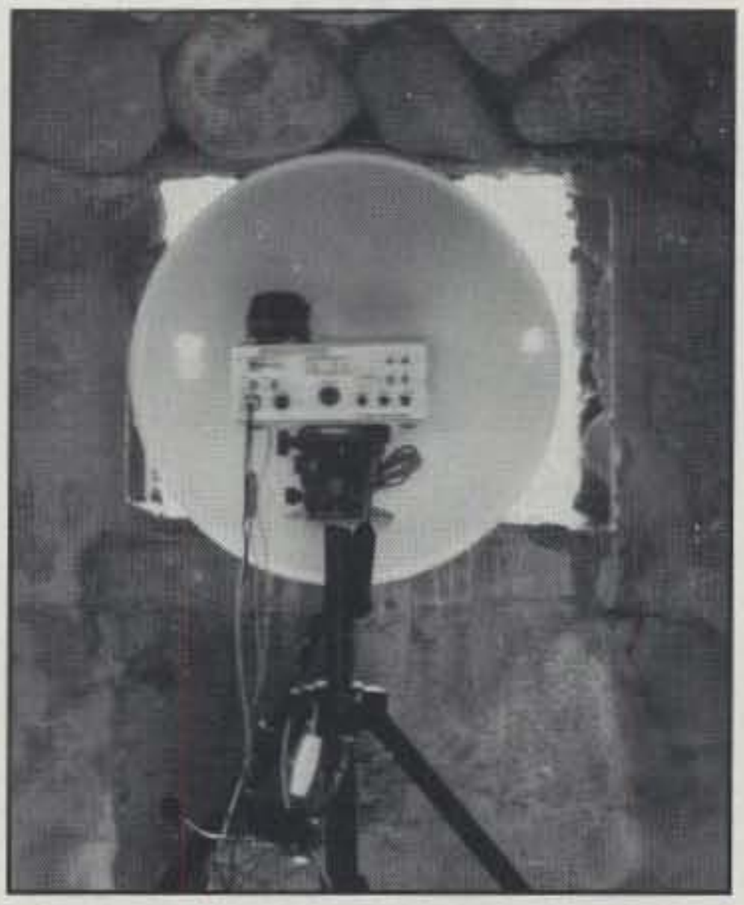
"On Sunday 16 June, there were astoundingly good conditions on 24 GHz, taking into consideration the conditions on 10 GHz. Connections were made between all OZ locations. The following reported contacts: OZ/ F1OIH - SM/OZ1JLA+OZ1FPN 150 km; SM/ OZ1JLA +OZ1FPN - OZ6TX 171 km; OZ/ PAØJGF - OZ1UM 179 km; and ODX: SM/ OZ1JLA +OZ1FPN - LA/DCØDA+OZ9ZI 253 km.

"Our ODX probably cannot be considered to be a Danish distance record, as both stations were operating in other countries. However, for all those involved it was their personal best connection. Besides, many of the connections were implemented with FM and fully noise-limited signals.

"**47 GHz:** With the signal strengths on 10 and 24 GHz, no one had great hopes of long distances on 47 GHz. Nevertheless, the following connections were made on 15 June: OZ1UM - OZ2FF 18 km; OZ1UM - OZ2LLP 31 km;



DCØDA from the very old museum lighthouse at Verdens Ende, Norway.



When the weather was bad, DCØDA and OZ9ZI moved inside the old lighthouse at Verdens Ende. It looks as if the lighthouse builders knew that someday the microwave people would operate from there.

OZ1UM - OZ/F1OIH 83 km; OZ/PAØJGF - OZ/DB6NT 38 km; and ODX: OZ/DB6NT - LA/OZ9ZI+DCØDA 162 km, which was the first LA-OZ connection on 47 GHz and a new OZ distance record. All connections apart from LA-OZ were repeated on 16 June.

"**76 GHz:** No one really believed in this band, but persistence was rewarded. OZ1UM and OZ/F1OIH carried out CW QSO on Saturday 15 June on 76 GHz over a distance of 83 km. It should be added that Vincent (F1OIH) had 'forgotten' the key, so the CW had to be carried out by whistling into the microphone. Ten minutes non-stop in this way with a T9 report—can anyone better that? This is the peak of persistence! On 16 June they repeated the connection, this time with SSB. OZ1UM's beacon was heard at OZ/F1OIH for more than 3 hours. ODX: OZ1UM - OZ/F1OIH 83 km, which is a Danish distance record.

"**145 GHz:** Despite many attempts on this band, no contacts were established, which must probably be attributed to the fact that the selected test distances were too ambitious. Despite persistent attempts on Friday 20 June between Fornæs Fyr and Sjællands Odde, a distance of 53 km, 145 GHz achieved no results this time.

"**Summary:** As can be seen from the results achieved, the significant connections were made from positions close by the sea and at a low level above it. In other words, these are pure tropo or ducting connections. As stated in a previous report (1991), there are enormous differences between the ways in which the various bands behave under given conditions.

"Even if the conditions are moderate on 10 and 24 GHz, there can be a brilliant 'hole through' on 47 GHz. In other words, there is a basis for a more serious collection of data on the distribution of the various frequency ranges over water, then comparing them with the relevant weather data. Cooperation with meteorologists, who, as you know, have sufficient computer power at their disposal to carry out such a comparison of data, is perhaps the right path to take.

"In order to promote such a series of tests in several countries, the IARU should divide up the record lists in such a way that a distinction is made between distances achieved above and below 50 m above sea level. Most people are of the opinion that what is required to set distance records is two high mountains and a sufficiently low temperature. Now there are limits for the maximum record distances because there are probably not very many places where a distance between two mountains of over 400 km with optical visibility can be achieved.

"The future will show that the longest distances on the highest frequencies will be

1996 SMIRK Contest Results

Callsign	SMIRK #	QTH	SMIRK QSOs	Others	Grids	Score	Comments
K1TOL	2079	ME	9	4	12	264	ME Winner
NM1K	5923	CT	8	121	38	4902	CT Winner
N1MIA	5929	WMA	35	85	31	4805	MA Winner
N2QHS	5787	NLI	3	3	6	54	NLI Winner
WA2ZNC	1172	WNY	2	2	3	18	WNY Winner
K3VRS	5887	MD	1	0	1	2	MD Winner
N3WAV	5975	PA	3	0	3	18	PA Winner
KE4BHB	5945	FL	8	2	9	162	
KF4CYB	5932	FL	3	1	4	28	
WB4DBB	952	VA	8	23	18	702	VA Winner
AD4DY	5724	AL	22	27	31	2201	AL Winner
KF4CYB	5932	FL	6	1	4	28	
KE4HGD	5766	SC	45	45	56	7560	SC Winner
AE4FA	5989	SC	17	12	22	1012	
KD4JDT	(none)	STX	8	1	7	119	
WA4NTF	3839	GA	27	33	45	3915	
WB4OQX	5796	GA	32	30	44	4136	GA Winner
KC4SUS	5658	FL	39	36	48	5472	FL Winner
KD4VBI	5812	FL	6	29	10	410	
W1ICW/5	3787	NTX	48	56	71	10792	NTX Winner, #4 World
KC5DRI	5955	OK	16	10	20	840	OK Winner
KC5EPL	5891	NTX	19	27	29	1885	
KB5IUA	5487	STX	111	170	121	47432	STX Winner, #1 World
KB5OAI	5936	NTX	39	49	54	6858	
W5OZI	5038	STX	74	57	75	15375	#3 Worldwide
KJ5RC	5953	MS	14	12	19	760	MS Winner
N5TNM	5725	AR	10	3	9	207	AR Winner
W3XO/5	500	STX	93	120	110	33660	#2 Worldwide
KB6NAN	7388	SCV	44	59	38	5586	CA Winner
N7GJD	5863	AZ	3	2	5	40	
NW7O	5350	NV	15	7	18	666	NV Winner
WB7OHF	2196	AZ	56	59	55	9405	AZ Winner, #5 World
KE7SW	5362	WW	0	9	2	18	WA Winner
W7US	5022	AZ	51	41	46	6578	
N8AXA	3603	OH	17	19	13	689	OH Winner
N8OWR	5774	OH	4	4	6	72	
WA9LWJ	6031	WI	8	11	12	324	WI Winner
N9PBA/8	5738	MI	14	8	11	242	MI Winner
WDØBQM	4939	NE	11	15	20	740	NE Winner
KBØMJD	5824	SD	11	9	13	403	SD -Winner
WØKEA	4637	CO	40	45	46	5750	CO Winner
NØLL	761	KS	38	11	21	1029	KS Winner
KBØLXX	5847	ND	8	9	11	275	ND Winner
VC2PIJ	(none)	Canada	6	10	7	154	Canada Winner
XE2HWB	5930	MX	14	15	13	377	Baja CA Winner
XE2/KC5FMT	5792	MX	21	41	31	2573	Mexico Winner
G1IOV	5609	UK	1	147	45	6705	DX & UK Winner
9A6V	6063	Croatia	0	45	31	1395	Croatia Winner

achieved over the sea. A good example is the Australian world record on 10 GHz and it is probably also only a matter of time before the Americans achieve a connection to Hawaii on this band.

"In the future, a distinction should also be made between types of modulation as it is considerably more difficult to make an SSB transmitter which can produce sufficient power on the high bands, not to mention ATV, which also uses a considerable bandwidth which affects the receiver's noise figure.

"A fair division would be according to the bandwidth used—for example, 300 Hz, 3 kHz, 30 kHz, 300 kHz, 3 MHz, and 30 MHz. This would give an incitement to achieve the best possible result with a given type of modulation and to use as yet untried types of modulation such as digital modulation. Thus, in order to promote such tests, this is a request to the IARU to make distinctions in the record lists.

"Finally, thank you to everyone who participated in yet another exciting Danish Microwave Activity Week, particularly our guests from DL, PA, and F. On behalf of the North Zealand GHz working group and PROCOM amateur radio club, 73 de Steen Gruby, OZ9ZI."

1996 SMIRK Contest Results

Poor to terrible sporadic-E propagation, but good participation describes the 1996 Six Meter International Radio Klub (SMIRK) Contest. Over a thousand 6 meter amateurs participated, with more than 250 SMIRK members getting in on the action, and lots of logs submitted to SMIRK Secretary/Contest Chairman Pat Rose, W5OZI.

John Godwin, KB5IUA, was the big winner again this year, giving him a "three-peat" with 111 SMIRKS, 170 non-SMIRKS, and 121 grids. John was followed by Bill Tynan, W3XO, in the number two spot. Cliff Ibell, G1IOV, had the highest score of the DX entries with 6705 points, and we were pleased to have an entry from Radio Club "Zadar," 9A6V, Republic of Croatia, who scored 1395 points. Mark Vaglienti, XE2/KC5FMT, beat out Bernardo Gonzalez, XE2HWB, for the top score from Mexico.

The 48-hour annual SMIRK contest is usu-

ally held on the weekend between the June ARRL VHF Contest and Field Day, and will be announced in all the major amateur radio publications and newsletters. Watch for details of the 1997 SMIRK contest. It is a great way to pick up some of those badly-needed grid squares, but moreover, it's a lot of fun!

SMIRK currently has over 6000 members worldwide and its goal is the promotion of 6 meter activity. SMIRK has donated equipment to amateurs in rare DX countries and to DXpeditions putting new countries on 6 meters.

To become a member of SMIRK, send a list of six SMIRK members you have contacted on 6 meters with their callsigns and SMIRK numbers to SMIRK Secretary Pat Rose, W5OZI, P.O. Box 393, Junction, Texas, 76849, along with a check in the amount of $6.00 payable to SMIRK. You will receive your attractive SMIRK membership certificate with your life-long SMIRK number, and the knowledge that your dues and membership payments will contribute to providing information and equipment to a worthy amateur in some DX location who may be giving you a new DXCC country on 6 meters.

SMIRK Leaders, Others Propose New 6 M DX Window

As reported in the December 1996 *QST* "World Above 50 MHz" column, several leaders of SMIRK plus others interested in 6 meter DXing gathered after the SMIRK breakfast at last year's Central States VHF Society annual meeting. The topic of discussion was expansion of the DX window from 50.100–50.125 MHz to 50.100–50.200 MHz. A subtopic was the relocation of the DX calling frequency. It is not necessary to repeat Emil's comments and reporting here. If you are interested in more details, obtain a copy of that *QST*.

As you can imagine, this topic is hot and controversial. To date, the VHF reflector on the Internet has had many exchanges concerning the subject. Below are two representative opposing viewpoints, one from Dave Bosteder, Jr., N8NQS, and the other from Chip Angle, N6CA. They are by far not the only views out there. However, because of the limits of this month's column, they are the two presented.

From October 1996 "Great Lakes VHF/UHF" Newsletter, Dave Bostedor Jr., N8NQS, Editor, writes: "While the trend is popular these days, for both political parties to cozy up to the 'Smaller Government' philosophy, we have a sincere group of 'Band Planners' wanting our 'self-governing body' the ARRL, to heap further restrictions on the 6 meter operators. Their intention is to prohibit the use of 50.125 MHz to 50.200 MHz for domestic QSOs. This is my opinion. The last thing I think we need is to further inhibit the utilization of the full 6 meter band by all licensed hams with FCC privileges in that area. I know that I am taking up a position opposite many dedicated 6 meter operators, many good men that I consider friends, but to open the DX window from its present place (50.100 MHz to 50.125 MHz) and change it (to 50.100 MHz to 50.200 MHz) seems worthy of careful consideration. I, for one, will not recognize such a band plan unless it becomes law.

"Let's take a look at the present U.S. CW/SSB 6 meter band plan. From 50.000 MHz to 50.100 MHz is reserved for CW only; 50.100 MHz and up is used for all-mode operations; 50.100 MHz to 50.125 MHz is the DX window, with 50.110 MHz being the DX calling fre-

quency; 50.125 MHz is the 'domestic' calling frequency, and most domestic QSOs occur between 50.130 MHz and 50.200 MHz.

"There just doesn't seem to be sufficient cause to force a change in these reasonable guidelines. I was fortunate to get my license early enough to enjoy the transcontinental DX openings on the waning side of the last sunspot cycle peak. When the number of DX stations exceeded the capacity of the DX window, it flowed into the domestic portion—no problem! I probably made most of my DX contacts above 50.125 MHz. Nothing prohibits the DX from moving up into the domestic QSO window. Many of the same operators who are promoting the expansion of the DX window, while shifting the domestic range up by 75 kHz, had probably few (if any) problems in the 50.125 MHz to 50.200 MHz range, with one domestic station in QSO with another, while the DX was 'in.'"

"I really believe that many of the proponents of the expanded DX window plan are going along with an idea that they don't really feel is best for the hobby. Have not many of the supporters used frequencies below 50.125 MHz for their Canadian, Mexican, and Caribbean expeditions? Many have tied up the calling frequency for extended periods of time, working station after station from their expedition sites. Shameful! Something doesn't seem right. I'm not the only expeditioner who has used 50.120 MHz during an expedition to avoid the QRM in the 'Domestic' window while putting rare grid squares on in Canada, the Caribbean, and Pacific Islands. By some, these would not be considered DX locations, and they would not work my station until I returned to 50.125 MHz+. I admire their dedication to what they believe is best, but I will draw the line at the point where they make it mandatory for everyone else to do it their way or no way!

"Think about this for a moment: We tune our transmitters to peak efficiency in the 50.110 MHz to 50.125 MHz range. We tune our amplifiers. We tune our antennas to the same range for optimum performance. Opening the DX windows and shifting the domestic window up will make it near impossible to maintain 'best tuned' conditions for a broad 200 kHz operating window. Will I tune my equipment for DX, or tune it for the domestic frequencies? If I select one, the other will suffer. They can say all they want about equipment being 'broad-banded,' but I submit that they are less than completely accurate to say that you can maintain optimum performance for all specific frequencies over a 200 kHz window. I have warned our readers about a mobile antenna that can't stay tuned in varying weather conditions. Those who have put the caution to the test have found the warning to be with foundation. Imagine having to maintain optimum tuning over a 200 kHz window with such an antenna!

"I propose that we leave well enough alone. I urge those who support the widening of the DX window and shifting the domestic window to reconsider. We don't need further limitations on such a fun hobby as operating on 6 meters!"

From the Internet, Chip Angle, N6CA, writes: "It was with great pleasure that I read the December *QST* 'World Above 50 MHz' column supporting in the new and upcoming international 50 MHz DX window, 50.100 to 50.200 MHz. I am especially glad to see that it is being done on time and well in advance of the next cycle and next summer sporadic-E. Congratulations, Emil, W3EP, on taking this position up front!

"I would like to now address some of the finer points which, up till now, have not been discussed nor surveyed with respect to the DX window. These are ideas are the direct result of discussions with other 6 meter operators and which I now support or am seriously thinking about. If we don't address all areas of the DX window, we will be stuck with some problems. Let's do it right the second time . . . that's right now.

"Non-DX calling frequency: Having the North American non-DX (domestic) calling frequency on 50.225 makes more sense to me in light of the following: If a local station operates on 50.200 and he is, let's say, 60 dB or more out of the noise, then for all practical purposes he renders the top 10 kHz or more of the DX window useless (50.190 to 50.200). We need a buffer zone between the domestic area and the DX area and the 25 kHz will provide it (absolutely essential). That is one of the many problems with the present DX window; having the local calling frequency at .125 leaves less than 15 kHz for the actual DX window when a typical local station is operating there (most of the time). Noise blankers will be inoperative this close. I live in the big city and have to run my blanker most of the time. Let's do it right this time. It will also make it easier for all of the 'well trained' operators to remember .225, 100 kHz up from present. The DX window is really going to get 'busy' this cycle.

"Non-DX CW operating segment: One of the major problems with last cycle was the domestic CW QSOs interfering with DX CW from Europe just below 50.100. I love to operate CW, but . . . let's make the domestic CW area for those guys who want to get US grids on CW and just rag chew, away from the DX CW area. I propose 50.200 to 50.225 as the recommended place for domestic CW. There will be no splatter down into the DX window from a local CW station and there will be substantially less clobbering of blankers from the lower levels of domestic CW activity.

"DX calling frequency: I would like to not have any calling frequency but rather an operating area. After all, the low bands don't have a 'calling frequency' and operating levels on 50 MHz are getting high enough to support a non-calling frequency band plan for some seasons of the year and or cycle.

"However, when the band isn't open we are better off with one. So let's put it in the middle of the DX window, say 50.150. If we start the new window off with SSB going up from .150 and CW going down from .150, then we will establish some good operating areas for people to narrow their search for their mode. With the domestic calling frequency at 50.225 we will be able to operate DX SSB all the way up to 50.200. With .150 as the calling frequency it will be a good starting point. Remember, there are a lot of guys who don't like CW or don't know the code and there will be more of them as time goes on.

"The present 'operated' DX CW area starts at 50.080 and goes up from there. If we continue it up to 50.130 or so, it will give adequate room for all of the big band openings and enough room for several loud locals to simultaneously operate.

"From 50.111 to about 50.115 is pretty well shot with all of the 'consumer appliances' using cheap off-frequency color-burst crystals that are flooding the market today. Let's not stick anyone with that problem again. There is no solution to it anyway. Eliminate 50.110 designated for any purpose.

"We are going to have to resolve the European Intercontinental DX window issue. I think it's a good idea which we should support. The only problem is it doesn't address CW nor SSB areas of operating. We don't need some loud local calling CQ DX Europe on 50.102 SSB virtually wiping out the entire lower portion of the window for weak CW contacts. Let's face it: CW and SSB shouldn't be in the same areas for obvious reasons. Look at the number of CW stations which are interfered with when an SSB station (non-US) operates in the CW segment of a band. Most weak 6 meter QSOs are on CW.

"Thanks for thinking about this and for all of us doing something about it before next cycle and next summer. Respond to me if you wish, but think about it for a few days before you do and be sure and respond to SMIRK, *QST,* and *CQ* magazines. Thanks Pat, W5OZI, for your SMIRK leadership in this effort as well. 73 de Chip N6CA."

From the October issue of "Rocky Mountain VHF+" Arliss, W7XU, writes: "I think I'll take this opportunity to cast my vote on the question of whether or not to expand the 6 meter DX window: I favor expanding the DX window. Here is my reasoning:

"Luckily, when I worked Europe on 6 meters sporadic-E this summer the only stations I heard on the band at the time were Europeans. However, the previous summer I had to dig for the Europeans in a pile of W1s, 2s, 3s, and 8s in the bottom 25 kHz of the phone band. I'm not a big gun on 6 meters (yet!), but even if I were, it is very tough competing from this part of the country with even medium-size stations on the East Coast (or West Coast when the band opens to the Pacific). Under those conditions, a roomier DX window would have been an advantage for me and other Midwest and Rocky Mountain stations. Similar conditions are likely to be present in a few years when F_2 propagation returns and, with some luck, when Europe is back via sporadic-E this next summer (Hey, I'm counting on it.).

"I know others have mentioned that for much of the time the DX window is vacant, so why expand it to 50 or 100 kHz of non-activity? I have some reservations in that regard also, but let's face it: Lot's of 6 meters sits vacant as it is now, even when the band is wide open. (Similarly, how much activity do you hear between 144.100 and 144.200 MHz outside of the contest weekends and for a few days in August?)

"All things considered, I'm in favor of moving the 6 meter U.S. calling frequency to 50.200 MHz and expanding the DX window from 50.100 to at least 50.150 MHz."

What's your opinion? Write and let me know. If there is sufficient response, I will devote a future column to it.

Rescue on Mount Evans

This past June Randy Simons, NØLRJ, was operating from Mount Evans, working a few new grids from his usual perch inside his mobile. Following his operation he began to descend the mountain. On his way down in the dark he was startled by a young girl seemingly wandering aimlessly in the road alone.

After getting her into his car and warming her up, he found out that she was among five hikers who had trekked up the mountain. He also learned that the others were still outside and in danger of exposure to the elements. Through his efforts and using amateur radio, he was able to locate and rescue all of the hikers. A dramatic, detailed account authored by Randy will appear in a forthcoming issue of our sister publication, *CQ VHF.*

Call for Papers

The Southeastern VHF Society seeks papers for its April Conference. If you have a paper you would like to submit, send it to Dick Hanson, N4HSM, at 7540 Williamsburg Dr., Cumming, GA 30131, or e-mail <n4hsm@aol.com> by January 31, 1997.

Congress Legislates Auction Of Amateur Band

During the last days of the 104th Congress, it passed legislation which would auction off a portion of the 2.3 GHz amateur band. Part of the Omnibus Consolidated Appropriations Act, this legislation did what the National Telecommunications and Information Administration (NTIA) had proposed to do with this amateur band. The frequency of 2.305–2.310 GHz band is scheduled to be auctioned by April. According to the ARRL, this spectrum may go for a possible new digital audio radio satellite service, a service which, again according to the League, is not welcomed by terrestrial broadcasters.

This portion of the band is virtually unused by the amateur radio fraternity worldwide. It is not surprising that we have no defense for it. However, this should serve as a caution for us concerning our other frequency allocations.

And Finally . . .

Lots of different news this month. Thanks to a break in my school studies, I have been able to do a bit of catching up. Thanks to you for your supplying me with your news and activities.

If you have some special news related to the wonderful world of the VHF+ frequencies, please send it to me. The best route is via my school e-mail address, as I check that almost daily. Nevertheless, the other routes do get to me eventually.

Until next month . . . 73, Joe, N6CL

BY BILL ORR, W6SAI

RADIO FUNdamentals

THINGS TO LEARN, PROJECTS TO BUILD, AND GEAR TO USE

Switching Supply Meets Amateur Radio!

The switching power supply has been around for a long time. It surfaced in the early '30s in 6 volt car radios. To change 6 volts DC to about 180 volts, a magnetically driven 60 Hz "vibrator" chopped the DC into pulses that could energize a suitable plate transformer and filter.

During World War II the use of a high-frequency aircraft primary power system based upon 400 or 800 Hz generators allowed a significant savings in transformer and filter weight and size. The final step, taken a few decades ago, was to combine the HF power system with an electronic switch pulser. The pulser operated as high as 200 kHz. And so the modern switching supply was born, just in time for the computer age. The ultimate product was a high-efficiency, lightweight power supply having about a four-to-one weight advantage over an equivalent linear supply.

The switching supply is now univerally used in computers, and surplus supplies can be purchased for a few dollars. Alas, the computer power supply doesn't provide voltages and current capacity compatible with the modern 100 watt SSB receiver. The surplus units provide ±5 volts at a lot of amperes and 13.8 volts at a few amperes. Not what is needed! What is required is a switching supply that delivers 13.8 volts DC at about 20 amperes from a 115/230 volt, 60 Hz primary source.

48 Campbell Lane, Menlo Park, CA 94025

Switching Supplies In Transceivers

Several modern transceivers incorporate switching supplies. The Japan Radio JST-245 and the Yaesu FT-990 are two examples of units that use this modern technique. Both of these transceivers weigh substantially less than equivalent units incorporating linear supplies.

For your 100 watt HF transceiver you can buy a switching supply that weighs about 4 pounds, as compared to 17 pounds for an equivalent conventional supply. Astron Corp. advertises a SS-25 switching supply which, as of early December, seems to be unavailable, and Kenwood has a PS-40 switching supply which is unadvertised, but seems to be readily available through the major distributors. A letter of inquiry about the SS-25 to Astron was not answered.

I saw a PS-40 switching supply at a nearby Ham Radio Outlet store and fell in love with it. A 4.4 pound black metal box measuring 7" × 2.5" × 9" overall, it powered my Kenwood TS-50S to full output with no problems. The instruction sheet suggested the supply be positioned to minimize any received spurious noise from the supply, or to avoid unwanted RF energy pickup from the transmitter. A minimum of 35 feet separation between supply and antenna was suggested.

The reason for physical separation between antenna and supply is that the receiver may "hear" the switching circuits of the supply as a slowly moving, slightly buzzing carrier. Normal-

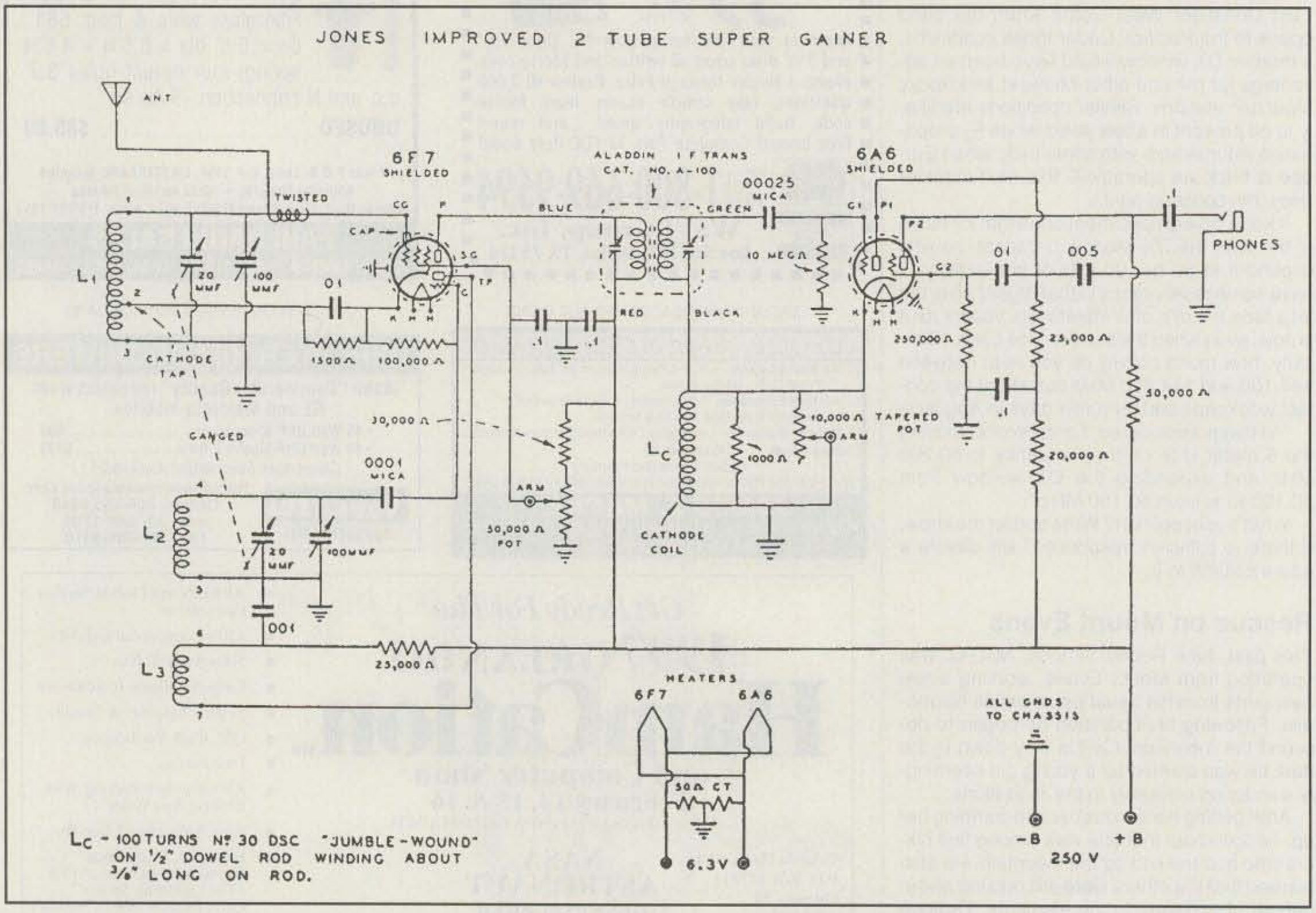


Fig. 1– Schematic of the two-tube amateur band receiver. Plug-in coils are used along with ganged bandspread capacitors.

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- BNC Connector
- 1.75 inches long.
- (Antenna shown actual size)

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- 144/430/1200MHz Transmit and Receive
- Rubber Duck
- BNC Connector
- 3.75 inches long.
- (Antenna shown actual size)

DAIWA®

NEW

HA-36

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- Rubber Duck
- BNC connector
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Base station amateur antennas for 2 Meters & 440, a variety of sizes to suit your needs.

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- **W-50** - 2M/70 cm Base antenna, fibre glass, 4.5/7.2dB, 200W
- **W-300** - 2M/70 cm Base antenna, fibre glass, 6.5/9dB, 200W

W - 30

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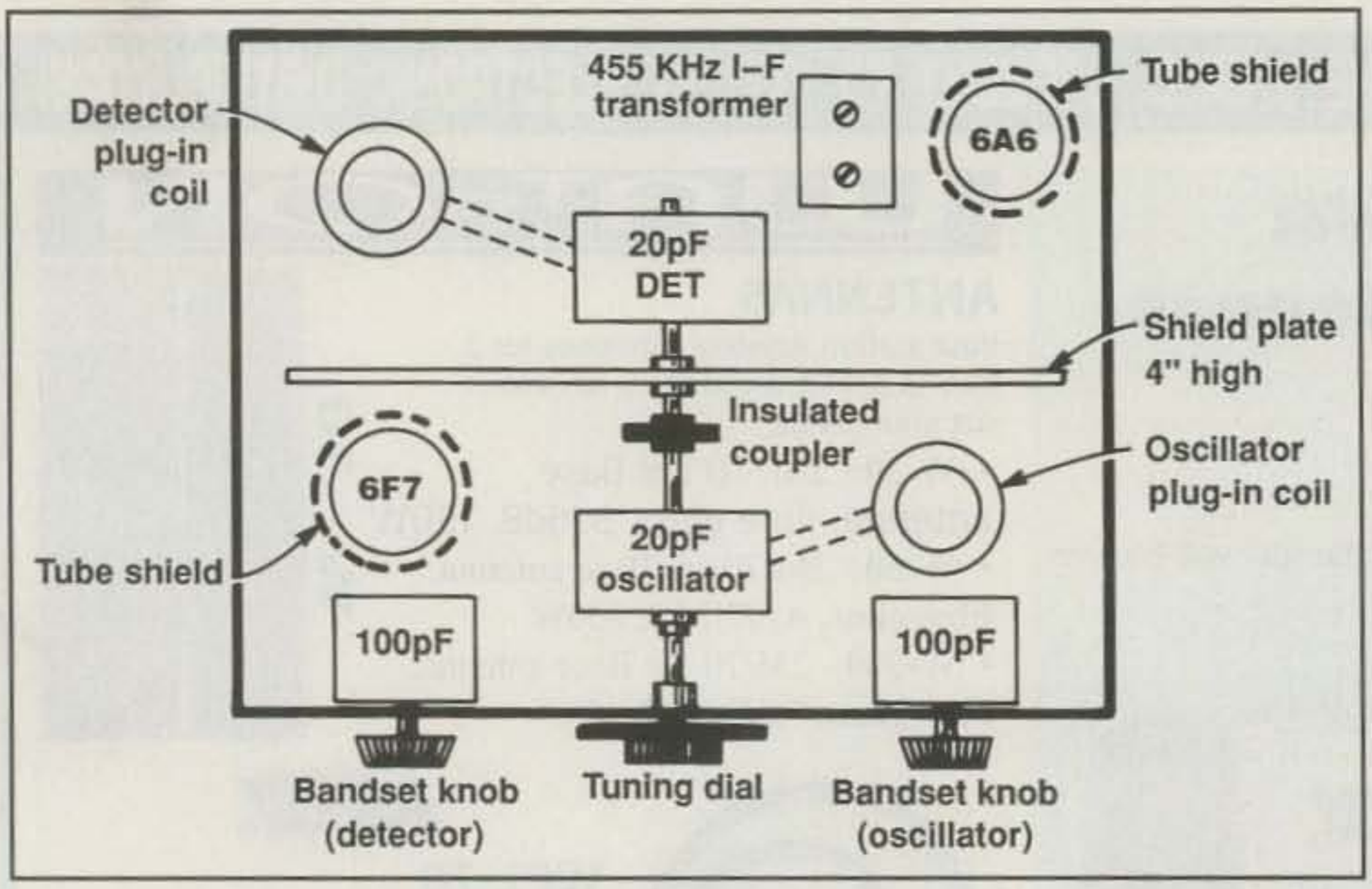


Fig. 2– Chassis layout of the two-tube receiver.

ly, these noises will be below the background, or "band" noise, of the receiver.

In addition, RF feedback from the transmitter may create instability in any power supply, let alone a switching one. Good installation practices, even when operating portable or on a DXpedition, solves these minor problems.

In my case, the end of my wire antenna was only about 20 feet above the station. I noticed no noise from the supply, which has well-filtered leads and is inclosed in an RF-tight box. Nor did I note any problems when the transceiver was running a full 100 watts output. I'm very happy with the TS-50S and probably will unload my linear supply at the next swapmeet.

DXpeditions take note: It's a lot easier to carry a 4 pound supply than a 17 pound one!

Naturally, as soon as I got home I removed the top portion of the enclosure to see the innards of the PS-40. It consisted of one circuit board with a lot of small, interesting components on it. Fully a quarter of the box was empty! With a little thought Kenwood could have packaged the 100 watt supply in an even smaller box! Or perhaps they could have placed a miniature loud speaker in the available space.

A small cooling fan was mounted on the back of the supply to ensure movement of air around the components. There was no schematic for the supply in the four-page manual, so I could only guess at the circuitry. The switching transistors were mounted to a heat sink, and other components (including the amazingly small high-voltage transformer) were tastefully arranged on the circuit board. The primary fuse was also mounted on the board. I noted a 115/230 volt primary switch on the rear of the unit. All-in-all it's a beautiful, compact arrangement. I look forward to "the son of PS- 40," which will have the same power capability and weight, but will be reboxed on a chassis about two-thirds the size of the present unit. Meanwhile, Kenwood receives the gold star for being the first on the market with a compact, general-purpose switching supply suitable for today's modern transceivers.

For more information on the history and operation of switching supplies, see my column in the April 1996 issue of *CQ*.

A Nifty Two-Tube Receiver

Every once in a while I describe simple transistorized or tube equipment for the amateur bands. I'm always amazed at the response I get. Plenty of fellas have fun building up these simple circuits—a refreshing switch from today's complex SSB transceivers that are almost impossible to repair, much less understand the circuitry!

Here's a simple two-tube 1937-style superhet receiver with bandspread tuning that covers amateur bands between 160 and 10 meters (less the WARC bands). The little receiver was designed by Frank Jones, W6AJF, and appeared in the 1937 *Radio Handbook*. Various versions of this simple circuit were described in other magazines, and the design was immensely popular with beginning amateurs with a thin purse.

The circuit is given in fig. 1. A 6F7 triode-pentode serves as a regenerative mixer and local oscillator. Regeneration is obtained by connecting the cathode across a small portion of the tuned input circuit and is controlled by adjusting the screen voltage of the 6F7. The triode oscillator is tuned 455 kHz above the frequency of the desired signal. Oscillation is obtained by a "tickler" winding (L3) coupled to the oscillator coil (L2).

The mixer is coupled to the 6A6 triode regenerative detector by a selective 455 kHz iron-core IF transformer. An "Aladdin" transformer is specified. Good luck! You'll have to make do with a similar transformer from a junked broadcast receiver. The 6A6 regeneration control is a variable resistance shunted across the cathode coil Lc.

The audio amplifier half of the 6A6 is resistance coupled to the detector section, and the plate circuit is coupled through a capacitor to the listener's earphones.

The tuning range is set by means of two 100 mmF (pF) variable capacitors, and bandspread tuning is accomplished by 2-gang, 20 mmF (pF) capacitors coupled to the main tuning dial. For ease of tuning, a geared dial is suggested. The general layout is shown in fig. 2.

2 TUBE SUPER-GAINER COIL DATA

All Coils Wound on 1½" Diameter Forms. Detector Coils Wound on 4-Prong Forms. Oscillator Coils Wound on 5-Prong Forms.

Wavelength	L1 Detector	L2 Oscillator	L3 Tickler
160 Meter	79 turns #28E. Tapped at 4 turns Closewound.	58 turns #28E. Closewound. Grid on top end.	20 turns #28E. Closewound 1/8" from L2. Same direction as L2 with plate on far end.
80 Meter	40t #20 DSC., Spaced to cover 1 3/4". Tap at 2 turns.	33t #20 DSC., Spaced to cover 1 3/4".	10t #28 DSC., Closewound 1/16" from L2.
40 Meter	12t #20 DSC., Spaced to cover 1 1/2". Tap at 1 1/2 turn.	11t #20 DSC., Spaced to cover 1 1/4".	7t #24 E. Closewound. Spaced 1/8" from L2.
20 Meter	7t #20 DSC., Spaced to cover 1 1/8". Tap at 1 turn.	7t #20 DSC., Spaced to cover 16 1/8".	4t #20 DSC. Closewound. Spaced 1/8" from L2.
10 Meter	3 1/2t #20 DSC., Spaced to cover 1". Tap at 1/3 turn.	3 1/2t #20 DSC., Spaced to cover 1".	3t #20 DSC., 1/8" from L2 and 1/16" between turns.

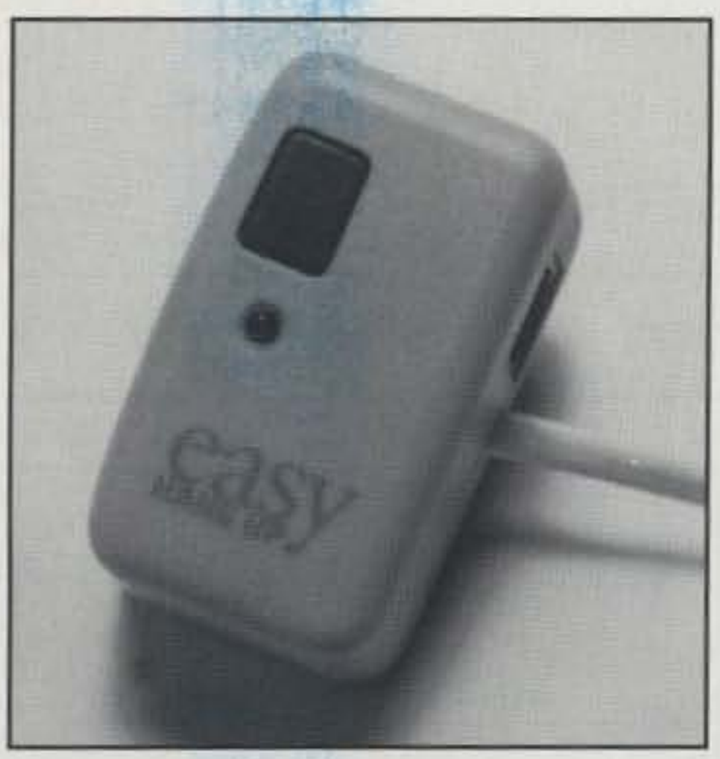
Table I– Plug-in coil winding data for two-tube receiver.

Receiver Construction And Alignment

The receiver is laid out on a metal chassis in the conventional manner that any old-timer will recognize. A shield plate between the input and oscillator tuning sections is recommended to reduce interlocking between the controls.

Plug-in coil data is given in Table I. Coil forms and many other components for this little radio can be obtained from Antique Electronic Supply, 6221 So. Maple Street, Tempe, AZ 85283 (phone 602-820-5411; fax 602-820-4643). Ask for their catalog. Parts unobtainable from this source may be found at fleamarkets or via classified ads in nostalgia publications, such as "The Old Timer's Bulletin" of the Antique Wireless Association. You can join this organization by writing to the Secretary, Box E, Breesport, NY 14816.

Once you have accumulated the parts, construction is straightforward. The receiver is



The "Easy Hang Up" device from Phonex Corp. is a telephone accessory that allows you to hang up on those unwanted telephone marketing people who invariably call during dinner! (See text for details.)

built on a metal chassis 9 inches wide, 7 inches deep and about 1 inch high. The metal panel is 9 inches by 5 inches. The coil form sockets are mounted above the chassis on metal spacers. You can use a flat plate for assembly, but fortunately metal chassis still seem to be available.

Check your wiring as you go along. I suggest small indicator scales be fastened under the bandsetting capacitor knobs for future settings.

The receiver will work with any power supply that delivers 180 to 250 volts at about 20 ma. Some modern amateurs, born into the world of solid state, have never worked with high voltage. Beware! Several hundred volts can give you a nasty shock. Keep that in mind when you align the receiver.

Receiver Alignment

Receiver alignment is simple, especially if you have or can borrow a signal generator. The IF transformer adjustments are peaked at 455 kHz. If the coupling between primary and secondary of the transformer is too tight, it may pull the 6F7 out of oscillation. A little detuning of one winding solves the problem, or an extra turn or two added to L3 helps. You can tell if the detector and audio stages are working. The strength of the received signal will vary as the potentiometer across the regenerative coil (L3) is manipulated.

Winding the plug-in coils is a lost art. It is simple if you do it right. I suggest you scrounge around and pick up a pre-war copy of an old *ARRL Handbook* or *Radio Handbook*. They provide a lot of helpful assembly information, plus coil winding hints. An old-timer will have no trouble. A newer amateur may run into problems not covered in today's handbooks. All coils are wound in the same direction (usually chosen as clockwise).

In any event, once the IF transformer is aligned, the HF oscillator can be set to the proper range. Keep the mixer out of oscillation by reducing the screen voltage on the 6F7. A nearby receiver will help you with the next step. Tune the 100 mmF (pF) oscillator capacitor (across L2) until you hear it in your test receiver. Set it 455 kHz above your test frequency. If, for example, you are aligning your receiver at 7.0 MHz, adjust the oscillator capacitor until you hear the oscillator at 7.455 kHz in the check receiver. The oscillator always operates 455 kHz above the receiving frequency. As an alternative you can use the signal generator as an alignment tool, listening for the generator signal in your receiver.

As you adjust the tapered potentiometer across Lc, you can probably hear receiver background noise. If you advance the 6F7 detector gain potentiometer, you'll hear it break into oscillation. Keep the setting below the oscillation point.

A wire antenna about 50 feet long is coupled to the mixer by a few turns of wire about the grid lead. You'll have to experiment with the number of turns. Too few turns make weak signals, while too many turns produces receiver overload. Once you hear a loud signal, peak up the 100 pF tuning capacitor across L1. You can play with the gain and regeneration potentiometers until you get a "feel" for the tuning. Bandspread tuning is accomplished with the dual-gang capacitors.

What more can I say? Go to it. If you can locate a copy of the 1937 Frank Jones *Radio Handbook*, you'll get the full story, plus lots of info about other interesting tube equipment. Let me know how this little receiver works for you!

Note that you will have to use high-impedance earphones (2000 ohms). Today's common low-impedance phones won't work with this circuit. Again, the fleamarket may come to the rescue. Or, you can add a small stepdown transformer between the phone circuit and your low-impedance phones.

Reader Feedback

I was pleasantly suprised by the number of letter I received regarding the end-fed Zepp antenna. Obviously, it is not a dead design, as I surmised.

Andy, W4ULD, wrote that he used a 66 foot Zepp with 33 foot tuned feeders for many years. He also could tune this antenna for 80 meter operation.

Andy says the cheapest and easiest way to make spreaders for an open-wire line is to use 3/8 inch PVC plastic pipe. Cut the spreaders about 3/4 inch longer than the desired wire spacing and drill a hole 3/8 inch from each end. The hole should be barely larger in diameter than the wire. Slide all the spreaders on one end of the wires. Set up the two wires taut and slide each spreader to its proper position on the wire. If the hole is small enough, the spreader will stay in place without any tie wires.

Andy recommends this type of line over "ladder" or "window" line, especially if you live in a damp climate or near the ocean. I also suggest it would be an ideal feedline for a G5RV-type antenna. I don't like the idea of feeding a G5RV with ladder or window line, as the antenna can exhibit a high SWR on the line at certain frequencies. Air insulation is better than plastic in my book, and Andy's construction closely approximates an air-insulated line, provided you hose down the insulators from time to time to keep grime, salt spray, or whatever off them.

Telephone Revenge!

Ever get a phone call from a telephone marketer during dinner hour? They seem to delight in calling at that time. Well, Phonex Corp., 6952 High Tech Dr., Midvale, UT 84057 has the answer. The "Easy Hang Up" is a telephone accessory that allows you to hang up on an unwanted telemarketer (see photo). Simply press the activation button on this small device and the following recorded message is given in a stern voice: "I'm sorry. This number does not accept this type of phone call. Please regard this message as your notification to remove this number from your list! Thank you." (Click and the unit disconnects.)

An alternative in some areas allows customers to block future calls from live operators by getting on companies "do not call" lists. I don't know if this works on automated calls, however. In any case, the "Easy Hang Up" box solves the problem with a touch of the button.

That's all until next time. Tune in again.

73, Bill, W6SAI

BY BILL WELSH, W6DDB

BILL'S BASICS

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Antenna Tuners and More—Part I

Antenna tuners benefit station performance in many ways. The following are some of those benefits.

• Impedance mismatches are masked from the transmitter, enabling maximum output power to be achieved.

• Antenna system reactances are nullified.

• Unbalanced transceiver inputs and outputs are matched to balanced and unbalanced antennas.

• Spurious radiations (including parasitics and harmonics) are minimized, reducing the possibility of broadcast or television interference. The common problem of strong amplitude modulation (AM) broadcasts causing interference to amateur 160, 80, and 40 meter communications is nearly eliminated. The possibility of interference to other communications is also minimized.

• Minimizing the spurious radiations makes more power available on the desired output frequency.

• The possibility of receiver front-end overload is greatly reduced.

• Reception and transmission characteristics are improved.

The following related subjects are covered in this article to provide an improved understanding of antenna tuner functions: baluns; decibels; dummy loads; feedlines; grounds; height and clearance of antennas; image rejection; manufacturers; multiband antennas; Q definition; random and longwire antennas; spurious emissions, including harmonics and parasitics; tuner adjustment procedure; and vendors.

The following coverage of factors related to antennas and antenna systems is intended to provide an improved in-depth understanding of this subject.

Baluns. A balun is a transformer that is designed to handle radio frequency (RF) energy. Fig. 1 shows a basic balun's schematic, plus a few typical connection systems.

Decibels. Decibels are used to express many factors related to amateur radio and electronics. A few of the most common uses of decibels are antenna gain, harmonic reduction, transmission line losses, and bandpass filter sharpness.

An isotropic radiator is a theoretical (only) antenna which amounts to a ball suspended in free space. This ball theoretically can radiate equal amounts of radio frequency energy in all directions. If an antenna's gain characteristic is being compared to that of an isotropic radiator, the gain is expressed in dBi. An isotropic radiator is the only completely non-directional antenna.

If an antenna's gain characteristic is being compared to that of a dipole, the gain is expressed in dBd. A dipole in free space has 2.15 decibels of gain over the theoretical isotropic radiator. There is no reason to let decibel figures confuse you. Although the following shortcuts are slightly inaccurate, the resultant values are accurate enough to meet our requirements.

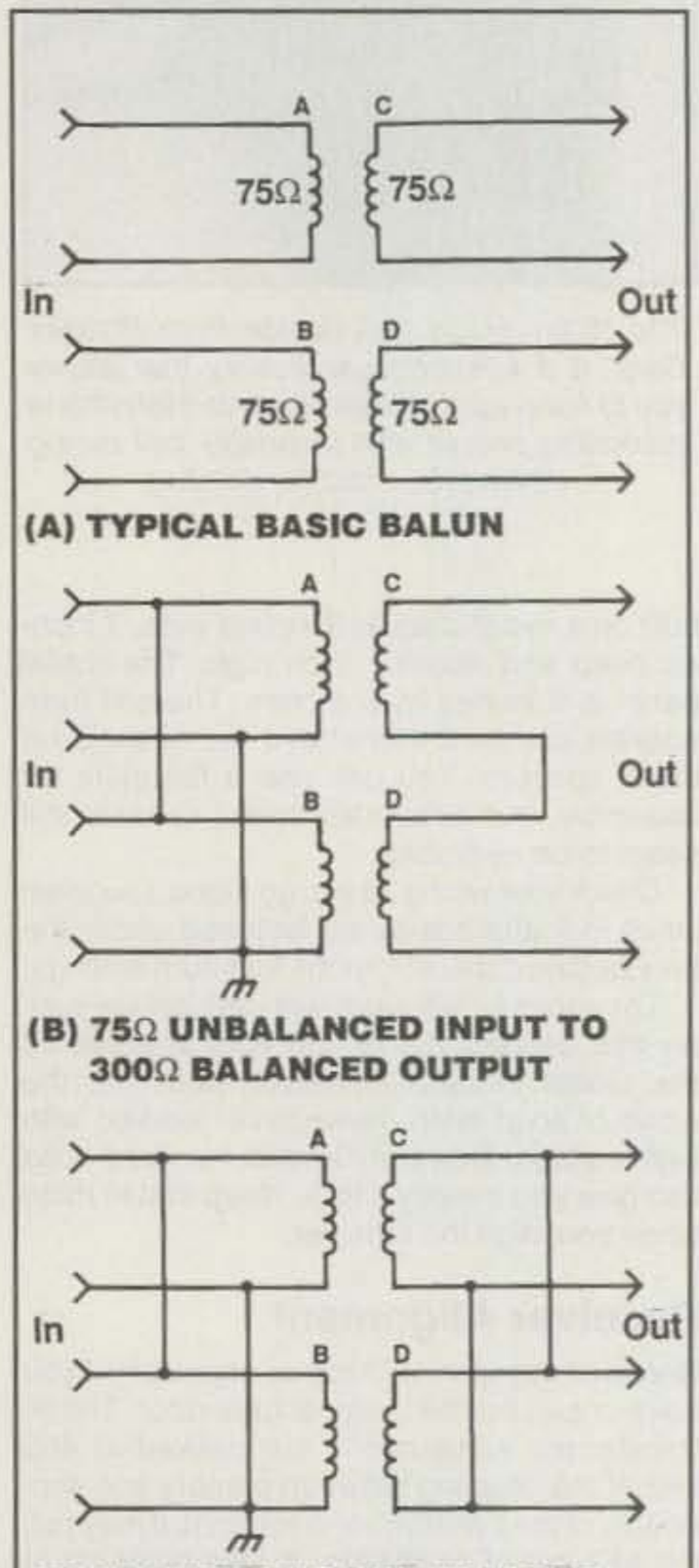
In regard to voltages and currents, each six (6) decibel change indicates a doubling (if positive) or halving (if negative) of the initial value. As an example, if a 64 volt (or ampere) value is increased 12 dB, it becomes 256 volts (or amperes). Similarly, if the original 64 volt value is reduced 12 dB, it becomes 16 volts.

In regard to power, each three (3) decibel change indicates a doubling or halving of the initial value. A 9 dB increase of a 10 microwatt signal results in a value of 80 microwatts. A 3 dB decrease of the initial 10 microwatt signal results in a value of 5 microwatts.

Dummy Loads. Most of the modern antenna tuners include a non-radiating built-in 50 ohm dummy load resistor that is useful when conducting transmitter tests. The need for a dummy load (pseudo antenna) has been significantly reduced by the decreased popularity of transmitters with vacuum tube final RF amplifiers. Amateurs using tube-type transmitters could pretune them into a dummy load instead of a real antenna, thereby minimizing on-the-air test emissions.

Feedlines. The most popular transmission line is coaxial cable (coax), which is easy to install and relatively efficient. The larger diameter types of coax have less loss than the thinner ones. A typical good 50 ohm coax is RG-213/U. Television twinline has an extremely low RF loss characteristic in the high-frequency range (3–30 MHz). The characteristic impedance of TV twinline is 300 ohms, which matches the folded dipole antenna, plus other antennas. Another low-loss feedline is ladderline, but it requires occasional cleaning and it is difficult to install. There are other types of feedlines, but they are not as popular with amateurs. You can easily lose a lot of the transmitter's output power in a lossy feedline. This loss of output energy is not good, but the loss of one half of the received signal is worse; it may make it impossible to hear weak signals. It is wise to use an efficient feedline.

Grounds. The most common fault of amateur radio station installations is the lack of a satisfactory ground system. Many stations have no ground attached to the equipment, whereas others use a poor ground. Modern gear is so good that excellent communication results can be achieved despite the lack of a ground. However, station performance is improved by a good RF ground. All the bypass capacitors in the transceivers dump energy on the chassis. If this energy is not channeled to a good RF station ground, it can cover up weak signals. Also, your antenna works against ground. The lack of a good ground can cause you to lose output power as the antenna system finds its own path to ground. In addition to the preceding factors, a station ground provides protection against the possibility of electric shock.



(A) TYPICAL BASIC BALUN

(B) 75Ω UNBALANCED INPUT TO 300Ω BALANCED OUTPUT

(C) (INSERT) 75Ω UNBALANCED INPUT TO 75Ω BALANCED OUTPUT

Notes:

1. Doubling the number of turns in the primary or secondary of the balun winding quadruples the impedance value over the initial value of a single winding.

2. The wiring and grounding can be changed to provide balanced-to-balanced, balanced-to-unbalanced, unbalanced-to-balanced, or unbalanced-to-unbalanced configurations at 75-to-75, 75-to-300, 300-to-75, or 300-to-300 ohm impedances.

3. The correct primary to secondary turns ratio is selected to provide desired input and output impedances.

Fig. 1– Schematic of a basic balun and a few typical connection systems.

45527 Third St. East, Lancaster, CA 93535-1802

Ten-year-old Ved Kamat, VK2LAD, lives in Sydney, Australia. He earned his license when he was 8 1/2 years old. Ved shares a station with his father, Gopal, VK2WGY.

Height and Clearance of Antennas. Each antenna should be installed as high as possible and where it is clear of obstructions. Wire antennas should not be erected close to other wiring, such as electric power lines. Wire antennas should be positioned where they cannot come in contact with power lines if they fall.

Image Rejection. Superheterodyne receivers are subject to interference to the desired signal by any signal at the opposite local oscillator beat point. As an example, a desired signal could be at 7055 kHz with a local oscillator beat frequency of 7510 kHz to produce an intermediate frequency at 455 kHz. However, a received signal at 7965 kHz is also 455 kHz different than 7510 kHz, which can result in both the 7055 kHz (desired) signal and the 7965 kHz (undesired) image signal being heard at the same time. The possibility of image signal interference is reduced by using a higher intermediate frequency. Image rejection is specified in decibels. A tuner provides improved image rejection because it acts like a bandpass filter, which opposes passage of the unwanted frequencies above and below the desired band of frequencies.

Manufacturers of antenna tuners and baluns include the following:

Ameritron, 116 Willow Road, Starkville, MS 39759 (601-323-8211).

Amidon, Inc., 240 Briggs Ave., Costa Mesa, CA 92626 (714-850-4660).

DWM Enterprises, 1709 North West Ave., Suite 103, Jackson, MI 49202.

ICOM America, Inc., 2380 116th Ave., Bellevue, WA 98009-9029 (206-450-6088).

Kenwood Communications Corp., Amateur Radio Products Group, P.O. Box 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745 (310-639-5300).

LDG Electronics, 1445 Paran Road, St. Leonard, MD 20685.

MFJ Enterprises, Inc., Box 494, Mississippi State, MS 39762 (601-323-6551).

Wm. M. Nye Company, Inc. (Nye Viking), 1427 Shannon Lane, Priest River, ID 83856.

N4XM, 7001 Briscoe Lane, Louisville, KY 40228.

Pacific Coast Parts Distributors, Inc., 15024 Staff C., Gardena, CA 90248.

Palomar Engineers, Box 462222, Escondido, CA 92046 (619-747-3343).

SGC, P.O. Box 3526, Bellevue, WA 98009 (206-746-6310).

Ten-Tec, 1185 Dolly Parton Pkwy., Sevierville, TN 37862 (423-453-7172).

Vectronics, 1007 Hwy 25 S, Starkville, MS 39759 (601-323-5800).

Yaesu USA, 17210 Edwards Road, Cerritos, CA 90701 (310-404-2700).

Multiband Antennas. There are a variety of amateur antennas which function on more than one band. The tri-band Yagi-Uda beam (Yagi) is very popular; it usually functions best on the highest frequency band it handles. As an example, if it handles the 10, 15, and 20 meter bands, it is best on the 10 meter band. Multiband verticals are popular because they do not require a lot of horizontal installation space. Verticals are highly susceptible to man-made noise, such as automobile ignition noise. If you live close to a road with a lot of traffic, a vertical antenna may be a poor choice. A vertical antenna is a good one to use to work foreign stations (DX), however. Adding resonant radials to the base of a vertical antenna converts it to the more efficient ground-plane antenna. If you want to work several bands but are just going to erect one antenna, a Carolina Windom is a good choice. One version covers the 10, 12, 15, 17, 20, 30, and 40 meter bands using an antenna that is the same length as a 1/2-wavelength 40 meter dipole. Random and longwire antennas are covered separately in this article. If possible, avoid coil-loaded physically short antennas because they are less efficient than full-length antennas.

Summary. This completes the first part of this two-part article. The second part covers random- and long-wire antennas, spurious emissions, harmonics, tuner adjustment procedure, vendors, tuner functions, and link coupling.

Photographs Wanted

Photographs of new amateurs in their shacks provide introductions to a few of the newer licensees. Photograph size is unimportant, but good definition, contrast, and subject matter are important. Color or black-and-white photographs can be used. Operating activites and achievements, plus a self-introduction, are needed with each picture. Send an SASE if a picture must be returned. A free one year *CQ* subscription (or renewal) is awarded to the one amateur whose picture I select as the winner for the month. If you are a subscriber, please enclose the mailing label (or copy) from your latest issue of *CQ*. One award is made each month, no matter how many photographs are printed. DX amateurs, who frequently work the American Novice bands, are also urged to submit photographs. 73, Bill, W6DDB

BY DAVE INGRAM, K4TWJ

WORLD OF IDEAS

A LOOK AT THE WORLD AROUND US

QRP—Red Hot and Cookin'!

Unbelievable but true: HF band conditions have barely started to improve and QRP is already hotter than ever. More companies and clubs are making new QRP kits, more operators are using QRP on the air, and more folks are homebrewing simple weekend projects just for "getting started" fun. Why such widespread interest in QRP? Simply stated, its economical cost, low profile, and high enjoyment are the right combination for the times. QRP is also the ideal answer for hamming in many restricted areas. If people do not see a large antenna and notice telephone or television interference, we are usually home free. Further, using a small peanut-whistle rig to occasionally beat out the "big boys" is a blast of fun! If you're one of the "been there, done that" crowd and have worked everything on the air while using a full gallon and maybe a couple of extra buckets to boot, I heartily recommend QRP as a delightful change of pace. You'll love it—really!

Need more encouragement? Okay. Let's start with a show-and-tell discussion of homebrewing and add some good tips for first-time success along the way. In the spotlight this month is a miniature CW transceiver called the Forty-9er (nicknamed by its designer, Wayne Burdick, N6KR, as it works 40 meters and uses a regular 9 volt battery for power).

NorCal and the Forty-9er

The Forty-9er started out as a "framework for expansion" project and became an immediate success, so NorCal (The North California QRP Club) started producing it in kit form. This direct conversion QRPp transceiver kit is now available from Jim Cates, WA6GER, 3241 Eastwood Road, Sacramento, CA 95821 for $25 plus $5 shipping. The NorCal group, incidentally, is a real mover and shaker in the world of QRP. Their quarterly mini-magazine, *QRPp,* is typically 70 pages, and is loaded with neat circuits to build. Subscriptions are $10 a year U.S., $15 Canada, $20 DX, and go to Jim, WA6GER, at the above address (make Forty-9er and subscription checks payable to Jim Cates, not NorCal). Bound back issues of *QRPp* are also available for '93, '94, and '95 for $15 plus $2 shipping from Doug Hendricks, 862

4941 Scenic View Drive, Birmingham, AL 35210

Photo A– The Forty-9er kit as received, unpacked, and loaded into an Altoids mint tin. The project can then be carried in a coat pocket and assembled a couple of parts at a time in spare moments. (K4TWJ photo)

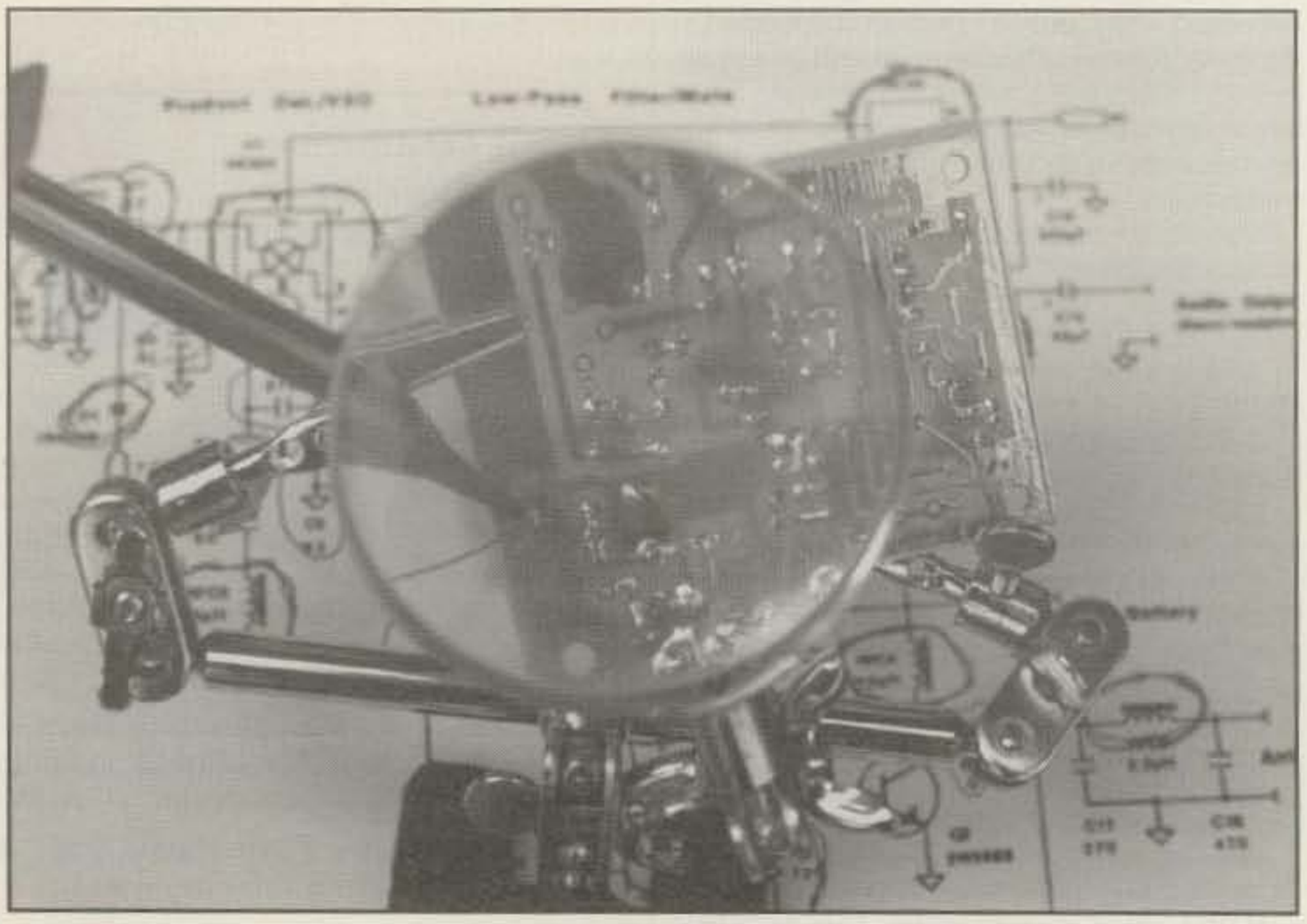


Photo B– "Third hand" devices as shown here are available from electronic stores and even RadioShacks. They are ideal for holding PC boards steady and magnifying solder points while leaving your hands free to work. (K4TWJ photo)

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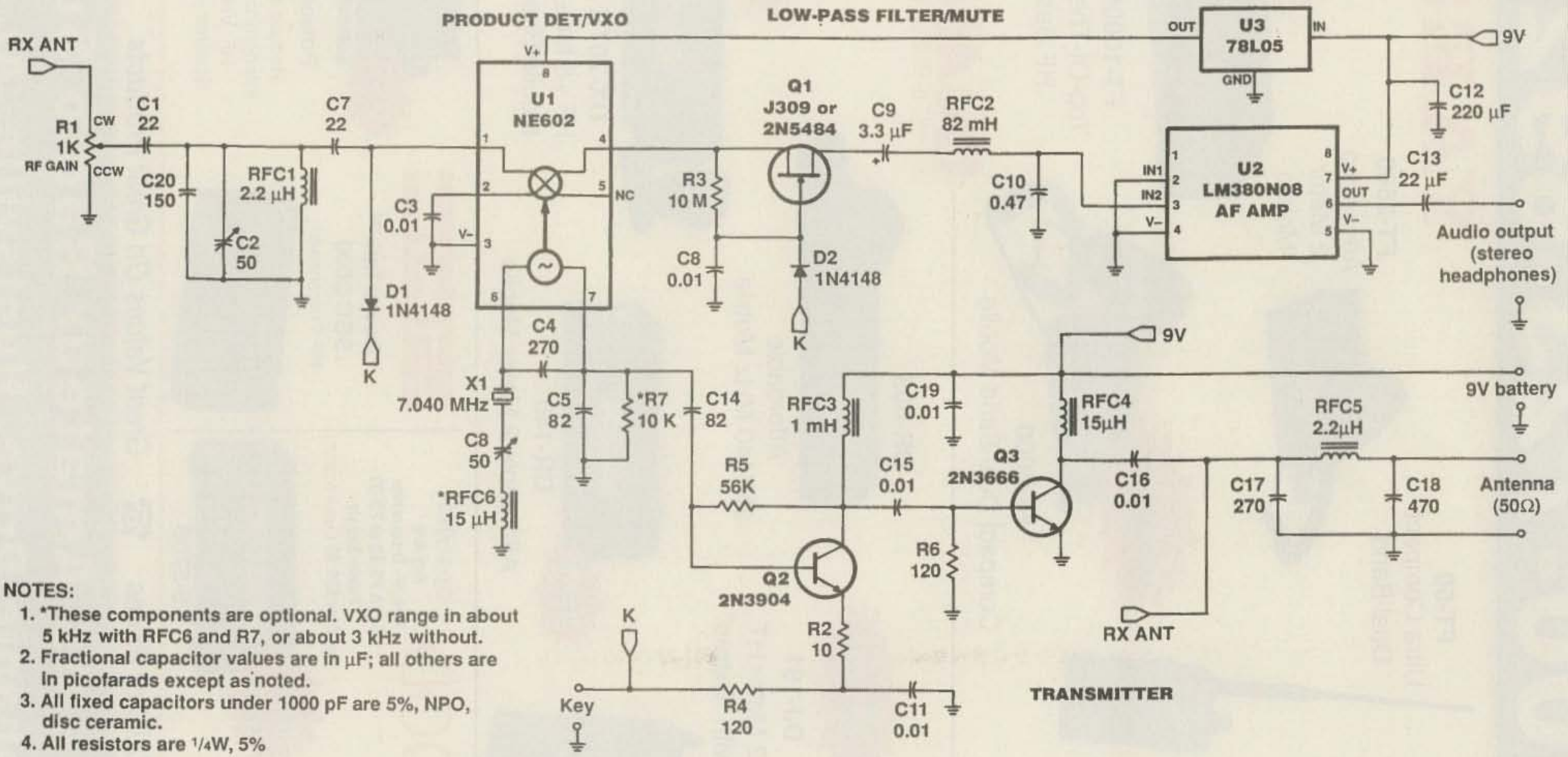

NOTES:

1. *These components are optional. VXO range in about 5 kHz with RFC6 and R7, or about 3 kHz without.
2. Fractional capacitor values are in µF; all others are in picofarads except as noted.
3. All fixed capacitors under 1000 pF are 5%, NPO, disc ceramic.
4. All resistors are 1/4W, 5%

Fig. 1– Schematic diagram of the Forty-9er QRPp transceiver designed by N6KR. Kits are available from WA6GER. Special thanks to NorCal and WA6GER for permission to feature the Forty-9er's diagram in this column.

Frank Ave., Dos Palos, CA 93620. That should prove more than adequate getting started inspiration. Now let's focus on the Forty-9er.

The Forty-9er's circuit diagram is given in fig. 1. It consists of a two-transistor transmitter and a dual IC receiver with full CW break-in and VXO frequency control. The NE602 functions as a combination oscillator and mixer/detector, with its frequency-generated signal tapped off to drive the transmitter. The VXO circuit (crystal, 50 pFd variable, and 15 uHy coil in series) is smooth as silk, and will pull a crystal's frequency 5 to 10 kHz. Remember this VXO idea; it can be applied to other QRP gear and even rockbound (crystal controlled) classic rigs. Molded 15 or 20 uHy coils are available from electronic suppliers nationwide. Power output of the Forty-9er is approximately 250 milliwatts with a 9 volt battery and 500 to 700 milliwatts with a 12 volt battery. Earphone volume is not excessive, but is adequate. A "buzz" is audible for a sidetone on transmit.

Photo A shows the Forty-9er unpacked and ready for assembly. It comes complete with a 7.040 MHz crystal, PC-mount warping capacitor, 2SC799 output transistor, and prewound/ molded coils (no winding necessary!). A six-sheet manual plus a collection of user-added mods is also included. I added the metal box—an Altoids peppermint tin—which makes a terrific enclosure for the completed rig. In fact, numerous QRPers are mounting their Forty-9ers in Altoids tins. They might even be visualized as a modern-day rendition of the famous Sucrets rigs of the '60s (which, incidentally, we will be featuring and resurrecting right here in the near future).

Secrets of Successful Homebrewing

All parts are on-hand, so we are ready to begin assembly, right? Not necessarily. Let's substitute accuracy for haste to ensure it will work at first "fire-up." There are basically three ways you might go wrong in homebrewing: putting a right part in the wrong place, putting a wrong part in the right place, and using bad parts. (Just because parts are new does not guarantee they are good. I speak from experience!) I thus start by curling up in an easy chair and checking each component with an ohmmeter. Resistors are checked against the kit list, their color code, and their actual value. Then coils and transistors are checked accordingly. Next capacitors are checked to ensure they are not shorted. Large values (above 1 mFd) will also show a "kick" after checking and swapping lead polarities. Finally, I inspect the PC board with a magnifying glass (plus ohmmeter) to ensure there are no breaks or bridges, and to visualize where each

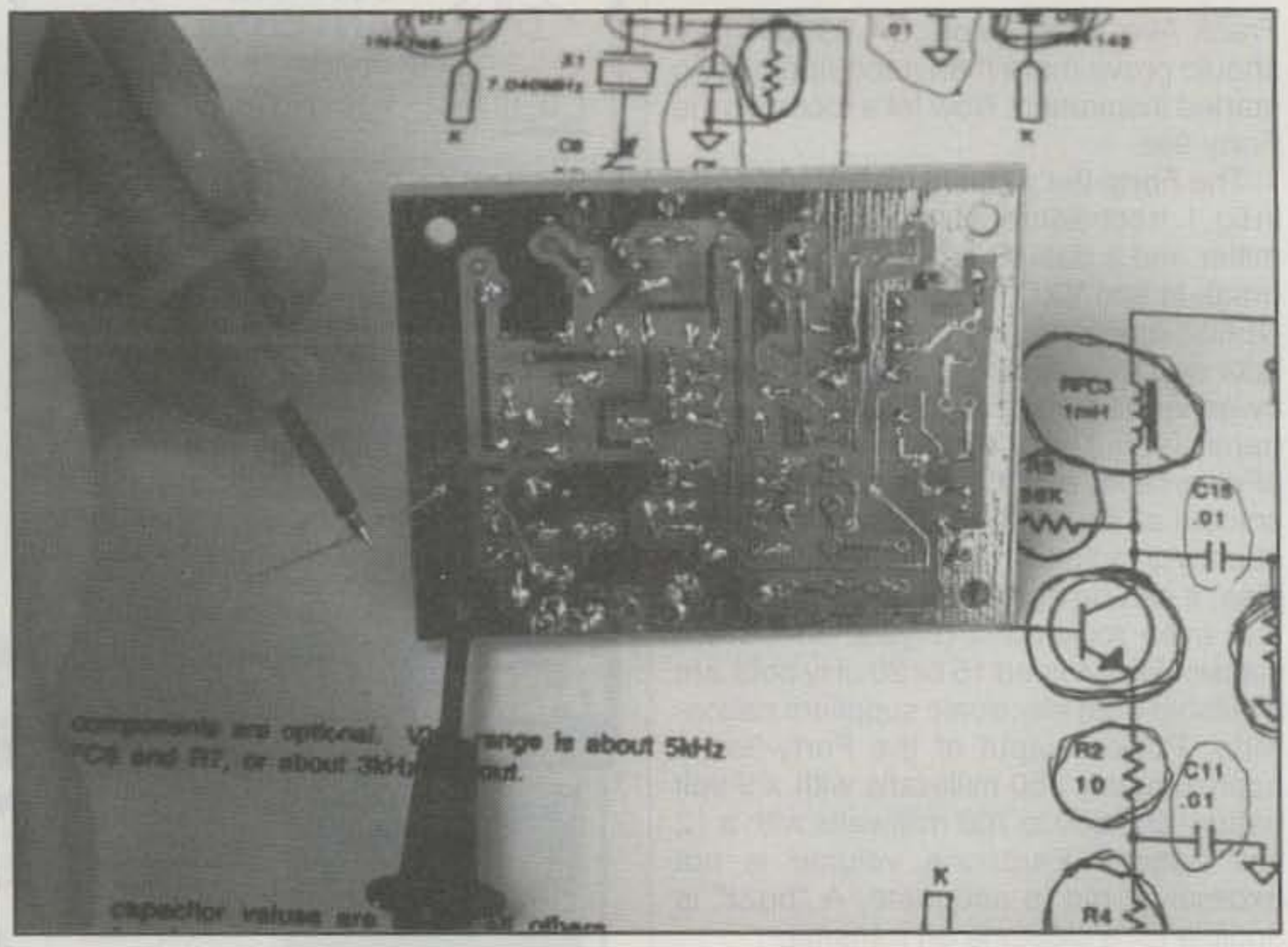

Photo C– Here I'm checking solder connections and double-checking component values after installation to ensure 100 percent success. In this particular case, continuity between one end of a resistor and ground is being confirmed. (Discussion in text.)

component fits. This diagram and PC board study helps me visualize the circuit, so when I actually build the rig, it's like assembling it for the second time.

Say you find holding a PC board steady while manipulating an iron and solder challenging? Pick up a "third hand" with magnifier as shown in photo B. Position its clips to hold the board at a comfortable angle, file the iron's tip to a pinpoint (like a sharpened pencil), use ultra-thin .022 silver bearing solder (RadioShack sells small rolls), and then use the magnifier for surgery-accurate soldering. Look beneath the third hand and board in photo B for another tip: Circle each component on the schematic after soldering it on the PC board.

After installing two or three components, and before cutting off their leads, pause to check your work. Poor solder connections can be avoided on the spot by using the tip shown in photo C. Touch one ohmmeter lead to an installed component's ready-for-trimming wire; touch the ohmmeter's other lead to the PC board's connections for same, and check continuity or component resistance. This way you read through the wire and through the solder and check PC wiring simultaneously. If a connection is not made properly or a component opens from overheating, you spot the trouble instantly. Neat, eh?

Watching a project being assembled "time lapse style" is always interesting, so I shot photos D, E, and F to share the process with you. The photos were shot outdoors in indirect sunlight for clarity; in between photos the project was in the third hand (indoors) and undergoing soldering/wiring checks as highlighted in photos B and C. I was too excited to shoot a stand-alone PC board photo after final assembly. Instead, I connected a battery, earphone, key, and antenna, and made a first contact—right "off the bat." It worked great! Patience and accuracy truly have their virtues!

Introducing the Altoids Tin

As mentioned earlier, Altoids mint tins have become a modern substitute for the classic Sucrets metal box of eras past. Yes, and the Altoids box makes an ideal enclosure for the Forty-9er. The usual way of installation is placing a thin layer of insulation or foam padding on the tin's bottom, then securing the PC board in the box with screws and fiber bushings like Clifton Sykes, AB5UA, did (photo G). Clifton used an RCA socket for the antenna connection and 1/8 inch sockets for the earphone and key, and routed the power leads through a grommet. George Lee, K5HT, took a slightly different approach (photo H). He rounded off two corners of the Forty-9er board so it would fit flush against the tin's left side and provide room for a 9 volt battery to squeeze in on the right side. He then added a BNC socket for the antenna, plus 1/8 inch sockets for the earphone and key. The completed project is a perfectly snug Altoids Forty-9er. I decided to try something a bit different, and discovered my Forty-9er board fit perfectly in a blank remote-control case I found at

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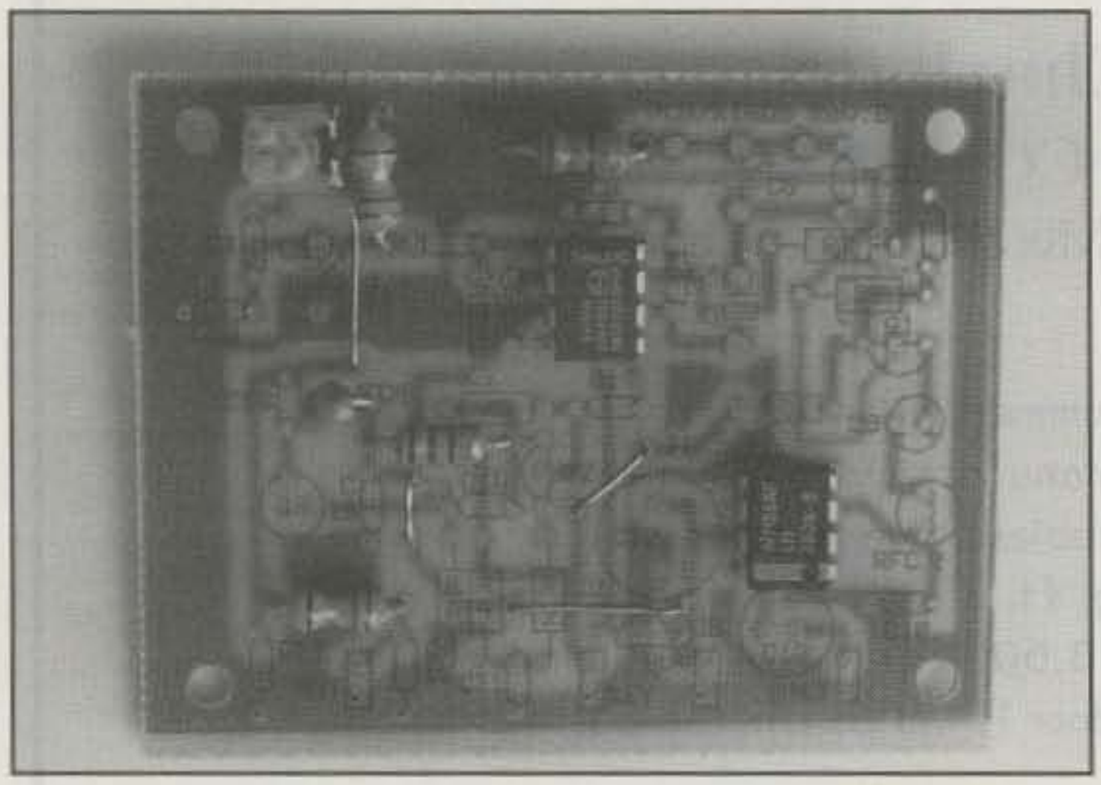

Photo D– Assembly of any homebrew project begins with pre-planning and installation of jumpers plus close-to-board components like those shown here.

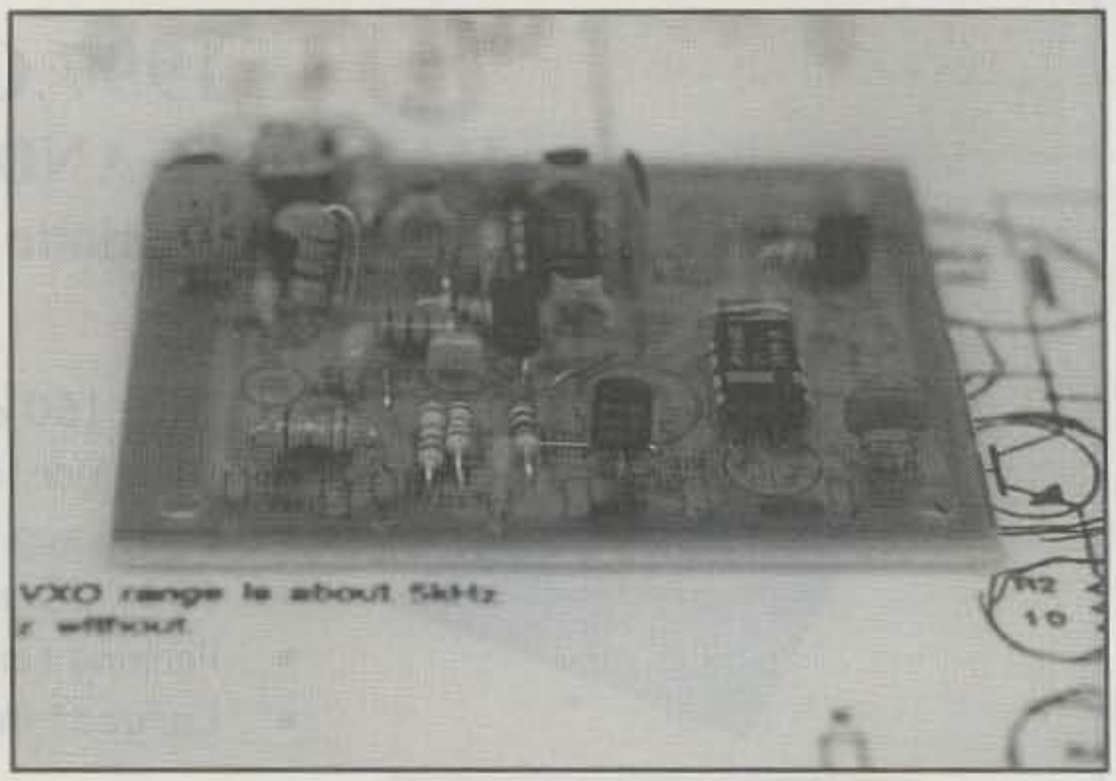

Photo E– More components have now been installed and checked. The project is starting to look like a QRP rig!

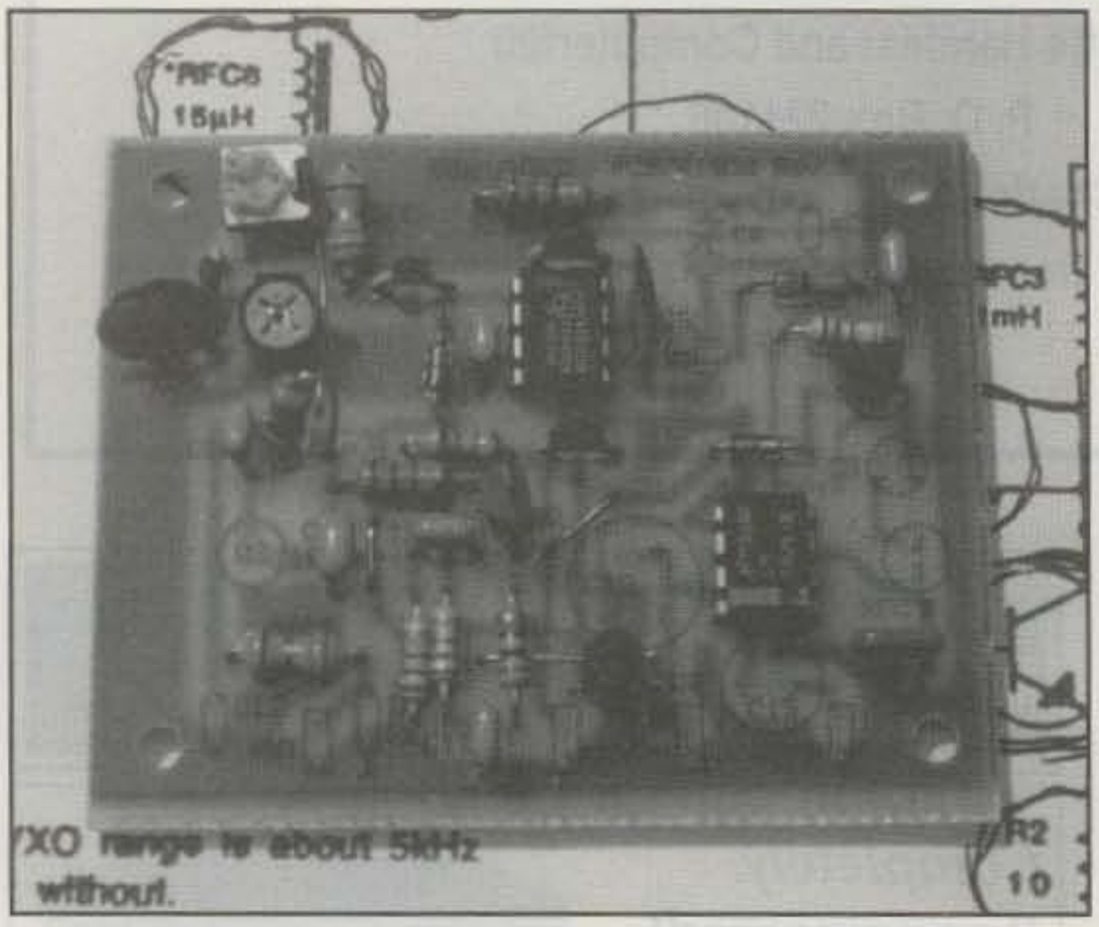

Photo F– The little transceiver is now almost completed. Notice each component has been installed, soldered, and double-checked, and its leads trimmed. Will it work at first fire-up? You bet it will!

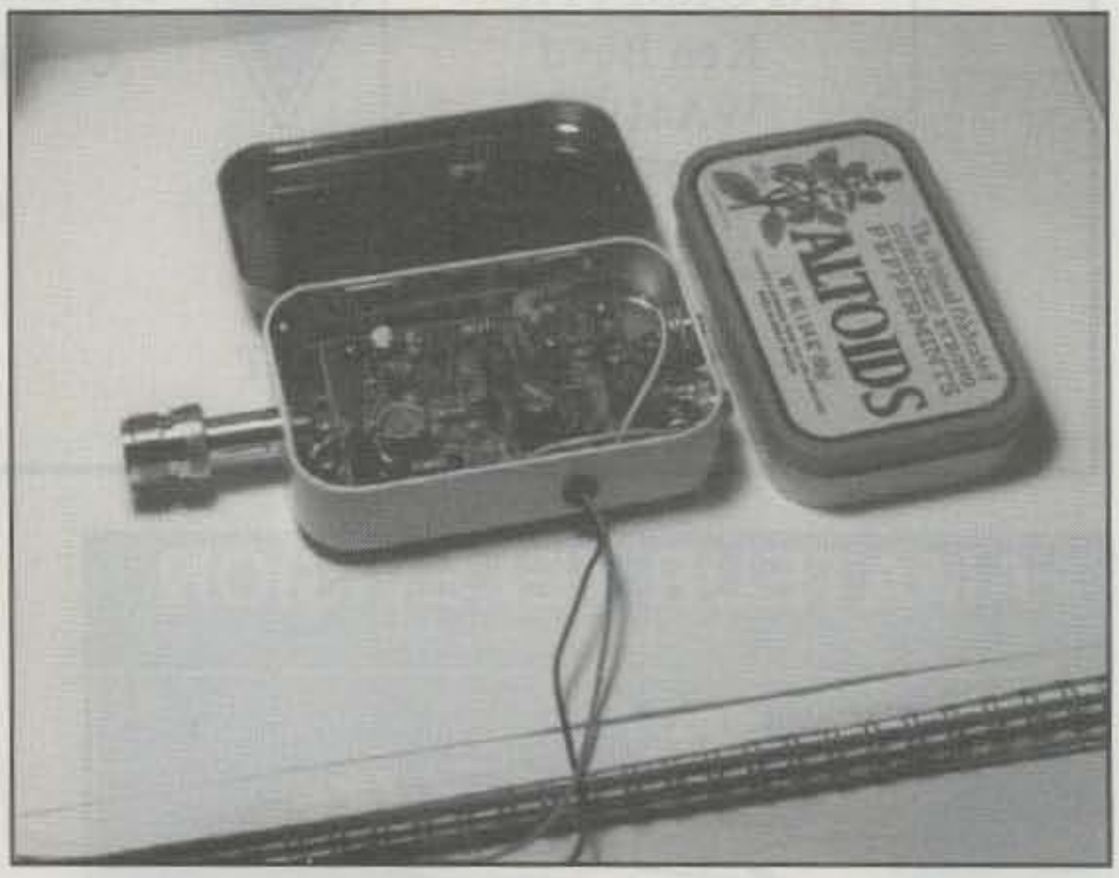

Photo G– Clifton, AB5UA, shares views of his homebrewed Forty-9er in an Altoids mint tin. The antenna connector is on the left, sockets for key and earphone are on the right, and 9 volt battery leads extend through the grommet. The lid is raised to tune the VXO capacitor during operation. (Photo by AB5UA)

RadioShack (photo I). The case even has a battery compartment. Nice! My Forty-9er works fine in the plastic case, but I'm not convinced it will stay there permanently. An Altoids tin is just sheer class!

While wrapping up this month's column, I received news from NorCal that a successor to the Forty-9er will soon be announced. The new rig will be the SST (Simple Superhet Transceiver) and will have a VFO, RIT, AGC, 5-pole filter, sidetone, and plenty of earphone volume. The SST will work on 9 to 18 volts, and is expected to be an entry-level project for first-time builders. Formal announcement of the SST is forthcoming. Possibly it will debut at Dayton '97.

Conclusion

As you probably surmised, this month's

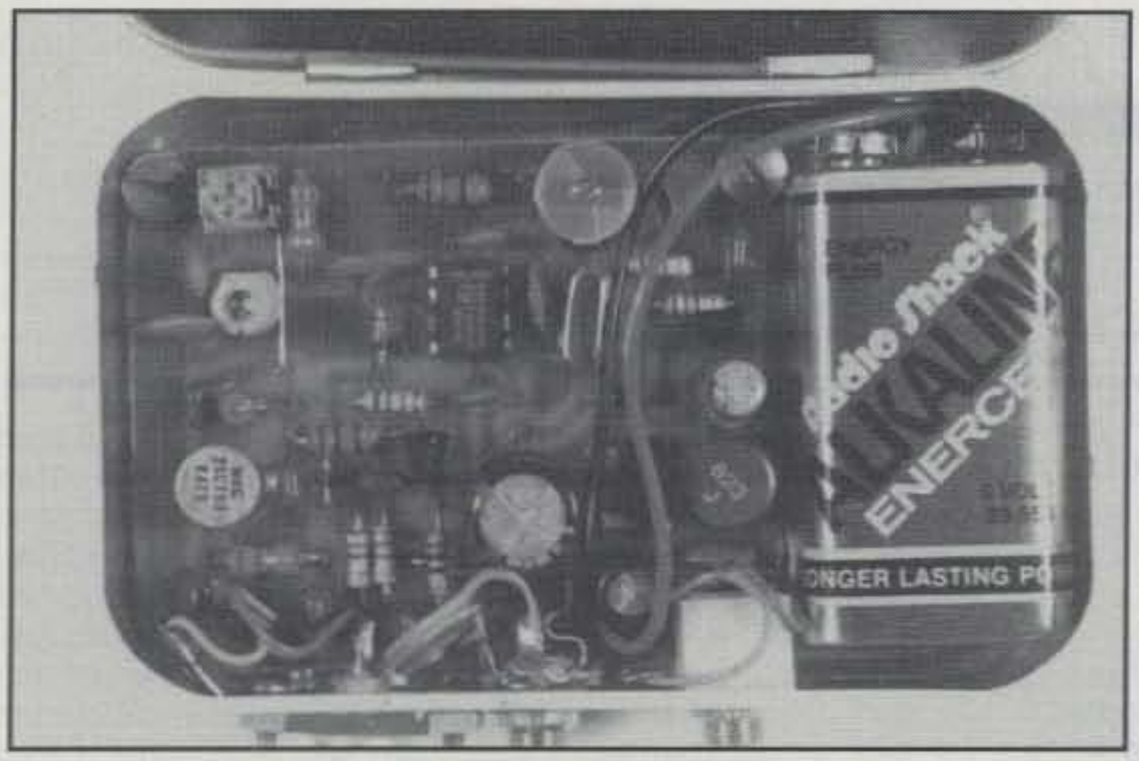

Photo H– George, K5HT, whittled the edges of his Forty-9er board so it would fit right into the Altoid tin's corners. As a result, a 9 volt battery could be snug-fit right in with the circuit board. Notice connectors for antenna, key, and earphones also squeezed into the tin. (Photo by K5HT)

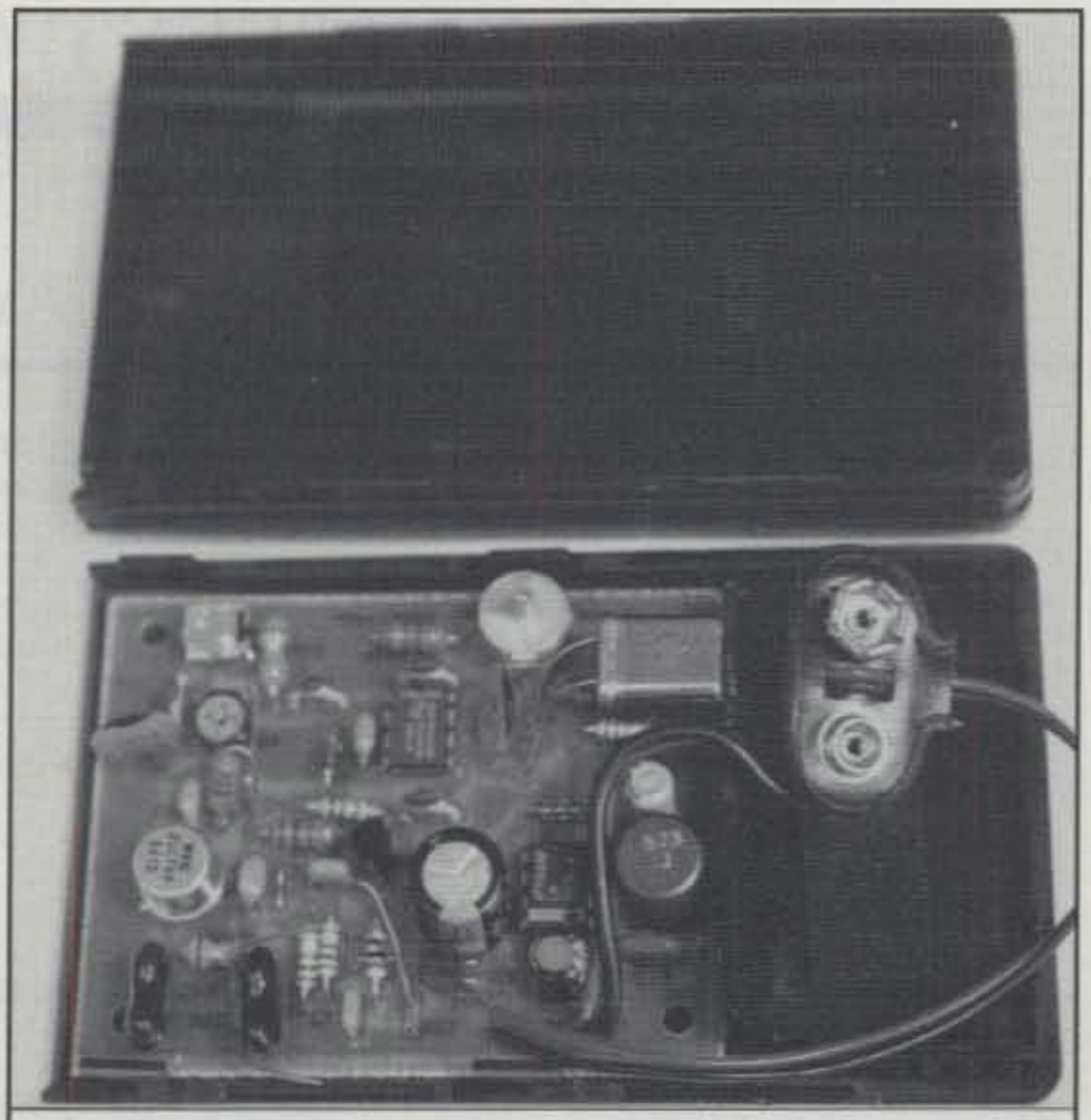

Photo I– My completed Forty-9er fit perfectly into an empty plastic case for a remote-control sold by RadioShack. Now I cannot decide if it should stay there or be moved into an Altoids tin! (Photo by K4TWJ)

column served double-duty by covering the Forty-9er and sharing a variety of often-overlooked tips for no-miss homebrewing. Success also inspires enthusiasm for building more projects (sort of like eating potato chips; it's difficult to stop with just one). Yes, and homebrewing is only one of QRP's big attractions. Using low power on the air is always a special treat. Keeping those thoughts in mind, next month's column will feature another simple QRP project plus late-breaking news in big-time QRP action. Stay tuned for Part II!

73, Dave, K4TWJ

BY JOHN DORR, K1AR

CONTEST CALENDAR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Can An Old Dog Get Excited About Contesting?

February's Contest Tip of the Month

I'm amazed at the number of top-notch CW contesters who can't copy conversational code. Sure, you can fire a callsign and exchange to them at 50 WPM, but don't dare ask what antenna they're using. In my book, code speed is more than ceremonial; it's one of the many factors that separate champions from everyone else. Never give up on improving your ability to copy QRQ CW. Finally, there's something that we learned from the 1980s that's worth remembering: Faster IS better!

After you've been contesting for 20 or 30 years, there's very little you haven't seen before. It's not so much that it's boring; it's just that experience has already shown you most of what you'll encounter in the sport of contest operating.

One of the areas of contest stimulation for me is meeting and/or breaking new personal operating milestones. For many CQ WW operators, working all zones is one of those operating targets. Active amateur radio operators have been known over the years to burn the midnight oil just so that they can log that last rare one and complete the sweep of "all 40." Still others who operate from big contest stations can make the claim after just one 48 hour weekend of operating.

In 1995, during one of our CQ WW CW multi-ops, I tasted the thrill of nearly working 40 zones on 40 meters. After a long and arduous journey, our team ended up with 39 zones, missing zone 12 for the sweep. The boys at N2RM (who also worked 39) had a reasonable answer. As you know, zone 12 mostly is taken up by the country of Chile. Well, take a look at the map. Chile is a long and skinny country. They just don't have the real estate to put up 40 meter dipoles that are broadside to North America! I guess that's about as good an explanation as any I heard that year for missing a CE!

The 1996 edition of the CQ WW CW Contest was not unlike recent years on 40 meters. There were an incredible number of multipliers (and zones) to be worked. As I recall, our multi-op effort worked over 100 countries in just the first 24 hours—and we had 37 zones, too!

With 3 zones to go and 24 hours of operating, a goal that eluded me was again within reach. However, it demanded outstanding LP conditions on Sunday morning to have any chance. By 1100Z on Sunday morning we were staring at a formidable challenge: zones 22, 26, and 28 were not to be found. Then the magic began. While I was calling CQ, I heard a faint signal off the side of my RIT. A little more listening yielded the callsign XZ1N calling CQ. As the adrenaline began to flow, I called and called with absolutely no success. I even got one "?" out of them, but no QSO. My hopes were dashed with that one interchange.

As you probably know, working 40 zones on a single band is really not that important from a scoring perspective. However, it sure gives you something to talk about after the contest. I guess it falls into the category of getting a "Clean Sweep" in the ARRL Sweepstakes. And over the years, we all know how much time we've wasted looking for a VE8.

As XZ1N moved off the band (Yes, there was nobody calling him!), I resigned myself to defeat—defeat, that is, until I heard HSØAC. If it had made the process faster, I would have climbed the tower to turn the antenna. This one was coming from the south, and of course the 40 seconds I had to wait while the antenna turned seemed like an eternity. Unlike the XZ, HSØAC had a huge pile-up calling him. It seemed that every station in Japan needed HS for a new one. As with the XZ, so did Thailand fade away without a QSO in our log.

By 1145Z it was really looking as if 40 zones was an impossibility. Then a bit of magic did take place. Scanning the bottom of 40, I heard an extremely weak station sending 59926. Could this be the third zone 26 in our newly created SWL entry? Well, third it was, as he signed 3W5FM. With one push of the F4-key, I called him and got an immediate answer. Now on to the small matter of working zones 22 and 28.

Moving up the band from the 3W, we worked a few other mults in the Pacific and South America. The band was still hot, but zones 22 and 28 stations are not exactly filling the restaurant! Then luck struck again. As I was tuning, I heard a station sign xxxx/G3NOM. Many of you know that G3NOM is a regular from Southeast Asia. Would we be able to copy his prefix? The thrill of contesting hit again. His callsign was 8D2/G3NOM, operating from Indonesia. A few calls and *bang!* He was in our log! I have to admit that the 8D2 threw me off, but the Zone 28 did not escape our passband.

By now the sun was well over our heads, and working the last zone was not in the cards that morning. Fortunately, we had worked all of the hard ones, and a zone 22 QSO was entirely possible in the 2000–2200Z time slot. That two hours of operating was perhaps the most exciting I can remember in a very long time. It may not seem so from the surface, because all we were doing was running Europe. However, the possibility of a VU calling in kept us riveted to the receiver.

Then it happened. After finishing a QSO with an ON4, I called QRZ to hear . . . TT calling me. Having had plenty of time to review the calls of the VUs we had worked on the other bands, my head started to spin. Could it be him? A quick QRZ was followed by music even Mozart could not compose—an absolutely clear and copiable station calling us, his callsign VU2MTT. With that one series of dashes and dots, a goal of mine had been achieved: being part of a team that worked 40 zones on 40 meters in one contest weekend (by the way, the team consisted of K1GQ, K1EA, and K1MM).

Now you may be thinking that this is not as big a deal as I'm making it out to be. Perhaps you're right. But it's events like that weekend that make contesting so great. It proved to me, yet again, that contesting is not just a game of calls and numbers. It's about personal achievement. It's the test of assembling a team of your friends to push the envelope of operating and propagation. Yes, it's about working 40 zones on 40 meters. After 25 years of contesting, I thought I had encountered just about all the thrills available. I have to admit, when my new friend VU2MTT called I was a little kid again. It reminded me of the excitement I experienced as a new contester when I had stations actually call *me* for the first time. It made me reminisce about the first time I worked Asia on 80 meters. The list is infinite and so is the fascination that comes from the hunt. That is what contesting is all about!

Calendar of Events

Jan.	**24-26**	**CQ WW 160 Meter CW Contest**
Jan.	25-26	REF CW Contest
Jan.	25-26	U.B.A. SSB Contest
Feb.	1	Northwest QRP Digital Contest
Feb.	1-2	New Hampshire QSO Party
Feb.	1-2	Vermont QSO Party
Feb.	1-2	Delaware QSO Party
Feb.	8-9	PACC Contest
Feb.	8-9	Digital Journal RTTY WPX Contest
Feb.	8-10	QCWA CW QSO Party
Feb.	14-16	YL-OM YLRL SSB QSO Party
Feb.	15-16	ARRL CW DX Contest
Feb.	21-23	YL-OM YLRL CW QSO Party
Feb.	**21-23**	**CQ WW 160 Meter SSB Contest**
Feb.	22-23	REF SSB Contest
Feb.	22-23	U.B.A. CW Contest
Mar.	1-2	ARRL SSB DX Contest
Mar.	8-10	QCWA SSB QSO Party
Mar.	9-10	Wisconsin QSO Party
Mar.	14-15	CLARA HF CW Contest
Mar.	15-16	Bermuda Contest
Mar.	15-17	Virginia QSO Party
Mar.	18-19	CLARA HF SSB Contest
Mar.	**29-30**	**CQ WW WPX SSB Contest**
Mar.	31	Low Power Spring Sprint
Apr.	5-6	EA RTTY Contest
Apr.	10-12	DX-NA CW YL Contest
Apr.	12-13	Japan Int'l HF CW DX Contest
Apr.	24-26	DX-YL Int'l HF SSB Contest
Apr.	26-27	Helvetia (HB9) Contest
May	3-4	ARI International DX Contest
May	**24-25**	**CQ WW WPX CW Contest**

The Real Story of Alpha

I rarely use my precious editorial space to endorse a commercial product or company. This month, however, I want to fill you in on a

8 Anchor Lane, Mt. Sinai, NY 11766-1200
e-mail K1AR@contesting.com
Compuserve ID: 71301,424

company that has had a profound impact on contesting—ETO/Alpha. By now many of you have heard that ETO was sold about a year ago to Applied Science and Technology, a technology firm in Massachusetts. The obvious concern of amateurs and contesters in particular was the outlook for ETO's amateur radio business. The good news is that ETO's amateur interests are alive and here to stay.

Recently at a local hamfest I had the pleasure of meeting with an old friend, Dave Wilson, AAØRS, who is better known in 160 meter circles as G3SZA. Together with Dick Ehrhorn, W4ETO, as chairman, Dave announced the creation of ALPHA/POWER, a new independent company specifically designed to take over the Alpha amplifier business from ETO. ALPHA/POWER's plan is not just to continue, but to enhance and reinvigorate all Alpha business functions.

The return of Alpha to independent ownership and operation will allow the new company to devote a level of priority to the amateur business that was impossible within the larger ETO operation—good news for many contesters.

To fill in the history, Dick Ehrhorn founded ETO in 1970 and designed all of the early Alpha linear amplifiers. ETO grew and diversified, becoming a $20 million company in 1995. For more than 10 years, ETO was the world's largest manufacturer of 5 to 30 KW linear RF amplifiers for magnetic resonance imaging (MRI) systems. More recently, ETO has become an important supplier of RF power to the semiconductor industry—hence the acquisition.

It's hard to kill an organization that has provided as many products to contesting as has Alpha. Fortunately, Dave Wilson has stepped up and will keep the dream alive. Keep an eye out for his new advertisements in the upcoming months.

Final Comments

Well, that wraps it up for this month. I appreciate the effort that many of you have taken to complete your CQ Contest Survey responses. My mailbox has been overflowing with data that will prove to be very interesting. Some of the results are going to surprise you! Look for the final results next month.

As I finish up this month's column, I'm riding on the Bridgeport, Connecticut Ferry on my way back to New England for another exciting week in high-tech. This may be the first *CQ* column written while the author was maritime mobile. While I don't have any claims of this vessel heading off to Heard Island, at least I can claim Long Island is an IOTA. Now I know the pileups will be fierce next time I sign on the air, hi!

Remember, I must receive your contest announcements for the May issue no later than March 1st. Make sure you send your information to my home QTH, please (8 Anchor Lane, Mt. Sinai, NY 11766-1200).

73, John, K1AR

Vermont QSO Party

0000Z Sat. to 2400Z Sun., Feb. 1–2

This is the 39th annual Vermont QSO Party sponsored by the Central Vermont Amateur Radio Club. This is a great opportunity to work one of the rarest states on several bands. Participation is open to all licensed radio amateurs worldwide on 160–2 meters.

Classes: Single or multi-operator all bands, club, QRP, rover.

Exchange: Vermont stations send RS(T) and county (14 total). Others send RS(T) and state/province or DXCC country.

Frequencies: Phone—first 25 kHz up from the beginning of the General band and Novice 10 meter band. CW—40 kHz up from the bottom edge of the bands and 20 kHz up from the bottom of the Novice portions. VHF—50.20, 144.20, and 146.69 MHz. Other modes can be used. Repeater contacts do not count.

Scoring: Credit 1 point per phone QSO and 2 points for CW or digital mode QSOs. Non-Vermont stations multiply total QSO points by the number of VT counties and special-event QSOs with W1BD. Vermont stations follow similar format with the addition of states/provinces/DXCC country multipliers. Stations may be worked up to four times per band (i.e., SSB, CW, RTTY, etc.).

Awards: Vermont stations submitting a log will receive a Vermont QSO Party certificate. Plaques will be awarded to the three highest scoring Vermont stations. Special certificates will also be awarded for the highest scoring station in each state, province, and DXCC country. There also will be a QRP category with the high-scoring station winning a certificate.

Send your postmarked entries no later than March 1, 1997 to: Central Vermont Amateur Radio Club, Vermont QSO Party, Barry Driscoll, KE1BV, P.O. Box 674, Montpelier, VT 05602. Include an SASE for final results.

New Hampshire QSO Party

0000Z Sat. to 2400Z Sun., Feb. 1–2

This year's party is again sponsored by the New Hampshire Amateur Radio Association. It's New Hampshire stations working all other stations. As with most QSO Parties, the same station may be worked once on each band mode.

Classes: Single or multi-operator all bands, club (large 50+, small <50), low power (<150 watts), high power, QRP, mobile, and above 50 MHz.

Exchange: RS(T) and QTH. County and state for NH stations; state, province, or country for others.

Scoring: All stations credit 1 point per SSB QSO and 2 points for digital QSOs (RTTY, CW, packet). NH stations multiply QSO points by number of NH counties, states, provinces, and DXCC countries. Others simply use counties. Count 5 points for phone and 10 points for CW when working the bonus stations: WB1CAG, KB1BRO, W1WQM, KC1XG, W1GUA, and K1BKE.

Final Score: Final score is calculated by multiplying QSO points times total multiplier and adding bonus points.

Frequencies: CW—1810, 3530, 7030, 14030, 21030, 28030. SSB—the first 25 kHz up from the bottom of the General band plus 50.20, 144.20, and 146.55 MHz. Repeater QSOs do not count.

Awards: Awards are available, although no details were provided in the announcement.

Logs must be received no later than March 31, 1997. Be sure to include an SASE for final results. Send logs and comments to: North Country ARC, Richard C. Force, WB1ASL, 12 Cottage Street, Lancaster, NH 03584-1903.

Dutch "PACC" Contest

1200Z Sat. to 1200Z Sun., Feb. 8–9

It's the world working The Netherlands on all six bands, 1.8 through 29.7 MHz, in the band sections recommended for contest operation by the IARU. The same station may be worked on each band, but on one mode only, phone or CW, for QSO and multiplier credit. Note that SSB QSOs are not allowed on 160 meters.

Categories: Single operator, multi-operator, and SWL.

Exchange: RS(T) plus a QSO number starting with 001. Dutch stations will add two letters to identify their province. There are 12 provinces: DR, FR, GD, GR, LB, NB, NH, OV, UT, FL, ZH, and ZL.

Scoring: Each QSO with a PA/PB/PI station counts one point. DX stations determine their multiplier by the number of provinces worked on each band (maximum of 72). Only one QSO is allowed per band, regardless of mode.

Final Score: Total number of QSOs times the number of provinces worked on each band.

Awards: Certificates will be awarded to the top-scoring station in each category in each country. Also second- and third-place awards if returns justify.

SWLs must log the call of the Dutch station as well as the station being worked and both serial numbers. Scoring same as above. Indicate the multiplier in a separate column in your log only the first time it is worked on each band. Include a summary sheet showing the scoring, your name and address in block letters, and the usual signed declaration.

Mailing deadline is March 31st to: PACC Contest, Frank E. van Dijk, PA3BFM, Middellaan 24, NL-3721 PH Bilthoven, Netherlands.

Digital Journal RTTY WPX Contest

0000Z Sat. to 2400Z Sun., Feb. 8–9

This is the third annual running of this fine digital mode contest sponsored by the *Digital Journal* and the International Digital Radio Association. This event is open to amateurs worldwide using any digital mode including Baudot, AMTOR, PACTOR, G-TOR, and CLOVER. Although inspired by the CQ WW WPX Contest, this contest is not affiliated with *CQ* magazine in any way.

Classes: Single operator (all band—high power and low power, single band), multi-single, multi-multi, and SWL. All categories are limited to 30 hours of operating except for multi-multi entries. Packet spotting is allowed in all categories.

Exchange: RST and serial number. Multi-multi stations may use separate numbers on each operating band.

Scoring: QSOs between stations on different continents are worth 3 points on 20–10 meters and 6 points on 40–80. QSOs with stations on the same continent but different countries are worth 2 points on 20–10 meters and 4 points on 40-80. QSOs with stations on the same continent and in the same country are worth 1 point on 20–10 meters and 1 point on 40–80. Each valid prefix is counted as a multiplier. Multipliers are only counted once (not per band). The CQ WPX rules are used to determine valid prefixes. The final score is calculated by multiplying total QSO points times the total multiplier.

Awards: A wide range of certificates and plaques is available for category winners. Contact AB5KD for more information.

Entries must be postmarked no later than 30 days after the end of the contest. Hard-copy logs and/or disks may be sent to: Ron Stailey, AB5KD, 504 Dove Haven Drive, Round Rock, TX 78664-5926. Electronic logs can be sent via Internet to <ab5kd@easy.com>.

QCWA QSO Party

CW: 1400Z Sat. to 0600Z Mon., Feb. 8–10
SSB: 1400Z Sat. to 0600Z Mon., Mar. 8–10

This is the golden anniversary of QCWA's fun, traditional QSO Party, open to all amateurs worldwide. Note that CW QSOs are only valid in the CW section and vise versa for SSB.

Classes: Single operator, all bands.

Exchange: Year of first license (1950 = "50"), chapter identification (members not belonging to a chapter should send "AL"), and state or DXCC country. Non-QCWA members do not send chapter information.

Scoring: Final score equals the total number of stations worked times the multiplier. Multipliers are the number of QCWA chapters worked during the contest (credit a chapter multiplier only once) and states, provinces, and countries. QSOs with W2MM count as 3 multipliers and 5 QSO points.

Frequencies: CW—3530–3560, 7025–7055, 14030–14060, 21040–21070, 28040–28070. SSB—3900–3930, 7230–7260, 14260–14300, 21350–21380, 28530–28560. No QSOs on WARC bands. Check 160 meters at 0400–0500Z and 1200–1300Z.

Awards: Certificates will be awarded to the top five scorers worldwide on each mode.

Separate logs and scores must be submitted for both modes. All logs must be received by April 1, 1997 and should be sent to: Arthur Monsees, W4BK, 420 Bay Ave., Apt. 1521, Clearwater, FL 34616 (February logs); and Donald Bice, W4PCO, 5511 18th Ave. N., St. Petersburg, FL 33710 (March logs).

YLRL YL-OM Contest

SSB: 1400Z Fri. to 0200Z Sun., Feb. 14–16
CW: 1400Z Sat. to 0200Z Sun., Feb. 21–23

Sponsored by the Young Ladies Radio League, this annual event is open to all licensed men and women operators around the world.

Exchange: Callsign, QSO number, RS(T), ARRL section/VE province/country.

Scoring: Phone and CW are considered separate contests. Score 1 point for each station worked. YLs only work OMs and OMs only work YLs. Credit a special multiplier of 1.5 if you are using 100 watts or less on CW and 200 watts PEP on SSB. Final score is the total QSO points times the sum of ARRL sections, provinces, and countries worked per band.

Frequencies: CW—3540–3570, 7040–70,

14040–070, 21120–150, and 28180–210 kHz. SSB—3940–70, 7240–70, 14250–280, 21380–410, 28280–410 kHz.

Awards: Special award cups will be awarded to the winning phone and CW YL and OM. Certificates will be sent to the high scorers in each US call area, VE province, and DX country, provided there are at least 10 valid QSOs in the log.

All logs are to be postmarked no later than 30 days after the contest and should be sent to: Nancy Hall, KC4IYD, P.O. Box 775, N. Olmsted, OH 44070-0775.

ARRL International DX Contest

CW: Feb. 15–16 Phone: March 1–2
0000Z Saturday to 2400Z Sunday

This is a great DX contest that you shouldn't miss. I strongly recommend that you study the announcement in the December issue of *QST* for more details. Also send a large SASE (2 IRCs for DX) for sample log and entry forms.

All bands may be used, 1.8 through 28 MHz, but not 10, 18, or 24 MHz. Aeronautical or maritime mobile stations cannot be worked for contest credit. Following is a brief outline.

Categories: Single operator, both single and all band, and single operator assisted. Multi-operator, one transmitter and two transmitters. Also multi-operator, multi-transmitter; and QRP, all band only (5 watts or less output). Multi-transmitter stations must remain on a band at least 10 minutes once a contact is made.

Exchange: RS(T) and state or province for W/VE; RS(T) and power input for DX stations (three-digit number).

QSO points: W/VE stations earn three points for each W/VE contact.

Multiplier: Each DXCC country worked on each band for W/VEs. DX stations use US states (48), District of Columbia (DC), and VE provinces (13) for their multiplier. (Maximum multiplier of 63 per band.)

Final Score: Total QSO points times the sum of the multiplier from each band. Entries with 500 or more QSOs must include a QSO check sheet.

Awards: Certificates given in each category, in each country, and in each ARRL section, plus a wide selection of plaques. Also certificates to DX stations making over 500 QSOs.

Disqualification regulations will be strictly enforced and are listed in the official rules. Mailing deadline for all entries is April 2nd, and they go to: ARRL DX Contest, 225 Main Street, Newington, CT 06111.

CQ WW 160 Meter SSB Contest

2200Z Fri. to 1600Z Sun., Feb. 21–23

Just a reminder that the SSB section of *CQ*'s 160 Meter Contest will be coming up the last full weekend of this month. Extensive coverage has been given to this event, with complete rules in the November issue. They are the same rules that have been used these past many years and are well known around the world.

Mailing deadline for your entry in last month's 160 CW contest is February 28th, and March 31st for this month's SSB section. They can be sent directly to the 160 Contest Director, David L. Thompson, K4JRB, 4166 Mill Stone Court, Norcross, GA 30092. Of course, they also can always be sent to the *CQ* office" CQ 160 Meter Contest, 76 North Broadway, Hicksville, NY 11801. (Indicate CW or SSB on the envelope.)

BY BUCK ROGERS, K4ABT

PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

The Mouse That Roared!

Have you ever wanted to make that handheld transceiver "kick some bootie"? Well, I just found the device to give your handheld some "personality," not to mention some teeth.

When I got the Mirage B-310-G, my intent was to use it with my MFJ-8621 five watt 9600 baud dataReady transceiver. That was before I tied my 3 watt Alinco handheld to it. Oh well, Jean Ann, I think I need another Mirage B-310-G Bi-Lateral Amplifier. I don't know which of the features gives me the best bang for my buck—the GaSFET receive pre-amplifier or the boost in power output from the handheld. The power punch developed by the linear amplifier gives me a smooth power curve from one end of the 2 meter band (144 to 148 MHz) to the other.

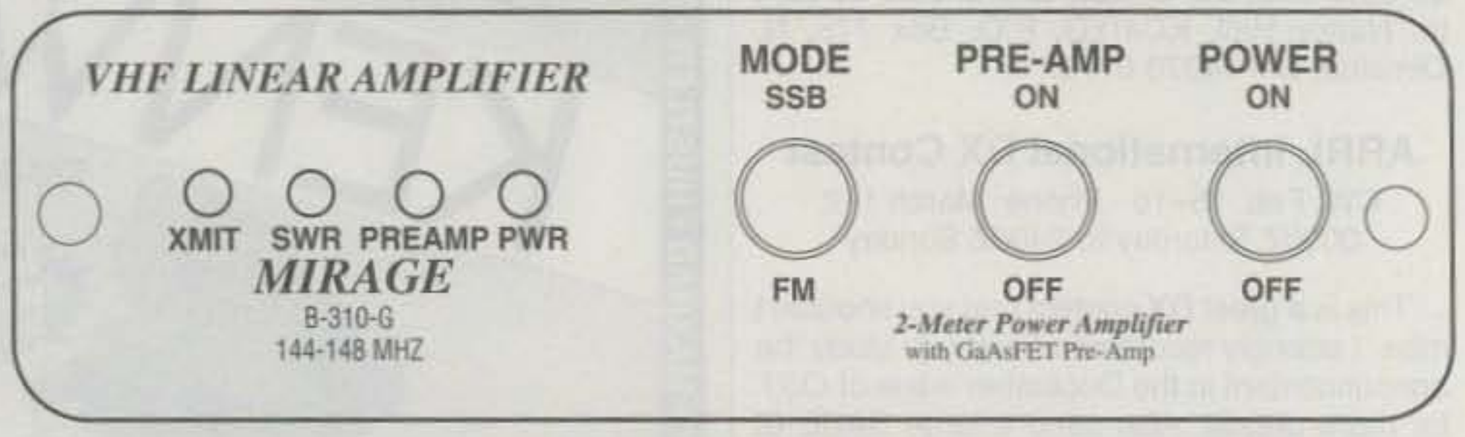

Fig. 1– Front (control) panel layout of the Mirage B-310-G 100 watt power amplifier with GaAsFET pre-amplifier.

The Mirage B-310-G

The Mirage B-310-G is a VHF power amplifier designed for the 144–148 MHz band. New features make it the most useful and versatile amplifier available for the handheld transceiver. Its all-mode compatibility (FM/SSB/CW), wrap-around heat sink, high-gain GaAsFET pre-amplifier, and 250 mw to 8 watts input begin the lineup of useful features.

What About The Power Input vs Output?

Well, I was beginning to think you would never ask. Take a look at the power curve of the B-310-G. Rather than plot a graphic curve using a nomogram, we will put the I/O ratio into a more readable format as shown in Table I.

Features of the B-310-G

Features of the Mirage B-310-G include:

• High output power of more than 100 watts with up to 8 watts input.

• All-mode compatibility (FM/SSB/CW). In the SSB mode the time constant of the Carrier Operated Transmit (COX) relay is set to approximately one second to prevent annoying relay chatter during conversation and to achieve smooth SSB transmission.

• Wrap-around heat sink. The heat sink and combined case was designed for excellent heat dissipation as well as a new smart appearance.

• Input power from 250 mw to 8 watts. With an input power of 8 watts maximum, the Mirage B-310-G is compatible with most modern handheld transceivers.

• GaAsFET receive pre-amplifier. A built-in low-noise GaAsFET receive pre-amp enables you to enjoy a more comfortable VHF QSO with weak stations.

• The manual is short and concise. It is small but well defined and includes a complete schematic of the PA and receive circuitry.

The specifications (see Table II) are not padded and fully support the behavior of the B-310-G in every way. I ran several tests with the B-310-G and in every phase and test the B-310-G excelled.

For $199 you can boost your 2 meter handheld to a whopping 100 watts of power, mobile or base! Talk farther and hit those distant repeaters. Or if you are into packet radio, you can hit that distant node or digi with the extra punch you've often wished for.

The rugged construction of the Mirage B-310-G amplifier makes it ideal for the off-road vehicles and "four bys" while operating any mode—FM, SSB, and CW—although I don't recommend operating CW while trying to maneuver over rough terrain.

The low-noise GaAsFET pre-amp provides an added 15 to 18 dB of gain to dig out those weak signals. Also, full SWR protection prevents damage from sudden changes in VSWR when the mobile antenna is whipping about in the breezes or whacking limbs when running off-road. Protection from reverse polarity is another feature that can save your amp if you accidentally connect power backwards when moving it from base to mobile.

LEDs, Switches, And Connectors

On the **front panel** are the following:

XMIT LED: The XMIT LED indicates the amp is transmitting on the air.

SWR LED: The SWR LED lights when the SWR is too high.

Pre-amp LED: The Pre-amp LED will illuminate when the pre-amp is engaged. The pre-amp can be used independently if the amplifier's power is off.

PWR LED: If the LED is in the OFF position the amplifier will pass the RF through the PA without amplifying. This means that both the receive and transmit signal will bypass the internal circuitry of the amplifier. If the LED is illuminated, the amplifier is in standby/ready and will amplify any signal that is supplied to its input of more than 250 mw.

Mode (SSB/FM) Switch: When in the SSB mode the amplifier will delay the change over time of the carrier-operated transmit relay to 1 second before disengaging. This prevents relay chatter as a result of working SSB or CW. In the FM mode the relay will operate normally and disengage once the transmit signal is dropped.

Pre-amp (On/Off) Switch: When engaged, the amplifier's pre-amp will be switched into the circuit for receive. A sensing circuit will disengage the pre-amp when a transmitted signal is applied to the amplifier's input. The pre-amp may also work independently if the amplifier's main power switch is off.

Power (On/Off) Switch: When engaged, the amplifier is ready to amplify any signal applied to its input within the frequency range of the amplifier.

The **back panel** has the following:

Antenna: The coax (output) from your antenna is connected to this port.

+13.8 VDC: The red wire is for positive and incorporates a Fuse holder. The Black wire is for negative. The B-310-G amplifier will accept voltages of 12 to 15 volts DC.

Radio: The coax from (input) your radio or exciter is connected to this port.

External Keying: Used to manually key the amplifier relay from an external source.

Installation

The Mirage B-310-G may be mounted using the mounting brackets (supplied) or simply placed in a convenient operating position. In either case, there must be adequate ventilation for the

Power Curve—Typical B-310-G Output Power							
Watts In	1/4	1/2	1	2	4	6	8
Watts Out	25	50	75	95	100	100+	100+

Table I– Power curve of the Mirage B-310-G in tabular form.

211 Luenburg Drive, Evington, VA 24550
e-mail: buck4abt@inmind.com

Specifications of the Mirage B-310-G

Frequency: 144 to 148 MHz
RF input: 250 mw to 8 watts
RF Output: 100 watts typical
Duty Cycle: Intermittent (ICAS)
Modes: FM, SSB, CW
Receive Pre-amp: 18 dB typical
Keying: Automatic sensing
Supply voltage: 12 to 13 volts DC
RF connectors: Two SO-239 UHF
Supply current: 15 amps typical
Fuse: Fast blow, 8 amp
Input/Output Impedance: 50 ohms

Table II– Specifications of the Mirage B-310-G 100 watt power amplifier are fully supported by the actual use of the unit.

finned heat sink. A little room at the bottom would be a good idea also, since the quiet fan will need an uninhibited air flow. This generally means at least 1 inch clearance from the heat sink to any surrounding enclosure and an unobstructed flow from the front to the back of the heat sink. Do not operate the amplifier in places where it will be exposed to another heat source such as heaters, radiators, etc.

One other caution: With extended transmissions (long-winded operators) the heat sink may become quite hot. This is where the built-in fan comes into play.

Wiring and Operation

The the only "shortcoming" I encountered with the Mirage B-310-G amplifier is the power leads could be extended about two additional feet. As received, the power leads were 30 inches long. If it becomes necessary to extend the DC power leads, use wire of the same gauge in order to avoid a voltage drop between the power source and the B-310-G. Be careful that the DC power supplied is no higher than 15 volts or damage could result. A source voltage of 13.8 volts is recommended and should be used whenever available.

Note: Some automobiles will generate a high current surge when started. I therefore make sure the B-310-G is off when I start the engine.

No More "Gotchas"

Remember how we often reach a point in the installation and suddenly remember that we didn't pick up those connectors and coax to interface the transceiver to the input of the amplifier? BOING!

We forgot to get a coax jumper, and even if we have the coax to make the jumper, the output of the handheld has a BNC connector instead of a UHF (SO-239) connector. Whoops!

Well, don't get agitated. Mirage remembered for us. Mirage has stepped out front and included a prepared length of good-quality coax already fitted with a PL-259 on one end and a handheld-ready BNC connector on the other. We don't even have to bother with fitting the BNC center pin onto the antenna.

The Antenna

Now let's round out the installation and connect the antenna to our B-310-G. We should make sure our antenna has a VSWR of 1.5:1 or bet-

ter for optimum performance. If used in a mobile installation (as I have done), choose a good mobile antenna that will withstand the power of this beast. Be sure to check the SWR for any degradation after the antenna has been in use with the B-310-G for a few minutes. I used my MFJ-249 antenna analyzer to make the VSWR test prior to putting power from the B-310-G into it. Just to be on the safe side, an antenna with a rating of 125 watts or more is recommended.

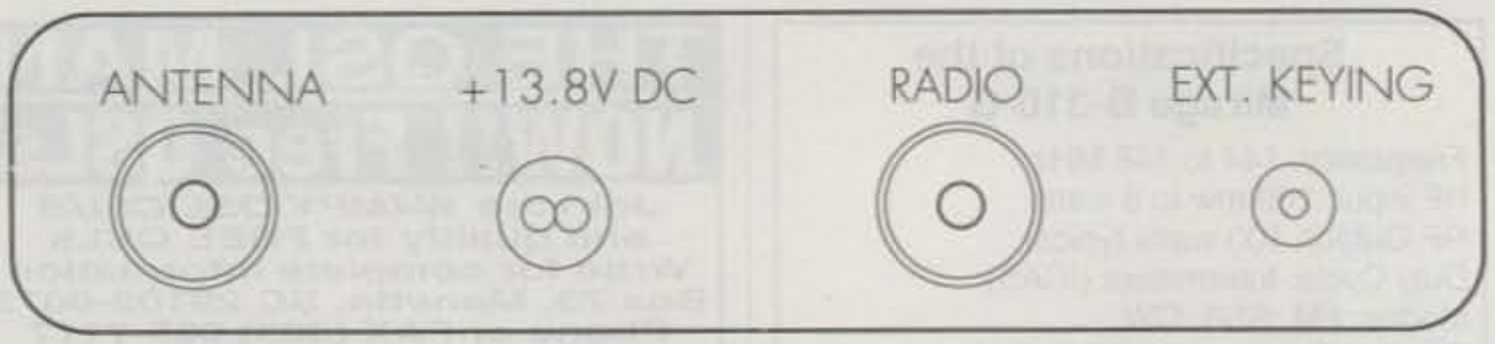

Fig. 2– Here is the rear view of the Mirage B-310-G power amplifier. Note the external keying jack. The B-310-G has built-in cooling fan for added cooling and protection of the internal PA components and power tansistors.

Simple and Easy Troubleshooting

The Mirage B-310-G is designed for long, trouble-free performance and should not require extensive in-the-field troubleshooting. If difficulty is encountered, check the following before assuming the amplifier has malfunctioned.

1. Loose antenna or power supply connections.
2. SWR of the antenna system.
3. Coaxial cables from radio to amplifier, and amplifier to antenna.
4. Low supply voltage from the power supply or automobile battery.
5. Power output of radio.
6. Improper fuse rating.

Technical Assistance

If for any reason you think you might have a problem with your unit, look at the troubleshooting section of the manual and make sure you are not overlooking the obvious. If the manual does not reference your problem or your problem is not solved by reading the manual, you may call Mirage at 601-323-8287. To expedite service, have your unit, manual, and all information on your station handy when you talk with the technicians at Mirage.

You also can send questions by fax to 601-323-6551. Send a complete description of your problem, an explanation of exactly how you are using your unit, and a complete description of your station.

Summary

Mirage's integrated Heatsink Cabinet™ and whisper-quiet fan gets heat out fast! This is how Mirage has been able to build this ultra-compact 4 3/4" × 1 3/4" × 7 3/4", 2 1/2 pound amplifier that delivers a powerful 100 watts.

They've included a free 3 foot handheld to B-310-G coax cable. Just plug and play! There are tall rubber mounting feet for home use and a mobile mounting bracket. Also included is an automatic RF sense Transmit/Receive switch; remote keying jack; LEDs that monitor "On Air," high SWR, pre-amp, and power; and pushbuttons that select SSB/FM, pre-amp, and power. The unit draws 15 amps at 12–15 VDC.

The B-310-G comes with a full one-year Mirage warranty, but with Mirage's traditional rugged design, you may never need to use the warranty. The unit is priced at $199. For more information contact Mirage, Communications Equipment, 921 Louisville Road, Starkville, MS 39759 (phone 601-323-8287; fax 601-323-6551). You can also visit the Mirage Internet web site at <http://www.mirageamp.com>.

73, BucK4ABT
e-mail at <BucK4ABT@inmind.com>

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- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)

SL SERIES

• LOW PROFILE POWER SUPPLY

MODEL	Colors Gray	Colors Black	Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11R-MC		•	7	11	5¾ × 7¼ × 9¾	13
SL-11R-GE	•		7	11	5¾ × 7 × 9¾	13
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13
SL-11R-EFJ		•	7	11	5⅛ × 7¼ × 9¾	13
SL-11MG		•	7	11	5⅛ × 7 1/18 × 9¾	13
SL-15R	•	•	12	15	2⅝ × 7 × 9¾	13
SL-15R-GE	•		12	15	5⅛ × 7⅝ × 9¾	14
SL-15R-RA		•	12	15	4¾ × 7¼ × 9¾	14
SL-15R-EFJ		•	12	15	5⅛ × 7 1/18 × 9¾	14

RS-L SERIES

• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL		Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
RS-4L	•	3	4	3½ × 6⅛ × 7¼	6
RS-5L	•	4	5	3½ × 6⅛ × 7¼	7

RM SERIES

MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 1	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty [Amps] @13.8VDC	@10VDC	@5VDC	ICS* [Amps] @13.8V	Size [IN] H × W × D	Shipping Wt. [lbs]
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
VS-70M	57	34	16	70	6 × 13¾ × 12½	48
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

ICS - Intermittent Communication Service (50% Duty Cycle 5 min. on 5 min. off)

BY DOUG DeMAW, W1FB

DOUG'S DESK

CONSTRUCTION PROJECTS, TECHNIQUES, AND THEORY

Go QRP with Double Sideband

Emphasis on the use of CW for QRP operation continues, despite most of today's amateurs preferring voice operation. The scarcity of SSB QRP signals may be attributed in part to a fear of not being heard with low power amid the din of QRO signals, especially on 20 and 75 meters. One might conclude also that the CW QRP mode is chosen by builders of homemade gear because these circuits are of simple design, and the cost for parts is minimal compared to the cost of those needed for an SSB transmitter.

A simple approach to low-power phone operation is the long-neglected DSSC (double sideband suppressed carrier) method. Some operators might argue that it is wrong to put a DSB signal in our crowded phone bands. After all, there is a hue and cry heard on some frequencies because AM operators are transmitting two sidebands, along with a potent carrier that creates loud heterodynes in SSB receivers. However, the power levels used by those operators is in the 100-watt-plus range, whereas few QRP operators use more than 10 watts of PEP SSB output power. It is hard to imagine a 1 or 5 watt DSB signal being a threat to anyone who is communicating in "kw alley."

Surprising distances can be spanned with a QRP phone signal if an effective antenna is used. Choosing a quiet frequency is important. I have lowered my SSB transmitter output power from I kw to 1 watt a number of times when carrying on a QSO in the 160 and 75 meter bands. When propagation conditions were good I remained Q5, even with 1 watt of output power. The difference in signal strength from 1 kw to 1 watt is 30 dB. Thus, if your 1 kw signal happened to be S9 plus 30 dB at the other end of the QSO, it would drop to S9 at 1 watt. Signals as weak as S3 are often readable if band noise is low. This article describes a simple DSSC generator for use as the heart of a QRP phone transmitter.

P.O. Box 250, Luther, MI 49656

A Low-Cost DSSC Generator

Unlike SSB, DSB can be accomplished without using the heterodyne technique. Specifically, the DSB signal is created at the desired operating frequency, *al la* the direct-conversion receiver principle in reverse. This simplifies the circuit and requires fewer parts than are needed for an SSB generator. Carrier suppression is not as great as when the same circuit is used with a crystal filter in an SSB generator, but it can be as deep as 25 dB. A four-diode doubly balanced modulator would provide greater carrier suppression. Removing one sideband with a filter makes it possible to realize as much as 40–50 dB of carrier suppression in a well-designed circuit.

Fig. 1 contains a practical circuit for generating a DSSC signal. U1 is the microphone

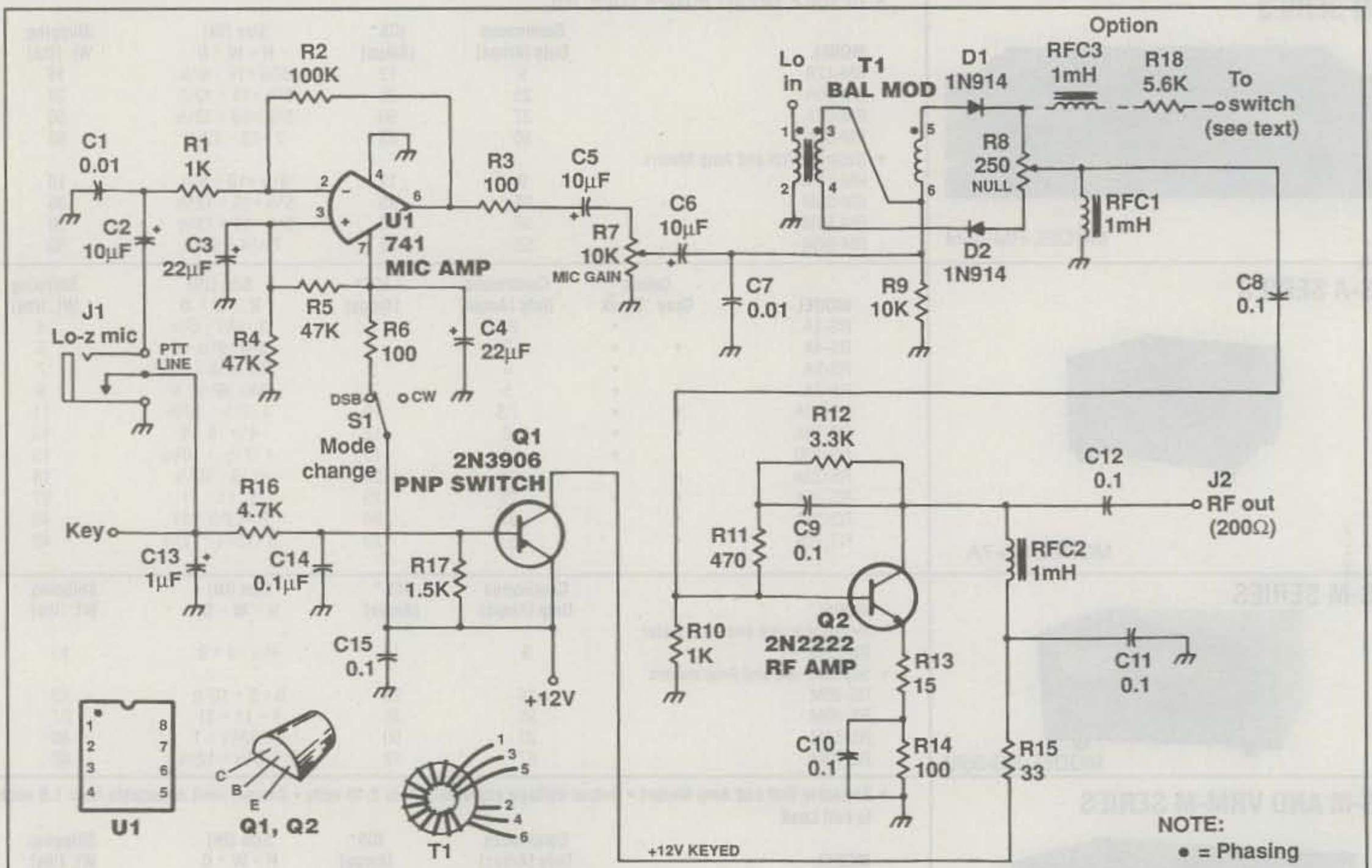

Fig. 1– Schematic diagram of the DSB generator. Decimal value capacitors are in µF. Polarized capacitors are electrolytic or tantalum. Resistors are 1/4 watt carbon. D1 and D2 are matched 1N914 silicon diodes (see text). RFC1–RFC3 are miniature molded RF chokes (Mouser brand). R7 is a 10K ohm audio taper carbon control. R8 is a 250 ohm linear taper PC-mount carbon control. T1 has 12 trifilar-wound turns (three wires in parallel) of No. 28 enamel wire on an Amidon FT-37-43 ferrite toroid (observe polarity).

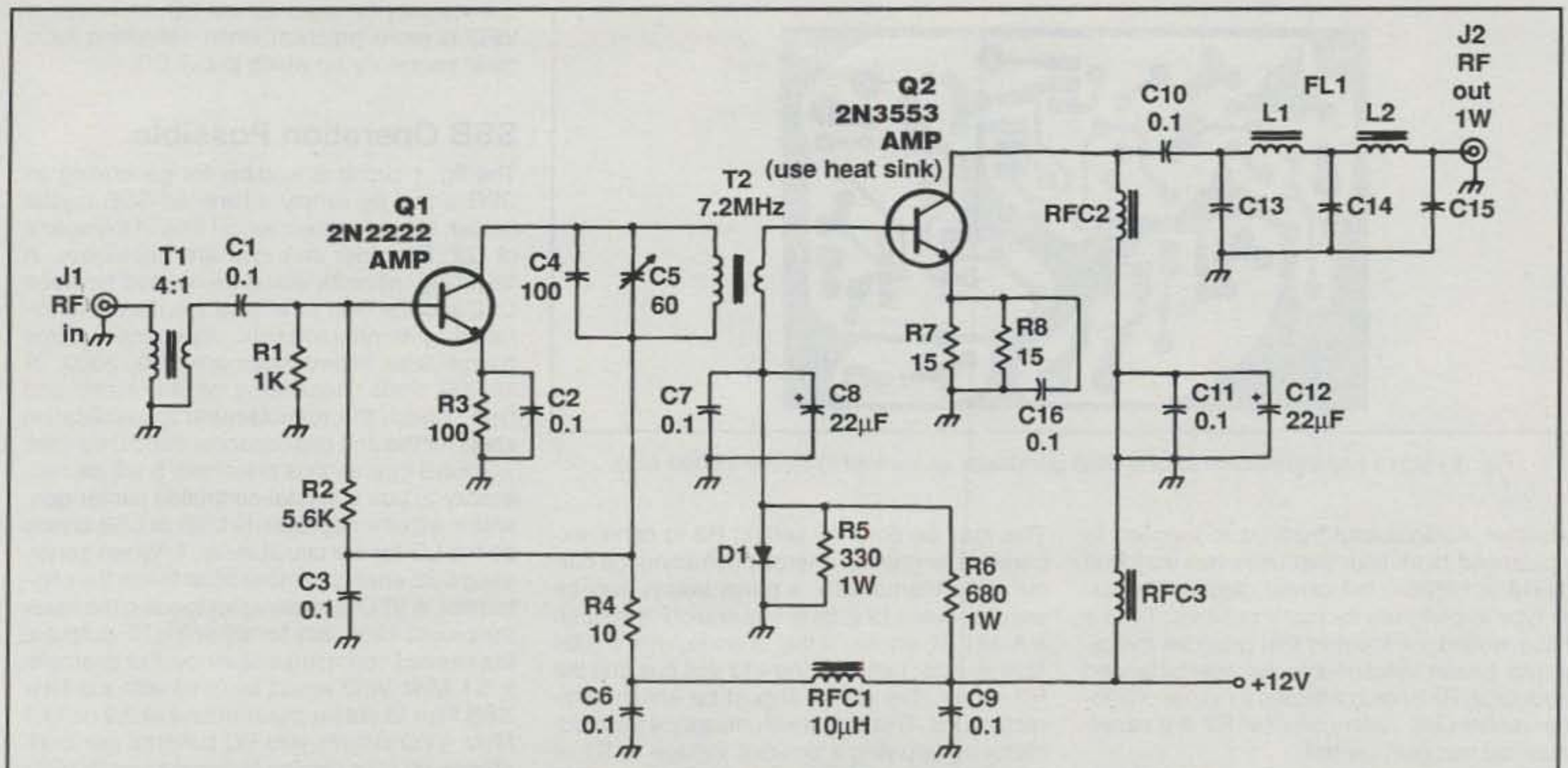

Fig. 2– Suggested circuit for a 1 watt linear amplifier for use with the circuit in fig. 1. C5 is a 60 pF plastic trimmer. C13, C14, and C15 are silver mica or polystyrene capacitors. D1 is a 50 PRV, 1 amp rectifier diode. L1 (1 µH) has 16 turns of No. 26 enam. wire on an Amidon T50-6 toroid. L2 (1.98 µH) has 22 turns of No. 26 enam. wire on a T50-6 toroid. RFC1 is a miniature 10 µH molded RF choke. RFC2 and RFC3 consist of 12 turns of No. 26 enam. wire on Amidon FT-37-43 ferrite toroids. T1 has 12 primary turns of No. 26 enam. wire on an FT-37-43 ferrite toroid. The secondary has 6 turns of No. 26 enam. wire. T2 (3.8 µH) contains 28 turns of No. 26 enam. wire on an Amidon T50-2 powdered iron toroid. The secondary has 4 turns of no. 26 enam. wire.

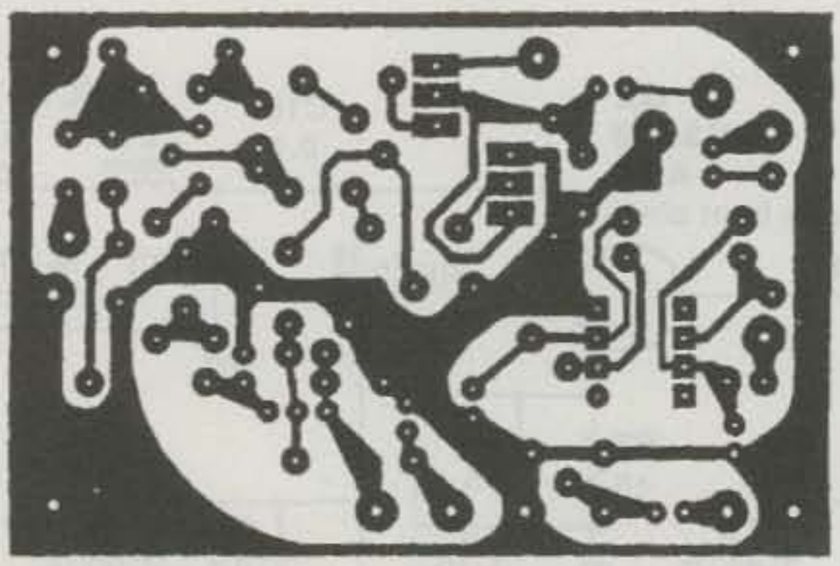

Fig. 3– Scale etching pattern for the DSB generator as viewed from the etched side.

amplifier. Audio output from U1 is supplied to a balanced modulator that uses two matched 1N914 or HP2800 hot-carrier diodes. The latter type is preferred by many builders. T1 is a trifilar-wound transformer that provides the required phase relationship for the balanced modulator. Balance is effected by virtue of trimmer resistor R8. Potentiomener R7 is a panel-mounted mic gain control.

RF output from the balanced modulator is amplified by class A linear amplifier Q2. This fed-back amplifier has an input impedance of 50 ohms and an output impedance of 200 ohms. Stage gain is 15 dB.

Q1 is a keying switch for CW and PTT operation. It turns on Q2 when S1 is in the CW position and the base of Q1 is grounded with a key or the mic. In order to operate this circuit on CW, it is necessary to unbalance D1 and D2. This may be done by setting R8 to either extreme of its rotation, thereby defeating the carrier null. Alternatively, a panel switch may be used to route +12 volts to one end of R8 through a 1 mH RF choke. If this is done, use a 5.6K ohm resistor between the +12 volt bus and the RF choke. The choke should be attached directly to R8. This circuit will unbalance the modulator by applying a positive voltage to D1 or D2. A single switch can provide the entire CW/DSB mode change if S1 is a DPDT type. Being able to create a carrier for tuning up is essential also for checking the output power of the DSB transmitter, or when performing antenna SWR adjustments.

The LO (local oscillator) energy is fed to terminal 1 of T1. The RF level at this port should be +7 dBm, or roughly 1 volt RMS. A crystal oscillator or VXO for the desired operating frequency may be used for the LO. However, a VFO is more practical when searching for a clear frequency on which to call CQ.

SSB Operation Possible

The fig. 1 circuit is suitable for generating an SSB signal by simply adding an SSB crystal ladder, lattice, or mechanical filter at the output of Q2. No other changes are necessary. A matching network would be needed between C12 and the filter to ensure the filter is terminated in its characteristic impedance. Some typical filter impedances are 500, 2000, or 10,000 ohms, depending on the brand and type. Check the manufacturer's specification sheet for this and end capacitor values required.

If SSB operation is preferred, it will be necessary to use a crystal-controlled carrier generator with the appropriate USB or LSB crystal as the LO for the circuit in fig. 1. When generating SSB energy, a mixer must follow the crystal filter. A VFO is required for feeding the mixer the proper frequency for obtaining RF output at the desired operating frequency. For example, a 5.1 MHz VFO would be used with a 9 MHz SSB filter to obtain mixer output at 3.9 or 14.1 MHz. VFO circuits with PC patterns are available in *W1FB's Design Notebook* and *W1FB's QRP Notebook*.[1]

A 1 Watt Linear Amplifier

Fig. 2 shows a suggested circuit that can be used alone, or as a driver for a 5 or 10 watt linear amplifier. As an alternative, you may use the broadband amplifier described in *W1FB's QRP Notebook* (2nd edition), page 135, by add-

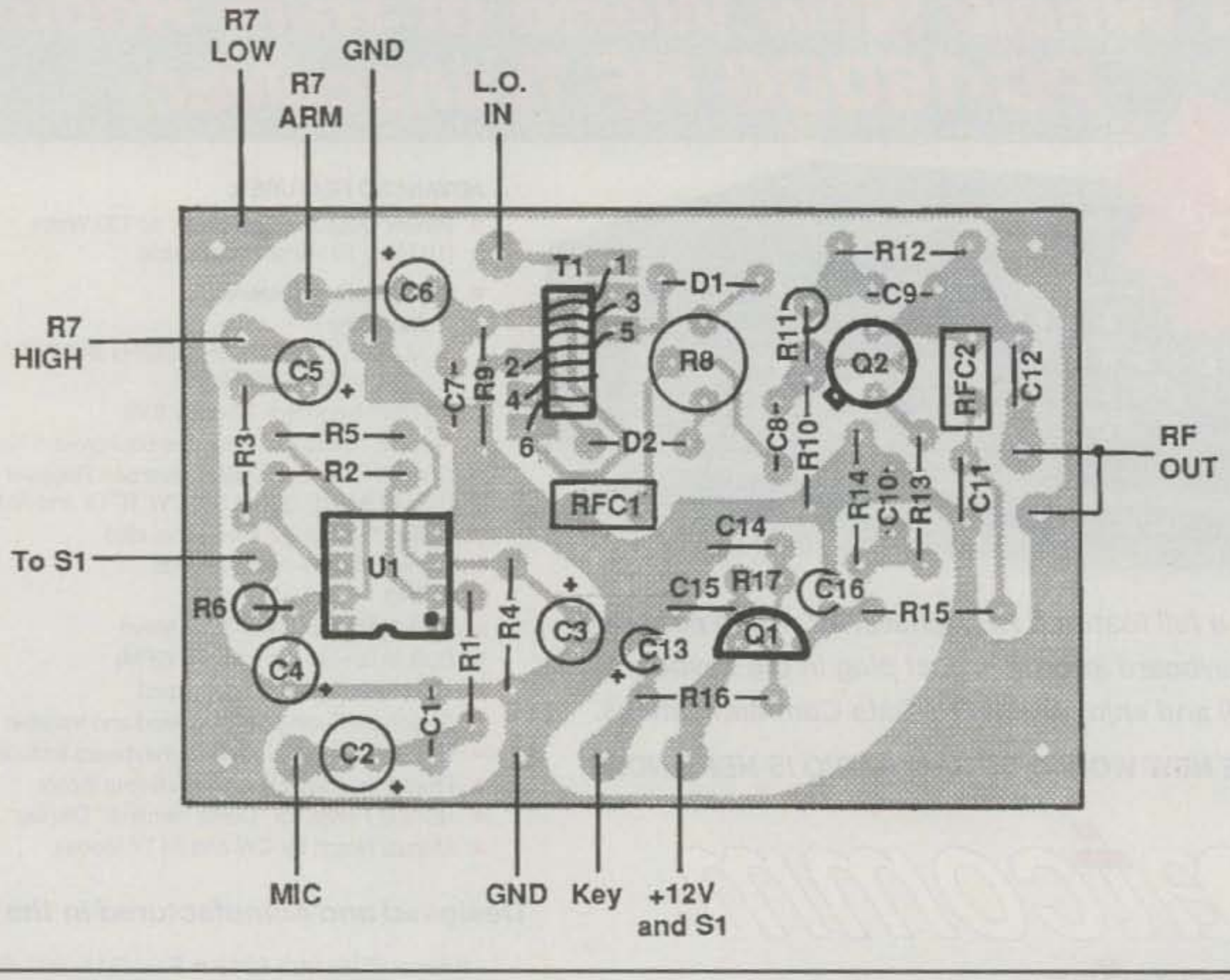

Fig. 4– Parts-placement x-ray view of the DSB PC board as seen from the component side of the board (not to scale).

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TS-50S HF Transceiver

Super compact! • 160–10M Amateur Band operation 500kHz–30MHz General Coverage receiver • 100W output Dual vfos • DDS (Direct Digital Synthesizer) with "fuzzy-logic" control • AIP system • 100 memory channels Dual-menu system • Multi-function microphone • 12V DC @ 20A • 7"w x 2½"h x 9"d, 6½ lbs..... **$1019.95**

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ing a harmonic filter at the output. PC board information is included with that circuit.

The input matching transformer (T1) in fig. 2 permits interfacing the fig. 1 circuit with Q1 of fig. 2. Q1 operates as a tuned class A amplifier at 7 MHz. It drives amplifier Q2 to approximately 1 watt of output power. D1 establishes the required class A mode for linear service. Substantial decoupling with RF chokes and bypass capacitors is used in the Q1 and Q2 +12 volt bus to discourage unwanted RF feedback which can cause self-oscillations to occur. FL1 is a low-pass filter. It launders the Q2 output energy and helps prevent harmonics from reaching the antenna. It also matches the Q2 collector impedance (72 ohms) to a 50 ohm antenna impedance.

A large press-fit type of heat sink should be used on Q2 to protect the transistor from excessive junction heating: The idling current prevents the transistor from resting between words.

The D1 barrier voltage (+0.7) forward biases Q2 for linear operation. This diode, in combination with C8, regulates the bias voltage. R7 and R8 protect Q2 from going into thermal runaway and destroying itself. SWR and voltage-spike protection can be realized by connecting a 33 volt Zener diode between the Q2 collector and circuit ground.

Construction Notes

A scale etching pattern for the DSB generator is given in fig. 3. Fig. 4 contains a parts-placement guide, as viewed from the component side of the PC board. Etched, drilled, and plated boards for this module are available for $4.50, plus $1.50 s&h.[2] Toroid cores may also be purchased by mail.[3]

D1 and D2 in fig. 1 should be a closely matched. You may do this by checking the diode forward and back resistances with a VTVM or VOM. Typically, the forward resistance will be between 6 and 10 ohms for 1N914 diodes. The back resistance will be 1 megohm or greater. The forward resistance is of the greatest importance for this and similar circuits.

Keep all component leads as short as possible by snugging the parts against the PC board. Unnecessarily long capacitor, resistor, and transistor leads introduce stray inductance that can cause instability and lower the circuit gain (degeneration).

Operation

Adjustment of the DSB generator is simple. Connect a low-impedance mic to J1 of fig. 1. Terminate output port J2 with a 220 ohm resistor (close enough to 200 ohms). Use 6 feet of wire as a short antenna. Attach it to the load resistor. Adjust the VFO (connected to the LO port) to a clear 40 meter frequency. Apply +12 volts and engage the PTT switch. Tune in the signal and adjust R8 for the lowest S-meter reading obtainable (null). This may be done more precisely by connecting an oscilloscope to the 220 ohm load resistor and adjusting R8 for minimum waveform height. Next, speak into the mic and observe the scope or S-meter. The DSB output power should rise substantially when you speak into the mic.

If you are a dedicated QRPp operator, you may want to try your luck with the 25 mw PEP output signal from the fig. 1 generator. This requires a 4:1 broadband transformer and a simple 50 ohm pi-section filter connected at J2. A local amateur should be able to give you an on-the-air check of your signal quality if you attach your 40 meter antenna to the module.

Final Comments

I chose the 40 meter band for this project because it offers good day and night-time communication conditions. Generally it is easier to find a clear frequency on 40 meters than on 75 or 20 meters. However, a 75 meter version of this circuit should be suitable for day-time operation when the band has low occupancy. There are good possibilities for DSB QRP fun on 160 meters after dark. I have had solid QSOs on 1.9 MHz with stations 500 miles away while using 1 watt of SSB power.

It is time to include phone operation in our QRP activities. Perhaps some of the QRP kit suppliers will recognize the potential of the DSB and SSB modes. How nice it would be to have low-cost kits available for CW and DSB or SSB operation.

Notes

1. The ARRL, Inc., 225 Main St., Newington, CT 06111.

2. FAR Circuits, 18N640 Field Ct., Dundee, IL 60118 (847-836-9148). A catalog of boards is available.

3. Amidon Associates, Inc., 3122 Alpine Ave., Santa Ana, CA 92704 (714-850-4660). A catalog is available. 73, Doug, W1FB

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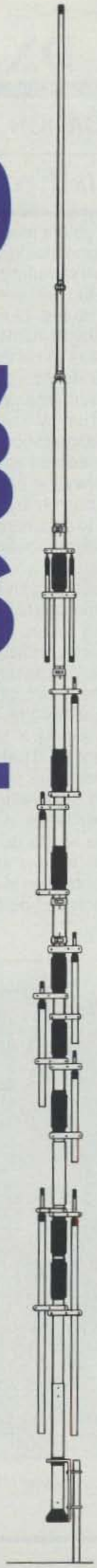

If you want an antenna for 80 meters, buy a real 80 meter antenna—The DX88 by Telex. The DX88 was designed for 80 through 10 meters. Don't settle for an antenna that's close and requires a kit. The DX88 offers coverage of all the HF amateur bands, including the WARC bands.

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CIRCLE 138 ON READER SERVICE CARD

DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

A Few Private Thoughts From A DXpedition Leader

This month I will turn over this space to Bob Schmieder, KK6EK, one of the two leaders of the 1997 Heard Island DXpedition. Bob gives DXers an inside look at what a serious DXpeditioner faces. His story should be required reading for everyone who works a DXpedition. Keep these thoughts in mind the next time you complain about having difficulty working a given operation. The DXpeditioners had a harder time getting to where they can give you a contact than you ever will have making that QSO from the comfort of your home. —VP2ML

There is no doubt about it: This is the most difficult, complicated, and expensive amateur radio expedition ever attempted. I am writing this in mid-November 1996, as we close in on the time for departure. Our preparations are essentially complete, save a few details such as propane fittings, elephant seal repellent (does anyone have any?), and extra socks. It's too early to start looking back, but with the hard part behind us, I willingly yield to a brief philosophical interlude. I record my feelings so I won't forget them. Share them with me; you may be sharing the airwaves with us as you read this. Already I am feeling underway, in the helicopter, on the island, erecting a city of tents, experiencing the violent wind and the drone of six Honda generators, sopping clothes and the mantra of CW pileups, the titanic volcano Big Ben looming over us issuing smoke and steam, the stench and noise of a million penguins, the thrill of operating a radio from the edge of the world . . .

It already has been quite a journey to get to this point. We have acquired and shipped two 20 foot containers crammed with 10 tons of gear to Reunion Island, nearly on the other side of the world from us here in California. The gear includes 7 wood-floor shelters, 8 generators, 6 radios, 56 antennas, 2000 gallons of gasoline, 1000 pounds of propane, food for 20 men for three weeks, 22 cots, 12 tables, 20 chairs, 6 computers, a microwave oven and copier, a small tractor, a big wagon, and a complete outhouse. We have raised almost $300,000. We have assembled a team of 20 radio amateurs from 10 nations worldwide. We have implemented by far the most complicated and extensive system for worldwide distribution of information from an expedition. And we already have souvenir coffee mugs. Nearly all this was put in place using e-mail and the World Wide Web for team communications.

We made a big mistake along the way, and it cost us dearly. Our original plan—developed by Ralph, KØIR; Peter, ON6TT; and myself—was to do this expedition in the winter of 1995. Most of the project was in place: the team, the permit, the equipment, the publicity. What didn't materialize was the transportation. At the last minute Australia seemed to deliver to us a miracle, but it was a crook in disguise. When he stole our money, we realized that this was going to be a hard one. We came home and thought it over very seriously, and re-designed the whole thing.

The real problem with Heard Island is that it's not on the way to anywhere. There are no shipping routes nearby, not even any regular tourist traffic. Therefore, getting there is very expensive. This simple fact will overwhelm almost any plan aimed at economy or simplicity. Unless you are willing to put your life at stake, you need to be well-financed. That's the start and end of it—money. How to get enough of it to get there on a round-trip ticket. There are a few other items in the middle, of course, such as where do you get people willing and able to take six weeks out of their commitments to go play radio in a very nasty place? How do you ensure that they will be comfortable, at least sufficiently so to do their job, and maybe even enjoy it? How do you collect a critical number of these people to make a team, and how do you coordinate this team in advance to ensure it functions efficiently and fairly? How do you respond to the expectations of individuals when they may conflict with the needs of the project as a whole?

Rade, YU8DX at his rig ready to go.

The positive side of HI is that it is one of the places thought about most by radio

The 1996 Insua Island IOTA EU-150 DXpedition team, CQ2I, multi-op for the 1996 IOTA Contest.

P.O. Box 50, Fulton, CA 95439

The WPX Program

SSB

2612	KZ9A	2616	JH3SAC
2613	YU7YZ	2617	TI5RLI
2614	OH2BLF	2618	F5PCX
2615	OD5NH		

CW

2929	S53EO	2933	OH2BLF
2930	DL8YR	2934	IK7QJH
2931	N1KCE	2935	JF2AFP
2932	EA3AIZ	2936	DL4DQA

Mixed

1765	OH2BLF	1767	IK4QJH
1766	WAØCLR	1768	JA6GT

Mixed: 450 OH2BLF, WAØCLR, IK4QJH, JA6GT. 500 OH2BLF, WAØCLR, IK4QJH, JA6GT. 550 OH2BLF, WAØCLR, IK4QJH, JA6GT. 600 OH2BLF, WAØCLR, IK4QJH. 650 OH2BLF, WAØCLR, IK4QJH. 700 OH2BLF, WAØCLR, IK4QJH. 750 OH2BLF, IK4QJH. 800 OH2BLF, IK4QJH. 850 OH2BLF, IK4QJH. 900 OH2BIF, IK4QJH. 950 OH2BLF. 1000 OH2BLF. 1100 N4PYD. 1150 N4PYD. 1200 I7PXV. 1250 I7PXV. 1300 I7PXV. 1350 I7PXV. 1400 I7PXV. 1450 I7PXV. 1500 I7PXV. 1550 I7PXV. 1600 I7PXV, CT1EEB. 1650 I7PXV, CT1EEB. 1700 I2EAY, I7PXV, CT1EEB. 1750 I7PXV, CT1EEB. 1800 JA1-20784, I7PXV, CT1EEB. 1850 JA1-20784, I7PXV. 1900 JA1-20784, I7PXV. 1950 JA1-20784. 2000 JA1-20784. 2250 N6JM. 2300 N6JM. 4000 W2FXA.

SSB: 350 KZ9A, OH2BLF, JN3SAC, TI5RLI, F5PCX, JF2AFP. 400 KZ9A, OH2BLF, TI5RLI, JN3SAC, F5PCX, JF2AFP. 450 KZ9A, OH2BLF, JN3SAC, TI5RLI, F5PCX, JF2AFP. 500 OH2BLF, JN3SAC, TI5RLI, F5PCX. 550 OH2BLF, JN3SAC, TI5RLI, F5PCX. 600 OH2BLF, JN3SAC, TI5RLI, F5PCX. 650 JN3SAC, TI5RLI, F5PCX. 700 JN3SAC, TI5RLI, F5PCX. 750 I2EAY, JN3SAC, TI5RLI, F5PCX. 800 I2EAY, TI5RLI. 850 LU5EWO, TI5RLI. 900 LU5EWN, TI5RLI. 950 LU5EWO, TI5RLI. 1000 LU5EWO, TI5RLI. 1050 LU5EWO, TI5RLI. 1100 N4PYD. 1350 NG9L. 1600 CT1EEB. 1650 CT1EEB. 1700 CT1EEB. 1750 CT1EEB. 1800 CT1EEB. 2150 KF7RU. 2350 WF4V, KS3F.

CW: 350 OH2BLF, DL4DQA. 400 OH2BLF. 450 LY3BY, OH2BLF. 500 LY3BY, OH2BLF, F5MQW. 550 LY3BY, OH2BLF. 600 LY3BY, OH2BLF. 900 DF6SW. 950 DF6SW, I5ZJK. 1000 I5ZJK. 1400 IK2ECP. 1450 I2EAY.

10 Meters:	OH2BLF, TI5RLI
15 Meters:	OH2BLF
20 Meters:	OH2BLF, TI5RLI
40 Meters:	OH2BLF, TI5RLI
80 Meters:	OH2BLF, TI5RLI
160 Meters:	HB9AUT
Asia:	OH2BLF, JN3SAC, TI5RLI
Africa:	OH2BLF, LU5EWO
No. Amer.:	OH2BLF, WAØCLR, TI5RLI
So. Amer.:	OH2BLF
Europe:	OH2BLF, JN3SAC, TI5RLI
Oceania:	OH2BLF, JN3SAC, TI5RLI

Award of Excellence: I7PXV, S53EO
Award of Excellence With 160 meter endorsement: HB9AUT
Award of Excellence Plaque Holders: I8YRK, W4CRW, SMØAJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, W4BQY, IØJX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, HI8LC, KA5W, KØJN, W4VQ, KF2O, K3UA, HA8XX, HA8UB, W8CNL, K7LJ, W1JR, F9RM, W5UR, WB8ZRL, SM3EVR, CT1FL, K2SHZ, UP1BZZ, W8RSW, WA4QMQ, EA7OH, K2POF, DJ4XA, IT9TQH, W8ILC, K2POA, N6JV, W2HG, ONL-4003, VE7DP, K9BG, W5AWT, KBØG, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE, N3ED, DF1SD, K7CU, I1POR, LU3YL/W4, NN4Q, KA3A, YBØTK, VE7WJ, VE7IG, K9QRF, YU2NA, N2AC, W4UW, NXØI, W9NUF, N4NX, SMØDJZ, DK5AD, WB4RUA, DK5AD, WD9IIC, W3ARK, I6DQE, LA7JO, VK4SS, K6JG, I1EEW, I8RFD, I3CRW, VEFXR, N4MM, KC7EM, ZS6BCR, CT1YH, IV3PVD, KA5RNH, ZP5JCY, F1HWB, KC8PG, NE4F, VE3MS, K9LJN, ZS6EZ, YU2AA, I1WXY, IK2ILH, DEØDAQ, LU1DOW, N1IR, IK4GME, WX3N, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, I5ZJK, JAØSU, S51NU, K9XR, WØULU, HB9DDZ, F6HMJ, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, KØIFL, IN3NJB, WT3W, S50A, AA6WJ, W3AP, W9IL, OE1EMN, IK1GPTG, KØDEQ, DL5ARS.

Award of Excellence Plaque Holders with 160 Meter Endorsement: CT1YH, IV3PVE, KA5RNH, ZP5JCY, AB9O, FM5WD, SMØDJZ, DK5AD, SM6CST, I1JQJ, PY2DBU, W3ARK, HI8LC, KA5W, UR2QD, VE3XN, K6XP, LA7JO, W4VQ, K6JG, K3UA, HA8UB, W4CRW, N4MM, K7LJ, SMØAJU, KF2O, SM3EVR, K5UR, UP1BZZ, OK1MP, N5TV, K2POF, W8CNL, DJ4XA, IT9TQH, DL9RK, N6JV, ONL-4003, W1JR, W6OUL, W5AWT, KBØG, F6BVB, W4BQY, YU7SF, W5UR, N4NO, DF1SD, K7CU, I1POR, W8RSW, N4KE, I2UIY, YBØTK, W8ILC, W1BWS, VE7WJ, K9QFR, NN4Q, W4UW, NXØI, G4BUE, LU3YL/W4, I4EAT, WB4RUA, VE7WJ, N4NX, DEØDXM, VE7IG, K9BG, I1EEW, AB9O, CT1YH, IV3PVD, KA5RNH, ZP5JCV, I2MQP, IØRIZ, W5ODD, WX3N, IK4GME, HA8XX, YU1AB, F6HMJ, HB9DDZ, K9XR, KØJN, ZS6EZ, JAØSU, I5ZJK, I2EOW, KS4S, KA1CLV, KØIFL, K9LJN, WT3W, IN3NJB, S50A, AA6WJ, W3AP, KØDEQ.

Complete rules and application forms may be obtained by sending a business-size self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to: "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101-9511 USA.

amateurs worldwide. Currently it ranks as the #1 most-wanted place that is politically accessible to mere mortals such as ourselves. Most of the people who already had HI confirmed are either dead or distracted. Nearly everyone in DXing wants a HI QSO. To boot, it is an astonishing visual spectacle—the 9000 foot smoking volcano rising above a glaciated landscape sculpted by 100 mph winds and the largest colony of penguins in the world.

I have a lot of experience (almost 20 years of it) in organizing and leading expeditions. I was confident that we could do this, and I knew the way: organize, plan, formalize, and document. If this sounds like the new corporate speak, that's purely coincidence; it's my experience speaking here. Without a plan, you will have editorial alterations ad infinitum, and it will never converge. After our financial disaster we worked out the plan, which I published as the Scoping Document in December 1995. That document spelled out what we would do, how we would do it, and when it would happen. Right now it's all going according to plan (pretty much).

Here are the boundaries we had to work within to implement the expedition: The total cost per person, including transportation and support, would be about $15K, of which $10K could be expected from the participant and $5K would have to be found elsewhere. The time would be 5–6 weeks, minimum, due to the hull speed of ships and the lack of an international airport on Heard Island. The terrible weather on HI required that we take numerous sturdy shelters and many backup antennas. We would need extra fuel and food. We would need to provide for the personal needs of the team, including privacy, sanitation, meals, diversion, and of course, the opportunity to work radio as much as

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993 .....NØAJZ

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All CW

97 .....KNØZ

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102.....G4BWP

160 Meter WAZ

70 .....W2FCR.....32 Zones .....Endorsement
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4362.....KA5OER
4363.....KN4JD
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CW/Phone

7712.....AA8LL
7713.....DL2UR
7714.....JA2ANM (CW)
7715.....K3QK

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. The processing fee for all *CQ* awards is $4.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $10.00 for nonsubscribers. Please make all checks payable to the Award Manager. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

possible. We would have to do it during the Austral summer. And we would need to have the money up front.

The plan called for a team of 20. At $10K per person, this raises $200K. Coincidentally, we found ship transportation from Reunion for exactly that amount. By the end of February 1996, by word of mouth and advertising on the Internet DX reflector, we had found all 20 DXpeditioners and even had a waiting list.

Now how could we manage all these people and get them to act cohesively? The basic tool I used was a hierarchical system of authority. We first agreed that Peter, ON6TT, and I would share responsibilities as Project Directors, Peter concentrating on radio and I concentrating on logistics. Ralph, KØIR, who had organized and led the Peter I 3YØPI DXpedition, was kicked upstairs into a kind of Chairman of the Board status. Then I established the board—five members of the team who would make all major decisions jointly.

We then established a system of czars, members of the team who accepted re-

5 Band WAZ

As of October 31, 1996, 448 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
AA4KT, 199 (26)
K7UR, 199 (34)
NAØY, 199 (26)
WØPGI, 199 (26)
W2YY, 199 (26)
W9WAQ, 199 (26)
W1JR, 199 (23)
VE7AHA, 199 (34)
W1FZ, 199 (26)
IK2GNW, 199 (1)
W9CH, 199 (26)
ACØM, 199 (34)
IK8BQE, 199 (31)
JA2IVK,199 (34,40m)
K1ST, 199 (26)
ABØP, 199 (23)
KL7Y, 199 (34)
UY5XE, 199 (27)
NN7X, 199 (34)
DL3ZA, 199 (31)
OE6MKG, 199 (31)
HA8IB, 199 (2 on 15)
DK1FW, 199 (31)
OH2DW, 199 (1)
IK1AOD, 199 (1)
DF3CB, 199 (1)
UA3AGW, 198 (1, 12)
VO1FB, 198 (19, 27)
EA5BCK, 198 (27, 39)
KZ4V, 198 (22, 26)
K4PI, 198 (23, 26)
G3KDB, 198 (1, 12)
DK2GZ, 198 (1, 24)
KG9N, 198 (18, 22)
KM2P, 198 (22, 26)
GM3YOR, 198 (12, 31)
DKØEE, 198 (19,31)
KØSR, 198 (22, 23)
K3NW, 198 (23, 26)
WB6OKK, 198 (22, 37)
S57J, 198 (2,26)
WR3E, 198 (23, 26)

The following have qualified for the basic 5 Band WAZ Award:

KO4OG, 183 Zones
Z31CZ, 150 Zones
WR3E, 198 Zones

Endorsements:

VE1BLX, 188 Zones
K4PR, 195 Zones
W2FCR, 196 Zones

1023 Stations have attained the 150 Zone level as of October 31, 1996.

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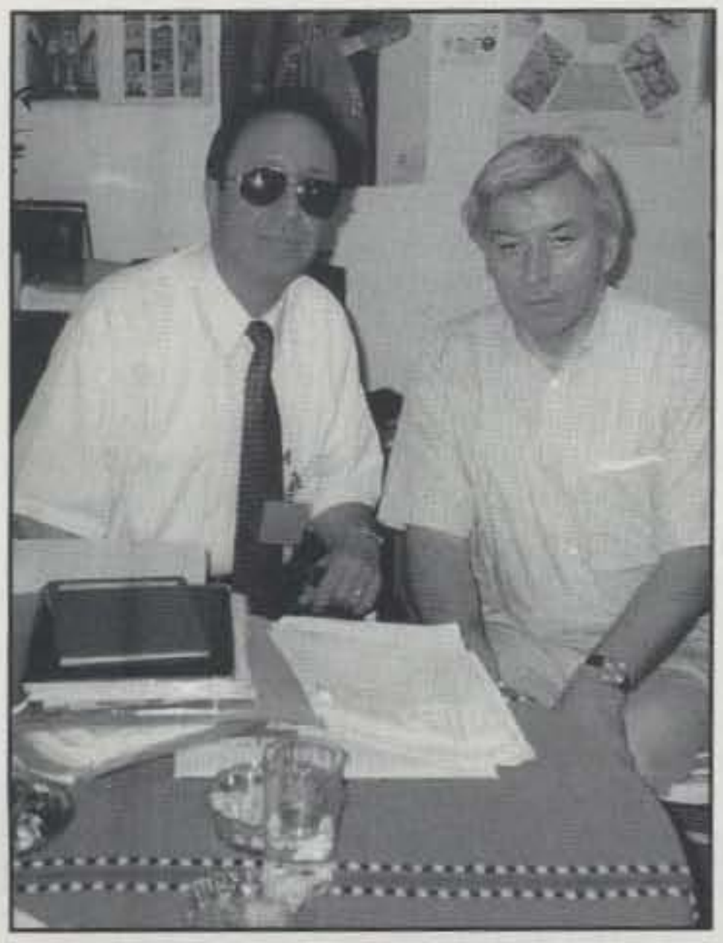

YK1AN and DJ9ZB compare notes.

sponsibility for a major piece of the project: antennas, campsite, cleanliness, computers, emergencies, equipment, food, fund-raising, medical, power, publicity, radio, and science. The czars have responsibility for their component, and the power to make decisions and conscript effort to deliver it. Each czar produced a written document describing his "czardom" and how he was going to make it happen. I was delighted that the czars did this willingly, even enthusiastically, and they did it extremely well. The only notable failure was fund-raising, which forced the team into further personal contributions.

The net result of this organizational effort was to diffuse the responsibility—and the heat—for major decisions among various people, and to give the participants a feeling that they were important and influential. Indeed, they were; there is no way Ralph, Peter, and I could have handled all the details as the project mushroomed into existence.

Just to show you how the mushroom grew, we established, with the help of Lyndon, VE7TCP, our own Internet reflector called heard-team. All team members, plus the pilots and a few others, were able to send messages to all other members simultaneously, and this is how the team talked among themselves. When the talk among those interested in computer operations became massive, it split off and we established a second reflector, appropriately called heard-nerds. On an average day during most of 1996 I would receive 10–20 messages relating to HI. On November 12th I received 61 messages, of which 56 were HI related.

The other major means of communicating within the team was the web pages. I developed an extensive set of pages that I posted on my personal server, ccnet. As the czars gave me their plans, I would post them for the rest of the team to see. The web became the most timely and most accurate source of information about the expedition. Except for an occasional fax or check, this was an entirely paperless expedition!

Then there is the question of keeping the team together. It is almost legendary that expeditions of this kind are formed, and then suffer when people bail out at the last minute. With this project that

The WPX Honor Roll

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with *CQ* Master Prefix List. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, file will be made inactive. Lifetime Honor Roll fee is $4.00 (U.S.) for each mode, with no fee for additions.

MIXED

4705 9A2AA	3277 N4MM	2948 HA8XX	2542 WB2YQH	2141 WA1JMP	1776 W7OM	1563 CT1YH	1329 KSØZ	1013 WB2PCF
4692 F9RM	3229 SM3EVR	2885 PAØSNG	2510 4N7ZZ	2132 DK5AD	1752 HA9PP	1560 I2EAY	1289 W0IZV	1003 KB5OHT
4194 IT9TQH	3218 N4UU	2879 YU7SP	2491 I2EOW	2105 N2AIF	1716 WB3DNA	1550 EA3CWK	1265 VE4ACY	999 VE6FR
3746 W2FXA	3184 I2PJA	2866 HAØDU	2455 S53EO	2070 KS4S	1699 CT1QF	1532 KØIFL	1222 YV7QP	967 JR3TOE
3740 EA2IA	3141 YU1AB	2834 YU7BCD	2416 K8LJG	2067 W6OUL	1683 LU8DY	1516 F5NBX	1212 CT3CU	953 S52QM
3589 K6JG	3101 I1EEW	2756 K9BG	2375 HA5NK	2054 9A4RU	1681 IØAOF	1500 CT1EEB	1197 IT9JPK	874 W2EZ
3451 N4NO	3078 ZP5JCY	2745 KF2O	2347 IK2ILH	2049 W8UMR	1669 K5IID	1402 I1-21171	1177 WT3SW	850 LUS1IDX
3442 W1BWS	3063 KA5W	2709 N2AC	2252 S51NU	2001 G4OBK	1662 PY2DBU	1383 OZ1ACB	1168 Z32KV	838 EA5BHK
3415 VE3XN	3006 WA8YTM	2688 K9AGB	2200 K5UR	1978 S58MU	1589 JN3SAC	1383 AI6Z	1137 YU7FW	835 AA1KS
3394 N6JV	3003 9A2NA	2601 SM7TV	2195 KØDEC	1967 W9IL	1587 AE5B	1362 YU1ZD	1122 N4PYD	801 EA2BNU
3299 I2UIY	2981 UA3FT	2601 I2MQP	2183 N6JM	1958 YU7JDE	1570 KC6X	1346 WA3HUP	1054 VE6BMX	636 9A2AJ

SSB

4595 F9RM	2777 OZ5EV	2294 EA3AQC	2022 CX6BZ	1533 LU7HJM	1401 W7OM	1106 KØIFL	912 ZS6Y	738 EA1OT
4186 IT9TQH	2754 EA8AKN	2240 I8KCI	1948 EA2AOM	1532 OE2EGL	1361 IK2AEQ	1101 KB4HU	907 KF7IO	712 DF1IC
4025 IØZV	2708 I1EEW	2237 WA4QMQ	1933 W4UW	1527 KBØC	1360 EA3BT	1100 EA8AG	889 W6RQQ	682 US1IDX
3679 VE1YX	2678 N4NO	2220 YU7BCD	1906 IN3QCI	1503 CT1EEB	1355 DK5WQ	1069 N4PYD	873 HA9PP	639 VE4ROY
3571 ZL3NS	2677 I4CSP	2216 WF4V	1903 K5UR	1501 AE5B	1332 G4OBK	1055 IT9JPK	860 IK4HPU	626 VE6BMX
3277 K6JG	2595 KA5W	2206 PY4OY	1754 K2POF	1483 N2AC	1327 W5ILR	1036 IKØJMS	846 JR3TOE	609 JA2OCU
3192 I2PJA	2588 HA8XX	2164 I2EOW	1748 LU8DY	1464 K8MDU	1321 I3ZSX	1031 LU5EWO	832 I6KYL	604 KZ5ZD
3172 WD8MGQ	2530 I5ZJK	2155 CT1AHU	1638 N6FX	1454 K3IXD	1317 K5IID	976 WT3W	821 EA3EQT	601 EA1MK
2966 ZP5JCY	2525 PAØSNG	2141 EA5AT	1636 IK2DUU	1447 K2EEK	1282 NG9L	971 DJ4GJ	782 YV7QP	
2903 CT4NH	2371 9A2NA	2133 4X6DK	1633 K8LJG	1441 W6OUL	1225 KC6X	966 KI7AO	780 I2EAY	
2884 N4MM	2370 LU8ESD	2102 KF7RU	1606 YU7SF	1439 WN5MBS	1124 W9IL	959 EA1AX	772 LW2DBM	
2834 I2UIY	2365 WA8YTM	2077 N4UU	1574 KS4S	1428 CT1BWW	1118 EA5GKE	943 S51NU	759 N3DRO	
2827 EA2IA	2362 I2MQP	2044 K5RPC	1567 EA5CGU	1419 WB3CON	1115 DF7HX	939 AI6Z	756 AE4MJ	
2798 F2VX	2330 KF2O	2029 KD9OT	1564 N2AIF	1415 HA5NK	1107 WA2FKF	918 LU3HBO	748 JH3SAC	

CW

4109 IT9TQH	2439 N2AC	2117 W8IQ	1863 HA8XX	1680 S58MU	1457 JN3SAC	1241 9A2HF	925 LW2EUE	830 LU7EAR
3681 WA2HZR	2435 K9QVB	2085 S51NR	1858 K8LJG	1649 N2AIF	1448 LU2YA	1231 EA7AAW	921 I2MQP	822 9A3UP
3376 N6JV	2318 W9DWQ	2076 JA9CWJ	1809 TI4SU	1645 I7PXV	1440 EA6BD	1182 EA6AA	919 HA9PP	796 I2EOW
3083 VE7CNE	2295 WA8YTM	2035 9A2NA	1767 K5UR	1608 G4OBK	1370 I2EAY	1130 AC5K	914 YV7QP	760 EA2BNU
2993 N4NO	2280 KA5W	1998 S51NU	1742 N6FX	1552 W6OUL	1356 IK2ECP	1101 K5IID	903 DF6SW	729 KF7JF
2957 YU7LS	2268 G4UOL	1982 KA7T	1741 W1WAI	1542 I1EEW	1342 EA7TG	1072 KC6X	899 K2LUQ	701 VE6BMX
2843 N4UU	2264 YU7BCD	1954 HA5NK	1740 OZ5UR	1523 DJ1YH	1278 W7OM	1072 AI6Z	863 PY4WS	697 K3WWP
2795 EA2IA	2263 N4MM	1939 EA7AZA	1722 VR2UW	1504 KS4S	1277 KA1CLV	1067 EA2CIN	863 KB5OHT	691 KØIFL
2771 K6JG	2250 I2UIY	1910 KF2O	1707 G4SSH	1480 IK3GER	1275 DJ4GJ	1066 IK5TSS	844 YU1TR	649 WT3W
2601 YU7SF	2224 LZ1XL	1903 G3VQO	1687 IT9VDQ	1477 ZP5JCY	1266 9A3SM	1051 4X6DK	831 LU3DSI	602 LU1VCD

would be totally unacceptable, because it would undermine the financial base and probably result in cancellation of the expedition. My defense was to tell people up front what to expect: the schedule, the responsibilities, the costs, and the consequences of withdrawing. I made it very clear that the team members needed to make their decisions to do this before joining. If you signed up, you made the commitment to see it through. The terms were serious: You paid your money in full by July 15, and if you dropped out, you lost it. As draconian as this may be, it worked well. Only one person attempted to flee, and one person who felt it necessary to withdraw near the end left all his money in, and even added some!

One of the fun parts was shopping for gear. Carlos, NP4IW, was "Equipment Czar," and since we live close by, we worked on it together. A friend provided warehouse space, and we first deposited the gear from the XRØY/Z DXpedition and the truckload sent by KØIR. We spent day after day, and sometimes whole weekends, making list after list of items we would need, from antennas to zip-lock bags. We sorted the lists by type, by application, alphabetically, and by source. We listed everything we might need, even if we didn't have it. Then we went to the big warehouse department stores and bought everything else, right down to boxes of screws and two new Honda generators. It was—trust me—a lot of work.

The gear was packed into two 20 foot steel ocean-going containers that we eventually had to purchase. We loaded them to the gills using the fork-lift in a blazing sun and during precious vacation time. My personal triumph came as we were closing the second container. We had just enough room left to include a small gasoline-powered garden tractor and large wagon. Although I suffered the ridicule of everyone who thought we were idiots for taking a tractor to HI, I know that it may well save our skins. Without it, it will probably be impossible to move all the equipment off the beach, should the helicopter be unable to land. I fully expect to return from Heard Island a hero for bringing along the tractor!

There is the inevitable question: Why are we doing this now, at the bottom of the sunspot cycle? Lots of people generously suggested we delay several years, when propagation will be better. There are really three reasons: First, from polar expeditions over the past five or so years we are gaining a lot of evidence that propagation is far better than anyone has a right to expect, based on the model predictions. That is, you can exercise your propagation software, conclude that there will be no propagation, and then someone goes there and finds great propagation, at least north/south.

Second, we are interested in extending our understanding of propagation, and the best way to do that is to test it under conditions of marginal performance. It would be useless to test it when it is zero or perfect; only the intermediate cases provide critical tests of models. The case of top band is even more interesting: We have no prediction ability for 160 meters. Anything we can do to acquire a database of contacts on 160 meters, therefore, is going to be helpful in developing models and predictors.

Third, this project started out as a natural extension of the 1994 3YØPI Peter I

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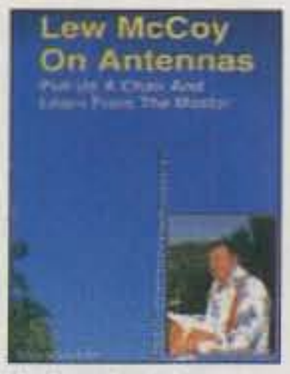

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26	EA3BT

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320	WB4UBD/327	310	K4JDJ/310
320	IK8CNT/328	300	EA3BT/303
320	N4KG/327	200	EA2AOK/234
320	AB7AU/322	OSCAR	LU8EBH

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320	N4KG/328	300	K7EHI/302
320	F3TH/326	250	KA5OER/260
310	I4LCK/317	150	EA3BT/178
310	K7JYE/312		

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Here are WA3YVN and W5VBX at a hospitality room overlooking Bourbon Street during the New Orleans DX Convention.

DXpedition. Four participants on that team (KØIR, KK6EK, ON6TT, HB9AHL) are principals on this one. We felt we had considerable momentum from 3YØPI, experience that we could use to produce the HI expedition. Delaying several years likely would mean abandoning that momentum. There were several good reasons to go ahead in 1995, and then reschedule it for 1997. The reasons for delaying were marginal.

Then there is the more generalized question: Why do we do this at all? For those of us for whom expeditions are a way of life, this is an opportunity to share our feelings and reasons. Of course, as scientists we want to extend our abilities to communicate from remote, hostile places. The underlying motivation for this is that we are participating in the great adventure of saving the world a bit at a time, and that includes the minimal creatures in faraway places. We can't save them if we don't understand them. We can't understand them if we don't go there. And if we don't share what we learn, we're just playing in the Field of the Lord. We want to bring attention to Heard Island, and to the diversity of nature.

We also use these great expeditions as agents for international goodwill. With ten nations participating in the HI adventure, we are making many bridges.

We also want to extend the field of computer-based communications technology. While it may be pedestrian to hook up several radios and several computers and several antennas on land with corporate or governmental budgets, it is quite another thing to do it with the additional constraints of transporting all the gear completely around the world, deploying it with a very tight time schedule under the most miserable environmental conditions anywhere, and do it all on voluntary contributions from amateurs.

Oh, yes. We also want to work pile-ups!

So why do we do such big expeditions? Why not the more usual team of three or four, and maybe a pickup of equipment? I probably already have alluded to the answer: the overhead of getting to HI, doing our job, and getting back makes the critical mass of people about 20. Fewer would not have the muscle power to do the mechanics quickly enough to meet the schedule; more would leave too little time for each person to do what he came for—work pile-ups.

So as the Australians say, there you have it. Now, please work us! Once you've done that, go look at the web pages and see if you can find yourself in the log. And if the HI expedition gives you an experience you would tell your friends about, please tell us. We'd love to add your experience to our own.

Frequently Asked Questions

Q: Who is doing this?

A: The team includes radio amateurs from ten countries worldwide: EA8AFJ, Michel Sabatino; HB9AHL; Willy Rusch; KØIR, Ralph Fedor; K4UEE, Bob Allphin; K9AJ, Mike McGirr; KK6EK, Robert

Schmieder; N6EK, Bob Fabry; N6MZ, Michael Mraz; NP4IW, Carlos Nascimento; OE9AMJ, Arno Metzer; ON6TT, Peter Casier; PA3DUU, Arie Nugteren; RA3AUU, Igor ("Harry") Booklan; VK2TQM, David Muller; W8FMG, Wes Lamboley; WØGJ (WAØPUJ), Glenn Johnson; WA3YVN, Al Hernandez; and 9V1YC, James Brooks.

Q: Who is paying for this?

A: The participants are paying their entire transportation bill, $200K, plus other major expenses. Several foundations, including NCDXF, INDEXA, and many other clubs and associations have contributed about $30K. We expect QSL donations to be about $20K. We're currently looking for the balance. The rough breakdown we envision is about 70% paid by the participants, about 20% paid by organizations, and about 10% paid by individuals.

Q: How many radios will you have, and what bands will they use?

A: We will have at least five stations on the air whenever there is propagation. We will be active on all HF bands (especially 160, 80, and 40), plus 6 meters, RTTY, and AMSAT.

Q: When will you come on the air, and how long will you operate?

A: On or before January 15, 1997. We'll operate about two weeks.

Q: Who is the QSL manager?

A: INDEXA c/o John Parrot, W4FRU, P.O. Box 5127, Suffolk, VA 23435.

Q: Where can I send contributions and will I be acknowledged?

A: Heard Island DXpedition c/o Bob Allphin, K4UEE, 4235 Blackland Dr., Marietta, GA 30067 USA <mallphin@aol.com> (preferred U.S. site for donations under $100). Heard Island DXpedition c/o Peter Casier, ON6TT, Oude Heerbaan 30B-9230 Wetteren, Belgium <pcasier@innet.be> (preferred European site for donations under $100). Northern California DX Foundation c/o Bruce Butler, W6OSP, P.O. Box 608, Menlo Park, CA 94026-0608 (preferred site for donations over $100). Cordell Expeditions c/o Bob Schmieder, KK6EK, 4295 Walnut Blvd Walnut Creek, CA 94596 (any donations). Donations to the Northern California DX Foundation and to Cordell Expeditions are tax deductible to the extent allowed by law for 501(c)(3) organizations. They should be designated specifically for the Heard Island DXpedition.

Summary

There you have it! I hope many of you had the good fortune of a contact with the Heard Island group.

73, Chod, VP2ML

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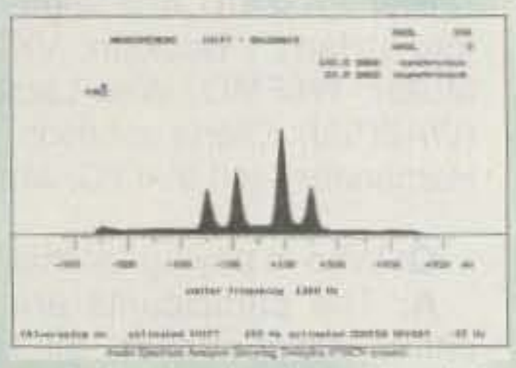

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System Requirements:

- IBM PC witha 386 or higher processor (486 or higher is recommended)
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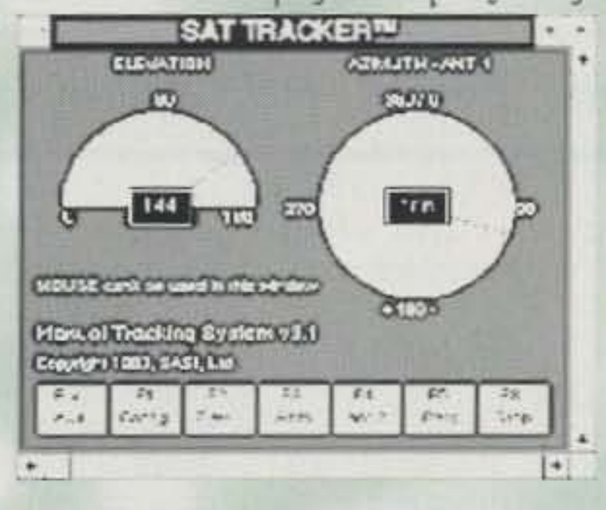

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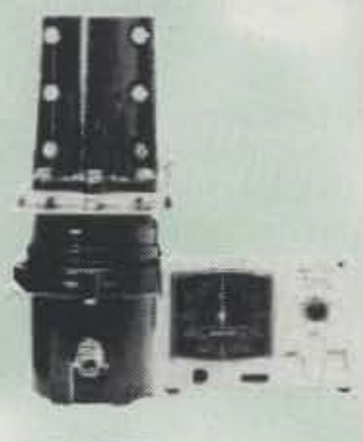

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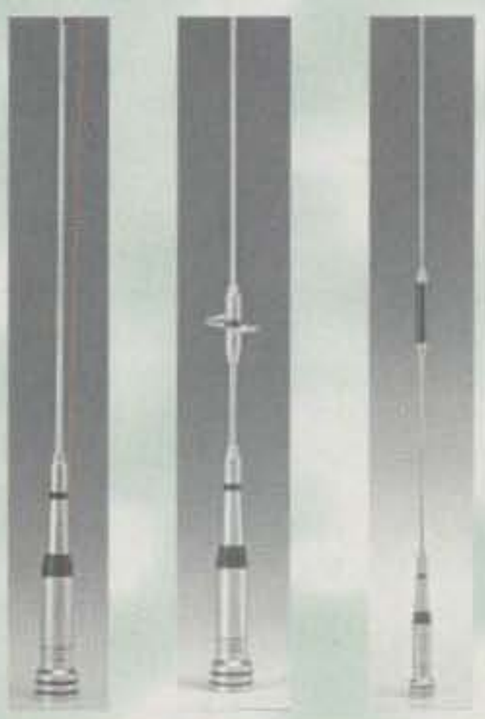

HP2070: VHF 1/4 wave/UHF 3/4 wave o dBd VHF/ 3.8 dBd UHF, GOLD/TEFLON UHF conn., 18.5 inch. long

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HP2000C: VHF 3/4 wave, 4dBd - 6.15 dBi., 143 - 149MHz, GOLD/TEFLON UHF conn., 60 inch. long

HP2000: VHF 1 x 5/8 wave, 3.2 dBd - 5.35dBi, 143 - 149MHz, GOLD/TEFLON UHF conn., 48.5 inch. long

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EDCO

BY FREDERICK O. MAIA, W5YI

WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

"Time": What Is It, Where Did It Come From, and How Is It Regulated?

We all know that radio operators use Greenwich Mean Time, but few of us seem to know why or how it came about. Did you know your PC operates on international time as well? This month let's talk about "time." It really is a very complex subject, but we will try to keep it simple!

Greenwich Mean Time (GMT) is used as the worldwide Universal Time standard. Its primary use is for navigational and scientific purposes, especially where observations or activities must be synchronized over great distances. Amateur radio communications and worldwide Internet web surfing are two examples. When you get a QSL card from a foreign amateur, it contains the same QSO time as your log book.

Did you know that even your e-mail has references to GMT? Check it out! Does your e-mail have a line in your header display that reads "Sat, 01 Feb 1997 15:42:47 –0500 (EST)"? The "minus 0500" is the time offset from GMT. In this example Eastern Standard Time is 5 hours behind GMT. Did you ever notice files in your web browser called "Cookies"? These files store certain information about you. They work only on GMT. Even the U.S. Space Shuttle is on GMT. As the world gets smaller and smaller, we must turn to international time!

The term "Co-ordinated Universal Time" (UTC) was introduced in 1972 and replaced GMT in 1986. It means the same thing. GMT is also known as Zulu (Z) time. "Zulu" is the ITU phonetic word for Z, an acronym for Zero.

The abbreviation for Coordinated Universal Time is UTC rather than CUT. In 1970 the Coordinated Universal Time system was devised by an international advisory group of technical experts within the International Telecommunication Union (ITU). The ITU felt it was best to designate a single abbreviation for use in all languages in order to minimize confusion. Since unanimous agreement could not be achieved on using either the English word order (CUT) or the French word order (TUC), a compromise of using neither (UTC) was adopted.

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (817-461-6443)

Greenwich Mean Time and The Prime Meridian

Credit for the establishment of international time really belongs to the 21st President of the United States. At the specific request of President Chester Arthur, the International Meridian Conference was convened in Washington, D.C. on November 1, 1984. It resulted in the establishment of a mean solar day based on Greenwich, England, the International Date Line, and 24 time zones. Actually, Greenwich Mean Time (GMT) had been adopted by the United States a year earlier, when wireline telegraph lines transmitted time signals to all major cities. Prior to that there were over 300 local times in the USA!

By definition, GMT is the time along the zero degree meridian. It was selected since it runs through the primary transit instrument at the Royal Observatory in Greenwich, England. From Greenwich, longitudes are measured around the world. East longitude travels east of Greenwich; west longitude goes west. The U.S. Naval Observatory (USNO) was established in Washington, D.C. in 1830 to cooperate with the Royal Greenwich Observatory to develop accurate time-keeping for the Navy. It still does so today!

Greenwich, being 0°, is called the prime meridian. A meridian is the imaginary north-south line that divides the Earth into 360 slices —or degrees—at the Equator. (There are 360 degrees in a circle.) All meridians begin at the North Pole and extend to the South Pole. The east-west "latitude" lines combine with longitude to form grids, or coordinates.

The ancient astronomers decided that a day should be one rotation of the Earth on its axis. However, not all days are 24 hours long! The overhead sun at noon can arrive as much as 17 minutes early or up to 15 minutes late. In fact, only 4 days per year have 24 hours in them. These days occur on or about December 25, April 15, June 14, and August 31. The rest are longer or shorter as measured from the overhead midday sun.

Since the Earth rotates once (360 degrees) in an approximate 24 hour period, 15° of longitude was made to correspond to one hour of time. The problem was, however, since international boundaries don't follow the 15° rule, time zones often zig-zag or divide areas that differ by half an hour only.

Government Regulation Of Time

Time zones are regulated by the United States Department of Transportation (DOT), and not the National Bureau of Standards as commonly believed. Time zones originally were controlled by the Interstate Commerce Commission because the need for time zones came about when railroads were first used for interstate commerce.

The United States was first divided into four time zones (Eastern, Central, Mountain, and Pacific) on November 18, 1883. In 1967 a congressional act transferred the duties of the Interstate Commerce Commission to the DOT. Time in the United States is governed by Title 15 (Commerce and Trade), Chapter 6 (Weights, Measures and Standard Time), Subchapter 9 (Standard Time) of the U.S. Code. This section:

•Authorizes the Secretary of Transportation to promote uniform adoption and observance of the same standard of time within and throughout each such standard time zone.

•Provides for the "advancement of time or changeover dates" (Daylight Savings Time) beginning at 2 AM on the first Sunday of April and ending at 2 AM on the last Sunday of October. Individual states may elect not to advance their time (observe Daylight Savings Time), but all must conform to the standard time within their time zone.

•Establishes eight time zones for the United States and its possessions " . . . for the convenience of commerce and common carriers engaged in interstate or foreign commerce" (see Table I). Some states (such as Idaho, Texas, and Oklahoma) lie within two time zones.

Zone	Based on the	Designation	Offet from GMT: Standard Time	Daylight Time
Zone One	60th degree of longitude	Atlantic Standard Time	Minus 4 hours	Minus 3 hours
Zone Two	75th degree of longitude	Eastern Standard Time	Minus 5 hours	Minus 4 hours
Zone Three	90th degree of longitude	Central Standard Time	Minus 6 hours	Minus 5 hours
Zone Four	105th degree of longitude	Mountain Standard Time	Minus 7 hours	Minus 6 hours
Zone Five	120th degree of longitude	Pacific Standard Time	Minus 8 hours	Minus 7 hours
Zone Six	135th degree of longitude	Alaska Standard Time	Minus 9 hours	Minus 8 hours
Zone Seven	150th degree of longitude	Hawaii-Aleutian Standard Time	Minus 10 hours	Minus 9 hours
Zone Eight	165th degree of longitude	Samoa Standard Time	Minus 11 hours	Minus 10 hours

Table I– Time zones in the United States.

phone, the accuracy may also be affected by the time it takes for the signal to travel from Boulder, Colorado to your location. Generally, the accuracy over the telephone should not be worse than about 40 thousandths of a second.

The time announced on WWV (and WWVH) is, in accordance with international recommendations of the International Telecommunication Union, Coordinated Universal Time, or UTC. UTC is a 24-hour time system, similar to "military" time. Thus, instead of AM and PM hours, its hours are numbered beginning with 00 at midnight, through 12 for noon, and ending just after 23:59:59 with 00 hours of the next day. The announced hour refers to time at the 0, or Greenwich, meridian.

Therefore, to obtain your local time, subtract a certain number of hours from what you hear, depending on how many time zones you are away from Greenwich (England). As an example, suppose you are in the Eastern time zone of the U.S. and you hear WWV announce the next minute as being "22 hours, 10 minutes, Coordinated Universal Time." To refer this time to Eastern Standard Time, you would first need to subtract 5 hours from the announced time, since the Eastern time zone is 5 time zones away from the Greenwich meridian. This makes your local time 17 hours, 10 minutes. Next, since the hour is greater than 12, subtract 12 hours to get 5:10 PM. If your locality is on Daylight Saving Time at the time, subtract 4 hours from the announced hour instead of 5 hours, since UTC does not change with respect to Daylight Saving Time.

WWV (and WWVH) also broadcasts precise 1 second time intervals, the interval between the "ticking sounds" you hear. In addition to the time and frequency standards, radio-wave propagation forecasts, weather bulletins, and geophysical data are broadcast by WWV and WWVH. NIST also offers a frequency measurement service that uses the Global Positioning System (GPS) to calibrate frequency standards.

The Search For An Accurate Timepiece

Originally based on the Earth's rotation, which has been found to be somewhat irregular, the international time standard is now based on highly accurate atomic time. In 1967 a new definition of a second was created based on radiation patterns of the Caesium-133 atom.

An atomic clock is a clock that keeps time using natural characteristic frequencies of atoms, such as cesium, hydrogen, or rubidium. Atomic clocks are extremely stable because the frequencies are almost unaffected by factors such as temperature, pressure, or humidity. UTC is now on an atomic time scale.

Even though time for the past three decades has been measured by atomic means, Earth time (scientifically referred to as "UT1") still rules. UT1 directly corresponds to the rotation of the Earth and is subject to that rotation's slight irregularities. Scientists adjust the difference between UT1 (Earth time) and UTC (atomic time) by subtracting or adding "leap seconds" on the last day of June or December.

These leap seconds are introduced into the UTC time system by international agreement for keeping the atomic-based time scale in approximate agreement with the astronomical UT1 time scale.

Some users (such as mariners using celestial navigation) need to know the UT1 time of their observations. Since only UTC time is normally broadcast by time-and-frequency radio stations such as WWV, these broadcasters agreed to occasionally adjust UTC time in steps of exactly 1 second so that the difference between UTC and UT1 would never exceed 0.9 seconds.

Leap seconds have been inserted as needed into the UTC time scale at average intervals slightly longer than one year. Since the start of the new atomic clock system in 1972, about 20 leap seconds have been inserted.

When Does The Next Millennium Begin?

A millennium is 1000 years. If you said January 1st, 2000, you would be dead wrong! The first millennium began at the start of the year AD 1 and ended at the end of the year AD 1000. The second millennium then began with the year 1001 and will conclude at the end of the year 2000. The third millenium will begin with AD 2001 and continue through AD 3000. Therefore, the next millennium begins with 2001!

Therefore, the Third Millennium does not begin until January 1, 2001. Few people (except astronomers) seem to be putting much stock in that, however. For us common people the 21st Century and Third Millennium Party begins on December 31, 1999 at midnight! And you can bet there will be another party on December 31, 2000!

After the party, however, will you come to a disaster at work? You could if your computers are not "2000 compliant." January 1st, 2000 could be a black day for you or your company if you have not taken steps to prepare your computer system for the new century! It seems a lot of computer programmers did not plan that their software would be around in 2000.

Most PCs store 1997 as "97." When it comes to "00" (2000), everything that took place in "97" is minus 97. You can subtract 97 from 99 and get two years, but you can't subtract 97 from zero! If you were born in 1950, in 2001 your computer will say you are minus 49 years old (1 minus 50)! You will need to check your operating system and programs, especially if they are old, to be sure that they have been upgraded!

The Year 2000 Is A Leap Year!

Be sure your programs and computer knows that the year 2000 is a Leap Year, too! Did you know that the year 1900 was *not* a Leap Year? Almost everyone thinks that any year divisible by four is a leap year. That is really all you have to know unless you are around when the year ends in "00." In those years the "Century Rule" applies. The century has to divide by 400—not 4! Therefore, 1700, 1800, and 1900 were not leap years, but the year 2000 will be a leap year.

To understand this, you need to know why leap years are necessary in the first place. Leap years are necessary because the actual length of a year is 365.242 days, not 365 days, as commonly stated. Therefore, on years that are evenly divisible by 4 (such as 1996, for example) an extra day is added to the calendar on February 29. However, since the year is slightly less than 365.25 days long, adding an extra day every 4 years results in about 3 extra days being added over a period of 400 years. For this reason, only 1 out of every 4 century years is considered as a leap year. 73, Fred, W5YI

The United States mainland has four meridians assigned to determine standard time zones: 75° (Eastern, GMT –0500), 90° (Central, GMT –0600), 105° (Mountain, GMT –0700), and 120° west of Greenwich, England (Pacific, GMT –0800). Puerto Rico observes Atlantic Standard Time. Daylight Savings Time is observed during summer (March–October). Great Britain goes on BST (British Summer Time) during this period.

Daylight time begins in the United States on the first Sunday in April and ends on the last Sunday in October. On the first Sunday in April clocks are set ahead one hour at 2 AM local standard time, which becomes 3 AM local daylight time. On the last Sunday in October clocks are set back one hour at 2 AM local daylight time, which becomes 1 AM local standard time. Not all places in the U.S. observe daylight time. In particular, Arizona, Hawaii, and most of Indiana do not use it.

Canada has a total of six time zones—the four that apply in the continental United States and an additional two to the east. Atlantic Standard Time is based on 60° west of Greenwich and is one hour ahead of Eastern Standard Time. Newfoundland Standard Time, based on 52° 30' west, is 30 minutes ahead of Atlantic Standard Time. Puerto Rico is in the Atlantic Standard Time zone.

Are Noon and Midnight 12 AM or 12 PM?

This is one of the trickiest time questions of them all. The best answer is that the terms 12 AM and 12 PM cause confusion and should not be used.

To illustrate this, consider that "AM" and "PM" are abbreviations for "ante meridiem" and "post meridiem." They mean "before noon" and "after noon," respectively. Noon is neither before nor after noon; it is simply noon. Therefore, neither the "AM" nor the "PM" designation is correct. On the other hand, midnight is both 12 hours before noon and 12 hours after noon. Therefore, either 12 AM or 12 PM could work as a designation for midnight, but both would be ambiguous.

To get around the problem, the terms 12 noon and 12 midnight should be used instead of 12 AM and 12 PM. For example, a bank might be open on Saturday from 8 AM to noon. Or a grocery store might be open daily until midnight. If you are making schedules, times such as 12:01 AM (1 minute after midnight) or 11:59 PM (1 minute before midnight) can also eliminate ambiguity. This method is used by the railroads and airlines.

National Institute of Standards and Technology

Located in Boulder, Colorado, the Time and Frequency Division of the Government's National Institute of Standards and Technology (NIST) maintains the time and frequency standard for the United States.

NIST (it is no longer called the National Bureau of Standards) has distributed time and frequency information to the public since 1923, when radio station WWV went on the air. Today NIST broadcasts over a number of mediums, including HF and LF radio signals, UHF satellite signals, telephone lines, and the Internet.

These broadcast services provide traceable, accurate time to millions of users every year.

WWV and WWVH are shortwave stations. A man's voice broadcasts from WWV on 2.5, 5.0, 10.0, 15.0, and 20.0 MHz from Ft. Collins, Colorado. A woman's voice is heard on WWVH at 2.5, 5.0, 10.0, and 15.0 MHz from Kauai, Hawaii and is designed primarily to serve the Pacific Ocean area.

WWVB is a low-frequency service that broadcasts (without voice) only on 60 kHz from Ft. Collins, Colorado. In general, the lower frequencies of 2.5 and 5 MHz are best heard during nighttime hours, the higher frequencies of 15 and 20 MHz are better during daytime hours, and 5 and 10 MHz are probably the best compromises overall.

The WWV time signal as transmitted from the Ft. Collins, Colorado station site is accurate within a few millionths of a second with respect to the UTC (NIST) time scale. However, as the signal travels from the station to your location, it may be reflected from the Earth's ionosphere and suffer other degrading propagation effects. As a result, the usable accuracy of the signal at your location may not be better than a few thousandths of a second at best.

If you listen to the WWV time signal by tele-

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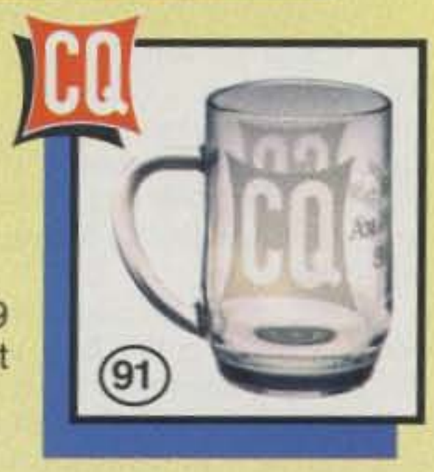

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BY GEORGE JACOBS, W3ASK

PROPAGATION

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Thank You, Thank You, Mr. Sun!

Solar activity was at almost rock-bottom levels during the first three weeks of November, with 10.7 cm solar flux levels in the upper 60s and low 70s. Then as the CQ World-Wide DX CW Contest weekend approached, Mr. Sun smiled and rained sunspots down upon the ionosphere. The solar flux count jumped to 91 on Saturday, November 23, the first day of the contest, and hit the 100 mark on Sunday. This was the highest level of sunspot activity in months, and it came right during the contest weekend!

Much as we had predicted, conditions during the CW contest weekend were mostly High Normal, rising to Above Normal in low latitudes. Conditions appear to have been even a bit better than they were during the contest SSB weekend. Geomagnetic conditions were quiet and ionospheric conditions were stable and strong for the beginning of a new solar cycle.

Early reports indicate good 15 meter worldwide openings, with 10 meter openings more frequent than during the SSB weekend.

Table I summarizes the worldwide HF propagation conditions based on reports jointly made by the USAF and the NOAA through the Space Environmental Services Center, Boulder, Colorado.

Improved HF propagation conditions were certainly noted during both the 1996 SSB and CW contest weekends. This is a positive indication that the new cycle has very likely begun, and that we now can expect increasingly better HF conditions over the next five years or so.

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for February 1997

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 4, 16, 19, 23	A	A	B	C
High Normal: 1, 5, 13, 21-22 24, 26	A	B	C	C-D
Low Normal: 2-3, 6-7, 10-11, 14-15, 17-18, 20, 25, 28	B	C	D	D-E
Below Normal: 8, 12, 27	C	C-D	D-E	E
Disturbed: 9	C-D	D	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S9 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. **Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.**

2. **With the *propagation index,* use the above table to find the expected signal quality associated with the band opening for any date of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good (B) on Feb. 1st, fair (C) on the 2nd and 3rd, excellent (A) on the 4th, good (B) on the 5th, etc.**

Sunspot Cycle Progress

The Royal Observatory of Belgium reports a mean sunspot number of 1.8 for October 1996. This was the same level as reported for September. The sun was spotless for the entire month, except on October 20–21 and 25–28. In fact, there wasn't a single spot observed on the sun's face between September 13 and October 20. October's mean value results in a 12-month running smoothed sunspot number of 9 centered on April 1996. This is a one point drop from March's value.

As reported earlier in this column, a sharp increase in solar activity began in late November. We will have more to say about this in next month's column, as more data is evaluated.

It may be several months before the world's scientists decide when Cycle 22 ended and Cycle 23 began. However, it looks more and more as if the sun itself is trying to tell us the date. It may well have been November 1996.

A smoothed sunspot number of approximately 11 is forecast for February 1997, as the new cycle is expected to climb slowly during its early months.

Canada's Dominion Radio Astrophysical Observatory in Penticton, British Columbia reports a 10.7 cm solar flux level of 69 for October 1996. This results in a smoothed value of 71 centered on April 1996. A smoothed 10.7 cm solar flux level of approximately 73 is predicted for February 1997.

February Conditions

February, while still a winter month, is a time of transition between winter and springtime propagation on the HF bands. Days will be getting noticeably longer in the Northern Hemisphere and nights will be getting shorter. Expect a seasonal decrease in the range of frequencies that will propagate long distances during the daylight hours (i.e., 10 and 12 meter bands), and an increase during the hours of darkness (i.e., 30 and 40 meter bands).

Rising solar activity coupled with normal seasonal chnges in HF propagation conditions is expected to result in a few 10 and 12 meter DX openings during February. The bands occasionally may open towards southern and tropical areas during the daytime when conditions are High Normal or better. There's a much better chance for 15 and 17 meter DX openings to many parts of the world during the daylight hours, especially when conditions are High Normal or better.

Twenty meters should continue to be the best band for DX propagation during February. Look for a DX window of an hour or two duration, beginning just after sunrise, during which the band should open to most areas of the world. DX should be possible throughout the day, with another peak in conditions expected during early afternoon. When conditions are High Normal or better, 20 meters should stay open to some areas of the world well into the hours of darkness.

Good nighttime DX propagation conditions are expected on 30 and 40 meters during February. Bands should open towards Europe and the east an hour or so before sundown, peaking during the early evening. South America should be within range from about 7 PM until sunrise. Look for openings towards the South Pacific, Asia, and the Far East from about an hour or two before to about an hour after local sunrise. Good 80 meter openings are also forecast to most areas of the world during the hours of darkness. Be sure to also check 160 meters between sundown and sunrise for fairly good DX openings to many areas of the world.

A seasonal increase in static levels may begin to be noticeable on the HF bands during February.

Short-Skip Conditions

On 160 meters no significant skip is expected during the daylight hours, but up to 1300 miles and beyond should be possible on a regular basis during most of the hours of darkness. On 80 meters expect openings up to about 250 miles during most of the daylight hours, with the skip

Geographical Area	November 23	November 24
Polar	Low Normal	Low Normal
Auroral	Low Normal	Low Normal
Middle Latitude	High Normal	High Normal
Low Latitude	High/Above Normal	High Normal
Equatorial	Above Normal	High/Above Normal
10.7 cm Radio Flux	91	100
WW Geomagnetic Ap Index	3	8

Table I– Summary of HF propagation conditions reported jointly by USAF and NOAA during the CQ WW DX Contest CW weekend of November 23–24.

11307 Clara Street, Silver Spring, MD 20902
e-mail: g.jacobs@ieee.org

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings. An ** indicates best time to check for 10 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate standard time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the propagation index will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

February 15–April 15, 1997
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

	15 Meters	20 Meters	40 Meters	80 Meters
Western & Central Europe & North Africa	10-12 (1)** 08-10 (1) 10-12 (2) 12-13 (1)	06-08 (1) 08-11 (2) 11-12 (3) 12-13 (4) 13-14 (3) 14-15 (2) 15-17 (1)	16-17 (1) 17-19 (2) 19-20 (3) 20-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-20 (1) 20-21 (2) 21-01 (3) 01-02 (2) 02-03 (1) 20-22 (1)* 22-01 (2)* 01-02 (1)*
Northern & CIS (former European USSR)	09-12 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-14 (2) 14-16 (1)	17-19 (1) 19-02 (2) 02-03 (1)	20-22 (1) 22-00 (2) 00-02 (1) 20-00 (1)*
Eastern Mediter-ranean & Middle East	09-11 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-14 (3) 14-15 (2) 15-17 (1)	18-20 (1) 20-23 (2) 23-01 (1)	19-23 (1) 20-22 (1)*
Western Africa	10-13 (1)** 09-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-19 (1)	18-19 (1) 19-00 (2) 00-02 (1)	19-21 (1) 21-23 (2) 23-01 (1) 21-01 (1)*
Eastern & Central Africa	11-13 (1)** 09-11 (1) 11-14 (2) 14-15 (1)	13-15 (1) 15-18 (2) 18-19 (1)	19-22 (1) 22-00 (2) 00-01 (1)	20-00 (1)
Southern Africa	10-13 (1)** 09-10 (1) 10-12 (2) 12-13 (3) 13-14 (2) 14-15 (1)	07-14 (1) 14-16 (2) 16-17 (3) 17-18 (2) 18-20 (1)	18-20 (1) 20-22 (2) 22-00 (1)	21-23 (1) 21-23 (1)*
Central & South Asia	09-11 (1) 16-18 (1)	06-07 (1) 07-09 (2) 09-11 (1) 18-21 (1)	04-07 (1) 17-21 (1)	04-07 (1) 18-20 (1)
Southeast Asia	17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	05-08 (1) 19-21 (1)	06-07 (1) 19-21 (1)
Far East	16-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-20 (1)	05-08 (1) 17-19 (1)	06-07 (1) 17-18 (1) 06-07 (1)*
South Pacific & New Zealand	14-16 (1) 12-15 (1) 15-18 (2) 18-19 (1)	15-19 (1) 19-22 (2) 22-07 (1) 07-09 (2) 09-11 (1)	00-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1)	02-03 (1) 03-06 (2) 06-07 (1) 02-07 (1)*
Australasia	15-17 (1)** 09-11 (1) 22-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-17 (2) 17-18 (1) 18-20 (2) 20-22 (1)	03-05 (1) 05-07 (2) 07-08 (1)	04-05 (1) 05-06 (2) 06-07 (1) 04-07 (1)*
Caribbean, Central America & Northern Countries of South America	11-16 (1)** 07-08 (1) 08-09 (2) 09-11 (4) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-19 (1) 19-20 (2) 20-03 (3) 03-05 (2) 05-07 (1)	19-21 (1) 21-04 (2) 04-06 (1) 20-02 (1)* 02-04 (2)* 04-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	12-15 (1)** 08-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-20 (2) 20-22 (1) 22-23 (2) 23-00 (1)	19-21 (1) 21-04 (2) 04-07 (1)	21-06 (1) 01-05 (1)*
McMurdo Sound, Antarctica	15-17 (1)	17-19 (1) 19-22 (2) 22-00 (1) 07-09 (1)	22-00 (1) 00-04 (2) 04-06 (1)	00-04 (1)

February 15–April 15, 1997
Time Zones: CST & MST
(24-Hour Time)
Central USA TO:

	15 Meters	20 Meters	40 Meters	80 Meters
Western & Southern Europe & North Africa	08-09 (1) 09-12 (2) 12-13 (1)	06-08 (1) 08-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	16-18 (1) 18-21 (2) 21-00 (1) 00-02 (2) 02-03 (1)	18-20 (1) 20-00 (2) 00-01 (1) 20-00 (1)*
Northern & Central Europe & CIS (former Euro. USSR	08-11 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-13 (2) 13-15 (1)	19-22 (1) 22-00 (2) 00-02 (1)	20-01 (1) 21-01 (1)*
Eastern Mediter-ranean & Middle East	08-11 (1)	07-11 (1) 11-14 (2) 14-16 (1) 22-00 (1)	19-20 (1) 20-22 (2) 22-23 (1)	20-22 (1)
Western Africa	09-12 (1)** 08-10 (1) 10-13 (2) 13-15 (1)	07-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	18-20 (1) 20-22 (2) 22-01 (1)	21-00 (1) 21-23 (1)*
Eastern & Central Africa	08-11 (1) 11-13 (2) 13-14 (1)	07-12 (1) 12-14 (2) 14-15 (3) 15-16 (2) 16-18 (1)	19-23 (1)	19-22 (1)
Southern Africa	10-12 (1)** 08-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-13 (1) 13-15 (2) 15-16 (3) 16-17 (2) 17-19 (1) 22-00 (1)	18-20 (1) 20-23 (2) 23-00 (1)	19-22 (1) 20-22 (1)*
Central & South Asia	09-11 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	04-08 (1) 17-21 (1)	05-07 (1) 17-19 (1)
Southeast Asia	10-13 (1) 17-19 (1)	06-07 (1) 07-10 (2) 10-12 (1) 17-21 (1)	04-08 (1) 17-19 (1)	05-07 (1) 17-18 (1)

	15 Meters	20 Meters	40 Meters	80 Meters	160 Meters
Far East	16-18 (1)** 16-17 (1) 17-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	02-04 (1) 04-07 (2) 07-08 (1)	04-07 (1) 05-07 (1)*	
South Pacific & New Zealand	14-17 (1)** 11-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-10 (2) 10-18 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-02 (1)	22-00 (1) 00-01 (2) 01-06 (3) 06-07 (2) 07-08 (1)	00-02 (1) 02-06 (2) 06-07 (1) 03-07 (1)*	
Australasia	14-17 (1)** 12-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-15 (1) 15-17 (2) 17-19 (1) 19-21 (2) 21-00 (1)	01-04 (1) 04-06 (3) 06-07 (2) 07-08 (1)	04-05 (1) 05-06 (2) 06-07 (1) 05-07 (1)*	
Caribbean, Central America & Northern Countries of South America	11-15 (1)** 07-08 (1) 08-09 (2) 09-11 (3) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	18-19 (1) 19-20 (2) 20-02 (3) 02-05 (2) 05-07 (1)	19-21 (1) 21-04 (2) 04-06 (1) 20-02 (1)* 02-04 (2)* 04-05 (1)*	
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	12-14 (1)** 07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	05-07 (1) 07-09 (2) 09-12 (1) 12-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-01 (1)	19-20 (1) 20-04 (2) 04-06 (1)	21-05 (1) 01-04 (1)*	
McMurdo Sound, Antarctica	15-17 (1)	16-19 (1) 19-22 (2) 22-00 (1) 07-10 (1)	22-01 (1) 01-04 (2) 04-06 (1)	01-04 (1)	
Western & Southern Europe & North Africa	08-11 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-14 (1) 22-00 (1)	19-22 (1) 22-00 (2) 00-01 (1)	19-22 (1) 20-22 (1)*	

February 15–April 15, 1997
Time Zone: PST
(24-Hour Time)
WESTERN USA TO:

	15 Meters	20 Meters	40 Meters	80 Meters	160 Meters
Northern, & Central Europe & CIS (former European USSR)	08-10 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-13 (1) 22-00 (1)	19-21 (1) 21-22 (2) 22-23 (1)	19-22 (1) 20-22 (1)*	
Eastern Mediter-ranean & Middle East	08-10 (1)	07-10 (1) 10-11 (2) 11-13 (1) 22-00 (1)	18-21 (1)	18-20 (1)	
Western Africa	09-10 (1)** 08-09 (1) 09-12 (2) 12-14 (1)	05-07 (1) 07-08 (2) 08-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-18 (1)	18-22 (1)	19-21 (1) 19-21 (1)*	
Eastern & Central Africa	09-11 (1)	06-08 (1) 11-13 (1) 13-15 (2) 15-16 (1)	18-21 (1)	18-20 (1)	
Southern Africa	09-11 (1)** 08-10 (1) 10-13 (2) 13-14 (1)	05-06 (1) 06-08 (2) 08-13 (1) 13-17 (2) 17-18 (1) 23-01 (1)	18-22 (1)	19-21 (1) 19-21 (1)*	
Central & South Asia	08-10 (1) 18-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-21 (1)	05-08 (1) 17-19 (1)	05-07 (1) 17-18 (1)	
Southeast Asia	16-18 (1)** 08-10 (1) 16-17 (1) 17-18 (2) 18-19 (1)	02-07 (1) 07-09 (2) 09-11 (1) 16-17 (1) 17-19 (2) 19-20 (1)	02-04 (1) 04-06 (2) 06-08 (1)	05-07 (1)	
Far East	14-16 (1) 16-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-19 (3) 19-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1)	02-03 (1) 03-06 (2) 06-07 (1) 03-06 (1)*	
South Pacific & New Zealand	15-17 (1)** 11-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	06-09 (1) 09-11 (2) 11-16 (1) 16-18 (2) 18-19 (3) 19-21 (4) 21-22 (3) 22-00 (2) 00-04 (1)	21-22 (1) 22-06 (3) 06-08 (2) 08-09 (1)	22-00 (1) 00-06 (2) 06-07 (1) 22-00 (1)* 00-06 (2)* 06-07 (1)*	
Australasia	15-17 (1)* 14-16 (1) 16-19 (2) 19-20 (1)	07-08 (1) 08-11 (2) 11-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-23 (1)	00-02 (1) 02-03 (2) 03-06 (3) 06-07 (2) 07-08 (1)	02-03 (1) 03-06 (2) 06-07 (1) 03-06 (1)*	
Caribbean, Central America & Northern Countries of South America	10-14 (1)** 07-08 (1) 08-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-14 (2) 14-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-02 (1)	18-19 (1) 19-20 (2) 20-01 (3) 01-04 (2) 04-06 (1)	19-20 (1) 20-03 (2) 03-04 (1) 20-01 (1)* 01-03 (2)* 03-04 (1)*	
Peru, Bolivia, Paraguay, Brazil, Chile Argentina & Uruguay	10-15 (1)** 07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-20 (1) 20-03 (2) 03-05 (1)	21-04 (1) 22-03 (1)*	
McMurdo Sound, Antarctica	13-15 (1) 15-17 (2) 17-18 (1)	16-19 (1) 19-22 (2) 22-02 (1) 06-07 (1) 07-09 (2) 09-11 (1)	22-02 (1) 02-05 (2) 05-06 (1)	02-05 (1)	

**Indicates best time for 160 meter openings.*
***Indicates best time for 10 meter openings.*
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

lengthening to between 400 and 1300 miles just after sundown, and between 800 and 2300 miles by midnight. On 30 and 40 meters daytime skip should be possible between approximately 250 and 750 miles, extending to between 750 and 2300 miles in the early evening.

During the hours of darkness expect to work 30 and 40 meter stations within a range of 1500 to 2300 miles. Daytime skip on 20 meters should range between 750 and 2300 miles through the late afternoon. During the late afternoon and until just after sundown it should lengthen to between 1500 and 2300 miles, with the band out for short-skip by 8 PM on most nights. On 17 and 15 meters skip should range between 1300 and 2300 miles during most of the daylight hours, with the bands going dead for short-skip about an hour or so after local sundown. Occasional short-skip openings may also be possible on 10 and 12 meters.

VHF Ionospheric Openings

Best chances for unusual ionospheric openings should be during periods of radio storminess on the HF bands. Check the Last-Minute Forecast at the beginning of this column for days during February that are expected to be Below Normal or Disturbed. Check the VHF bands on these days for auroral-type and sporadic-*E* short-skip openings.

Short-Skip Charts for February, valid for distances between approximately 50 and 2400 miles and between Alaska, Hawaii, and the mainland, appeared in January's column.

73, George, W3ASK

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Advertiser's Index

(continued on page 115)

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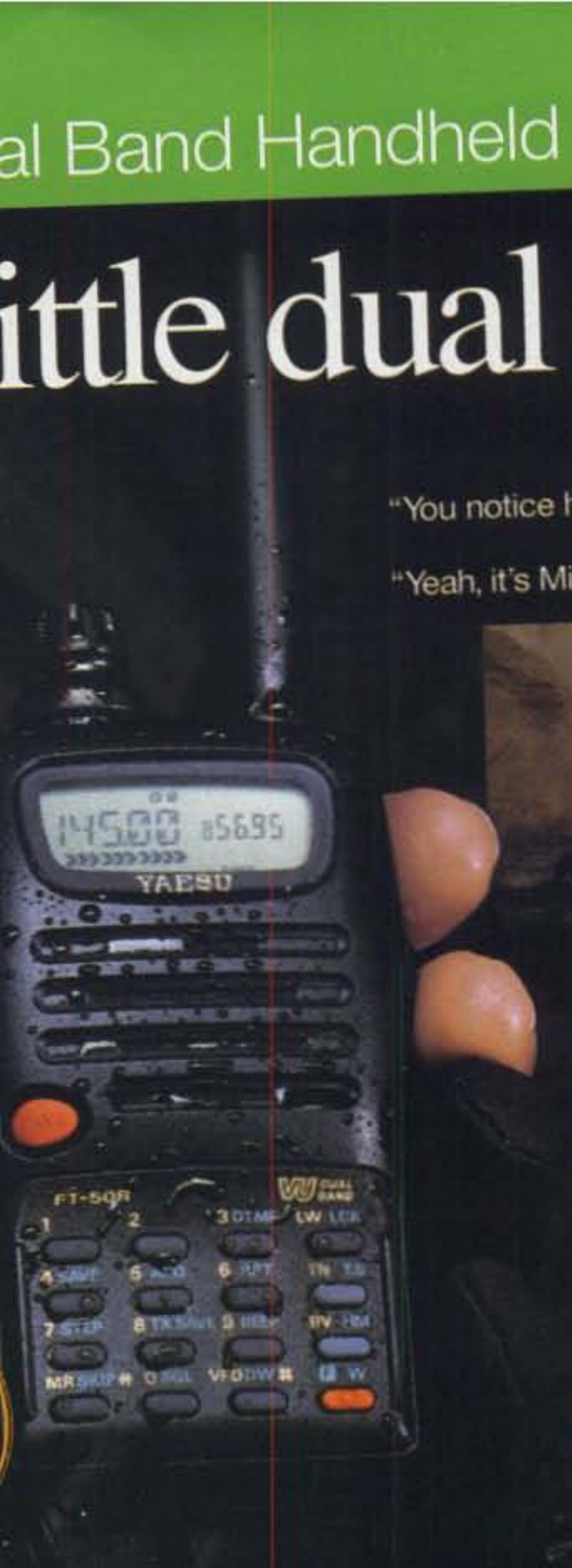

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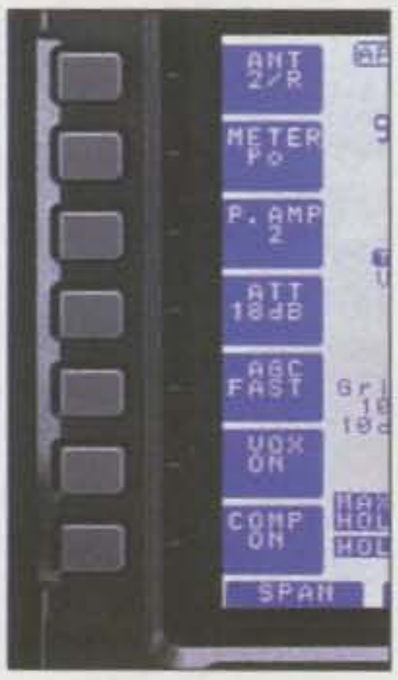

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