International Edition

October 1984 Issue #289
$2.50 USA / $3.00 Canada

73®

Amateur Radio's Technical Journal

A CWC/I Publication

Down With Towers!
Page 38

Beat It!
Page 48

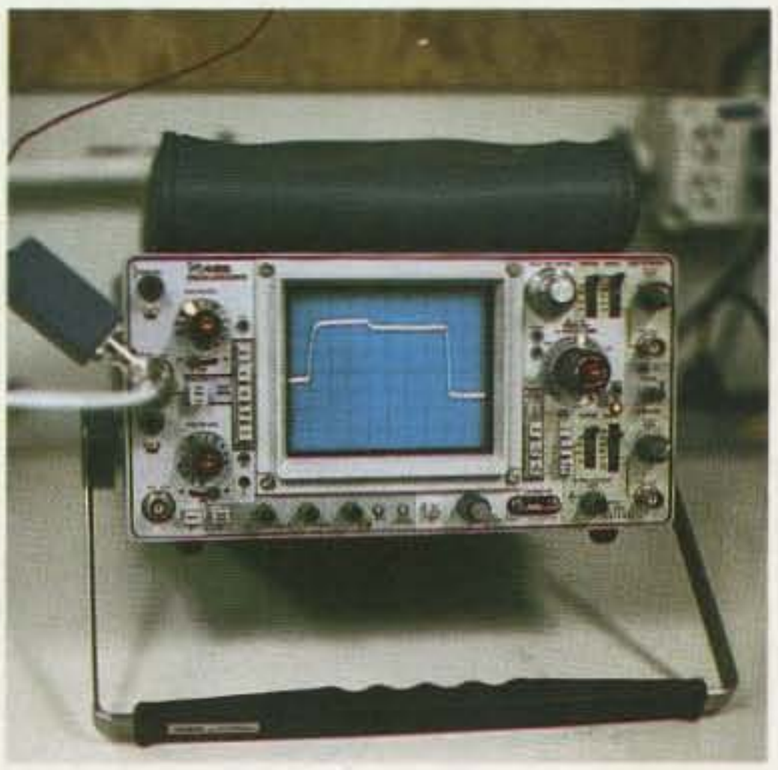
Tri-Band Umbrella
Page 20

Base-Fed Poplars?
Page 62

Black-Tie Affair
Page 26

X-Rated Aluminum
Page 32

High-Rise Bonanza
Page 44



Troubleshooting—10

Antennas! 9 Articles

Eggbeater—48

10
0
A 74470 65946

ICOM IC-745

160-10 MTR 100W XCVR / 0.1-30MHz RCVR

The IC-745 represents a major breakthrough in the ham industry...a full featured HF base station transceiver with a combination of standard features found on no other transceiver in its price range.

Compare these exceptional standard features:

- **100KHz - 30MHz Receiver**
- **16 Memories**
- **100% Transmit Duty Cycle Transmitter with exceptionally low distortion**
- **IF Shift AND Passband Tuning**
- **Receiver Preamp**
- **10Hz/50Hz/1KHz Tuning Rates with 1MHz band steps**
- **Adjustable Noise Blanker (width and level)**
- **Continuously Adjustable AGC with an OFF position**
- **Full function Metering with a built-in SWR Bridge**
- **Optional Internal AC Power Supply**

Other Standard Features.
Included as standard are many of the features most asked for by experienced ham radio operators: dual VFO's, RF speech compressor, tunable notch filter, all-mode squelch, program band scan, memory scan (frequency and modes are stored), receiver and transmitter incremental tuning and VOX.

ICOM's proven transceiver designs and technology are used in the IC-745 all ham band transceiver which includes SSB, CW, RTTY, AM receive and an optional FM **plus** a 100KHz to 30MHz general coverage receiver.

ICOM System.
The IC-745 is compatible with ICOM's full line of standard HF accessories.

Accessories available include the IC-PS15 base supply, IC-PS30 system power supply (switching), IC-PS35 internal power supply, the IC-2KL linear amplifier, AT100 automatic antenna tuner, AT500 automatic antenna tuner, HP1 headphones, and HM12 hand or SM6 base microphone.

Options. The EX241 marker and EX242 FM module, plus a wide variety of filters for sharp audio reception are available.

Filter	-6dB Width	Center Freq. MHz
FL45	500 Hz	9.000
FL53A	270 Hz	9.000
FL44A	2.1 KHz	0.455
FL52A	500 Hz	0.455
FL54	250 Hz	0.455

The IC-745 is the only transceiver today that has such features standard...the number of options and accessories available...and such an affordable price.


IC-745
Shown with IC-PS35
Internal Power Supply.

ICOM
The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 **(206)454-8155** / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234 **(214)620-2780**

7451283

6 STORE BUYING POWER

KENWOOD

TW-4000A

TM-201
TM-401

TR-7950

TRY OUR
SUPER LOW PRICES – ALL ITEMS
CALL OR VISIT

TH-21AT/ TH-41AT
TH-21A TH-41A
TR-2600A

NEW! NEW! NEW!

TM-211A/ TM-411A

TS-930S

TS-430S

R-600, R-1000, R-2000

BIRD

MODEL 43 AND ELEMENTS

CALL FOR PRICES

YAESU

FT-757GX

FT-726R
EXCELLENT FOR OSCAR

CALL FOR LOW PRICES ON ALL YAESU ITEMS

FT-208R

FT-708R

NEW!
FT-203R

MIRAGE

AMPLIFIER SALE

B-3016	SALE	$199.95
B-1016	SALE	$249.95
B-108	SALE	$159.95
B-23A	SALE	$ 79.95
D-1010	SALE	$289.95

R-71A GENERAL COVERAGE RECEIVER

Superior grade receiver provides general coverage 100kHz to 30MHz.

ICOM

IC-751 SALE
CALL FOR SALE PRICES

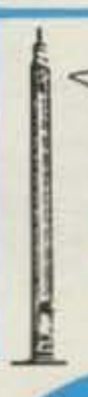
HAND-HELDS

ALL ACCESSORIES IN STOCK

SALE PRICES
IC-2AT $219
IC-3AT $239
IC-4AT $239

NEW!
IC-02AT
2M,HT

CALL FOR SPECIAL PRICES



Tri-Ex

SALE!

W-51 $899
W-36 $549
LM-470D $2799

ALLIANCE

ROTOR SALE

HD-73 $99.95

U-110 $54.95

KLM SALE

KT-34A	SALE	$329
KT-34XA	SALE	$469
40M-2	SALE	$309

CALL FOR LOW, LOW PRICES
80 THRU 1¼M KLM ANTENNAS

TRISTAO SALE

MA-40 SALE $599
40', 2 SECT. TUBULAR TOWER

MA-550 SALE $899
55' 3 SECT. TUBULAR TOWER.

PERSONALIZED SERVICE

BOB FERRERO, W6RJ
President
JIM RAFFERTY, N6RJ
VP-So.Calif.Div. Anaheim
Managers:
GEORGE,WB6DSV *Burlingame*
GREG,N6PO *Oakland*
BOB, K7RDH *Phoenix*
GLENN,K6NA *San Diego*
AL, K6YRA *Van Nuys*
and other active amateurs

FREE SHIPMENT

UPS SURFACE (Continental U.S.) (MOST ITEMS)

TOLL-FREE PHONE

Hawaiian amateurs are welcome to use our free phone

800 854-6046

(Calif. and Arizona customers please phone or visit listed stores)

PHONE HOURS: 9:30 AM to 5:30 PM PACIFIC TIME.
STORE HOURS: 10 AM to 5:30 PM Mon. through Sat.

HAM RADIO OUTLET

ANAHEIM, CA 92801
2620 W. La Palma,
(714) 761-3033, (213) 860-2040,
Between Disneyland & Knotts Berry Farm.

BURLINGAME, CA 94010
999 Howard Ave.,
(415) 342-5757,
5 miles south on 101 from S.F. Airport.

OAKLAND, CA 94609
2811 Telegraph Ave.,
(415) 451-5757,
Hwy 24 Downtown. Left 27th off-ramp.

PHOENIX, AZ 85015
1702 W. Camelback Rd.,
(602) 242-3515,
East of Highway 17.

SAN DIEGO, CA 92123
5375 Kearny Villa Rd.,
(619) 560-4900,
Hwy 163 & Clairemont Mesa Blvd.

VAN NUYS, CA 91401
6265 Sepulveda Blvd.,
(818) 988-2212
San Diego Fwy at Victory Blvd

MasterCard VISA

AEA • ALLIANCE • ALPHA • AMECO • AMPHENOL • ANIXTER-MARK • ANTENNA SPECIALISTS • ARRL • ASTRON • BELDEN BENCHER • BIRD • BUTTERNUT • B & W • CALLBOOK COLLINS • CURTIS • CUSHCRAFT • DAIWA • DRAKE • DX EDGE EIMAC • HUSTLER • HY-GAIN • ICOM • J.W. MILLER • KANTRONICS KENWOOD • KLM • LARSEN • LUNAR • METZ • MFJ • MICRO-LOG MINI-PRODUCTS • MIRAGE • NYE • PALOMAR • ROBOT • ROHN SHURE • SIGNAL-ONE • STONER • TEMPO • TEN-TEC • TRISTAO TRI-EX • VIEWSTAR • VOCOM • YAESU and many more!

Prices, specifications, descriptions subject to change without notice. Calif. and Arizona residents please add sales tax.

INFO

Manuscripts

Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts.

Editorial Offices:

Pine Street
Peterborough NH 03458
Phone: 603-924-9471

Advertising Offices:

Elm Street
Peterborough NH 03458
Phone: 603-924-7138

Circulation Offices:

Elm Street
Peterborough NH 03458
Phone: 603-924-9471

Subscription Rates

In the United States and Possessions:
One Year (12 issues) $25.00
Two Years (24 issues) $38.00
Three Years (36 issues) $53.00

Elsewhere:

Canada and Mexico—$27.97/1 year only, U.S. funds. Foreign surface mail—$44.97/1 year only, U.S. funds drawn on U.S. bank. Foreign air mail—please inquire.

To subscribe, renew or change an address:

Write to *73*, Subscription Department, PO Box 931, Farmingdale NY 11737. For renewals and changes of address, include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of gift recipients.

Subscription problem or question:

Write to *73*, Subscription Department, PO Box 931, Farmingdale NY 11737. Please include an address label.

73: Amateur Radio's Technical Journal (ISSN 0745-080X) is published monthly by CW Communications/Peterborough, Inc., 80 Pine Street, Peterborough NH 03458. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Entire contents copyright © 1984, CW Communications/Peterborough, Inc. All rights reserved. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher. Microfilm Edition—University Microfilm, Ann Arbor MI 48106. Postmaster: Send address changes to *73*, Subscription Services, PO Box 931, Farmingdale NY 11737. Nationally distributed by International Circulation Distributors.

The DX 1000 makes tuning in London as easy as dialing a phone.

Direct access keyboard tuning brings a new level of simplicity to shortwave radio. With the Uniden® Bearcat® DX 1000, dialing in the BBC in London is as easy as dialing a telephone. And you can switch from the BBC to Peruvian Huayno music from Radio Andina instantly. Without bandswitching.

Featuring the innovative microprocessor digital technology made famous by Uniden® Bearcat® scanner radios, the DX 1000 covers 10 kHz to 30 MHz continuously, with PLL synthesized accuracy. But as easy as it is to tune, it has all the features even the most sophisticated "DXer" could want. 10 memory channels let you store favorite stations for instant recall —or for faster "band-scanning" during key openings. The digital display measures frequencies to 1 kHz, or at the touch of a button, doubles as a two time zone, 24-hour digital quartz clock. A built-in timer wakes you to your favorite shortwave station. Or, it can be programmed to activate peripheral equipment like a tape recorder to record up to five different broadcasts—any frequency, any mode—while you are asleep or at work.

The DX 1000 also includes independent selectivity selection to help you separate high-powered stations on adjacent frequencies. Plus a noise blanking system that stops Russian pulse radar interference.

There's never been an easier way to hear what the world has to say. With the Uniden® Bearcat® DX 1000 shortwave radio, you have direct access to the world.

For the name of your nearest retailer dial toll-free ...1-800-SCANNER.

Frequency Range: 10 kHz to 30 MHz continuously. **Tuning:** Direct keyboard entry, selectable 3 or 24 kHz per revolution knob tuning, or manual step tuning in selectable 1-99 kHz steps. **Sensitivity:** 1.0 μV AM, 0.5 μV CW/SSB/FM, 1.6-30 MHz. **Image and IF Rejection:** 70 dB or more. **Memory:** 10 frequency capacity. **Frequency Stability:** Better than 100 Hz after warm-up. **Modes:** AM/LSB/USB/CW/FM. **AGC:** Selectable Fast/Slow release times. **Filter Bandwidths:** 2.7 kHz, 6 kHz and 12 kHz. **Filter Selection Independent of Mode.**

uniden®

Bearcat®

300

Uniden® Corporation of America,
Personal Communications Division
6345 Castleway Court,
Indianapolis, IN 46250

W2NSD/1
NEVER SAY DIE

editorial by Wayne Green

ALUMNI DINNER

A ham friend, Bill Ashby K2TKN/W8ETJ, who wrote articles for my *73* magazine, mentioned back in the early 60s that he was working for a firm making microcircuits. I think his firm was one of the first in the business. Now look where we are!

Here I am, twenty years later, sitting on a plane coming back from Washington, writing an editorial on a picocomputer. Well, perhaps things aren't all that different, really. Twenty-five years ago, when I started *73*, I used to carry a Hermes Rocket typewriter, which was not much bigger or heavier than my pico (briefcase) computer. The pico has word processing and an address file, so we've had some progress.

A lot of oceans have gone under my planes since then, and the world of microelectronics has gone berserk. 256K RAM chips indeed! Solid state was still just getting started twenty years ago, though I remember buying a couple tiny Sony BC/SW radios in Tokyo in 1959. They worked great, beating the dickens out of the little US-made broadcast transistor radios. That was before integrated circuits, so they had to use eentsy resistors and capacitors.

With the 25th anniversary of my starting *73* coming up in a few months, it seemed like as good a time as any to throw a small party for Wayne Green alumni. I keep running across people in the various electronics industries who at one time or another worked for me—and there have been a couple thousand. It seemed like it would be fun for us to get together and say hello again. If you know anyone who has ever worked for me, pass along the word, okay?

In 1960, amateur radio was growing at 11% per year—and had been for 17 years. There was an intense interest in new technologies, so I thought that a ham magazine devoted to home building and inventing would fly. I had just barely enough money to print and mail the first issue, which fortunately was in the black.

I started by doing everything: soliciting articles, editing them, proofreading the type, laying out the pages, selling the advertising, writing, printing, and mailing circulation letters, typing stencils for subscribers—everything. That's quite a learning experience. I didn't have money for going to the movies or eating much, so I made do with things like homemade oxtail soup, which was very cheap.

A couple years later, I moved the one-man staff (me) to New Hampshire and started recruiting used hams. The early ones were college dropouts who worked for the learning experience, room and board, and $20 a week. They helped with processing subscriptions, printing names on wrappers, editing articles, proofreading, bookkeeping, washing dishes, and so on. I taught them publishing, sold advertising, and cooked three meals a day for the tribe. We had up to eight living in and doing the work back around 1963. We had a ball!

When we had a chance, we piled into our VW wagon and headed out for a picnic, visiting New Hampshire's Polar Caves, Franconia Notch, The Flume, Cannon Mountain, Mount Washington, and so on. We climbed Washington, swam in The Foot Basin—it was fun.

Down through the years I've fed hundreds of people into the electronics and computer industries. One runs a very successful satellite-receiving business, another one of the top computer PR firms, and several are magazine editors. A call on the PA system at the West Coast Computer Faire for ex-Wayne Green

Continued on page 72

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, 80 Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

STAFF

EDITOR/PUBLISHER
Wayne Green W2NSD/1

EDITORIAL DIRECTOR CWC/PETERBOROUGH
Jeff DeTray WB8BTH

EDITORIAL OPERATIONS MANAGER CWC/PETERBOROUGH
Jack Burnett

EXECUTIVE/MANAGING EDITOR
Susan Philbrick

ASST. MANAGING EDITOR
Steve Jewett

TECHNICAL/INTERNATIONAL EDITOR
Perry Donham KK2Y

EDITORIAL ASSISTANTS
Nancy Noyd
Richard Phenix
Chris Schmidt

ASSOCIATES
Robert Baker WB2GFE
John Edwards KI2U
Bill Gosney KE7C
Chod Harris VP2ML
Avery L. Jenkins WB8JLG
Dr. Marc Leavey WA3AJR
Bill Pasternak WA6ITF
Peter Stark K2OAW
Robert Swirsky AF2M

ADVERTISING
1-800-441-4403

SALES MANAGER
Jim Gray W1XU

SALES REPRESENTATIVE
Ross Kenyon KA1GAV

WEST COAST OFFICE
1060 Marsh Road
Menlo Park CA 94025
1-415-328-3470

SALES MANAGER
Giorgio Saluti

SALES REPRESENTATIVES
Allison Walsh
Karen Letendre

PRODUCTION DIRECTOR
Nancy Salmon

ASST. PRODUCTION MGR./MFG.
Susan Gross

TYPESETTING MANAGER
Dennis Christensen

FILM PREP
Robert M. Villeneuve

PHOTOGRAPHY MANAGER
Nathaniel Haynes

CREATIVE DIRECTOR
Christine Destrempes

DESIGN MANAGER
Joyce Pillarella

DESIGNER
Diane Ritson

VICE PRESIDENT/GENERAL MANAGER
Debra Wetherbee

VICE PRESIDENT/FINANCE
Roger Murphy

ASSISTANT TO VP/GM
Matt Smith KA1IEI

ASSISTANT TO VP/FINANCE
Dominique Smith

DIRECTOR OF MARKETING AND SALES
Dave Schissler

DIRECTOR OF ADVERTISING
Stephen Twombly

MARKETING MANAGER
Pamela Esty

DIRECTOR OF CIRCULATION
William P. Howard

ASST. CIRCULATION MANAGER
Frank Smith

DIRECT AND NEWSSTAND SALES MGR.
Ginnie Boudrieau
1-800-343-0728

DIRECTOR OF CREDIT, SALES, AND COLLECTION
William M. Boyer

DIRECTOR OF PUBLIC RELATIONS
James Leonard

KENWOOD

...pacesetter in amateur radio

TS-430S "Digital DX-terity!"

TS-430S

Digital DX-terity...that outstanding attribute built into every KENWOOD TS-430S that lets you QSY from band to band, frequency to frequency, and from mode to mode with the speed and ease that will give you a dominant position in DX operations.

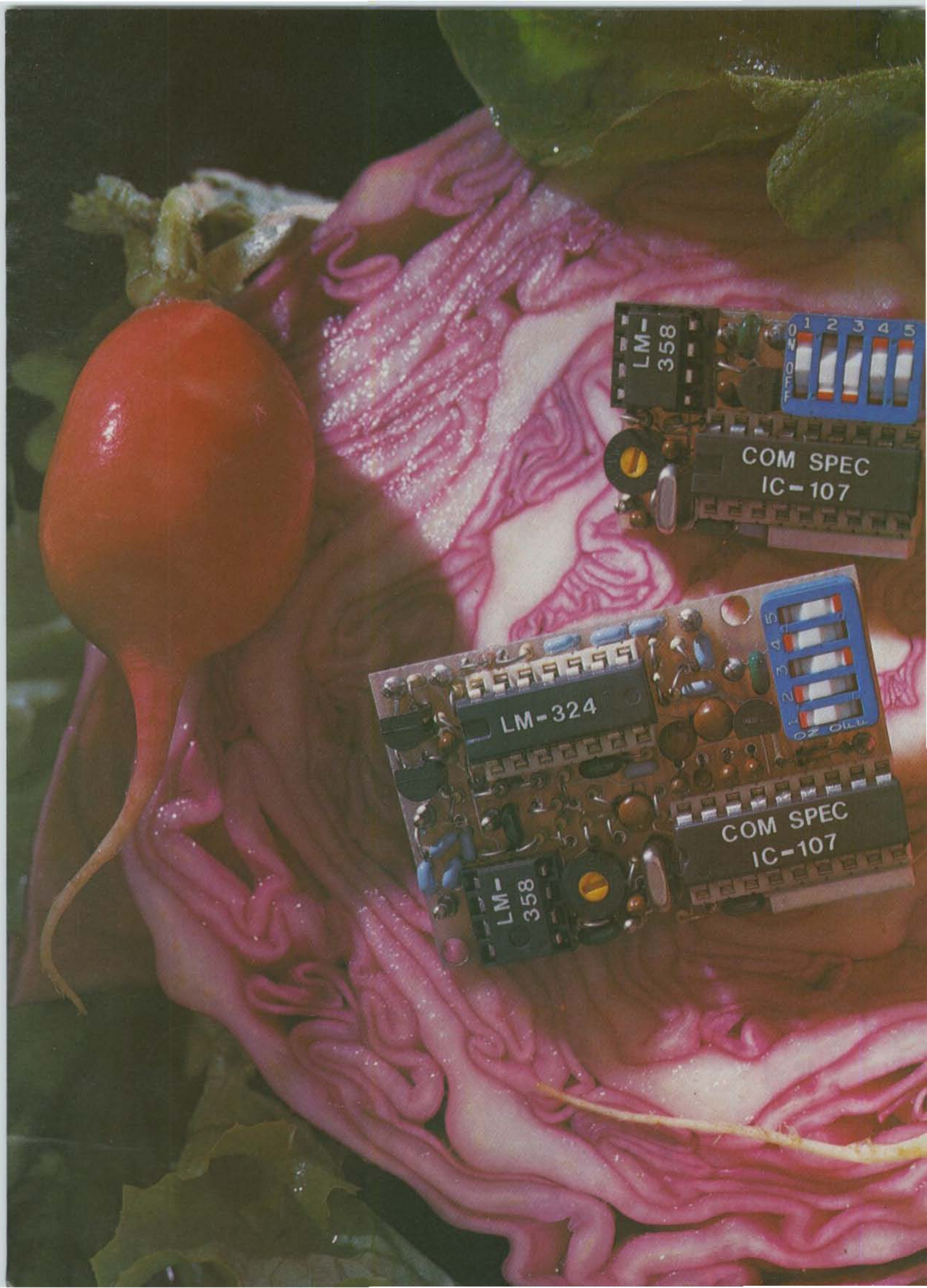
KENWOOD'S TS-430S, a revolutionary, ultra-compact, HF transceiver has already won the hearts of radio Amateurs the world over. It covers 160-10 meters, including the new WARC bands (easily modified for HF MARS). Its high dynamic range receiver tunes from 150 kHz-30 MHz. It utilizes an innovative UP conversion PLL circuit for superior frequency stability and accuracy. Two digital VFO's allow fast split-frequency operations. A choice of USB, LSB, CW, or AM, with FM optional, are at the operators fingertips. All Solid-state technology permits inputs of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.

Eight memories store frequency, mode, and band data, with Lithium battery memory back-up. Memory scan and programmable automatic band scan help speed up operations. An IF shift circuit, a tuneable notch filter, and a Narrow-Wide switch for IF filter selection help eliminate QRM. It has a built-in speech processor. A fluorescent tube digital display makes tuning easy and fast. An all-mode squelch circuit, a noise blanker, and an RF attenuator control help clean up the signal. And there's a VOX circuit, plus semi-break-in, with side-tone. All-in-all, it just could be that the expression "Digital DX-terity" is a bit of an understatement.

TS-430S Optional Accessories:
In typical KENWOOD fashion, there are plenty of optional accessories for this great HF transceiver. There is a special power supply, the PS-430. An external speaker, the SP-430, is also available. And the MB-430 mounting bracket is available for mobile operation. The AT-250 automatic antenna tuner was designed primarily with the TS-430S in mind, and for those who prefer to "roll their own," the AT-130 antenna tuner is available. The FM-430 FM unit is available for FM operations. The YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters, the YK-88SN SSB filter, and the YK-88A AM filter may be easily installed for serious DX-ing. An MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, an MC-42S mobile hand mic., and an MC-55 8-pin mobile microphone, are available, depending on your requirements. TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter 160~6 meter, SW100A SWR/power/volt meter 160-2m, HS-4, HS-5, HS-6, HS-7 headphones, are also available.

More information on the TS-430S is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

Specifications and prices are subject to change without notice or obligation.


LM-358
0 1 2 3 4 5
ON OFF
COM SPEC
IC-107
LM-324
LM-358
COM SPEC
IC-107

A fresh idea!

Our new crop of tone equipment is the freshest thing growing in the encoder/decoder field today. All tones are instantly programmable by setting a dip switch; no counter is required. Frequency accuracy is an astonishing ± .1 Hz over all temperature extremes. Multiple tone frequency operation is a snap since the dip switch may be remoted. Our SS-32 encode only model is programmed for all 32 CTCSS tones or all test tones, touch-tones and burst-tones. And, of course, there's no need to mention our 1 day delivery and 1 year warranty.

TS-32

SS-32

TS-32 Encoder-Decoder

- Size: 1.25″ x 2.0″ x .40″
- High-pass tone filter included that may be muted
- Meets all new RS-220-A specifications
- Available in all 32 EIA standard CTCSS tones

SS-32 Encoder

- Size: .9″ x 1.3″ x .40″
- Available with either Group A or Group B tones

Frequencies Available:

Group A			
67.0 XZ	91.5 ZZ	118.8 2B	156.7 5A
71.9 XA	94.8 ZA	123.0 3Z	162.2 5B
74.4 WA	97.4 ZB	127.3 3A	167.9 6Z
77.0 XB	100.0 1Z	131.8 3B	173.8 6A
79.7 SP	103.5 1A	136.5 4Z	179.9 6B
82.5 YZ	107.2 1B	141.3 4A	186.2 7Z
85.4 YA	110.9 2Z	146.2 4B	192.8 7A
88.5 YB	114.8 2A	151.4 5Z	203.5 M1

- Frequency accuracy, ± .1 Hz maximum −40°C to +85°C
- Frequencies to 250 Hz available on special order
- Continuous tone

Group B		
TEST-TONES:	TOUCH-TONES:	BURST-TONES:
600	697 1209	1600 1850 2150 2400
1000	770 1336	1650 1900 2200 2450
1500	852 1477	1700 1950 2250 2500
2175	941 1633	1750 2000 2300 2550
2805		1800 2100 2350

- Frequency accuracy, ± 1 Hz maximum −40°C to +85°C
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

Wired and tested: TS-32 **$59.95**, SS-32 **$29.95**

VISA

COMMUNICATIONS SPECIALISTS

master charge

426 West Taft Avenue, Orange, California 92667
(800) 854-0547 / California: (714) 998-3021

15

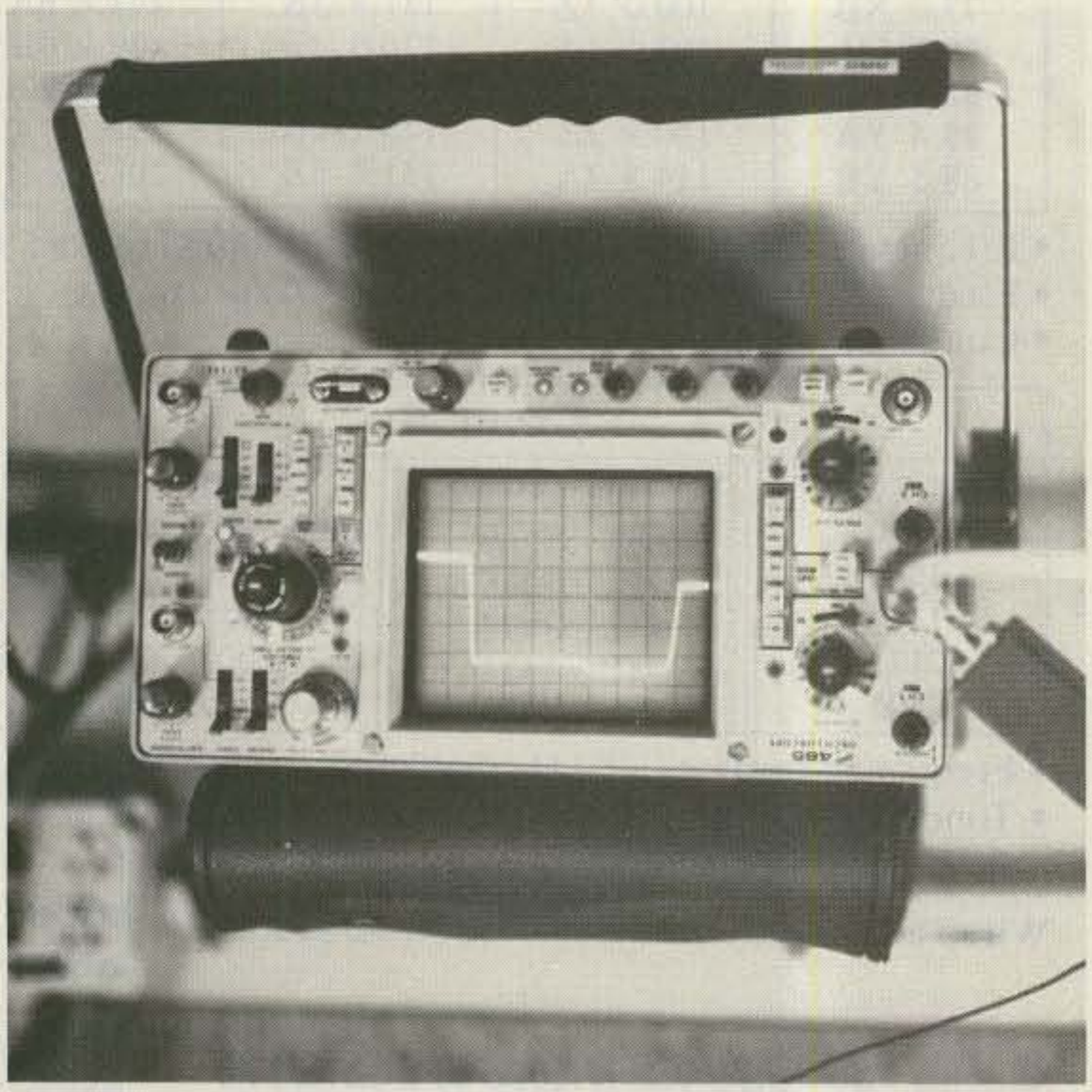
Joseph J. Carr K4IPV
5440 So. 8th Road
Arlington VA 22204

Find Fault with Your Coax

Is your cable really doing its job?
Find out with this elegant detective method.

Time Domain Reflectometry (TDR) is perhaps the most powerful method for wringing out a radio transmission line. Professional TDR instruments are expensive and therefore beyond the reach of amateurs. If you have access to an oscilloscope, however, you can build an *impromptu* TDR unit that will provide at least elementary capability.

TDR techniques can be used to locate faults on transmission lines, measure vswr, and determine the velocity factor of coaxial cable. The fault-finding capability is especially useful on systems containing very long transmission line, or, where the transmission line is hidden for much of its run.



The K4IPV home-brewed reflectometer.

Transmission Lines—Simplified and Revisited

Most amateurs have a rudimentary idea of the nature of a transmission line, especially as the term is used in radio-antenna contexts. On the naive level, we know that it is the cable which carries signals back and forth between the rig and the antenna. On a slightly more technical level, we find that the transmission line can be modeled as a complex circuit having both distributed inductance (L) and distributed capacitance (C). Fig. 1 shows an equivalent circuit. If dimension "A" in Fig. 1 is unit length, then L is the inductance per unit of length and C is the capacitance per unit of length. There is also a source impedance, R_S, which is the transmitter output impedance, and a load impedance, R_L, which is the antenna radiation resistance.

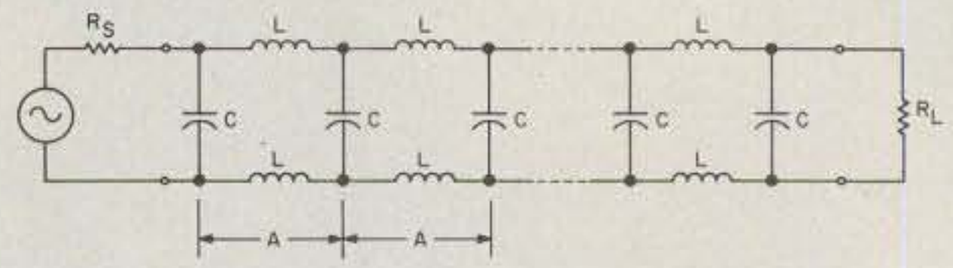


Fig. 1. Schematic representation of a transmission line.

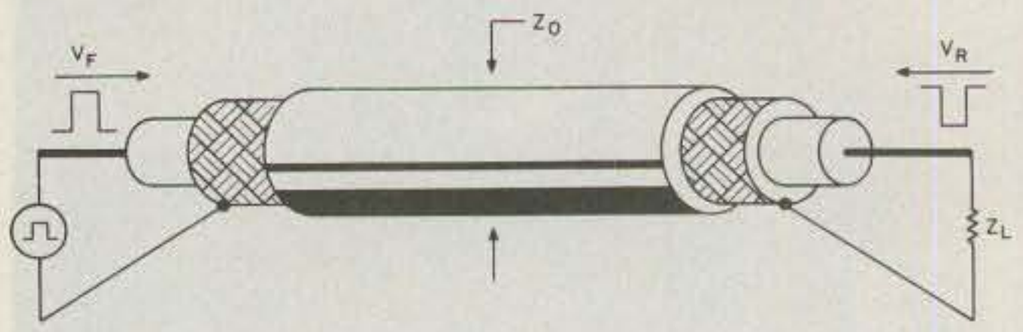


Fig. 2. Coax cable with surge impedance Z_0 and load impedance Z_L.

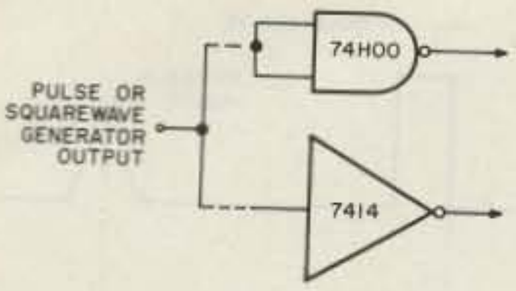


Fig. 3. Buffer to improve rise time of a signal.

Transmission lines have a property called either *surge impedance* or *characteristic impedance,* either of which is represented by the symbol Z_0. In the simplest definition, surge impedance is the square route of the ratio L to C: $Z_0 = \sqrt{L/C}$.

Let's consider what happens on a transmission line; see Fig. 2. In this illustration, we have a length of coaxial cable with a surge impedance, Z_0, terminated with a load impedance, Z_L. At the input end of the transmission line is a pulse generator. So what normally happens?

We are told that the transmission line acts as if it were infinitely long when $Z_L = Z_0$. In that case, a pulse (V_F) applied to the input end will disappear into the coax and never return. In other words, the load will dissipate *all* of the pulse's energy when the load impedance (Z_L) matches the transmission line surge impedance (Z_0). This is why we put so much emphasis on a proper match between Z_L and Z_0, as indicated (hopefully) by a 1:1 vswr.

But what of the case where Z_L is not equal to Z_0? In that case, not all of the energy in the forward or incident pulse (V_F) is absorbed by the load. Some of the energy is reflected back down the line in the opposite direction. Pulse V_F in Fig. 2 is the forward pulse that is applied by the signal generator. When it hits the load end of the line, some of its energy is absorbed by Z_L and the remainder is reflected back towards the load in the form of pulse V_R. (Note that the *phase* of the V_R is reversed compared with V_F.)

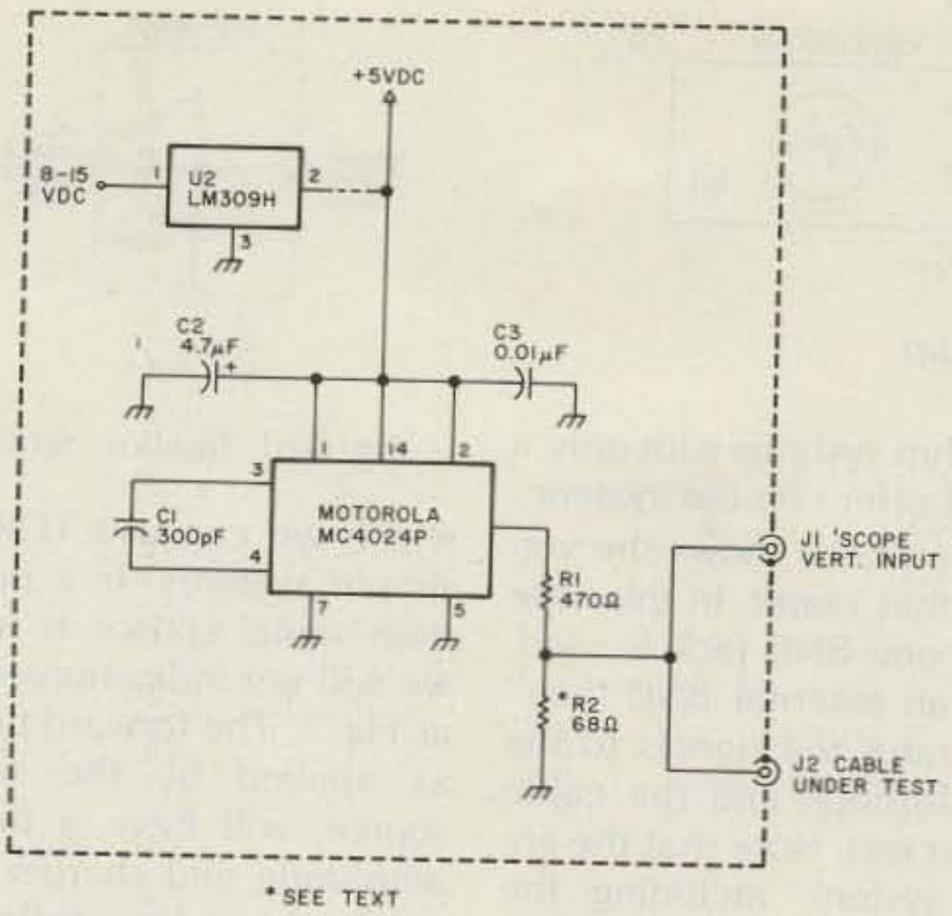


Fig. 4(a). Square-wave signal generator.

Radio waves and pulses travel down a transmission line at a known velocity that is some fraction of the speed of light (c). The so-called *velocity factor* of a transmission line is that fraction. Thus, a velocity factor of 0.66 means that waves and pulses propagate in that line at 66% of the speed of light (i.e., 0.66c).

If the speed of propagation on a line is known or can be measured, and if we have a means of timing the interval between the application of the forward pulse and the return of the reflected pulse, then we can calculate the length of the line. If the line is either open or shorted, then the length computed is the distance from the input end and the fault. In a long system, such information can save a lot of hunt 'n' check work.

Signal Sources

There are two basic TDR techniques available to the amateur; one uses a real pulse and the other a square wave. Equipment needed for these techniques is rather simple, except for the 'scope.

The oscilloscope needs a bandwidth of 5 MHz or more (preferably more). In addition, it must have a horizontal sweep calibrated in units of time (e.g., μs/cm).

The signal source can be any pulse or square-wave generator, either commercial or home-brew. In researching this article, I used a Tektronix IM-500 series pulse generator, a Heath IF-18 square-wave generator, and several home-brew generators (discussed in text). It is highly desirable that the signal source have a fast rise time.

If your oscilloscope has a +GATE output, then you may already have a pulse generator. The +GATE outputs a short-duration pulse every time the sweep is triggered. In the auto-trigger (i.e., free run) mode, the sweep is constantly retriggered regardless of whether or not a signal is present in the vertical channel. Thus, we will see a constant pulse train at the +GATE output during auto-trigger operation.

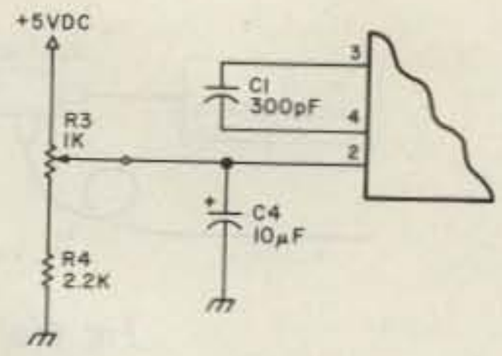


Fig. 4(b). Variable frequency modification.

If you plan to use a square-wave generator as the signal source, then it may be advisable to improve the rise time of the signal. Fig. 3 shows two buffers that can be used. The 74H00 is a high-speed version of the 7400 two-input NAND gate. This device is shown connected as an inverter (i.e., both inputs tied together). The 7400 is recommended for TTL-compatible outputs.

The 7414 used in Fig. 3 is a Schmitt trigger. As such, it will produce a fast rise-time output pulse. Like all TTL devices, there are limits to the allowable input-voltage swings. Note that the Schmitt trigger can be used to make square waves out of sine waves. The Schmitt output is binary, i.e., only two states are allowed, HIGH and LOW. The output will snap HIGH when the input passes a certain threshold voltage in a positive-going direction and will drop LOW only when the signal crosses another threshold in the negative-going direction.

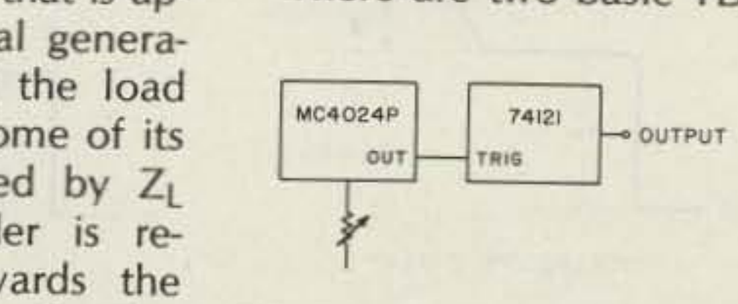


Fig. 5(a). Pulse-generator circuit (block diagram).

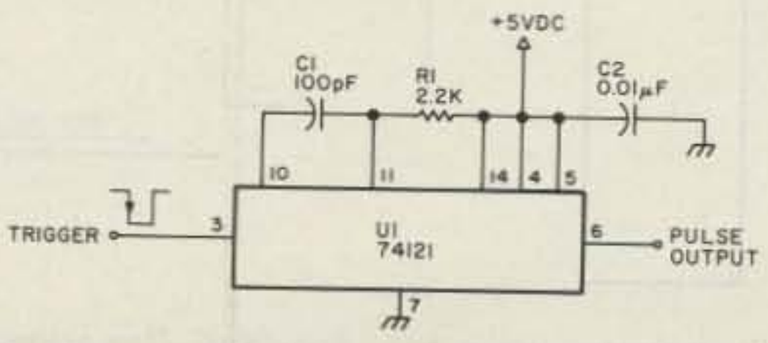


Fig. 5(b). Pulse-generator schematic.

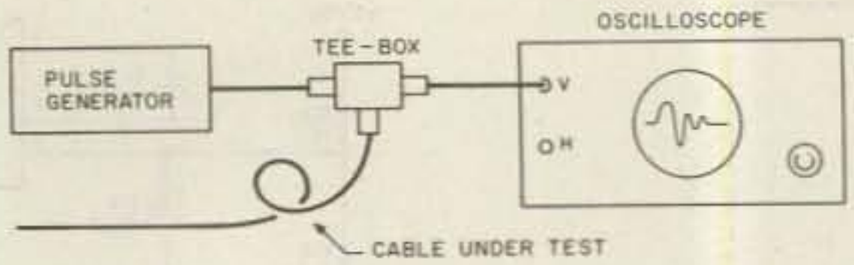


Fig. 6(a). Test setup.

Fig. 4(a) shows a homebrew square-wave signal generator based on the Motorola MC4024P voltage-controlled oscillator (vco) chip. *Note*: this is not the CMOS 4024 device.

The MC4024P contains two vco's, but this project uses only one. The frequency is controlled by capacitor C1 and is set to approximately the range needed for our application. In some cases we will want to vary the frequency, so we can use the circuit modification of Fig. 4(b). Potentiometer R3 changes the voltage applied to the vco-control input (pin 2). A 3:1 frequency ratio is possible. One use for this capability is optimization of one of the TDR techniques given below.

The output from the MC4024P device is a TTL-compatible square wave. For TDR, however, we can use almost any level within the ability of the 'scope, but the source must have an output impedance that is matched to the transmission line. Impedance matching is the function of R2 in Fig. 4(a). If only one style of coax is being tested, then set R2 equal to its Z_0 (e.g., 50 Ohms, 75 Ohms, etc.); the value of 68 Ohms allows testing in 50- *and* 75-Ohm systems with only a small effect on the system.

The photo shows the version that I built. In this case only one BNC jack is used, and an external BNC "tee" separates the signals to the oscilloscope and the cable under test. Note that the entire system, including the Pomona box, represents only a $15 accessory to a standard oscilloscope.

A pulse-generator circuit is shown in Figs. 5(a) and 5(b). Here we see a monostable multivibrator (one-shot) driven by a square-wave source such as the one in Figs. 4(a) and 4(b). The detailed circuit for the one-shot stage is given in Fig. 5(b).

A typical test setup is shown in Fig. 6(a). The interconnections between instruments is accomplished by a special tee-box—see Fig. 6(b). The circuitry is housed in a Pomona box fitted with three BNC or (if older test equipment is used) SO-239 UHF connectors. When building the tee-box, keep leads as short as possible; use "good VHF layout practices." Note that the tee-box is not needed if you build your own pulse/square-wave signal source that incorporates similar elements.

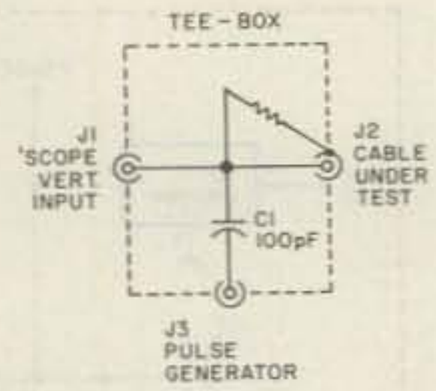


Fig. 6(b). Tee-box detail.

TDR Methods

There are two methods by which we can use TDR on simple systems. If a pulse-train signal source is used, we will get indications such as Fig. 7. The forward pulse, as applied by the signal source, will have a higher amplitude and sharper features than the reflected pulse. Coaxial code normally attenuates signal, so one would expect the amplitude to decrease. The waveshape also will change since this attenuation is different for different frequencies.

Notice that the reflected wave is different in (a) and (b) in Fig. 7. In (a) we see the situation existing when the transmission line is unterminated, i.e., open-circuited. Here the reflected pulse has the same polarity as the forward pulse. If there is a break in the coax line, then we will see this waveform. The situation for a terminated or shorted line is shown in (b); here the reflected wave has a reverse polarity.

The length of the line can be found from the time T required for the reflected pulse to return to the point of origin. The following factors affect T: length of the line, velocity factor of the line, and constant representing the speed of light. Our basic equation is:

$$L = 983.5VT/2$$

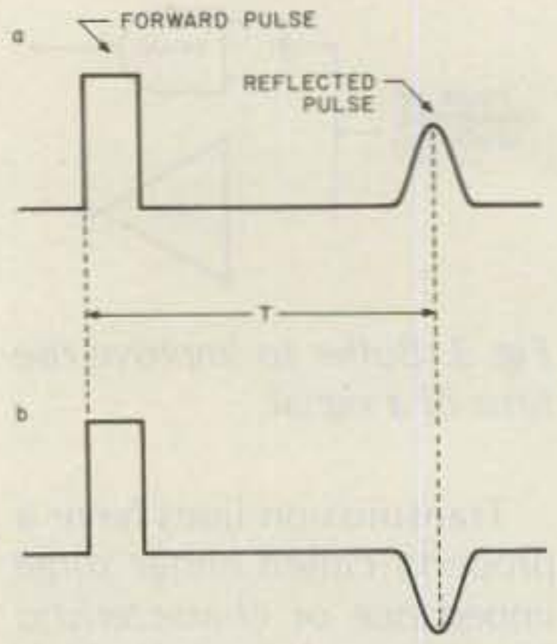


Fig. 7. TDR with a pulse-train signal source.

where L is the line length in feet, V is the velocity factor (0–1), T is the round-trip time in microseconds, as measured on the oscilloscope, 983.5 is the speed of light in feet per microseconds (ft/μs), and 2 represents the fact that T is a round-trip time.

We can rearrange the basic equation to also find T or V, as needed:

$$V = 2L/983.5T$$
$$T = 2L/983.5V$$

Let's work an example of each. Let's say we have a long piece of 75-Ohm coaxial cable used as a data line between the computer and a CRT video terminal. Your boss knows you catch bullets in your teeth and dabble in ham radio. *You*, therefore, are the resident expert and have to find out where the signal went. Being smart enough to subscribe to this magazine, you remember this article and pull it out. You obtain a pulse waveform similar to (b) in Fig. 7 and measure T as 0.63 microseconds. How far down the line is the short? First, we must determine the velocity factor. Since most TV-type coax is foam, we

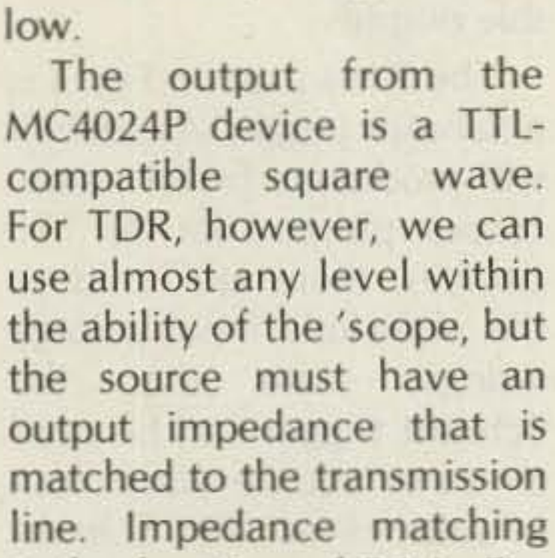


Fig. 8. Adjust square wave to match "A."

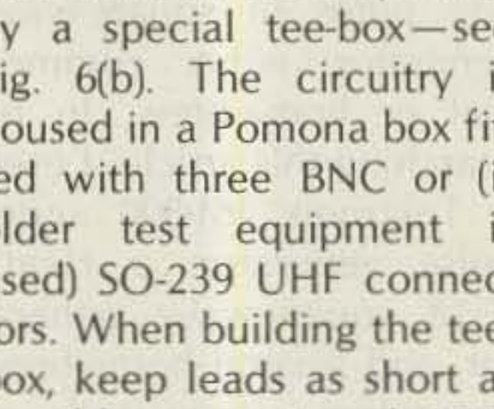


Fig. 9(a). The adjusted waveform.

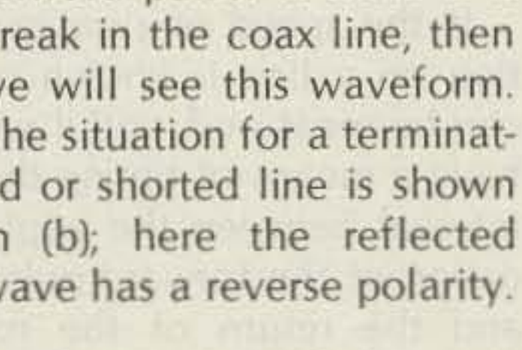


Fig. 9(b). Sum of the forward and reverse voltages.

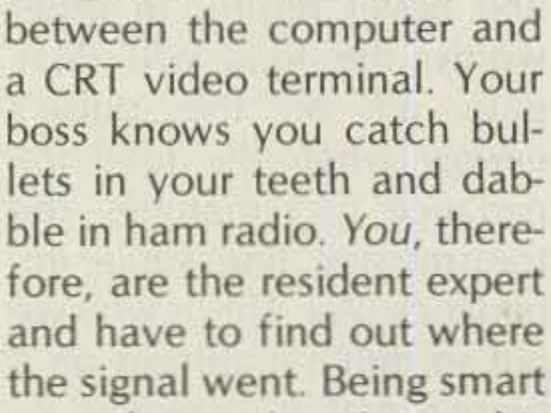


Fig. 9(c). Load impedance less than surge impedance.

NEW! uniden® Bearcat® Products

Communications Electronics,™ the world's largest distributor of radio scanners, is pleased to announce that *Bearcat* brand scanner radios have been acquired by Uniden Corporation of America. Because of this acquisition, Communications Electronics will now carry the complete line of Uniden *Bearcat* scanners, CB radios and Uniden *Bandit*™ radar detectors. To celebrate this acquisition, we have special pricing on the Uniden line of electronic products.

Bearcat®† 300-E

List price $549.95/**CE price $339.00**

7-Band, 50 Channel • Service Search • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC

Bands: 32-50, 118-136 AM, 144-174, 421-512 MHz.

The *Bearcat* 300 is the most advanced automatic scanning radio that has ever been offered to the public. The *Bearcat* 300 uses a bright green fluorescent digital display, so it's ideal for mobile applications. The *Bearcat* 300 now has these added features: Service Search, Display Intensity Control, Hold Search and Resume Search keys, Separate Band keys to permit lock-in/lock-out of any band for more efficient service search.

Bearcat® 20/20-E

List price $449.95/**CE price $269.00**

7-Band, 40 Channel • Crystalless • Searches AM Aircraft and Public Service bands • AC/DC Priority Channel • Direct Channel Access • Delay

Frequency range 32-50, 118-136 AM, 144-174, 420-512 MHz.

Find an easy chair. Turn on your *Bearcat* 20/20 and you're in an airplane cockpit. Listening to all the air-to-ground conversations. Maybe you'll pick up an exciting search and rescue mission on the Coast Guard channel. In a flash, you're back on the ground listening as news crews report a fast breaking story. Or hearing police and fire calls in your own neighborhood, in plenty of time so you can take precautions. You can even hear ham radio transmission, business phone calls and government intelligence agencies. Without leaving your easy chair. Because you've got a *Bearcat* 20/20 right beside it.

The *Bearcat* 20/20 monitors 40 frequencies from 7 bands, including aircraft. A two-position switch, located on the front panel, allows monitoring of 20 channels at a time.

Bearcat® 210XL-E

List price $349.95/**CE price $209.00**

6-Band, 18 Channel • Crystalless • AC/DC

Frequency range 32-50, 144-174, 421-512 MHz.

The *Bearcat* 210XL scanning radio is the second generation scanner that replaces the popular *Bearcat* 210 and 211. It has almost twice the scanning capacity of the *Bearcat* 210 with 18 channels plus dual scanning speeds and a bright green fluorescent display. Automatic search finds new frequencies. Features scan delay, single antenna, patented track tuning and more.

Bearcat® 260-E

List price $399.95/**CE price $249.00**

8-Band, 16 Channel • Priority • AC/DC

Frequency range 30-50, 138-174, 406-512 MHz.

Keep up with police and fire calls, ham radio operators and other transmission while you're on the road with a *Bearcat* 260 scanner. Designed with police and fire department cooperation, its unique, practical shape and special two-position mounting bracket makes hump mounted or under dash installation possible in any vehicle. The *Bearcat* 260 is so ruggedly built for mobile use that it meets military standard 810c, curve y for vibration rating. Incorporated in its rugged, all metal case is a specially positioned speaker delivering 3 watts of crisp, clear audio.

✓ *See List of Advertisers on page 98*

NEW! Bearcat® 201-E

List price $279.95/**CE price $179.00**

9-Band, 16 Channel • Crystalless • AC only Priority • Scan Delay • One Key Weather

Frequency range 30-50, 118-136 AM, 146-174, 420-512 MHz.

The *Bearcat* 201 performs any scanning function you could possibly want. With push button ease, you can program up to 16 channels for automatic monitoring. Push another button and search for new frequencies. There are no crystals to limit what you want to hear.

NEW! Bearcat® 180-E

List price $249.95/**CE price $149.00**

8-Band, 16 Channel • Priority • AC only

Frequency range: 30-50, 138-174, 406-512 MHz.

Police and fire calls. Ham radio transmissions. Business and government undercover operations. You can hear it all on a *Bearcat* 180 scanner radio. Imagine the thrill of hearing a major news event unfold even before the news organizations can report it. And the security of knowing what's happening in your neighborhood by hearing police and fire calls in time to take precautions. There's nothing like scanning to keep you in-the-know, and no better way to get scanner radio performance at a value price than with the *Bearcat* 180.

Bearcat® 100-E

The first no-crystal programmable handheld scanner.

List price $449.95/**CE price $234.00/*SPECIAL!***

8-Band, 16 Channel • Liquid Crystal Display Search • Limit • Hold • Lockout • AC/DC

Frequency range: 30-50, 138-174, 406-512 MHz.

The world's first no-crystal handheld scanner has compressed into a 3" x 7" x 1¼" case more scanning power than is found in many base or mobile scanners. The *Bearcat* 100 has a full 16 channels with frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the 2-Meter and 70 cm. Amateur bands, *plus* Military and Federal Government frequencies. It has chrome-plated keys for functions that are user controlled, such as lockout, manual and automatic scan. Even search is provided, both manual and automatic. Wow...what a scanner!

The *Bearcat* 100 produces audio power output of 300 milliwatts, is track-tuned and has selectivity of better than 50 dB down and sensitivity of 0.6 microvolts on VHF and 1.0 microvolts on UHF. Power consumption is kept extremely low by using a liquid crystal display and exclusive low power integrated circuits.

Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. The *Bearcat* 100 is in stock for quick shipment, so order your scanner today.

Bearcat® DX1000-E

List price $649.95/**CE price $489.00**

Frequency range 10 kHz to 30 MHz.

The *Bearcat* DX1000 shortwave radio makes tuning in London as easy as dialing a phone. It features PLL synthesized accuracy, two time zone 24-hour digital quartz clock and a built-in timer to wake you to your favorite shortwave station. It can be programmed to activate peripheral equipment like a tape recorder to record up to five different broadcasts, any frequency, any mode, while you are asleep or at work. It will receive AM, LSB, USB, CW and FM broadcasts.

There's never been an easier way to hear what the world has to say. With the *Bearcat* DX1000 shortwave receiver, you now have direct access to the world.

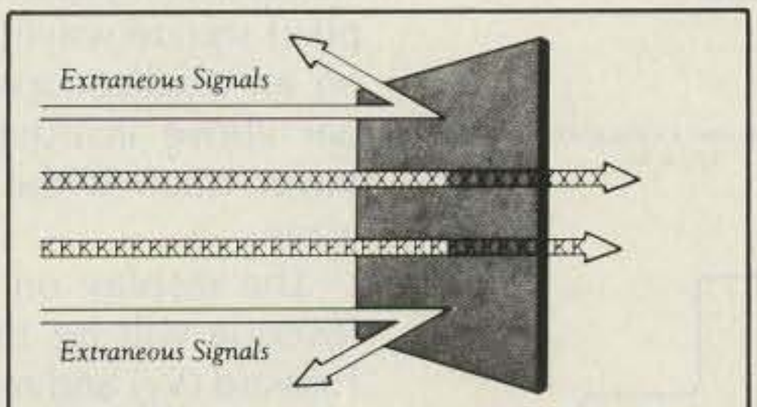
Uniden® PC22-E

List price $159.95/**CE price $99.00**

The *Uniden* PC22 is a 40 channel AM remote mobile CB radio. It's the answer for today's smaller cars which don't always provide adequate space for mounting. Since all the controls are on the microphone, you can stash the "guts" in the trunk. The microphone has up/down channel selector, digital display, TX/RX indicator and external speaker jack. Dimensions: 5¾" W x 7⅞" D x 1½" H. 13.8 VDC, positive or negative ground.

QUANTITY DISCOUNTS AVAILABLE

Order two scanners at the same time and deduct 1%, for three scanners deduct 2%, four scanners deduct 3%, five scanners deduct 4% and six or more scanners purchased at the same time earns you a 5% discount off our super low single unit price.



Both Bandit™ radar detectors feature E.D.I.T.,™ the Electronic Data Interference Terminator that edits-out false alarm signals.

Uniden® PC33-E

List price $59.95/**CE price $44.00**

The *Uniden* PC33 boasts a super-compact case and front-panel mike connector to fit comfortably in today's smaller cars. *Controls:* Power & Volume, Squelch; *Switches:* ANL. Other features of the PC33 include Graduated LED "S"/RF Meter, Digital channel indicator. Dimensions: 6" W x 6" D x 1⅞" H. ±13.8 VDC.

Uniden® PC55-E

List price $89.95/**CE price $59.00**

The full featured *Uniden* PC55 front-panel mike connector makes installation easier when space is a factor. It has ANL, PA-CB, Channel 9 and RF Gain switches. LED "S"/RF meter, TX lite, PA & external speaker jacks. Dimensions: 6" W x 6" D x 1⅞" H. ±13.8 VDC.

Bandit™ Radar Detectors

Now that everyone else has taken their best shot at radar detection, the Uniden Bandit™ has done them one better...with E.D.I.T.,™ the Electronic Data Interference Terminator that actually edits-out false alarm signals.

The Bandit 55, features a convenient brightness/dimmer control for comfortable day or night driving, plus a handy highway/city control for maximum flexibility wherever you drive. The Bandit 95 Remote, is a two-piece modular unit that lets you mount the long-range radar antenna behind the grill, out of view. The ultra-compact control unit can then be inconspicuously tucked under the dash or clipped to the visor. Order **Bandit 55-E** for $119.00 each or the **Bandit 95-E Remote** for $139.00 each.

OTHER RADIOS AND ACCESSORIES

FB-E-E Frequency Directory for Eastern U.S.A. $12.00
FB-W-E Frequency Directory for Western U.S.A. ... $12.00
BC-WA-E Bearcat Weather Alert™ $35.00
A60-E Magnet mount mobile antenna $35.00
A70-E Base station antenna $35.00

Add $3.00 shipping for all *accessories* ordered at the same time. Add $3.00 shipping per scanner antenna.

BUY WITH CONFIDENCE

To ***get the fastest delivery from CE*** of any product in this ad, send or phone your order directly to our Scanner Distribution Center.™ Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CE is instructed differently. A $5.00 additional handling fee will be charged for all orders with a merchandise total under $50.00. Shipments are F.O.B. Ann Arbor, Michigan. No COD's. Most products that we sell have a manufacturer's warranty. Free copies of warranties on these products are available prior to purchase by writing to CE. International orders are invited with a $20.00 surcharge for special handling *in addition* to shipping charges. Non-certified checks require bank clearance.

Mail orders to: Communications Electronics,™ Box 1002, Ann Arbor, Michigan 48106 U.S.A. Add $7.00 per scanner, radar detector or CB or $12.00 per shortwave receiver for U.P.S. *ground* shipping and handling in the continental U.S.A. For Canada, Puerto Rico, Hawaii, Alaska, or APO/FPO delivery, shipping charges are three times continental U.S. rates. If you have a Visa or Master Card, you may call and place a credit card order. Order toll-free in the U.S. Dial 800-521-4414. In Canada, order toll-free by calling 800-221-3475. WUI Telex CE anytime, dial 671-0155. If you are outside the U.S. or in Michigan dial 313-973-8888. Order today.

Order Toll Free . . . call 1-800-521-4414

CE™ COMMUNICATIONS ELECTRONICS™ ✓296

Consumer Products Division

818 Phoenix □ Box 1002 □ Ann Arbor, Michigan 48106 U.S.A.
Call TOLL-FREE 800-521-4414 or outside U.S.A. 313-973-8888

can assume V=0.8. Therefore:

$$L = 983.5VT/2$$
$$L = (983.5)(0.8)(0.63)/2$$
$$L = 495.7/2 = 248 \text{ feet}$$

Tracing the line on the building plans, you find the area where the short should be found. Going to that area, you find a carpenter at work subdividing a room—and find the nail he drove through your coax! You hold off busting his chops when you notice the hammer in his hand.

You can use the same equation to find the length of coax needed to accomplish a specified delay. Coax delay lines are used often and are a lot cheaper than lumped-constant delay lines.

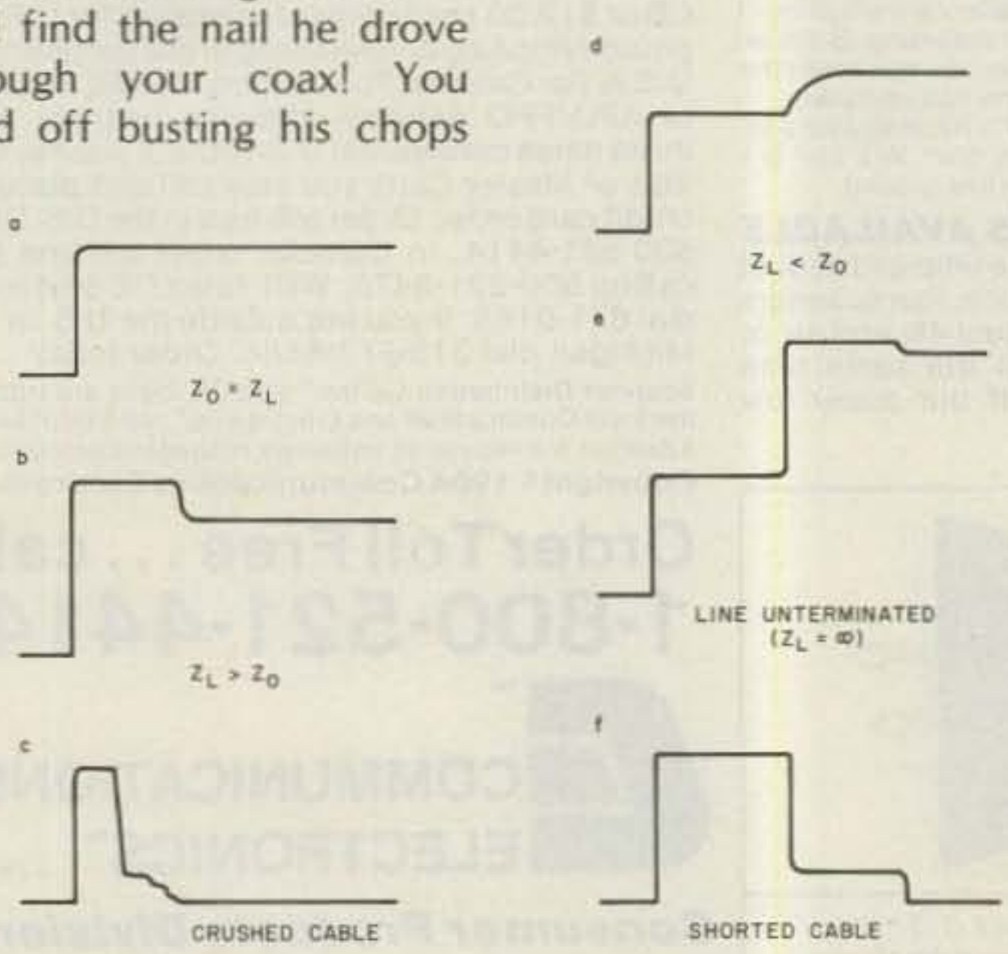


Fig. 10. A variety of traces.

It is necessary to know the actual velocity factor (V) of a piece of coax. If you are trying to make a quarter- or half-wavelength stub, then the velocity factor must be known. For noncritical applications, we can accept the common wisdom factors of 0.66 for regular cable, 0.7 for Teflon® and 0.8 for foam. But *actual* velocity factors often differ from these values, so they must be measured.

Make the measurement of T using about 50 feet of cable. The precise length must be known, and the load end should either be left unterminated or terminated in a severe mismatched impedance. This latter stipulation is needed to enhance the reflected pulse. If L and T are known, then V can be computed. If you make enough measurements on coax, you will find that published velocity factors are quite nominal and that the range of V for supposedly identical samples of cable is quite large. In fact, you may well come to doubt much of the "standard wisdom" published about transmission lines popular in amateur radio.

The alternate method used for amateur TDR uses a square wave rather than a pulse. Adjust the square-wave frequency and the oscilloscope timebase to display the top portion of the square wave as shown by dimension "A" in Fig. 8. For a perfectly symmetrical square wave, the period will be approximately 2A, so the frequency will be 1/2A.

In Fig. 9(a), the upper waveform represents the applied square wave as viewed on an oscilloscope adjusted per above instructions. The lower trace is the reflected wave.

The display on the oscilloscope will be the *sum* of forward (V_F) and reverse (V_R) voltages, such as Fig. 9(b). In the case where the load impedance is equal to the coax surge impedance (i.e., $Z_L = Z_0$), the trace will be similar to the upper trace in (a). The trace in (b) represents the case where the load impedance is greater than the surge impedance ($Z_L > Z_0$), while 9(c) is that obtained for Z_L less than Z_0 (i.e., $Z_L < Z_0$).

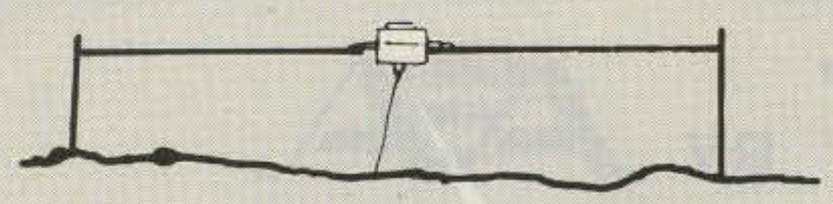
These traces not only tell us the direction of mismatch but also the approximate magnitude (in the form of a vswr). Using the designations of Figs. 9, we can compute the approximate vswr from:

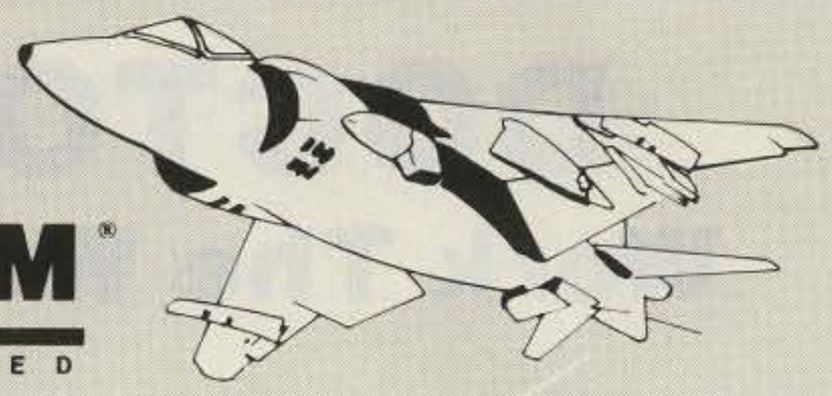
$$\text{vswr} = V_F + V_R / V_F - V_R$$

The vswr measurement thus obtained is only approximate because transmission line attenuation reduces the reflected power returning to the transmitter end. This method, like all other methods, produces valid results only when the measurement is corrected for normal attenuation effects and the line is a multiple of half wavelength.

Fig. 10 shows the results of square-wave TDR for various situations. Fig. 10(a) shows the situation where $Z_L = Z_0$. If the system is perfect (rare!), then the upper horizontal line in (a) will be perfectly flat. If there are glitches in that portion, then it may indicate anomalies on the line. I have seen both minor crushes or bends and in-line connectors splicing sections of line cause anomalies in an otherwise perfect trace. For connectors, the glitch may be slight (especially if BNC connectors are used), but it *will* be present.

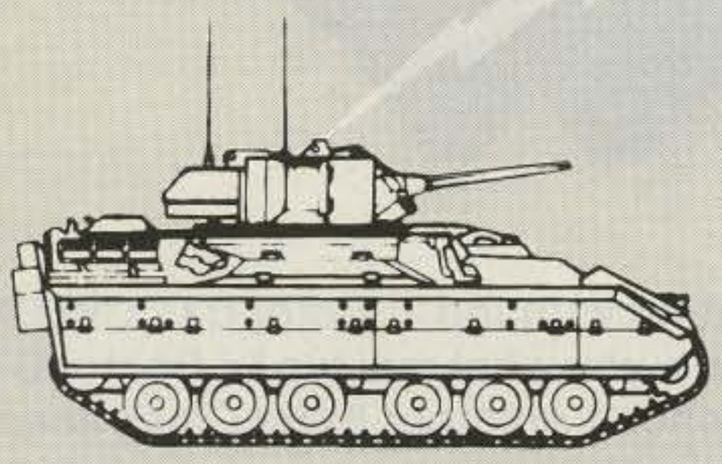
The traces shown in Fig. 10 demonstrate the wide degree of change of the trace caused by line problems. Although Time Domain Reflectometers are complex instruments compared with our simple system, our system is capable of giving us a great deal of data about transmission lines that would otherwise be difficult to obtain. ■

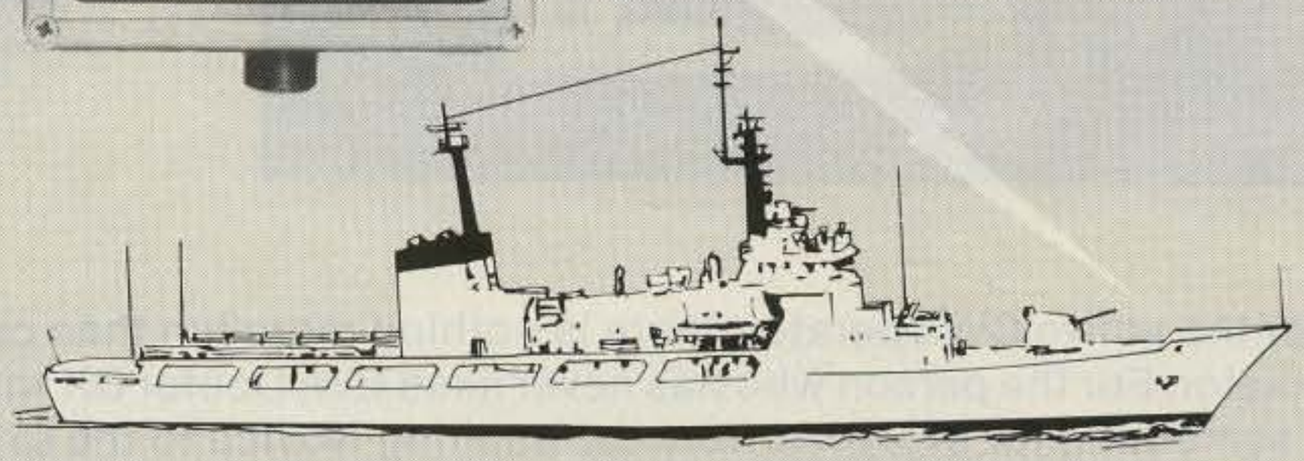




MAXCOM®
INCORPORATED

AUTOMATIC ANTENNA MATCHER





ONE ANTENNA .3 TO 70 MHZ.
VSWR 1.5:1 OR LESS

UNEXCELLED FOR **"FREQUENCY HOPPING"**

* NO MOVING PARTS !
* 5 YEAR WARRANTY !
* INSTANT MATCHING !
* 50 OHM INPUT !
* LOW NOISE !
* DIPOLE !
* MARINE !
* AMATEUR !
* 100% SOLID STATE !
* NO CONTROL LEADS !
* LIGHT WEIGHT !
* HIGH EFFICIENCY !
* 200 TO 2KW. P.E.P. !
* LONG WIRE !
* MILITARY !
* AVIONICS !

* NOW IN USE ON THE FOLLOWING NAVY VESSELS *

* USS ENTERPRISE * USS HECTOR * USS SARATOGA * USS PHOENIX * USS PRAIRIE *
* USS LEXINGTON, AND US NAVY M.A.R.S. *

"NEW R.F. GROUNDLESS LONGWIRE MODELS NOW AVAILABLE"

CONTACT

MAGNUM DISTRIBUTORS INC.

1831 South Dixie Highway, Pompano Beach, Florida 33060
305-785-2002 • Telex 514365 (English FTL)

54

See List of Advertisers on page 98

DOCTOR DX™ BY AEA

Work The World With No Antenna

For the active CW operator, there is nothing more fun than operating with the "Doctor DX" CW DX simulator. For the person who has never liked CW, Doctor DX will show you what real fun is. Doctor DX has something for everyone from the aspiring Novice to the experienced Amateur Extra Class licensee. And you need no FCC license to operate Doctor DX!

With Doctor DX, all you need is a Commodore-64 computer, a key (or keyer), and a TV set. There is no need for an expensive transceiver, amplifier and antenna farm to enjoy the thrill of working "rare DX." No more TVI or dead bands! Doctor DX is more than the most sophisticated CW trainer ever developed, it is your DXpedition ticket to anywhere in the world at a very affordable price.

Doctor DX simulates real H.F. CW band conditions. All the stations you will work are generated by the computer. As you tune up and down the particular band you have selected, you will hear realistic sounding stations in contact with other stations (some within your skip zone). There is also the normal QRN and QRM one would expect to hear in the real world. All call letters heard are totally random (subject to the country's callsign assignment rules). The prefixes are weighted according to the Amateur Radio population density, with 304 possible countries represented. The speed of stations operating in the lower portion of the bands is much faster than those operating in the upper band segments. The "operators" are also more polished in the lower portion of the bands.

Radio propagation (programmed for each band) represents what you would expect to hear on a good propagation day at the peak of the sunspot cycle. The propagation follows the internal real-time clock that you set before beginning operation. All the simulated stations you hear (with proper prefixes) are at distances you would expect to hear for the time of day and band selected.

You can learn and enhance your CW operating skills with Doctor DX. Doctor DX will not reward bad habits. AEA even offers an awards program to owners of Doctor DX that work all zones, 100 countries, 5 band Dr DXCC, or Doctor DX Honor Roll.

The Doctor DX CW trainer is a totally new concept in Amateur Radio. See what all the excitement is about. Send for full details, and see your dealer for a demonstration.

Send Us Your QSL Today And We Will Rush Full Details!

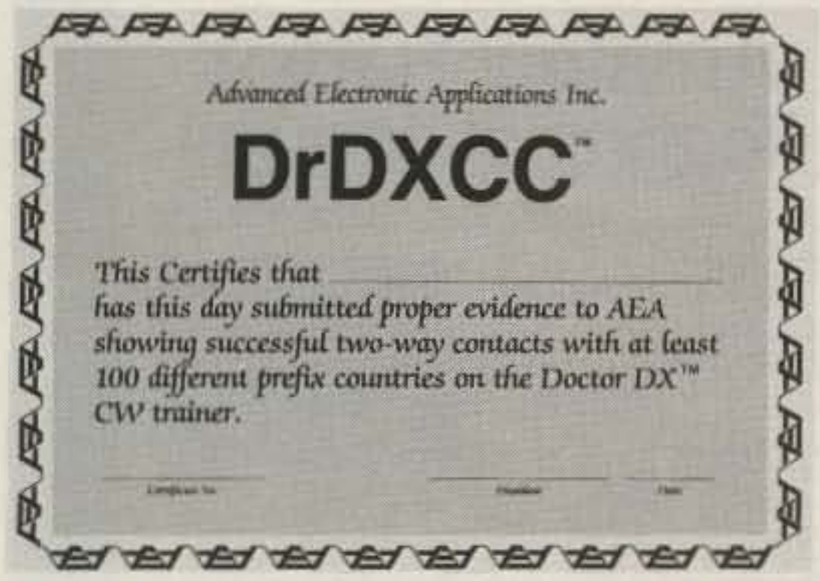
Advanced Electronic Applications, Inc.

P.O. BOX C-2160 • LYNNWOOD, WA 98036
(206) 775-7373 • TELEX: 152571 AEA INTL

AEA Brings you the Breakthrough!

Doctor DX™ Challenge

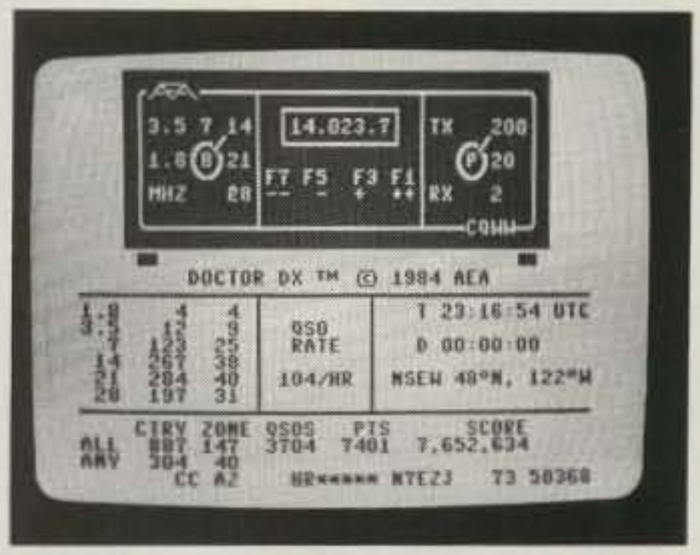
BY AEA



DOCTOR DX CONTEST BOX

TOP SPRINT SCORES	TOP MARATHON SCORES
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____

WILL YOUR CALL APPEAR HERE?



For good clean, competitive fun, Doctor DX™ shows your score and QSO rate for continuous monitoring of your improved CW operating skills. The DDX-64 can be a vehicle for fairly settling those club rivalries by competing with your friends under identical operating conditions.

AEA also has two on-going CW contests that you can enter with Doctor DX as your own schedule permits. The AEA SPRINT CONTEST is a timed non-stop eight hour event and the AEA MARATHON CONTEST is a timed 24 hour non-stop event. The top 5 contest scores will be published in our future advertisements and upgraded periodically as new higher scores are achieved.

In addition to the two AEA contests, we are offering award certificates for achieving certain milestones. You will be automatically alerted when you have achieved these milestones by a display at the bottom of the monitor screen.

AEA DrDXCC is achieved when you have worked 100 different countries, regardless of the frequency band or the amount of time operated. DOCTOR DX WAZ can be earned by working all 40 CQWW zones of the world, without regard to the band or duration of operating time. The DOCTOR DX HONOR ROLL is reserved for top notch operators capable of working 250 countries without regard for band or operating time. Additional endorsement awards are available for each additional 10 countries worked up to 300 (out of 304 possible) countries. AEA 5 BAND Dr DXCC is a very difficult award to achieve. It requires working 100 countries on each of five different bands, without regard for the amount of operating time.

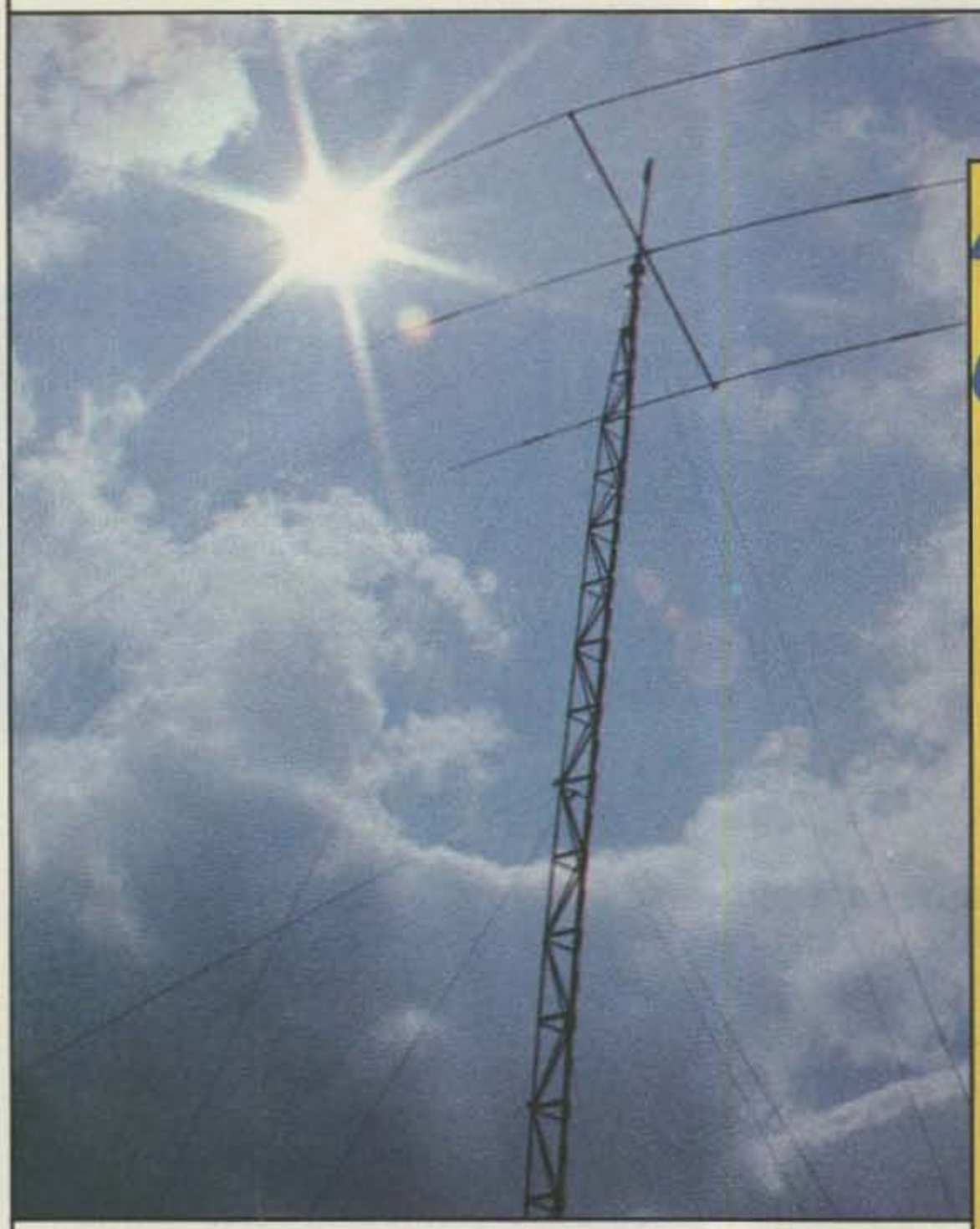
Each award can be obtained by filling out a photocopy of the award application form (supplied) along with the score information and qualifying check sum from your screen display. Please enclose $3.00 to cover handling costs for each certificate ($1.00 for Honor Roll endorsements). Awards will only be granted to owners having a Doctor DX warranty card on file.

There is no need to ever be bored with your hobby again just because the bands are dead or you are apartment bound. Try Amateur Radio's own version of Solitaire - DOCTOR DX.

Advanced Electronic Applications, Inc.
P.O. BOX C-2160 • LYNNWOOD, WA 98036
(206) 775-7373 • TELEX: 152571 AEA INTL

AEA Brings you the Breakthrough!

COMMUNICATE



FIRST WITH US, THEN THE WORLD!

Better communications start with your subscription to 73 Amateur Radio's Technical Journal

YES! Start my no-risk subscription today and send me 12 issues of **73** for $19.97. I understand that with payment enclosed or credit card order I will receive a FREE issue making a total of 13 issues for $19.97.

☐ CHECK/MO ☐ MC ☐ VISA ☐ AE ☐ Bill Me $19.97 for 12 issues

Card # _____ Exp. Date _____

Signature _____

Name _____

Address _____

City _____ State _____ Zip _____

Canada & Mexico $22.97, 1 year only, US funds drawn on US bank.
Foreign Surface $25.00, 1 year only, US funds drawn on US bank.
Foreign airmail please inquire. Please allow 6–8 weeks for delivery.

73 Amateur Radio's Technical Journal
PO Box 931, Farmingdale, NY 11737

34AF6

↙ See List of Advertisers on page 98

Harry D. Hooton W6TYH
1420 Shamrock Lane
Lincoln CA 95648

The Aussie Parasol Beam

What has twelve corners, three bands, and uses 140 feet of wire? Hint: It's not a quad.

The Australian ham with Novice-license privileges is limited to certain frequencies and very low antenna power—somewhere in the vicinity of 20 Watts PEP. Nevertheless, many of these Novices (not necessarily beginners in electronics) produce outstanding signals all over the globe on the 10- and 15-meter bands. Some of these stations, such as VK7KDR (formerly VK7NDR), VK7NRD, VK3VGW, and others that I have worked over 100 times, have spent many hours hand-honing their antenna systems close to perfection.

During the years 1978 through 1982, when I was on the air every day, there were many VK Novice stations that *consistently* laid down S9+ signals at W6TYH. My curiosity being aroused, I contacted most of these hams and found that they were using the VK2ABQ "parasol" beam antenna described by Fred VK2ABQ in the October, 1973, issue of *Electronics Australia*.

I wish to express my gratitude to the many VK hams who mailed me photocopies of the original article and others that showed more recent modifications of this unusual antenna system.

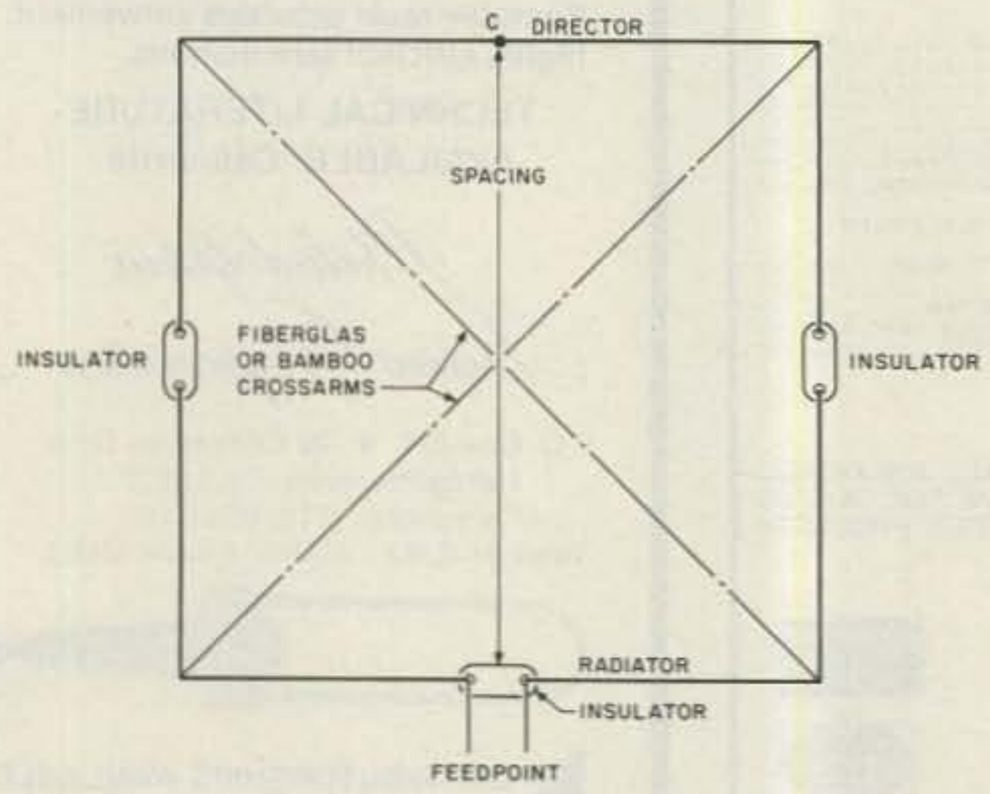


Fig. 1. Australian parasol beam antenna. Construction is similar to one frame of a cubical quad, but plane of loop is parallel to surface of the earth. Array is horizontally polarized.

One of the features of the parasol array that first caught my attention was its small, compact size. I immediately had visions of a 40-meter beam using a parasol-type loop. It is also suitable for the ham who wants a triband antenna system but is cramped for space. Because it is very light, when constructed with ordinary copper-wire conductors and bamboo or fiberglass spreaders, it can be rotated with a heavy-duty TV antenna rotator.

To satisfy my curiosity, I built and tested a dual-band parasol array with loops for the 10- and 15-meter bands only. Although the installation was not permanent, the following data should be of interest to all hams who desire a low-cost, simple, and low-weight antenna system for the three highest HF bands.

Antenna Design

As shown in Fig. 1, the parasol antenna consists basically of two wire conductor elements, each of which has its ends bent inward at right angles to the center section. Since most of the radiated field from an antenna element emanates from the center portion, the radiation efficiency is not noticeably poorer than that of a given element that used inductive traps or other shortening devices. As shown here, the parasol array is a modified 2-element yagi, using a driven element and a parasitic director.

The Australian versions of the array are fed directly at the center(s) of the driven element(s) with 72-Ohm coaxial cable. Although no specific swr figures were included in the photocopy material received from Fred VK2PHQ, I have been informed that the line swr is not greater than 2.5:1 when the three driven-element feedpoints are connected in parallel and fed from a single 72-Ohm line.

Frequency(MHz)	A	B	C	D	E	F
7.15	46' 7"	8' 2"	9' 9"	46' 7"	25'	16' 9"
14.3	23' 5"	4' 1"	4' 10"	23' 5"	12' 6"	8' 4"
21.3	15' 8"	2' 9"	3' 3"	15' 8"	8' 5"	5' 8"
28.6	11' 8"	2'	2' 5"	11' 8"	6' 3"	4' 2"

Table 1. Approximate dimensions of elements and spacing for 40-, 20-, 15-, and 10-meter parasol beam antennas.

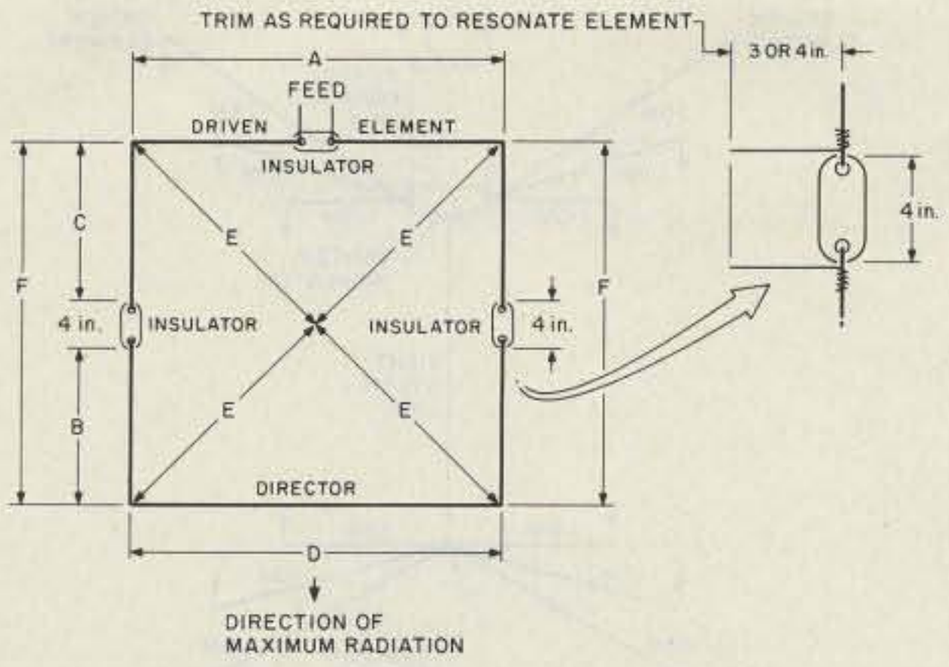


Fig. 2. General arrangement of parasol beam antenna.

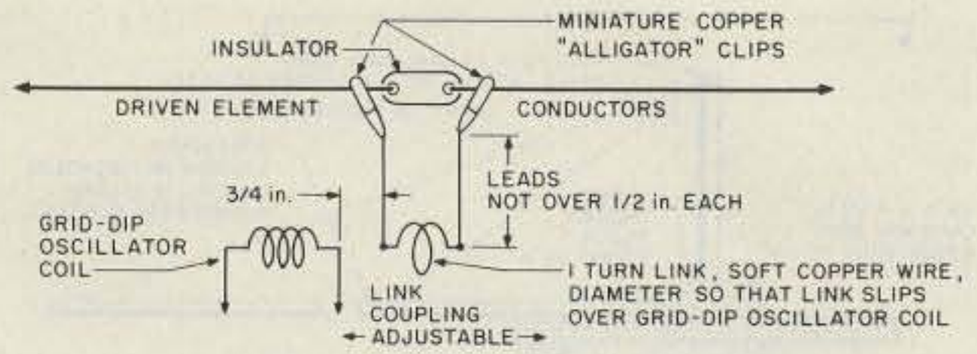


Fig. 3. How the grid-dip oscillator is coupled to the feedpoint of the driven element (see text).

In the W6TYH experimental version, the driven elements were fed by separate gamma-match arrangements, the coaxial line being switched from one to the other by a stepping relay. It should be possible to "match" the 72-Ohm (or 52-Ohm) coaxial line to the three feedpoints at a practical usable swr value by attaching a suitable coaxial line transformer to each feedpoint and connecting them in parallel at the end of the main transmission line.

The length of the folded, or bent, end sections will depend on the spacing between the driven and parasitic elements. In the W6TYH experimental version, the spacing (free space) between the centers of the driven and parasitic elements was made 0.11 wavelengths to keep the overall size as small as possible. Table 1 gives the dimensions of the parasol array for one-, two-, or three-band operation. The element lengths, particularly in the three-band arrangement, are approximate and should be "dipped" and trimmed to resonance as described later.

The approximate dimensions A, B, C, D, and E of Fig. 2 can be calculated by the following formulas. Assuming insulators I1 and I2 are 4 inches long, with F being the frequency in MHz and A to E dimensions are in feet, A = 335/F, B = 58.3/F, C = 69.7/F, D = 335/F, and E = 178.75/F.

It must be emphasized that the above dimensions are approximate but will be close to the actual operating values. The ends of the element conductors can be made about 3 or 4 inches longer than the calculated values, as shown at B in Fig. 2, and then trimmed to resonate the element at its proper frequency. In most cases, the director element will function satisfactorily when cut to the calculated value or about 5 percent shorter than the driven-element length.

Practical Construction

To start, you will need one spider or X mount, such as those used in the construction of the cubical quad antenna. You also will need four crossarm (spreader) sections, as shown. Each crossarm should be at least 14 feet long if a triband 20-15-10-meter array is to be constructed. The crossarm drilling data can be found as dimension E in Table 1. All of the wire elements should be strung on the frame before attempting any resonance adjustments.

With the array at least 8 or 10 feet above the ground, start with the 10-meter driven element and resonate it as described in the next section. Next, resonate the 15-meter driven element and recheck the resonant frequency of the 10-meter driven element. Third, resonate the 20-meter driven element and recheck the resonant frequencies of both the 15- and 10-meter elements. In the prototype array at W6TYH, the interaction between the three driven elements was negligible as far as the dip meter indication was concerned. However, when each driven element was being adjusted for lowest reflected power at its feedpoint, the swr reading changed when the matching adjustments of the other driven elements were moved.

It is likely that the greatest interaction will take place when all three feedpoints are connected in parallel and fed by a single coaxial transmission line. If the line swr is not higher than 2.5:1 on the element with the highest swr, usually 20 meters, the performance of the array will not have deteriorated to any great extent and an antenna tuner can be used at the transmitter end to present a 50-Ohm-resistance load to the transmitter output terminal.

Resonance Adjustments

As in any other parasitic array, the parasol antenna will give optimum performance only if the driven and parasitic elements are resonant at their proper frequencies. The length dimensions given for the parasitic director elements are about 5 percent shorter than those of the driven element. In the prototype array, the parasitic directors were calculated and cut according to the formula. The directors performed satisfactorily without further adjustment. The driven-element lengths required adjustment, however, as outlined below.

The preliminary driven-element adjustments are most easily made with a grid-dip oscillator and a calibrated receiver. First, make a 1- or 2-turn link coil from no. 14 soft-copper wire and with a diameter small enough to fit snugly over the grid-dip oscillator coil. As shown in Fig. 3, the link-coil ends are fitted with small copper alligator clips. Connect the alligator clips to the center ends of the driven-element conductors, as shown. Slip the

Parts List

140 feet, no. 12 copper wire, plastic covered household type	@ 10¢ per ft.	$14.00
4 bamboo spreaders	@ 50¢ ea.	2.00
1 marine plywood, 3/8" × 18" × 18"	@ $2.00	2.00
4 carriage bolts, 4-1/2" × 1/4"	@ 30¢ ea.	1.20
4 carriage bolts, 2-1/2" × 1/4"	@ 25¢ ea.	1.00
4 U-bolts, 1-1/4"	@ 75¢ ea.	3.00
Miscellaneous (alligator clips, etc.)		2.00
		$25.20

Note: 52- or 72-Ohm transmission line and insulators not included in above total.

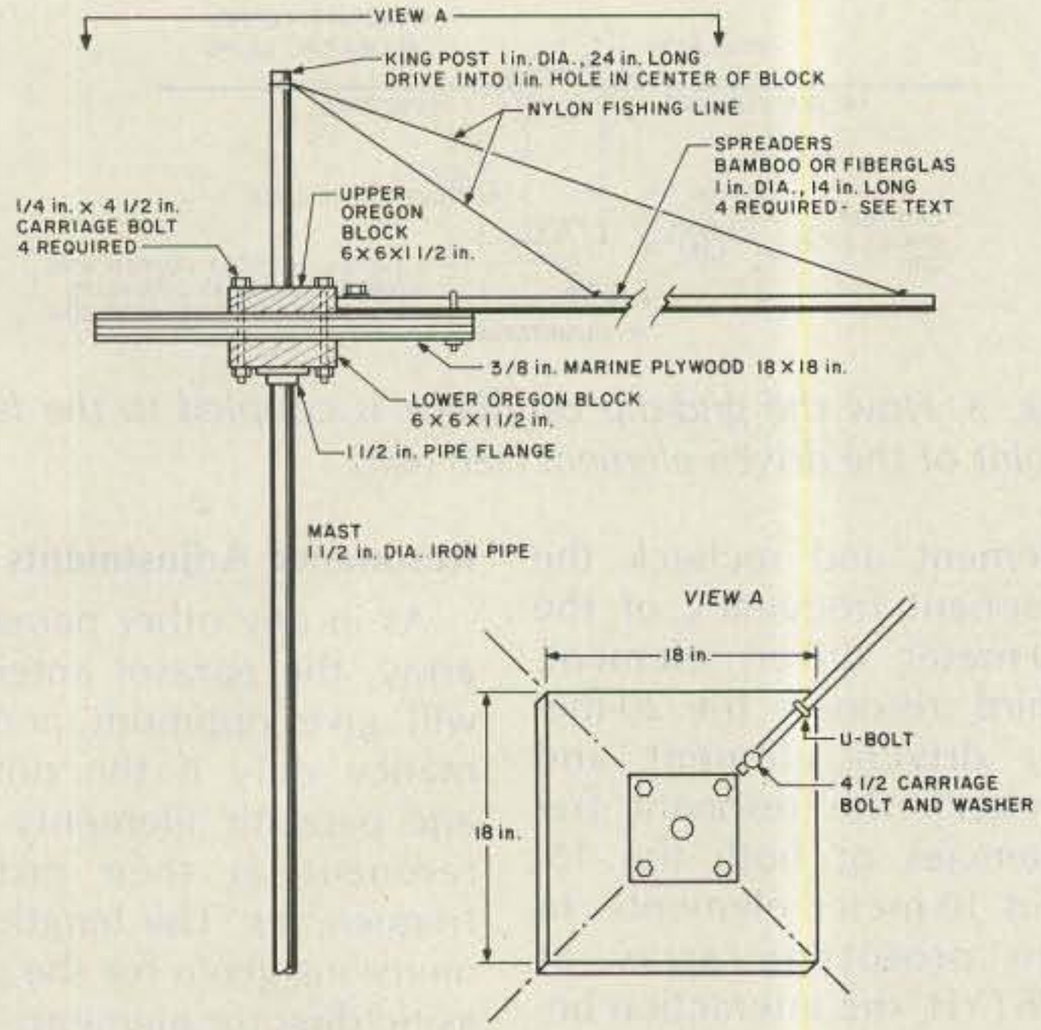


Fig. 4. Array assembly, parasol antenna.

link coil over the grid-dip coil form, and rotate the grid-dip oscillator dial until a deep null or "dip" is indicated.

With the calibrated receiver, check the grid-dip oscillator at the point where the null occurs. During this first check, the resonant frequency of the driven element is almost certain to be very close to, or outside, the lower frequency limits of the amateur band. Clip off half an inch or so of the excess wire at the support insulators and repeat the process. Be sure that you check the grip-dip oscillator frequency *with the calibrated receiver* each time that a dip is indicated. *Do not* depend on the calibrations of the grid-dip oscillator dial as the oscillator will be pulled off calibration by absorption of the rf energy by the driven element at its point of resonance. This pulling effect can be reduced by reducing the coupling between the grid-dip oscillator and the link coil to the point where only a very small null is indicated.

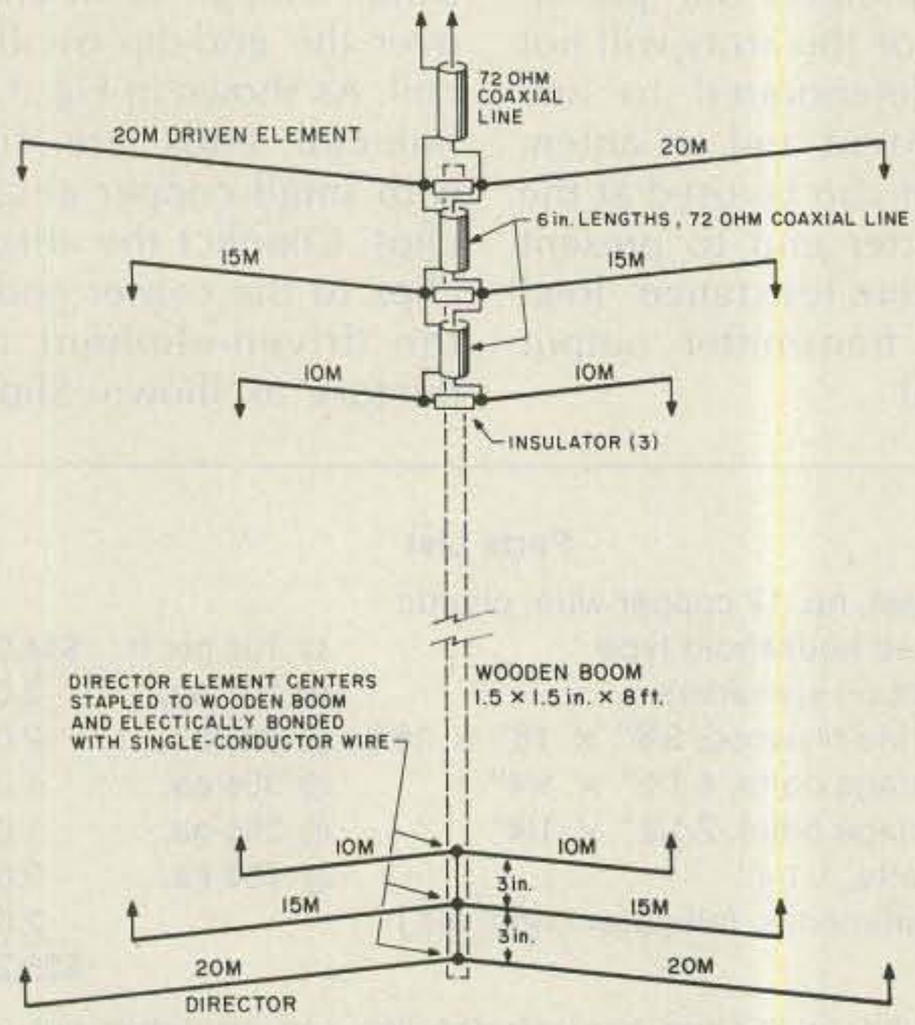


Fig. 6. Modified version of Australian parasol antenna (said to improve front-to-back ratio).

Continue to trim each end of the driven element and check the grid-dip oscillator frequency at the null until the element is resonant at a frequency about 50 kHz lower than the desired operating frequency. The driven-element resonant frequency can then be "worked in," or "fine tuned," to exact resonance at the operating frequency during the matching adjustments.

During the adjustment of the driven element for resonance, it is possible that the grid-dip oscillator may indicate two nulls—one deeper than the other. The major null will indicate the frequency at which the driven element is resonant. The minor null will be somewhat higher in frequency and will be the resonant frequency of the director. With very close coupling between the pick-up loop and the grid-dip oscillator coil, the minor null should be pronounced. When the coupling between the link coil and the oscillator coil is reduced, the minor null may not be apparent. The minor null should occur at a frequency about 5 percent higher than that of the driven element.

Mounting the Array

In the original Aussie version of the array, the spreaders were mounted on an 18" × 18" × 3/8" piece of "bondwood" (plywood) as shown in Fig. 4. If the plywood mount is used, it should be good quality *marine plywood*. The center of the board was reinforced by a pair of 6" × 6" × 1-1/2" "Oregon" blocks. The upper plate has a 1-inch hole at the center for the 1-inch-diameter dowel kingpost. The kingpost is about 24 inches high and is sanded to fit tightly when driven into the center hole of the upper block. In the VK version, the spreaders were made from 1-inch hardwood dowels. Most American hams will prefer bamboo or fiberglass spreaders. Each spreader is supported at two points, as shown, by heavy-duty nylon fishing line; hence the name, "parasol array."

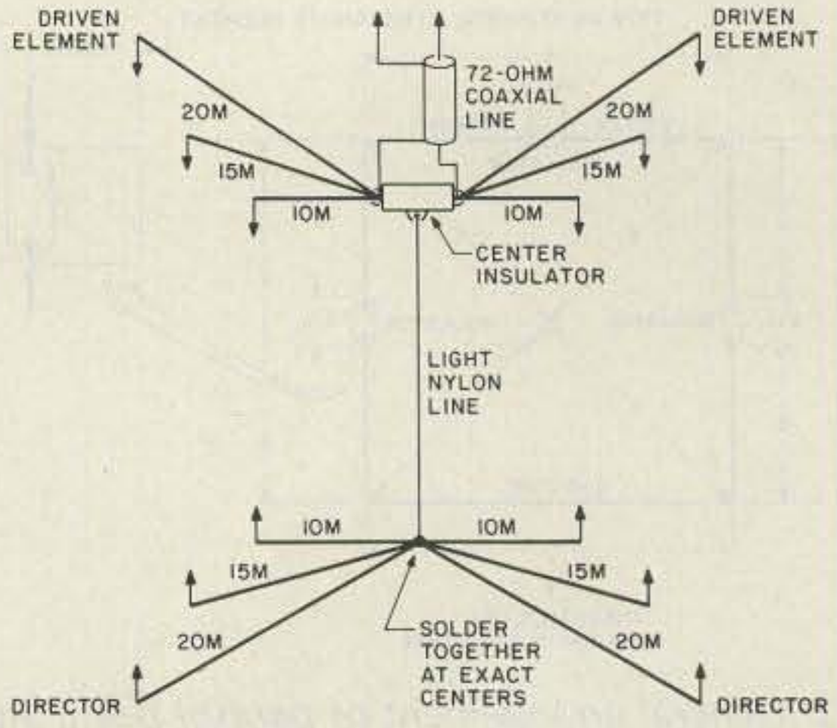


Fig. 5. Original Australian feed arrangement.

Feed System

The original Australian feed arrangement for the three driven elements is shown in Fig. 5. Here, the three driven elements use a common center insulator with the three feedpoints connected in parallel and fed with a single coaxial transmission line. A nylon tie cord is connected between the driven-element center insulator and the center point on the parasitic director (or reflector, as the case may be) and is drawn taut. The center

points of the three directors (reflectors) are electrically bonded together.

Another VK arrangement is shown in Fig. 6. Here, a light wooden boom, 1-1/2" × 1-1/2" × 96", is used to support the driven-element center insulators. The three feedpoints are connected together with short lengths of 72-Ohm coaxial cable. The center points of the director (reflector) are attached to the wooden boom, as shown, and connected together electrically with a single copper conductor.

Antenna Performance

The W6TYH parasol array was constructed to satisfy my own curiosity, more or less. Although the antenna was a jerry-built affair mechanically and was suspended by a rope and pulley attached to an overhanging tree limb, it was electrically correct. On the 15- and 10-meter bands its performance was compared with that of a "standard" 2-element yagi similar to the one I described in "Rotary Beam for 10 or 15: the LB-2" (*73* for May, 1980), and in most cases there was little difference in the strength of the distant signal. The experimental model appeared to have about 5 dB forward gain and about 15 dB front-to-back ratio—about the same as that of the 2-element yagi used for comparison. The Australian hams rate this antenna at 5 dB forward gain, 18 dB front-to-back ratio, and 37 dB side rejection when used on the 15-meter band.

At any rate, the parasol antenna is probably the least expensive tribander. It should be possible to build it for not over twenty to thirty dollars. It can be rotated easily with a TV antenna rotator. ■

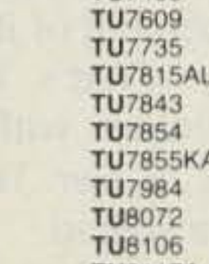
See List of Advertisers on page 98

NO SHIPPING CHARGES!

TUBES

STOCK #	1-9	10-24	25+
TU2C39A/7289	32.99	31.39	29.89
TU2C39B	179.99	170.99	162.99
TU2C40A	149.99	142.49	135.39
TU2C42	139.99	132.99	126.39
TU2E26	7.59	7.20	6.89
TU2K28A	289.99	275.49	261.69
TU3-500Z	99.99	94.99	90.29
TU3-1000Z	379.99	360.99	342.99
TU3B28	8.99	8.55	8.19
TU3CX400U7	239.99	227.99	216.59
TU3CX100A7	509.99	489.99	465.49
TU3CX3000F1	549.99	522.49	496.39
TU3CW30000H7	1669.99	1586.49	1507.19
TU4-65A/8165	66.99	63.99	60.79
TU4-125A/4D21	76.99	73.19	69.59
TU4-250A/5D22	95.99	91.19	86.69
TU4-400A/8438	95.99	91.19	86.69
TU4-400B	106.99	101.69	96.59
TU4-400C	106.99	101.69	96.59
TU4-1000A/8166	429.99	408.49	388.09
TU4CX250B/7203	51.99	49.39	46.99
TU4CX250FG/8621	72.99	69.39	65.99
TU4CX250K/8245	121.99	115.89	110.09
TU4CX250R	87.99	83.59	79.39
TU4CX300A	165.99	157.69	149.79
TU4CX350A	106.99	101.69	96.59
TU4CX350F	112.99	107.39	102.09
TU4CX350FJ	135.99	129.19	122.79
TU4CX600J	819.99	778.99	740.09
TU4CX1000A	469.99	446.49	424.19
TU4CX1500B	539.99	512.99	487.39
TU4CX5000A	1079.99	1025.99	974.69
TU4CX10000D	1229.99	1168.49	1110.09
TU4CX15000A	1469.99	1396.49	1326.69
TU4D32	229.99	218.49	207.59
TU4E27A	229.99	218.49	207.59
TU4PR60A	189.99	180.49	171.49
TU4PR60B	329.99	313.49	297.79
TU4PR65A/8187	159.99	151.99	144.39
TU4PR1000A/8189	569.99	541.49	514.39
TU4X150A/7034	57.99	55.09	52.39
TU4X150D/7609	89.99	85.49	81.19
TU4X500A	399.99	379.99	360.99
TU5CX1500A	639.99	607.99	577.59
TU416B	41.99	39.89	37.89
TU416C	57.99	55.09	52.39
TU7271	129.99	123.49	117.39
TU7360	12.99	12.39	11.79
TU7377	79.99	75.99	72.19
TU7408	2.19	2.09	1.99
TU7609	89.99	85.49	81.19
TU7735	35.99	34.19	32.49
TU7815AL	54.99	52.29	49.69
TU7843	102.99	97.89	92.99
TU7854	120.99	114.99	109.29
TU7855KAL	119.99	113.99	108.29
TU7984	13.99	13.29	12.69
TU8072	79.99	75.99	72.19
TU8106	4.69	4.45	4.25
TU8117A	216.99	206.19	195.89
TU8121	102.99	97.89	92.99
TU8122	102.99	97.89	92.99
TU8134	455.99	433.19	411.59
TU8156	11.99	11.39	10.89
TU8233	55.99	53.19	50.59
TU8236	32.99	31.39	29.89
TU8295A	599.99	569.99	541.49
TU8458	32.99	31.39	29.89
TU8462	124.99	118.79	112.89
TU8505A	90.99	86.49	82.19
TU8533	99.99	94.99	90.29
TU8560A	69.99	66.49	63.19
TU8560AS	89.99	85.49	81.19
TU8608	34.99	33.29	31.69
TU8624	94.99	90.29	85.79
TU8637	64.99	61.79	58.69

STOCK #	1-9	10-24	25+
TU572B/T160L	47.99	45.59	43.29
TU807	7.99	7.59	7.19
TU811A	14.39	13.69	12.99
TU812A	26.99	25.69	24.39
TU813	47.99	45.59	43.29
TU4600A/1182	479.99	455.99	433.19
TU4657	79.99	75.99	72.19
TU4662	95.99	91.19	86.69
TU5675	40.99	38.99	37.09
TU5721	299.99	284.99	270.79
TU5768	119.99	113.99	108.29
TU5819	149.99	142.49	135.39
TU5836	299.99	284.99	270.79
TU5837	299.99	284.99	270.79
TU5861	135.99	129.19	122.79
TU5867A	179.99	170.99	162.49
TU5868 AX9902	272.99	259.39	246.39
TU5876A	40.99	38.99	37.09
TU5881	7.49	7.10	6.75
TU5893	56.99	54.19	51.49
TU5894	50.99	48.49	46.09
TU5894B/8737	50.99	48.49	46.09
TU5946	389.99	370.49	351.99
TU6083/AZ9909	90.99	86.49	82.19
TU6146A	8.09	7.69	7.29
TU6146B/8298	9.99	9.49	8.99
TU6146W/7212	16.99	16.19	1539
TU6156	104.99	99.79	94.79
TU6159A	12.99	12.39	11.79
TU6159B	22.59	21.49	20.49
TU6280	39.99	37.99	36.09
TU6291	175.99	167.19	158.89
TU6293	21.99	20.89	19.89
TU6360A	5.59	5.29	5.00
TU6399	529.99	503.49	478.39
TU6550A	9.49	8.99	8.59
TU6883B/8032A/8552	9.49	8.99	8.59
TU6897	141.99	134.89	128.19
TU6907	74.99	71.29	67.79
TU6922	4.69	4.45	4.25
TU6939	20.99	19.99	18.99
TU7094	243.99	231.79	220.19
TU7117	34.99	33.29	31.69
TU7211	94.99	90.29	85.79
TU7213	899.99	854.99	812.29
TU7214	999.99	949.99	902.49
TU8643	79.99	75.99	72.19
TU8647	159.99	151.99	144.39
TU8683	90.99	86.49	82.19
TU8877	449.99	427.49	406.09
TU8908	12.49	11.89	11.29
TU8950	12.49	11.89	11.29
TU6L6METAL	22.99	21.89	20.79
TU6L6GC	4.79	4.55	4.35
TU6CA7/EL34	4.99	4.75	4.50
TU6CL6/6L43	3.29	3.12	2.95
TU6DJ8/ECC88	2.29	2.19	2.09
TU6DQ5	6.29	5.99	5.69
TU6GF5	5.59	5.30	5.05
TU6GJ5A	5.99	5.69	5.40
TU6GK6	5.69	5.40	5.15
TU6HB5	5.69	5.40	5.15
TU6HF5	8.29	7.89	7.49
TU6JG6A	5.99	5.69	5.39
TU6JM6	5.69	5.40	5.15
TU6JN6	5.69	5.40	5.15
TU6JS6C	6.99	6.65	6.30
TU6KN6	4.79	4.55	4.35
TU6KD6	7.99	7.59	7.19
TU6LF6	6.59	6.25	5.95
TU6LQ6	6.59	6.25	5.95
TU6ME6	8.49	8.05	7.65
TU12AT7/ECC81	3.39	3.22	3.06
TU12AX7/ECC83	2.79	2.65	2.51
TU12BY7/EL180	4.79	4.55	4.35
TU12JB6A	6.29	5.99	5.69



UNICORN ELECTRONICS

(818) 341-8833

10010 Canoga Ave., Unit B-8, Chatsworth, CA 91311

Minimum order $15.00—No shipping charges on prepaid orders—C.O.D. add $3.00—UPS Blue add $3.00—Calif. residents add 6½% sales tax. Personal checks held for clearance. VISA-MC SEND FOR A FREE CATALOG.

✓203

✓ See List of Advertisers on page 98

The Incredible Broadband Bowtie

Truly designed for solid-state finals, this 75m antenna features 50 Ohms at the feed—and less than 1.5:1 swr across the band.

Jim Burtoft KC3HW
RD #2, Box 131
Washington PA 15301

"Yeah, I've got a transistorized transceiver. . ."

"Do I like it? Sure, I like it a lot. . ."

"What do I think of the solid-state finals? Well, they are not as great as they sound. The finals are really sensitive to swr. I ended up buying an antenna tuner just to get the thing to load up."

If you're the owner of an all-transistor rig, you've probably had a QSO like the above. While these rigs are nice, they do have their own set of problems. Chief among the problems is their best known feature—the solid-state final amp.

Transistor rigs differ substantially from their tube-final cousins. Tube finals use an impedance-matching (pi) network to match the tube's impedance to the antenna's impedance. Transistors do things another way. Power from the broadbanded final transistor is fed through a bandpass filter into a 50-Ohm load.

This new system means that theoretically you can set the tuning dial to any frequency and generate a signal with no further adjustment to the transmitter. This possibility intrigued me because I enjoy rag-chewing on 75-meter phone and I operate a transistorized rig. However, a little experimenting showed me that it wasn't going to be as easy as it sounded. There's a catch.

While the transistor finals are broadbanded, they require that the load they feed be 50 Ohms or very close to it. Unfortunately, a dipole antenna is not broadbanded. Keeping the swr low as you tune across the band—that's the catch.

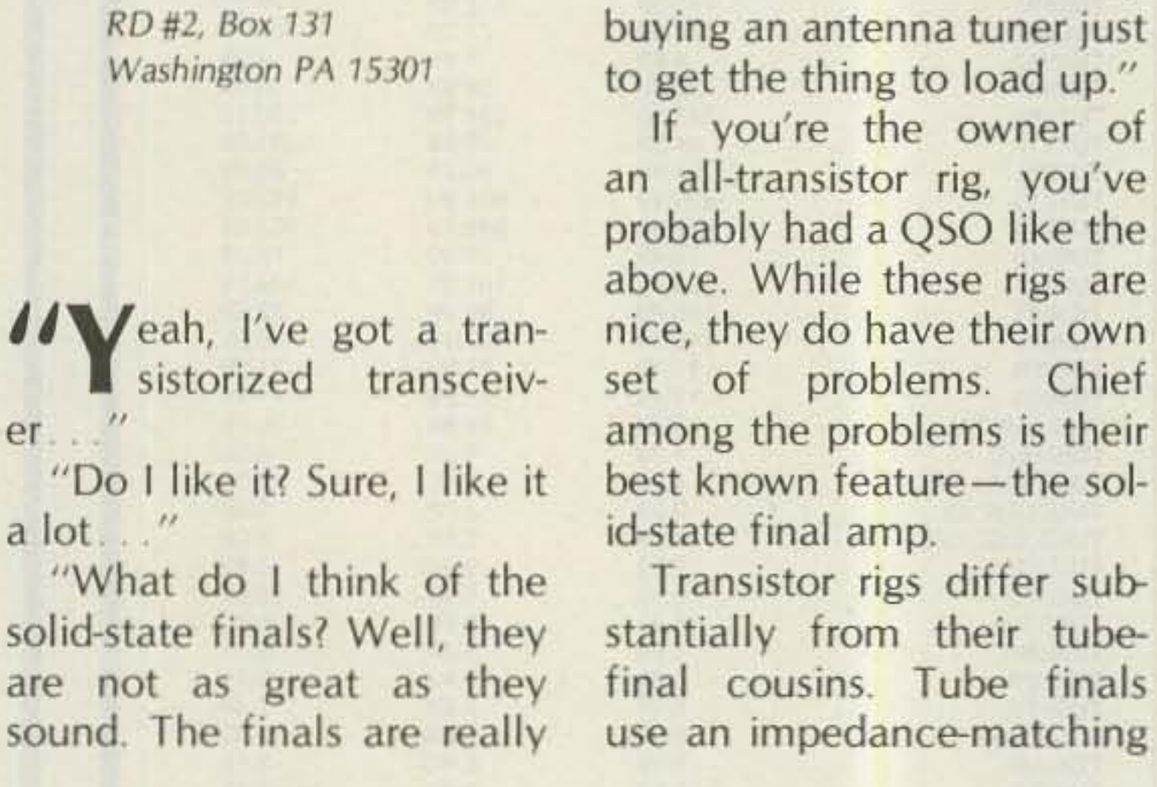
According to the theory books, a dipole should be able to cover a band equal to three percent of its design frequency. That's 100 kHz on 75 meters without exceeding a 2:1 swr. That's not much of a spread.

I decided that what I needed was a broadbanded dipole. The design requirements were:

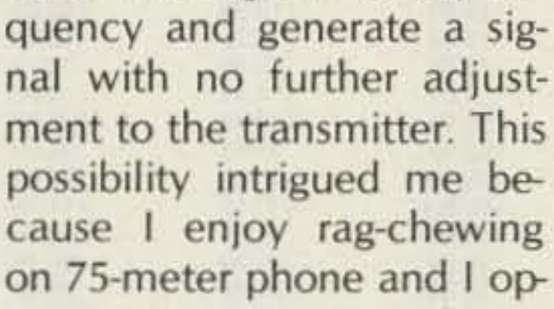
1. Uses no exotic or expensive material.
2. Easy to construct.
3. Achieves a 1.5:1 swr or less over the 75-meter phone band.

Design requirement number one eliminated double bazookas and folded dipoles. They require expensive coax and ladder line or an impedance-matching network. I wanted to keep it cheap and easy.

As I searched, my mind wandered back to a short blurb in William Orr's *Radio*



Swr meter showing the swr (the tuner was bypassed).



EQUIVALENT CIRCUIT FOR A DIPOLE ANTENNA. RESONANT FREQUENCY DEPENDS UPON VALUES OF L AND C.

Fig. 1.

Handbook. In his description of a tuned doublet antenna, he mentioned that the antenna could be made more broadbanded by fanning the ends of the antenna. Could the answer to my search be a simple adaptation of this idea? I decided to find out.

To start, I cut enough wire for two dipoles. The two dipoles were tied together at the center insulator while the legs were fanned one foot apart. Swr measurements indicated that I was heading in the right direction although there were a couple of problems.

The first problem was that the new combined dipole was too long. The old dipole formula just didn't work in this situation. This change was an unexpected confirmation of a lot of the antenna theory I had learned.

Remember that an antenna is equivalent to a series-resonant circuit. In fact, we could substitute a series-LC circuit for an antenna as in Fig. 1. The resonant frequency depends upon the values of L and C. If either L or C changes, the resonant frequency shifts.

Now let's go back to a real antenna. The LC relationship still applies. By spreading the ends, we have increased the antenna's capacitance. This, of course, shifts its resonant frequency. The only way to bring the frequency back is to compensate by changing the inductance, too.

Inductance is changed by shortening the antenna. In this case, the antenna had to be shortened a total of ten feet to bring the frequency back. It's the reduction of inductance, incidentally, which increases an antenna's broadbandedness.

The second problem was mechanical—how to keep the antenna in its proper position. On my first attempt, I used strips of wood to spread the antenna ends apart by about one foot, with a halyard attached at the center. This worked, but when hoisted into the air, the ends wanted to windmill, twisting the wires together and reducing capacitance.

No sweat. I just hung a brick to the bottom of each spreader. That solved that problem but created another. The whole thing took on a Rube Goldberg appearance; it was a visual embarrassment. Besides, there was the practical problem of having these two bricks suspended forty feet in the air on the ends of some rope. Needless to say, the XYL was quick to point out these problems, too.

Eventually both problems were resolved with the development of the "Broadband Bowtie Dipole" seen in Fig. 2. One look at the drawing should explain how the antenna got its name.

After numerous cuts and tries, I found that one-hundred-ten feet seemed to make the antenna resonant about the middle of the 75-meter phone band. Experiments also showed that fanning the ends more than three feet offered little or no advantage. With the ends fanned three feet, my swr was less than 1.5:1 on the edges of the phone band (see Fig. 3). Now my transistor finals perk happily along with no need to tune.

Length of the transmission line is also important. To have your transistor transceiver see the same impedance as the antenna offers, the transmission line must be some multiple of one half wave. For solid dielectric RG-58, this is a multiple of eighty-three feet.

Mounting problems were solved with the double-halyard system also shown in Fig. 2. Rope spreaders replace the original wood spreaders. Be careful not to put too much tension on the lower halyard or the whole system will be dragged closer to the ground.

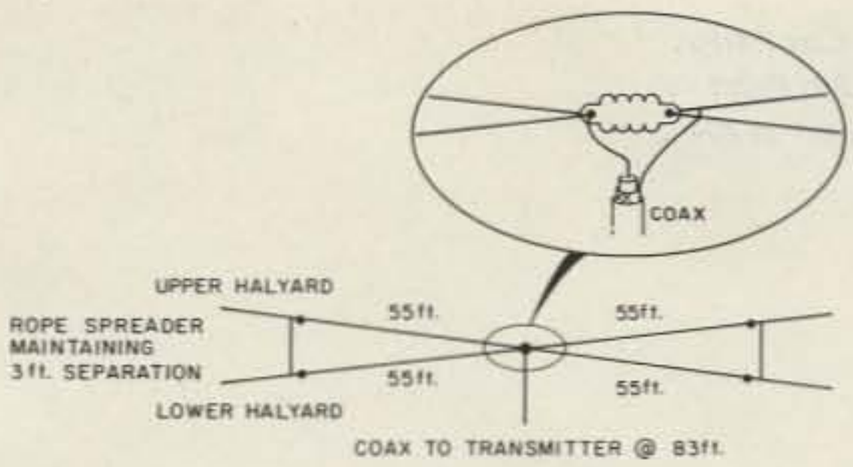


Fig. 2.

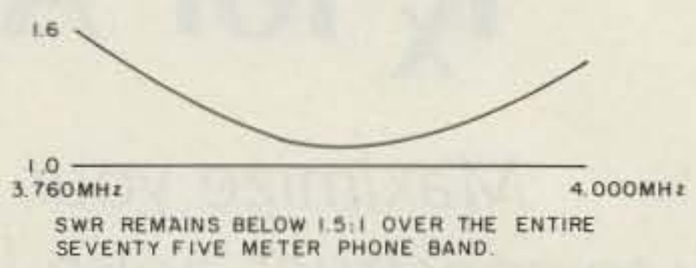


Fig. 3.

Incidentally, those interested in antennas might like to know that all antennas at station KC3HW are made from electric-fence wire. This 18-gauge steel wire comes on quarter-mile spools and is long-lasting. It's available through farm-supply stores and Sears for about ten dollars a roll.

More avenues of experimenting are open to you, the reader. How about a higher band? While I've not attempted to try the Bowtie on forty meters, it should have a flatter swr than on seventy-five.

Best of luck, and enjoy your newfound freedom. ■

↙ See List of Advertisers on page 98

Joseph J. Carr K4IPV
5440 So. 8th Road
Arlington VA 22204

R_x for Ailing Antennas

Maximize your system's performance with this easy-to-construct noise bridge. It's just what the doctor ordered.

The *antenna noise bridge* is an instrument which most amateur-radio enthusiasts have seen advertised but only a few know how to use. Several different models are offered by Palomar, Omega-T, and MFJ (see photos). When used with a receiver (preferably a general-coverage shortwave receiver), the noise bridge makes it easy to "wring out" antennas, transmission lines, and other tuned circuits.

The heart of any bridge, perhaps, is the signal source. In the noise bridge, the signal source is a noise generator such as shown in Fig. 1. The actual noise source is the zener diode connected to the base of transistor Q1. A zener diode operating in the avalanche mode produces large amounts of semi-white noise. If you connect it to an audio-amplifier input, then the output is perceived as hiss. Some people call this circuit a Gaussian noise source, but that designation is a little off the mark. True Gaussian noise contains all phases and amplitudes of all frequencies. The noise produced by the circuit in Fig. 1 is bandwidth limited to less than 300 MHz, or so. If Q1 through Q3 are selected with care, this generator produces results throughout the HF spectrum and in the VHF spectrum at least to 2 meters.

The stages following the noise-generating diode form a wideband amplifier. If the transistors are selected for UHF frequency characteristics, then the frequency response will be well into the VHF range. Good selections from the replacement lines are ECG-107 and ECG-108 or their equivalents.

Fig. 2 shows the actual bridge circuit. The block marked "noise-generator circuit" is a circuit such as in Fig. 1.

The heart of the noise bridge is transformer T1. There are three windings on the toroidal core of T1, and these windings are trifilar-wound. A toroidal core capable of 1- through 150-MHz operation, about 3/4 to 1 inch in diameter, should be sufficient. The wire is #28, either enameled or with the sort of synthetic material that covers wire used in wire-wrap systems. Ten to 15 turns are appropriate.

Conceptually, this bridge is similar to the simple Wheatstone bridge. Recall that that bridge contains four arms (each a resistor) formed into a diamond-shaped circuit. Excitation is applied between two of the resistor junctions while output signal is taken from the other junctions. In the noise bridge, coils L1 and L2 form two of the arms, the antenna impedance forms the third arm, and impedance R1/C2 forms the fourth arm. Excitation is through coil L3. Since L1/L2 are trifilar-wound, these two coils form identical impedances. Thus, the bridge will be in balance when the antenna impedance matches R1/C2.

Capacitor C1 has a value half that of C2. Thus, C2 will have to be exactly in the middle of its range to balance (i.e., null) the circuit. The purpose of this scheme

Noise bridge from Omega-T.

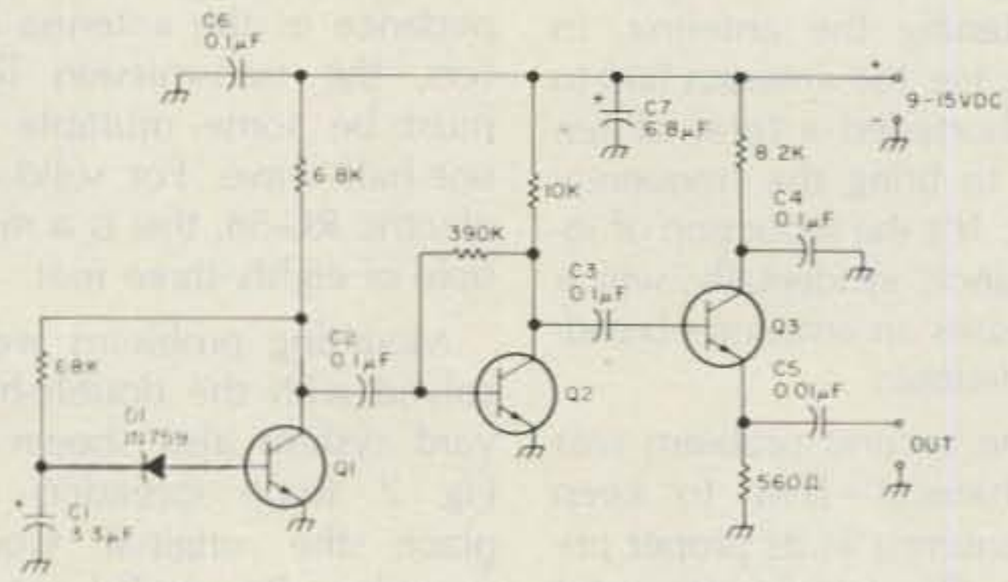
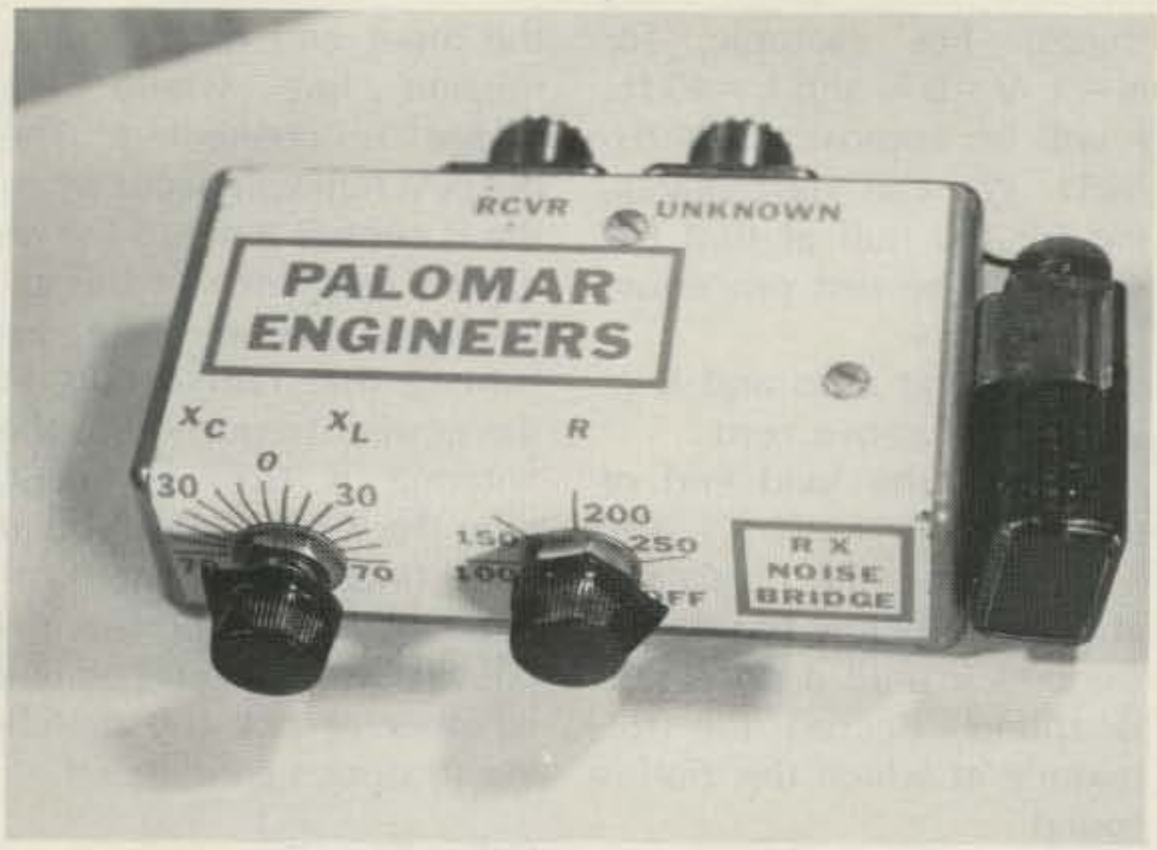


Fig. 1. Noise generator as the signal source.



Palomar Engineers' noise bridge.

MFJ rf noise bridge.

is to allow measurement of inductive reactance components of antenna impedance as well as capacitive. Exactly at resonance, the antenna impedance reactances are equal ($X_L = X_C$), so they cancel each other. In that case, the value of C2 equals C1. If the antenna is capacitive (X_C greater than X_L), then the null is found on C2 at a capacitance less than C1. If, on the other hand, the antenna is inductive (X_C less than X_L), then the null will be found when C2 is greater than C1.

Null occurs when the impedance of R1/C2 is equal to the antenna impedance (taking into consideration C1). This null is indicated by a sudden decrease in the noise level coming from the receiver (or by a dip on the receiver S-meter). This response is shown in Fig. 3. There is usually a lot of interaction between R1 and C2, so these controls must be adjusted several times to find true null.

The null indicator is a receiver. The best type of receiver is a general-coverage shortwave receiver with an envelope (i.e., AM) detector and, preferably, an S-meter. Ham-band-only receivers require the null be inside the ham bands (often *not* the case!). I have found it difficult to use the bridge with SSB/CW modes. Tune very slowly while searching for the null. Perhaps the most common mistake made when using a noise bridge is tuning the receiver too fast. The null tends to be sharp, and is easily missed if tuning rate is high.

Finding Antenna Length

The arithmetic equations which we use to find antenna lengths are "ball park" only, except in someplace called "free space." The real physical length will be longer or shorter than the calculated length. Part of the job in setting up an antenna is cutting (or lengthening) to size. In the usual scenario, one takes a vswr bridge and measures the swr at several points within the band in order to find where the minima is located. From that information we can tell whether to lengthen or shorten the antenna.

The noise bridge gives us another method. We connect the general-coverage receiver via a short length of coax to the RCVR port of the noise bridge, and the antenna coax to the ANTENNA port of the noise bridge. Set the X control on the bridge to mid-range (i.e., C2 at half-scale) and the R control to some value between 5 and 20 Ohms (will be readjusted later). The receiver is tuned to the antenna design frequency. The procedure is as follows:

1. Vary X for a null; this null will be broad, so listen carefully and tune slowly.

2. Observe whether the X nulls are on the X_L or X_C side of zero. If the null is on the X_L side, then the antenna is too long and the actual resonant is *below* the design resonant frequency. If the null is on the X_C side of zero, then the antenna is too short and its actual resonant frequency is above the design resonant frequency.

3. Return the X control to zero.

4. Tune the receiver *slowly* in the direction indicated by the result of step 2.

5. Look for a null as you tune the receiver. When you find the apparent null, adjust R, X, and the receiver for deepest null (except interaction). This deepest null is the resonant frequency of the antenna.

6. Adjust the length of the antenna as indicated by the null: (a) if F_R is above the design frequency, then lengthen the antenna, or (b) if F_R is below the design frequency, shorten the antenna. Occasionally F_R will be so close to the design frequency that no action is needed.

The noise bridge is especially useful where the resonant frequency is out of the amateur bands. It also is useful inside the band, but so is a vswr bridge. We cannot, however, excite an antenna outside the band!

Half-wave Transmission Lines

It is frequently the case that we must excite antennas through transmission lines which are integer multiples of half-wavelength. Antenna impedance measurements, vswr or iswr, and similar measurements must be made either at the antenna terminals or through matching transmission lines which are integer multiples of half-wavelength. The reason for this is that the impedance is at the load and is repeated every half-wavelength down the line. Thus, if we measure the impedance (or vswr/iswr) through 0.5, 1.0, or 1.5 wavelength of coax, it is equivalent to making the measurement at the load (antenna) end.

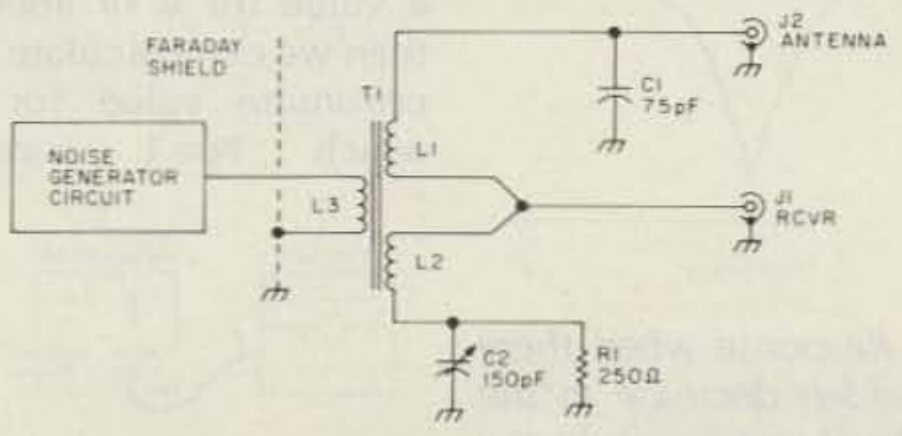


Fig. 2. Actual bridge circuit.

So how do we find half-wavelength? Some people might tell us that the length in feet is $492/F_{MHz}$, but that equation does not account for velocity factor. Since the wave velocity in the cable is a fraction (0 to 1) of the velocity in space, we must use the velocity factor (V) to reduce the physical length. The corrected length is found in Equation 1:

$$L_{ft}=492V/F_{MHz}$$

We normally use figures for V that are glibly quoted in spec sheets and antenna books (e.g., 0.66 for "regular" coax, 0.70 for Teflon™ dielectric, and 0.80 for foam dielectric). But when we actually *measure* velocity factor, we find these figures often are incorrect by as much as 25 percent—a factor that seriously affects Equation 1!

Fortunately, we can use the noise bridge to *find* half-wavelength; Fig. 4 shows how. If the coax is shorted at a point exactly one half-wavelength from the drive end, then there will be a sharp null in the noise at that frequency.

Normally, we would start with a physical length 10 percent or so longer than estimated from the equation length. We then begin shortening the coax, reestablishing the short circuit each time, until the null moves to the correct frequency. This method involves the sacrifice of a small amount of coax but yields a length that has an electrical length of exactly one half wave at the desired frequency. Some people use heavy pins or wire nails pulsed through the coax insulation to achieve the short circuit.

An alternative to the short method, as well as a check on the validity of the short method, is to use a 50–200-Ohm carbon-composition (or other noninductive) resistor in place of the short. The R dial on the noise bridge should read the same as the resistor value at half-wavelength.

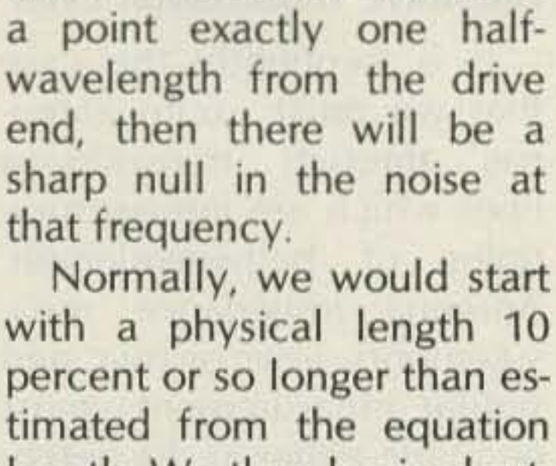


Fig. 3. Response when there is a sudden decrease in the noise level coming from the receiver.

Finding Coax Velocity Factor

The published velocity factor for coaxial cable is frequently in error. If we rely on this standard wisdom it is likely that we will at one time or another get into trouble. But it also is true that the velocity factor of any given lot of coax will have a uniform velocity factor even though it differs from the standard. Thus, if we buy a roll of cable (500 or 1000 ft. for example) and measure the actual velocity factor, then we can depend on that figure for the entire roll. From Equation 1 we know that velocity factor V is found in Equation 2:

$$V=LFN/492$$

where V is the velocity factor (0 to 1), L is the cable length in feet, F is the frequency in megahertz, and N is an integer (1, 2, 3 . . . etc.).

We can use our noise bridge to find V if we know L and can determine F on the receiver dial. A setup such as Fig. 4 is used. Measure a convenient length of coaxial cable (around 40′ will yield good results). Know (by measurement) the *exact* length of the cable to within an inch or two. If we assume a value for V of about 0.7, then we can calculate an approximate value for F at which N=1 (simplifies things). For example, for N=1, V=0.7, and L=40 ft., F will be approximately 8.6 MHz. We can start searching for the null at that frequency. The test procedure is as follows:

1. Set X at zero and R at just a little above zero.
2. Short the load end of the coax.
3. Adjust the receiver above and below the design frequency until a deep null is found. Record the frequency at which this null is found.
4. Using the premeasured length and the frequency found in step 3, calculate the velocity factor V using Equation 2.

You can repeat this experiment at different values of length (L) and average the results to find the "best" value of V. Once a value is determined, it can be used safely for the entire roll. You will be surprised how far removed the values actually measured are from the standard published values!

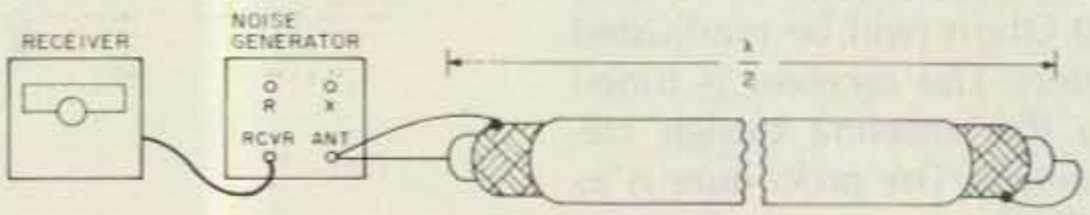


Fig. 4. Using the noise bridge to find half-wavelength.

Measuring Antenna Impedance

Measuring antenna impedance with a noise bridge is very similar to the method used for finding the correct antenna length. We are assuming that the antenna is properly cut and the null is found at the correct frequency. Despite the fact that the null is on the correct frequency, it does not mean that the impedance is correct. Of course, incorrect impedance means a vswr problem.

To measure antenna impedance, we should connect the antenna to the noise bridge through a piece of coaxial cable that is electrically one half-wavelength. That way, the antenna impedance will be reflected to the input end of the transmission line where the bridge is connected. The deepest null will occur when the R control is set to the radiation resistance of the antenna. Again we are assuming that null occurs at the correct frequency. If the antenna is truly resonant, then the X control will be at zero (indicating that $X_L=X_C$). Once the impedance is known, we can determine whether or not any matching strategies are needed.

Other Circuits

The noise bridge can be used to measure the input impedance of any tuned resonant circuit provided that the impedance is within the range of the bridge. One would not want to use the bridge on any device that is supplying power, but on passive circuits it should work nicely.

Untuned amplifiers and networks can also be tested with white noise. In those tests, one would not use the bridge portion of the instrument; only the noise-generator section is used. The circuit of Fig. 2 must be fitted with a BNC or SO-239 output connector that brings the noise signal to the outside world.

One unusual application for noise generators is in testing of signal-averaging instruments used in communications laboratories (as well as in physiology/neurology). In those applications, the noise signal and a low-amplitude sine wave are mixed in a linear summation network before being applied to the averager. If the instrument is working properly, then the noise will average to near zero while the periodic sine wave is enhanced.

The R-X noise bridge is a low-cost instrument, yet it can provide amazing results. Few items of amateur test equipment work as well or are as useful as this unfortunately neglected instrument. ■

WE SHIP WORLDWIDE

Barry Electronics Corp.

WORLD WIDE AMATEUR RADIO SINCE 1950

Your one source for all Radio Equipment!

~305

For the best buys in town call:
212-925-7000
Los Precios Mas Bajos en Nueva York . . .

KITTY SAYS: WE ARE NOW OPEN 7 DAYS A WEEK.
Saturday & Sunday 10 to 5 P.M.
Monday-Friday 9 to 6:30 PM Thurs. to 8 PM
Come to Barry's for the best buys in town.

ONV Safety belts-in stock

ICOM

IC-R71A, IC-751, IC745, IC-27A/H, IC-37A
IC-47A, IC-271A/H, IC-2KL, IC471AH

YAESU

FT-ONE, FT-980, FT-757GX
FT-726R, FT-77, FRG-7700, FT-203R

SMART PATCH
CES-Simplex Autopatch 510-SA Will Patch FM Transceiver To Your Telephone. Great For Telephone Calls From Mobile To Base. Simple To Use - $319.95.

"FALL" into SUPER SAVINGS at BARRY'S

KENWOOD

Heil microphones equalizers stocked

R-600, R-1000, R-2000, TS-930S/AT, TS 430S, TR2600A/3500, TR 7950, TW-4000A. Kenwood Service/Repair. TH-21A, TH-41A, TM-211A/411A & TS-711A/811A

YAESU	ICOM
FT-208R/708R	IC2AT
FT-209R	IC3AT
FTC-1903	IC4AT
	IC02AT
	IC-04AT

Land-Mobile H/T
Midland
Wilson Mini-Com II
Yaesu FTC-2203, FT-4703
Icom IC-M12 (Marine)
Tempo M-1

DRAKE, EARTH SATELLITE STATION, ESS-2250, ESR-24.

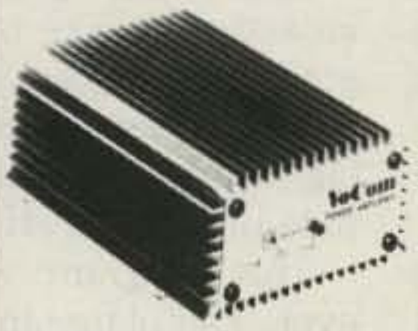
Nye-MB5 3 Kilowatt Tuner

ROCKWELL/COLLINS
KWM-380

Transceivers

VoCom/Mirage/Daiwa
Tokyo Hy-Power Amplifiers &
5/8λ HT Gain
Antennas IN STOCK

Large inventory of Saxton Wire & Cable



Computer Interfaces stocked: MFJ-1224
AEA CP-1, PKT-1
Phillystran Authorized Distributor

MICROLOG-AIR I in stock

KANTRONICS
UTU, Interface II, software

ALPHA AMPLIFIERS

Repeaters Stocked.
Spectrum
Yaesu FTR-2410, Wilson
ICOM IC-RP 3010 (440 MHz)
ICOM IC-RP 1210 (1.2 GHz)

SANTEC
ST-222/UP
ST-142/UP
ST-442/UP
HT-7

MFJ Models
900, 981, 941C, & 941D

MURCH
Model
UT2000B

HAM MasterTapes—Beta or VHS Tapes

JBC soldering line in stock.

DIGITAL FREQUENCY COUNTER
Trionyx-
Model TR-1000
0-600 MHz

Complete Butternut Antenna Inventory In Stock!

ROBOT 450C-800C-1200C Color Mod Kits

Long-range Wireless Telephone for export in stock

BENCHER PADDLES & Vibroplex Keys In Stock!!

Fox-Tango Filters
LUNAR PREAMPS STOCKED
DENTRON IS BACK IN STOCK!

EIMAC
3-500Z
572B, 6JS6C
12BY7A &
4-400A

BIRD
Wattmeters &
Elements
In Stock

Tri-Ex Towers

Hy-Gain Towers & Antennas, and Rotors will be shipped direct to you FREE of shipping cost.

AEA 144 MHz
AEA 440 MHz
ANTENNAS

New TEN-TEC 2591 HT, Corsairs stocked

MAIL ALL ORDERS TO **BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012.**

New York City's LARGEST STOCKING HAM DEALER
COMPLETE REPAIR LAB ON PREMISES

"Aqui Se Habla Espanol"

BARRY INTERNATIONAL TELEX 12-7670
TOP TRADES GIVEN ON USED EQUIPMENT
Monday-Friday 9 A.M. to 6:30 P.M.
Thursday to 8 P.M.
Saturday & Sunday 10 A.M. to 5 P.M. (Free Parking)
Paid parking lot across the street anytime.
AUTHORIZED DISTS. MCKAY DYMEK FOR SHORTWAVE ANTENNAS & RECEIVERS.

Subways: IRT/LEX-"Spring St. Station"
BMT-"Prince St. Station"
IND-"F" Train-Bwy. Station"

Bus: Broadway #6 to Spring St.
Path—9th St./6th Ave. Station.

Ask about our Marine SSB 150-watt transceiver... also VHF synthesized Marine/Commercial portable and mobile units.

We Stock: AEA, ARRL, Alpha, Ameco, Antenna Specialists, Astatic, Astron, B & K, B & W, Bash, Bencher, Bird, Butternut, CDE, CES, Collins, Communications Spec. Connectors, Covercraft, Cubic (Swan), Cushcraft, Daiwa, Dentron, Digimax, Drake, ETO (Alpha), Eimac, Encomm, Heil-Sound, Henry, Hustler (Newtronics), Hy-Gain, Icom, KLM, Kantronics, Larsen, MCM (Daiwa), MFJ, J.W. Miller, Mini-Products, Mirage, Newtronics, Nye Viking, Palomar, RF Products, Radio Amateur Callbook, Robot, Rockwell Collins, Saxton, Shure, Swan, Telex, Tempo, Ten-Tec, Tokyo Hi Power, Trionyx TUBES, W2AU, Waber, Wilson, Yaesu Ham and Commercial Radios, Vocom, Vibroplex, Curtis, Tri-Ex, Wacom Duplexers, Repeaters, Phelps Dodge, Fanon Intercoms, Scanners, Crystals, Radio Publications.

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
DEALER INQUIRIES INVITED. PHONE IN YOUR ORDER & BE REIMBURSED.
COMMERCIAL RADIOS stocked & serviced on premises.

Amateur Radio & Computer Courses Given On Our Premises, Call
Export Orders Shipped Immediately. TELEX 12-7670

Joseph A. Ryan WB5LLM
414 Church St., PO Box 622
Florence MS 39073-0622

Ryan's Vertical Ecstasy

Warning: Graphic depiction of vertical antenna array patterns. Explicit CoCo language. May incite construction frenzy.

Well now, this program is ideal for those desiring to experiment with designing quarter-wave vertical antenna arrays (multi-element). Formerly, unless you had the facilities of an antenna-testing laboratory available or some rather extensive equipment on hand, you had to go the old build 'n' try method.

With this program (and your trusty CoCo—see below), you can design multi-element quarter-wave vertical arrays in the comfort of your shack and construct only the final selected result. It allows you to insert up to ten elements in any layout with either + or − phasing, with any power level to any element (all referenced to a reference element), see the result displayed on a simplified Smith chart, and then call up the front-to-back ratio and gain data for the array.

This is not completely original. The original version of this program was published in the May, 1980, issue of *73*, in an article by Dennis Mitchell K8UR. It was written for the TRS-80 Model I and, to use it with the TRS-80(C)—CoCo—I found that I had to extensively revise and modify it. Eventually, I wound up redoing the graphics completely in order to take advantage of the CoCo's hi-resolution capabilities. Along the way, several features were added, like output-to-printer and distance-measurement capabilities (for converting degrees of wavelength to feet for any given frequency).

The program, as written, requires the full 32K Extended Basic version of the TRS-80(C) that's apparently in use by many hams today. However, by removing the printer option, the rather long program-operating instructions (roughly lines 960 through 1120), and several other lines (see the REM statements), you could squeeze this into a 16K Extended Basic CoCo and still have the graphic output as well as the generated data.

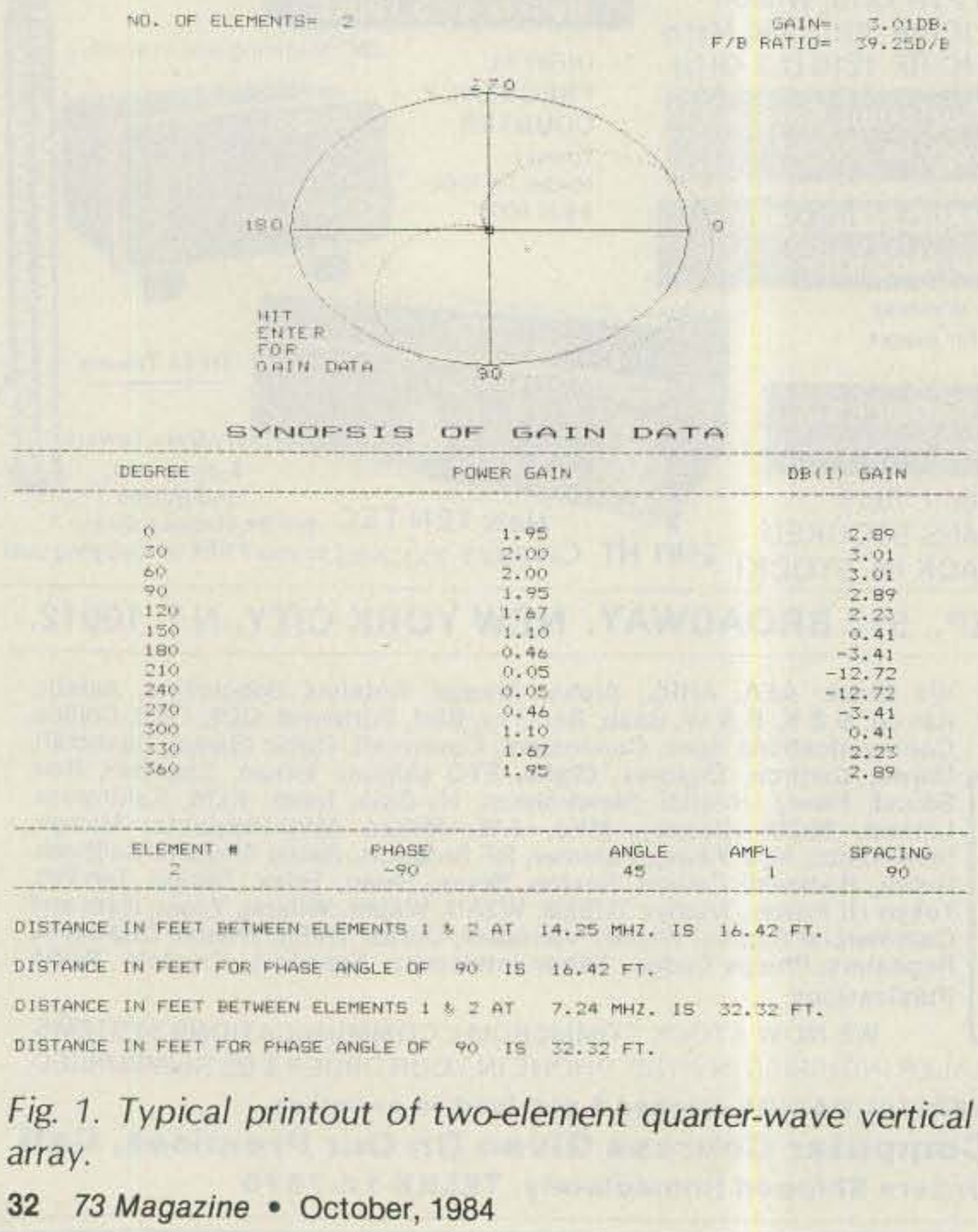


Fig. 1. Typical printout of two-element quarter-wave vertical array.

Program Restrictions and Capabilities

Now first of all, this is for quarter-wave vertical elements only. No multiband verticals count, as this program calculates for distance between elements and length of feedline between elements, which, obviously, change with frequency changes. However, if you're willing to build the result keeping in mind that you'd have to move the elements and lengthen (or shorten) the inter-element feedlines, I suppose they could be used. To be sensible, just plan on using straight quarter-wave elements (made out of TV-mast tubing and mounted on a soda bottle, if necessary).

Note that this program will calculate and display only the array's *horizontal*-angle radiation pattern. The vertical-angle radiation pattern is determined by your local effective ground (see references) and no provision has been made herein for that for two reasons: It probably would drastically increase the size of the program, and your effective-ground value changes daily (again, see the referenced article on ground effects).

This program will, however, calculate and display the array radiation pattern (horizontal), the F/B ratio, dB of gain, etc., for any arrangement of elements, spacing, and phasing.

Program Operation

A little about the program operation. Briefly, the various inputs requested are:

1. *Number of elements:* Anywhere from two to ten (this can be increased by changing the value 10 in line 80).

2. *Input relative phase:* In degrees from 0 to 360 (+ for leading and − for lagging). 360 degrees represents one wavelength, obviously. Two wavelengths would be 720, etc.

3. *Input angle of el.:* The direction, in degrees, from the reference element (0 to 360).

4. *Rel. amplitude of el.:* The power, in Watts, going to the element in question. (If equal to that going to the reference element from the transmitter, then the answer is 1; if less, because you're inserting an rf attenuator in the line, then a decimal value.)

5. *Input spacing of el.:* This is the distance from the reference element, in degrees (i.e., 90 = ¼ wave), to the element in question.

Finally, at each element step you're asked if the data you have input is correct. If not, you can answer with an N and enter the data for that element again. If your answer to the final element input is Y, then the program will go into the calculate mode.

While calculating, the program will go into the graphics mode and show the simplified Smith chart, displaying the elements as you have called for them to be assembled into an array. The view is "bird's-eye" (see the printout example, Fig. 1). *Be patient*—Basic takes time, and a full array of 10 elements could take 10–12 minutes to calculate.

Of course, you can insert the old "Vitamin E" poke—POKE 65495,0—at the beginning of the program listing, but I left it out because I run this program from disk, and without making internal modifications to the CoCo, the disk controller doesn't like this speed-up poke. If you're not running this with a disk system, you probably could use this poke, but, be sure to also insert the slow-down poke (POKE 65494,0) prior to any line calling for a printer output (if you use the printer option). This would speed up the calculating time by a factor of approximately 2, but for smaller numbers of elements it really isn't necessary.

When the calculations are complete, the screen will erase and then replay the Smith chart with the elements displayed and begin plotting the radiation pattern, one degree at a time, before your eyes (sound included). When finished, follow the prompt and hit ENTER for the display of power-gain and F/B ratio figures. Follow the prompt to display the menu of optional features.

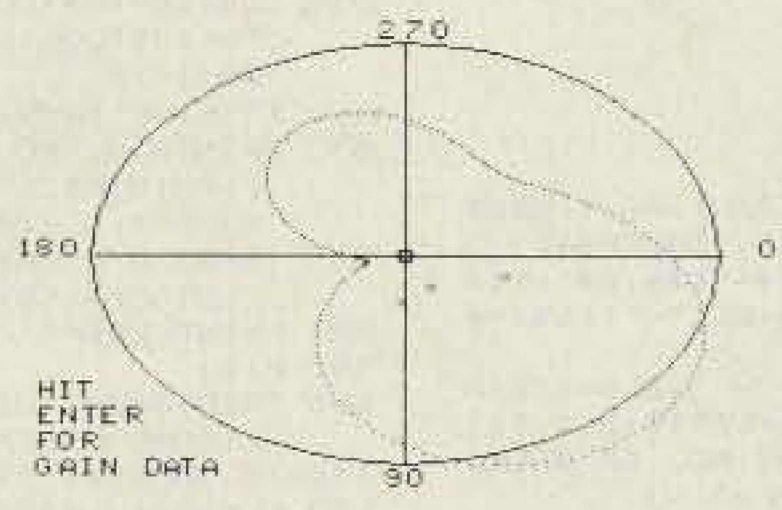
The menu has eight choices. Item one will re-display the Smith-chart plot. Items two and three will display the power gain and gain in dB either every two degrees or (in item three) every 30 degrees. The latter is best for one screen display.

Item four is for a restart to calculate a new array. Item five will re-display only the Smith chart with the element placement, but no plot. Item six goes to a subroutine for calculating the actual physical distances between elements and the physical lengths of the feedlines between elements for a given frequency. This same subroutine is offered as part of item eight, which is the printout selection. Item seven simply re-displays the original display showing your input values for the original calculation. Item eight, should you elect to include it, needs several comments.

Printout Routine

Some of you may not elect to include this feature as its main purpose is to create a file of plotted antenna arrays in notebook or loose-leaf form. The sample printouts included herein (Figs. 1 and 2) show the results of the printout routine itself. If you choose to incorporate this system, you'll be prompted, after the majority of the data is printed out, for the distance calculations. The printout routine allows as many as you desire for as many frequencies as you want. Just remember that for a given array design, the pattern will not vary because of frequency because the calculations do not require frequency as an input. The whole program assumes that you know how to calculate the length of a quarter-wave antenna. This distance calculation is a final touch, and allows the calculation of oddball inter-element and feedline lengths.

NO. OF ELEMENTS= 4 GAIN= 4.71DB. F/B RATIO= 2.45D/B



SYNOPSIS OF GAIN DATA

DEGREE	POWER GAIN	DB(I) GAIN
0	2.17	3.37
30	2.79	4.45
60	2.94	4.68
90	2.41	3.82
120	1.42	1.52
150	0.50	-2.99
180	0.51	-2.94
210	1.23	0.91
240	1.78	2.50
270	1.69	2.29
300	1.30	1.15
330	1.50	1.76
360	2.17	3.37

ELEMENT #	PHASE	ANGLE	AMPL	SPACING
2	-90	90	1	90
3	-180	67.5	1	67.5
4	-135	22.5	1	112.5

```
DISTANCE IN FEET BETWEEN ELEMENTS 1 & 2 AT  14.25 MHZ. IS  16.42 FT.
DISTANCE IN FEET BETWEEN ELEMENTS 1 & 3 AT  14.25 MHZ. IS  12.32 FT.
DISTANCE IN FEET BETWEEN ELEMENTS 1 & 4 AT  14.25 MHZ. IS  20.53 FT.

DISTANCE IN FEET FOR PHASE ANGLE OF  90  IS  16.42 FT.
DISTANCE IN FEET FOR PHASE ANGLE OF  180  IS  32.84 FT.
DISTANCE IN FEET FOR PHASE ANGLE OF  135  IS  24.63 FT.

DISTANCE IN FEET BETWEEN ELEMENTS 1 & 2 AT  21.32 MHZ. IS  10.98 FT.
DISTANCE IN FEET BETWEEN ELEMENTS 1 & 3 AT  21.32 MHZ. IS   8.23 FT.
DISTANCE IN FEET BETWEEN ELEMENTS 1 & 4 AT  21.32 MHZ. IS  13.72 FT.

DISTANCE IN FEET FOR PHASE ANGLE OF  90  IS  10.98 FT.
DISTANCE IN FEET FOR PHASE ANGLE OF  180  IS  21.95 FT.
DISTANCE IN FEET FOR PHASE ANGLE OF  135  IS  16.46 FT.
```

Fig. 2. Printout of a four-element quarter-wave vertical array showing add pattern.

In order to use the printout routine, some hardware consideration must be taken. This program, as listed herein, is designed to work with a Star Gemini 10 (or 10X) dot-matrix printer. The screen-dump routine, which is not part of this program, is a commercial software product (probably sold by several companies). You may have written your own for this or have a different brand of printer (i.e., Epson, Okidata, Radio Shack, etc.). If so, the DEFUSR and USR0 calls in line 1390 will most certainly be different. Use your own.

If you are using a Radio Shack LP-VII/DMP-100 printer, you can use their SCRNPRT program, but insert the correct CHR$( ) figures for expanded print, etc. (see the REM statements in the listing). In all cases, load and execute the screen-dump program prior to loading and running this one. All of this, of course, only if you plan to use the printer output.

Terminology Definitions

Wavelength: In this case, the distance in degrees (0 to 360, as in a circle) from the beginning of a wave to the end. All measurements in this program are converted into feet and inches already. If you are planning a rather gigantic array with element separations greater that one wavelength, then simply add the degrees on (i.e., 1½ wavelengths = 540 degrees). The distance-calculation option allows the calculation of the linear distance between elements, etc.

Angle of element: In this case, the location of the element in question with refer-

Input Listing

```
10 CLS
20 GOSUB 960
30 CLEAR 300
40 DIM GN(360),GM(360):AA=1:BB=2
   :RD=.0174533:CV=58:CH=45
50 VI=1038:ZL=10:F$="###.##":F1=
   0:KY$=STRING$(80,"-"):X$="#
   ##.##"
60 HY$=STRING$(32,"-"):BL$=STRIN
   G$(32," "):B$=LEFT$(BL$,7)
70 PRINT@224,"INPUT NO. OF ELEM.
   (MAX.10)";:INPUT NI
80 IF NI=0 OR NI>10 THEN 70
90 CU=(NI+3)*32: GOSUB760
100 FOR N=2 TO NI
110 PRINT@CU,"INP.REL.PHASE OF E
   LE.#";N;
120 INPUT A(N):GOSUB 780:PRINT@(
   N+1)*32+7,A(N);
130 PRINT@CU,"INPUT ANGLE OF ELE
   MENT #";N;
140 INPUTO(N):GOSUB 780:PRINT@(N
   +1)*32+14,O(N);
150 PRINT@CU,"? REL.AMPL.OF ELEM
   ENT#";N;
160 INPUT K(N):GOSUB 780:PRINT@(
   N+1)*32+21,K(N);
170 PRINT@CU,"INPUT SPACING OF E
   LE. #";N;
180 INPUT B(N):GOSUB 780:PRINT@(
   N+1)*32+28,B(N);
190 PRINT@CU,"";:INPUT" DATA COR
   RECT?<Y OR N>";AN$
200 IF AN$=""THEN NEXT N
210 IF LEFT$(AN$,1)="Y" THEN NEX
   T N ELSE 110
220 GOSUB 780:GOSUB900
230 ZM=0
240 FOR J=0 TO 360STEP 2
250 FOR N=2 TO NI
260 C=(B(N)*COS((O(N)-J)*RD)+A(N
   ))*RD
270 HO=COS(C)*K(N)+HO:VT=SIN(C)+
   VT
280 GN(J)=SQR((AA+HO)^BB+(VT^BB)
   )
290 IFGN(J)>ZM THEN ZM=GN(J):P1=
   J
300 IFGN(J)<ZL THEN ZL=GN(J):P2=
   J
310 NEXT N
320 VT=0:HO=0
330 NEXT J
340 IFP1>=180THENP3=P1-180ELSEP3
   =P1+180
350 '
360 GOSUB1150
370 GOSUB1190
380 GOSUB900
390 LINE(128,15)-(128,178),PSET
400 LINE(30,96)-(229,96),PSET
410 FOR M=0 TO 360 STEP 2
420 SOUND140,1
430 IF F1=0 THEN GM(M)=GN(M)
440 GN(M)=(46/ZM)*GN(M)
450 X=COS(M*RD)*GN(M)*2.5:IFX<-1
   28 THENX=-128:IFX>128 THENX
   =128
460 Y=SIN(M*RD)*GN(M)*2.00:IFY<-
   96 THENY=-96:IFY>96 THENY=9
   6
470 PSET(128+X,96+Y,3)
480 NEXTM
490 DRAW"BM12,152;U3NU3R4NU3D3BM
   +3,0":DRAW"BM19,152;R1NR1U6
   NL1R1BM+4,+6":DRAW"BM26,152
   ;U6NL2R2BM+3,+6"
500 DRAW"BM12,162;NR4U3NR2U3R4BM
   +3,+6":DRAW"BM19,162;U6F1D1
   F2D1F1NU6BM+3,0":DRAW"BM28,
   162;U6NL2R2BM+3,+6":DRAW"BM
   32,162;NR4U3NR2U3R4BM+3,+6"
   :DRAW"BM40,162;U6R3F1D1G1L2
   NL1F3BM+3,0"
510 DRAW"BM12,172;U3NR2U3R4BM+3,
   +6":DRAW"BM19,172;H1U4E1R2F
   1D4G1L2BM+6,0":DRAW"BM26,17
   2;U6R3F1D1G1L2NL1F3BM+3,0"
520 DRAW"BM12,182;H1U4E1R2F1BM+0
   ,+2NL1D2G1L2BM+6,0":DRAW"BM
   19,182;U4E2F2D2NL4D2BM+3,0"
   :DRAW"BM26,182;R1NR1U6NL1R1
   BM+4,+6":DRAW"BM32,182;U6F1
   D1F2D1F1NU6BM+3,0"
530 DRAW"BM46,182;U6R3F1D4G1L3BM
   +7,0":DRAW"BM52,182;U4E2F2D
   2NL4D2BM+3,0":DRAW"BM59,182
   ;U6NL2R2BM+3,+6":DRAW"BM64,
   182;U4E2F2D2NL4D2BM+3,0"
540 IF INKEY$=""GOTO540 ELSE GOT
   O550
550 CLS:DB=10*(LOG(ZM)/LOG(10)):
   FB=10*(LOG(GM(P1)/GM(P3))/L
   OG(10))
560 IF F1=0 THEN DC=DB
570 PRINT@10,"NO. ELEMENT'S:";NI
   ;:PRINT@42,"GAIN: ";:PRINTU
   SINGF$:DC;:PRINT"DB";:PRINT
   @68,"F/B RATIO:";:PRINT@82,
    USINGF$:FB;:PRINT"DB";
580 PRINT:PRINT
590 F1=1
600 PRINT@480,"HIT ANY KEY FOR O
   PTIONS LIST";
610 IF INKEY$=""THEN GOTO 610
620 CLS:PRINT@7,"MENU OF OPTIONS
   ";:PRINT@32,HY$;:PRINT@64,"
   1) PLOT PATTERN";:PRINT@96,
   "2) GAIN EVERY 30 DEGREES";
   :PRINT@128,"3) GAIN EVERY 2
    DEGREES";:PRINT@192,"4) NE
   W START";:PRINT@224,"5) ELE
   MENT PLACEMENT";:PRINT@256,
   "6) DISTANCE  CALCULATIONS"
630 PRINT@288,"7) ELEMENT DATA":
   PRINT@352,"8) OUTPUT TO PRI
   NTER OF CHART &   GAIN DAT
   A, ETC.":'DELETE PRINT@352
   STATEMENT IF NO PRINTER OPT
   ION
640 X=0:Y=0:INPUT"SELECTION":LL:
   IFLL=1 THENZM=46ELSE IFLL=3
    THEN J=2
650 ON LL GOTO 780,680,700,800,8
   10,1200,670
660 T=1:GOSUB1380:'DELETE IF NO
    PRINTER OPTION USED
670 GOSUB 760:GOTO600
680 CLS:PRINTTAB(4)"SYNOPSIS OF
    GAIN DATA" :PRINTHY$;
690 J=30:REMDEGREE STEP
700 PRINT"DEGREE";TAB(8);"PWR.GA
   IN";TAB(20);"DB(I)GAIN"
710 FORI=0TO360 STEP J
720 PRINTTAB(2);I;TAB(8);:PRINTU
   SINGF$;GM(I);:IFGM(I)>=0THE
   NPRINTTAB(21);:PRINTUSINGF$
   ;10*(LOG(GM(I))/LOG(10))
730 NEXT I
740 GOTO600
750 END
760 CLS:PRINTHY$;:PRINT"EL.#";TA
   B(6);"PHASE";TAB(13);"ANGLE
   ";TAB(20);"AMPL.";TAB(26);"
   SPACE":PRINTHY$;
770 FOR I=2TONI:PRINTI;TAB(6);A(
   I);TAB(14);O(I);TAB(20);K(I
   );TAB(27);B(I):NEXT:PRINTHY
   $
780 PRINT@CU,BL$;:RETURN
790 FOR I=CU TO 869STEP64:PRINT@
   I,BL$;:NEXT:RETURN
800 CLS:CLEAR: RUN40
810 PMODE4,1:PCLS:SCREEN1,1:FOR
   PL=2 TO NI+1:IF B(PL)>BG TH
   ENBG=B(PL):NEXT
820 GOSUB1150
830 GOSUB1190
840 FOR RL=2 TO NI:XX=COS(O(RL)*
   RD)
850 XX=XX*B(RL) /BG*28+128
860 YY=SIN(O(RL)*RD)*B(RL)/BG*18
   +96:PSET(XX,YY,3):PSET(XX+1
   ,YY+1,3):PSET(XX-1,YY-1,3):
   PSET(XX+1,YY-1,3):PSET(XX-1
   ,YY+1,3)
870 NEXT RL
880 FOR V=1TO20:PSET(128,96,3):P
   SET(129,97,3):PSET(127,94,3
   ):PSET(129,94,3):PSET(127,9
   6,3):NEXT:FOR VV=1TO20:PRES
   ET(129,97):PRESET(127,94):P
   RESET(129,14):PRESET(127,94
   ):NEXT:GOTO890
890 GOTO490
900 FOR PL=2TONI+1:IF B(PL)>BG T
   HEN BG=B(PL):NEXT
910 PMODE4,1:PCLS:SCREEN1,1
920 GOSUB1150
930 GOSUB1190
940 FOR RL=2TONI:XX=COS(O(RL)*RD
   ):XX=XX*B(RL)/BG*28+128:YY=
   SIN(O(RL)*RD)*B(RL)/BG*18+9
   6:C=3:PSET(XX,YY,3):PSET(XX
   +1,YY+1,3):PSET(XX-1,YY-1,3
   ):PSET(XX+1,YY-1,3):PSET(XX
   -1,YY+1,3):PSET(128,96,3):N
   EXT
950 RETURN
960 CLS:PRINTCHR$(23):PRINT@74,"
   VERT";:FORI=1TO150:NEXT:PRI
   NT@74,B$:PRINT@78,"PLOT":FO
   RI=1TO150: NEXT:PRINT@76,B$
   :PRINT@74,"VERT";:FORI=1TO1
   50:NEXT:PRINT@78,"PLOT";:PR
   INT@85 ,"";:FORJ=1TO8:PRINT
   :FORI=1TO100:NEXT:NEXT:GOTO
   970
970 PRINT@ 68,"POLAR PLOTTING PR
   OGRAM":PRINT@102,"FOR DRIVE
   N ARRAYS":GOTO980
980 PRINT@163,"1979 - D.C.MITCHE
   LL - K8UR";:PRINT@229,"AS M
   ODIFIED FOR USE ON";:PRINT@
   260,"A TRS-80 'COLOR COMPUT
   ER'";:PRINT@334,"-BY-";:PRI
   NT@387,"1981-  J.A. RYAN -
   WB5LLM ";:FORI=1TO5000:NEXT
   :CLS:PRINTCHR$(28)
990 PRINT"  THIS PROGRAM LETS TH
   E USER DESIGN HIS OWN PHASE
   D ANTENNA ARRAYS UP TO 10 E
   LEMENTS. MORE ELEMENTS MAY
   BE USED BY CHANGING THE '10
   ' IN LINE 280 TO THE DESIRE
   D NUMBER OF ELEMENTS."
1000 PRINT"NOTE: PLOTTING TIME I
   S ABOUT 1.5 MINUTES"
1010 PRINT"FOR 2 ELEMENTS & ABOU
   T 45 SEC. LONGER PER"
1020 PRINT"EACH ADDITIONAL ELEME
   NT."
1030 PRINT@448,"HIT ENTER TO CON
   TINUE";:INPUTUU$:CLS
1040 PRINT"  TO DESIGN AN ARRAY,
    PLACE THE ELEMENTS OUT AS
   DESIRED USING A 'BIRDS EYE'
    VIEW OF THE ARRAY AND AN X
   -Y COORDINATE SYSTEM WITH 0
   -DEGREES AT THE RIGHT, 270
   AT TOP, 180 AT LEFT AND 90
   DEGREES AT THE BOTTOM."
1050 PRINT "THE PROGRAM WILL ASK
    YOU PHASE, ANGLE, AMPLITUD
   E AND SPACING. PHASE IS(-)
   FOR LAGGING AND (+) FOR LEA
   DING PHASE. PHASE IS IN DEG
   REES FROM THE REFERENCE ELE
   MENT.  CHOOSE ONE ELEMENT O
   F THE ARRAY AS A REFERENCE.
   "
1060 PRINT@448,"HIT ENTER TO CON
   TINUE";:INPUTUU$:CLS
1070 PRINT" (ALL MEASUREMENTS FO
   R THE OTHER ELEMENTS WILL B
   E TAKEN FROM THE REFERENCE
   ELEMENT CHOSEN).  ANY ELEME
   NT WILL DO.  THE ANGLE IS T
   HE ANGLE BETWEEN THE (0)DEG
   REE HEADING OF YOU X-Y COOR
   DINATE."
1080 PRINT" THE REFERENCE ELEMEN
   T WHICH IS ALWAYS AT THE CE
   NTER OF THE X-Y COORDINATE,
    AND THE ELEMENT IN QUESTIO
   N."
1090 PRINT@448,"HIT ENTER TO CON
   TINUE";:INPUTUU$:CLS
1100 PRINT"  THE AMPLITUDE IS T
   HE AMOUNT OF POWER WHICH TH
   E ELEMENT IN QUESTION RECEI
   VES COMPARED TO YOUR REFERE
   NCE.  IT IS EXPRESSED AS A
   RATIO.  THE REFERENCE ELEME
   NT ALWAYS GETS 1:1 POWER SO
    IF"
1110 PRINT" ELEMENT 2 WERE TO GE
   T TWICE AS MUCH POWER, YOUR
    INPUT WOULD BE (2) FOR AMP
   LITUDE. THE SPACING IS HOW
   FAR THE ELEMENT IN QUESTION
    IS FROM THE REFERENCE IN D
   EGREES."
1120 PRINT@448,"HIT ENTER TO CON
   TINUE";:INPUTUU$:CLS
1130 GOTO30
1140 'DON'T REMOVE LINES 1150 TO
    1330
1150 DRAW"BM120,12;NR4U1E1R1E2U1
   H1L2G1BM+7,+5":DRAW"BM129,1
   2;U1E4U1L4BM+7,+6":DRAW"BM1
   38,12;H1U4E1R2F1D4G1L2BM+6,
   0"
1160 DRAW"BM242,96;H1U4E1R2F1D4G
   1L2BM+6,0":DRAW"BM122,185;F
   1R2E1U4H1L2G1D1F1R2BM+4,+3"
   :DRAW"BM130,186;H1U4E1R2F1D
   4G1L2BM+6,0"
1170 DRAW"BM6,96;R1NR1U6G1BM+6,+
   5":DRAW"BM12,96;H1U1E1H1U1E
   1R2F1D1G1NL2F1D1G1L2BM+6,0"
   :DRAW"BM20,96;H1U4E1R2F1D4G
   1L2BM+6,0"
1180 RETURN
1190 CIRCLE(128,96),100,,.825:CI
   RCLE(128,96),3,,1:RETURN
1200 CLS:PRINT@2,"DISTANCE BETWE
   EN ELEMENTS AND PHASING CAL
   CULATIONS":PRINT:PRINT:PRIN
   T"FREQ. IN MHZ.(TO NEAREST
   .00)"
1210 INPUTR
1215 FOR I=2 TO NI
1220 XX=936/R:YY=XX/360:ZA(I)=YY
   *A(I):ZB(I)=YY*B(I)
1225 PRINT"DIST. IN FT. BETWEEN
   ELEMENTS";:PRINT "1 &";I;:P
   RINT"AT ";R;:PRINT"MHZ. IS
   ";:PRINTUSINGX$;ZB(I);:PRIN
   T"FT":NEXTI
1230 FOR I=2 TO NI
1240 XX=936/R:YY=XX/360:ZA(I)=YY
   *A(I):ZB(I)=YY*B(I)
1250 NEXTI
1260 PRINT:PRINT
1270 '
1280 IF T=1 THEN GOTO 1340 ELSE
   GOTO 1290
1290 FOR I=2 TO NI:PRINT "DIST.
    IN FT. FOR A PHASE ANGLE O
   F";:PRINT(A(I)*-1);:PRINT"
   IS";:PRINTUSINGX$;(ZA(I)*-1
   );:PRINT"FT.":NEXTI
1300 PRINT:PRINT
1310 INPUT"DO YOU WANT ANOTHER D
   ISTANCE    CALCULATION    (
   Y=YES, N=NO)";C$
1320 IF C$="Y" THEN GOTO 1200
1325 IF C$<>"Y" AND T<>1 THEN GO
   TO620
1330 IF C$<>"Y" THEN PRINT#-2,CH
   R$(12):GOTO 620
1340 CLS:PRINT@130,"PRINTOUT OF
   DISTANCE CALCULATION":PRINT
   #-2," ":FOR I=2 TO NI:PRINT
   #-2,"DISTANCE IN FEET BETWE
   EN ELEMENTS";:PRINT#-2," 1
   &";I;:PRINT#-2,"AT ";:PRINT
   #-2,USINGX$;R;:PRINT#-2," M
   HZ. IS ";:PRINT#-2,USINGX$;
   ZB(I);:PRINT#-2," FT.":NEXT
1350 PRINT#-2:FOR I=2 TO NI:XX=9
   36/R:YY=XX/360:ZZ(I)=YY*A(I
   )
1360 PRINT#-2,"DISTANCE IN FEET
   FOR PHASE ANGLE OF ";:PRINT
   #-2,(A(I)*-1);:PRINT#-2," I
   S ";:PRINT#-2,USINGX$;(ZA(I
   )*-1);:PRINT#-2," FT."
1370 NEXTI:GOTO1310
1380 CLS:PRINT@132,"SENDING TO P
   RINTER":GOSUB 1400:REM PRIN
   TER ROUTINE FROM HERE TO 15
   00
1390 POKE150,1:DEFUSR1=&H7E00:Y=
   USR1(0):CLS:GOTO1410
1400 POKE150,1:PRINT#-2,;" ":PRI
   NT#-2,TAB(10);"NO. OF ELEME
   NTS= ";NI;:PRINT#-2,TAB(64)
   ;"GAIN= ";:PRINT#-2,USINGF$
   :DC;:PRINT#-2,"DB.":PRINT#-
   2,TAB(59);"F/B RATIO= ";:PR
   INT#-2,USINGF$;FB;:PRINT#-2
   ,"D/B";:PRINT#-2," ":RETURN
1410 CLS:PRINT@132,"PRINTOUT OF
   GAIN DATA":PRINT#-2," ":PRI
   NT#-2," "
1420 PRINT#-2,CHR$(14);TAB(10);"
   SYNOPSIS OF GAIN DATA":PRIN
   T#-2,KY$
1430 PRINT#-2,CHR$(20);:PRINT#-2
   ,TAB(10);"DEGREE";:PRINT#-2
   ,TAB(38);"POWER GAIN";:PRIN
   T#-2,TAB(66);"DB(I) GAIN":P
   RINT#-2,KY$:PRINT#-2," "
1440 J=30:FOR I=0 TO 360 STEP J
1450 PRINT#-2,TAB(10);I;TAB(39);
   :PRINT#-2,USINGF$;GM(I);:IF
   GM(I)>=0THENPRINT#-2,TAB(68
   );:PRINT#-2,USINGF$;10*(LOG
   (GM(I))/LOG(10))
1460 NEXT I
1470 CLS
1480 CLS:PRINT@130,"PRINTOUT OF
   ELEMENT DATA":PRINT#-2," ":
   PRINT#-2," ":PRINT#-2,KY$
1490 PRINT#-2,TAB(10);"ELEMENT #
   ";:PRINT#-2,TAB(30);"PHASE"
   ;:PRINT#-2,TAB(50);"ANGLE";
   :PRINT#-2,TAB(60);"AMPL";:P
   RINT#-2,TAB(70);"SPACING"
1500 FOR I=2TONI:PRINT#-2,TAB(12
   );I;:PRINT#-2,TAB(31);A(I);
   :PRINT#-2,TAB(50);O(I);:PRI
   NT#-2,TAB(62);K(I);:PRINT#-
   2,TAB(72);B(I):NEXTI:PRINT#
   -2,KY$:GOTO1200
1510 END
```

ence to the center of the chart and the reference element, in degrees around the compass (i.e., 45 degrees would be northeast).

Relative phase: Refers to the measurements, again as described above, except here it refers to the length of the feedline between the reference element and the element in question (or the prior element if the elements are in series).

REL(ative) AMPL(itude) of element: Refers to the amount of power this element receives (in the transmit mode) with respect to the reference element. If the power to the element in question is the same as that of the reference element, then the answer would be 1. If it is twice as much, the answer would be 2, and if half as much, .5 (here using an attenuator). In receiving-only

Ham MasterTapes™

THE N2NY HAM RADIO COURSE ON VIDEOTAPE

PRESENTS:

THE ONLY HAM RADIO COURSE ON VIDEOTAPE

Ham MasterTapes brings the best possible personalized Ham Radio license preparation right into your own living room. If you, a friend or family member wants the best help available to get past the FCC test hurdle, it's available now in Beta or VHS home video format.

Larry Horne, N2NY brings his 33 years of Ham Radio teaching experience right to your home. Each of the 26 video lessons has close-up details of components and systems along with superb graphic drawings. Each lesson has important points superimposed over the action and reviewed at the end of each section. This makes note-taking a snap! Miss something? Didn't get it the first time? Just back up the tape and run it again or freeze-frame it for detailed close-up study!

Larry's classroom is a real ham shack. Lee, a 13-year-old boy, and Virginia are led through the learning process. The questions that they ask are the ones Larry knows you would ask if you were there in person. You soon feel like you're part of an ideal small class.

The topics covered will not only get you through the Novice test—General class theory is covered also. By the time you get your Novice license, you will be able to upgrade to General or Technician!

Larry's technique of involving the viewer with the demonstrations makes the most difficult topics easy to understand. Understanding—not mere memorization—is what makes Ham MasterTapes so effective. When you study the 700 possible FCC questions, the answers will be obvious.

Larry doesn't stop with just test-passing. All the proper techniques of operating practices and courtesy are demonstrated. The instruction manual for that new rig won't be a mystery! Larry becomes your own personal instructor to help you on that first set-up and contact!

The Ham MasterTapes series is produced in one of New York City's top commercial studios. Not only is the production crew made up of real professionals but many of them are also licensed amateurs. Everybody puts in obvious extra effort to make the production a classic.

The 6-hour course is available on three 2-hour Beta II or VHS-SP cartridges for $199.95, for individual, home or nonprofit Ham Club use. (High schools or colleges must order our Scholastic licensed version, $499.95 for Beta or VHS and $750 for 3/4" U-matic.)

To order, call or write Larry Horne, N2NY at Ham MasterTapes, 136 East 31st Street, New York NY 10016. Phone 212-685-7844 or 673-0680. MasterCard and Visa accepted. New York state residents add appropriate sales tax.

SOME OF THE TOPICS COVERED INCLUDE:

AMPLITUDE MODULATION
DOUBLE SIDEBAND
SINGLE SIDEBAND
FREQUENCY MODULATION
PHASE MODULATION
SIDEBANDS
BANDWIDTH LIMITS
ENVELOPE
DEVIATION
OVERMODULATION
SCATTER
FREQUENCY TRANSLATION
ANTENNAS AND FEEDLINES
YAGI ANTENNAS
QUAD ANTENNAS
POLARIZATION
FEEDPOINT IMPEDANCE
HALF-WAVE DIPOLE
QUARTER-WAVE VERTICAL
RADIATION PATTERNS
DIRECTIVITY
MAJOR LOBES
CHARACTERISTIC IMPEDANCE
STANDING WAVES
ATTENUATION
ANTENNA-FEEDING MISMATCH
STATION ID
CALL SIGNS
LOGGING REQUIREMENTS
POWER LIMITATION
CONTROL OP REQUIREMENTS
R-S-T REPORTING SYSTEM
TELEGRAPHY SPEED
ZERO-BEATING SIGNAL
TRANSMITTER TUNE-UP
TELEGRAPHY ABBREVIATIONS
RADIO WAVE PROPAGATION
SKY WAVE AND SKIP
GROUND WAVE
HARMONIC INTERFERENCE
SWR READINGS
SIGNALS AND EMISSIONS
BACKWAVE
KEY CLICKS-CHIRPS
SUPERIMPOSED HUM
SPURIOUS EMISSIONS
COMPUTERS
OSCAR
ATV-SSTV
OPERATING COURTESY
RULES AND REGULATIONS
OPERATING PROCEDURES
RADIO WAVE PROPAGATION
AMATEUR RADIO PRACTICE
ELECTRICAL PRINCIPLES
CIRCUIT COMPONENTS
PRACTICAL CIRCUITS
SIGNALS AND EMISSIONS
RADIO WAVE PROPAGATION
EMERGENCY COMMUNICATIONS
TRANSMITTER POWER LIMITS
STATION-ID REQUIREMENTS
THIRD-PARTY PARTICIPATION
FREQUENCY BANDS
SELECTION OF FREQUENCIES
R.C. MODELS
PROHIBITED PRACTICES
RADIOTELEPHONY
RADIO TELEPRINTING
REPEATERS
VOX TRANSMITTER CONTROL
BREAK-IN TELEGRAPHY
ANTENNA ORIENTATION
INTERNATIONAL COMMUNICATION
EMERGENCY-PREP DRILLS
IONOSPHERIC LAYERS D-E-F
MAXIMUM USEABLE FREQUENCY
IONOSPHERIC DISTURBANCES
SUNSPOTS
SCATTER, DUCTING
LINE-OF-SIGHT
TROPOSPHERIC BENDING
SAFETY PRECAUTIONS
TRANSMITTER PERFORMANCE
TWO-TONE TEST
NEUTRALIZING AMPLIFIERS
POWER MEASUREMENT
TEST EQUIPMENT
OSCILLOSCOPES
MULTIMETERS
SIGNAL GENERATORS
SIGNAL TRACERS
AUDIO RECTIFICATION
REFLECTOMETERS - SWR
SPEECH PROCESSORS
ANTENNA-TUNING UNITS
S-METERS
WATTMETERS
IMPEDANCE
RESISTANCE
REACTANCE
INDUCTANCE
CAPACITANCE
IMPEDANCE MATCHING
OHM'S LAW
AMPS AND VOLTS DIVIDERS
POWER CALCULATIONS
SERIES AND PARALLEL
FILTERS

Ham MasterTapes™

THE N2NY HAM RADIO COURSE ON VIDEOTAPE

136 East 31st Street
New York, New York 10016
(212) 685-7844 • 673-0680

Cross-Reference Label References

```
00030  01130
00040  00800
00070  00080
00380  00650
00490  00890
00540  00540
00550  00540
00600  00670 00740
00610  00610
00620  01325 01330
00670  00650
00680  00650
00700  00650
00760  00090 00670
00780  00120 00140 00160 00180
       00220
00800  00650
00810  00650
00890  00880
00900  00220 00380
00960  00020
00970  00960
00980  00970
01150  00360 00820 00920
01190  00370 00830 00930
01200  00650 01320 01500
01290  01280
01310  01370
01340  01280
01380  00660
01400  01380
01410  01390
A()    00120 00120 00260 00770
       01220 01240 01290 01350
       01360 01500
AA     00040 00280
AN$    00190 00200 00210
B$     00060 00960 00960
B()    00180 00180 00260 00770
       00810 00810 00850 00860
       00900 00900 00940 00940
       01220 01240 01500
BB     00040 00280 00280
BG     00810 00810 00850 00860
       00900 00900 00940 00940
BL$    00060 00060 00780 00790
C      00260 00270 00270 00940
C$     01310 01320 01325 01330
CH     00040
CU     00090 00110 00130 00150
       00170 00190 00780 00790
CV     00040
DB     00550 00560
DC     00560 00570 01400
F$     00050 00570 00570 00720
       00720 01400 01400 01450
       01450
F1     00050 00430 00560 00590
FB     00550 00570 01400
GM()   00040 00430 00550 00550
       00720 00720 00720 01450
       01450 01450
GN()   00040 00280 00290 00290
       00300 00300 00430 00440
       00440 00450 00460
H7     01390
HO     00270 00270 00280 00320
HY$    00060 00620 00680 00760
       00760 00770
I      00710 00720 00720 00720
       00720 00730 00770 00770
       00770 00770 00770 00770
       00790 00790 00960 00960
       00960 00960 00980 01215
       01220 01220 01220 01220
       01225 01225 01225 01230
       01240 01240 01240 01240
       01250 01290 01290 01290
       01290 01340 01340 01340
       01350 01350 01350 01360
       01360 01370 01440 01450
       01450 01450 01450 01460
       01500 01500 01500 01500
       01500 01500 01500
J      00240 00260 00280 00290
       00290 00290 00300 00300
       00300 00330 00640 00690
       00710 00960 01440 01440
K()    00160 00160 00270 00770
       01500
KY$    00050 01420 01430 01480
       01500
LL     00640 00640 00640 00650
M      00410 00430 00430 00440
       00440 00450 00450 00460
       00460 00480
N      00100 00110 00120 00120
       00120 00130 00140 00140
       00140 00150 00160 00160
       00160 00170 00180 00180
       00180 00200 00210 00250
       00260 00260 00260 00270
       00310
NI     00070 00080 00080 00090
       00100 00250 00570 00770
       00810 00840 00900 00940
       01215 01230 01290 01340
       01350 01400 01500
O()    00140 00140 00260 00770
       00840 00860 00940 00940
       01500
P1     00290 00340 00340 00340
       00550
P2     00300
P3     00340 00340 00550
PL     00810 00810 00810 00900
       00900 00900
R      01210 01220 01225 01240
       01340 01350
RD     00040 00260 00260 00450
       00460 00840 00860 00940
       00940
RL     00840 00840 00850 00860
       00860 00870 00940 00940
       00940 00940 00940
T      00660 01280 01325
UU$    01030 01060 01090 01120
V      00880
V1     00050
VT     00270 00270 00280 00320
VV     00880
X      00450 00450 00450 00450
       00450 00470 00640
X$     00050 01225 01290 01340
       01340 01360
XX     00840 00850 00850 00860
       00860 00860 00860 00860
       00940 00940 00940 00940
       00940 00940 00940 00940
       01220 01220 01240 01240
       01350 01350
Y      00460 00460 00460 00460
       00460 00470 00640 01390
YY     00860 00860 00860 00860
       00860 00860 00940 00940
       00940 00940 00940 00940
       01220 01220 01220 01240
       01240 01240 01350 01350
ZA()   01220 01240 01290 01360
ZB()   01220 01225 01240 01340
ZL     00050 00300 00300
ZM     00230 00290 00290 00440
       00550 00640
ZZ()   01350
```

conditions, the answer would always be 1.

Input spacing of ELE-(ment): Refers to the distance between the reference element and the element in question. This is not necessarily the same as relative phase, above.

That's it! Experiment with it. You'll get some surprises when it comes to various values you pump into the phase-angle and distance inputs as well as the layout of the array. A typical two-element array with the elements and phase angle set at 90 (and −90) degrees (a quarter-wave) will give a heart-shaped radiation pattern with a 3.0-dB gain and a 32-dB F/B ratio. Try others, including situations where the distances are less than the phase-angle figure.

Type carefully, especially from line 860 to line 950. ■

References

Dennis Mitchell K8UR, "Antenna Engineer," *73*, May, 1980.

Joe Hypnarowski WA6VNR, "Effective Grounds," *CQ*, August, 1982.

AMATEUR RADIO IS NO PLACE FOR AMATEURS.

The word amateur is a little misleading. There's nothing amateur about the way hams maneuver signals successfully through the airwaves.

It takes a unique blend of human skill and product excellence.

That's why so many amateurs gravitate toward Larsen amateur antennas.

Larsen antennas are designed by engineers who know amateur radio from the business end of the mike; who make it their business to see that every Larsen antenna goes the distance, or it doesn't go out the door.

As with our commercial products, every Larsen amateur antenna features our exclusive high efficiency platings—either Kūlrod® chrome, or Kūlrod T™ Teflon.®

Both deliver extra miles and all-weather protection. And they're backed by our no-nonsense warranty.

So wherever you operate—from 10 meters to 1.3 GHz—Larsen antennas will deliver strong performance . . . instead of blue sky.

Ask your favorite amateur dealer to tune you in to Larsen's professional quality, or write for a free amateur catalog.

Larsen Antennas 322

The Amateur's Professional

IN USA: LARSEN ELECTRONICS, INC.
11611 N.E. 50TH AVE. P.O. BOX 1799
VANCOUVER, WA 98668
206-573-2722

IN CANADA: CANADIAN LARSEN ELECTRONICS, LTD.
283 E. 11TH AVE. UNIT 101
VANCOUVER, B.C. V5T 2C4
604-872-8517

Try Low and Behold

Here's a shock: You've been wasting money on towers and poles. W1GV explains why low antennas may outperform high-altitude aluminum.

Stan Gibilisco W1GV/4
PO Box 561652
Miami FL 33156

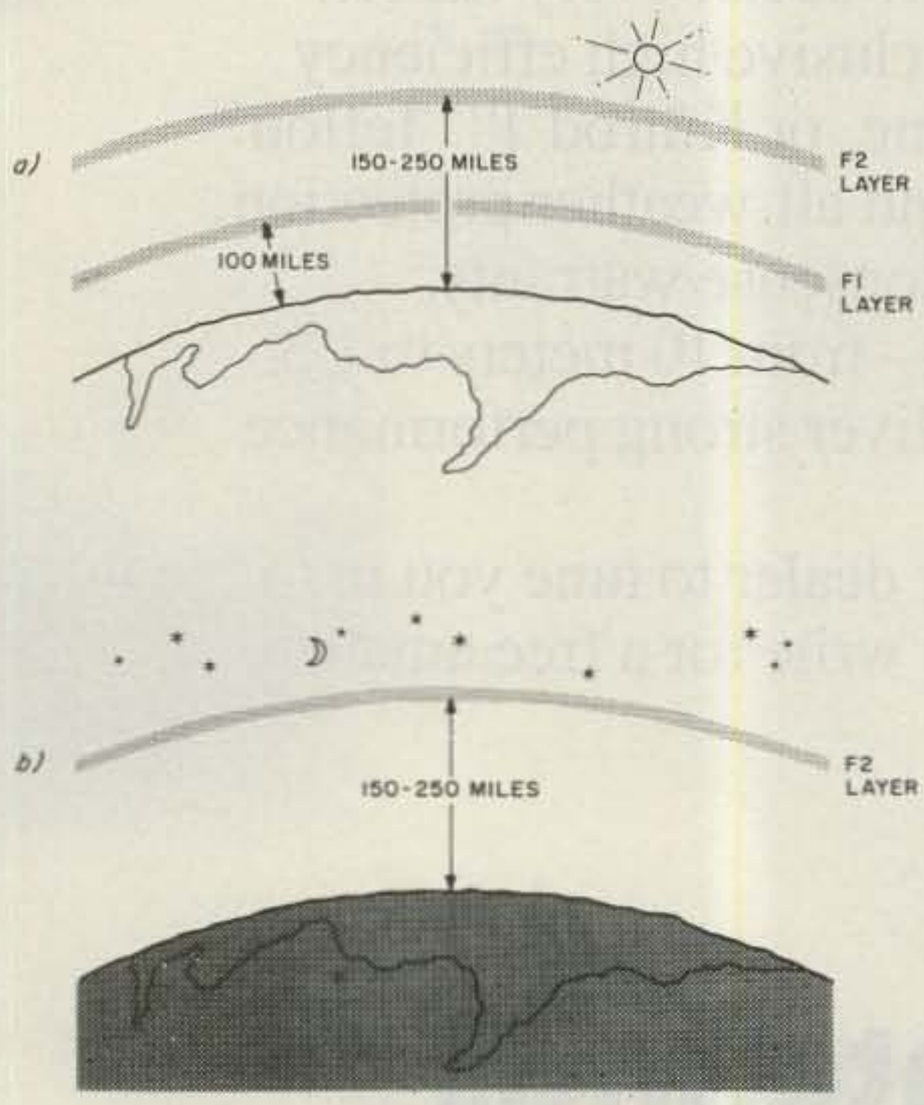


Fig. 1. During the hours of daylight, the ionospheric F layer sometimes splits into two parts, as shown at (a). These regions occur at altitudes of about 100 miles (the F1-layer) and 150 to 250 miles (the F2-layer). During the hours of darkness and occasionally during the day, the F layer consists of a single ionized region at an altitude of 150 to 250 miles.

We all have heard that the higher we put an antenna the better it will work. But this is not always true! Especially if you are a contester, you can benefit from a knowledge of how antenna height affects propagation distance.

You have just gone to a tremendous amount of trouble—not to mention expense—to put your tri-bander up another 40 feet. The new 90-foot tower graces your neighborhood. You drive up the street with pride. Lay persons gape at the structure with awe. A space-age communicator genius, that's you!

Finally, everything is hooked up and ready to go. You anxiously switch on the rig and tune to 14.225 MHz, getting ready for some DX. Sure enough, there's a CX3. You call him with the linear off, just for fun. A dozen others call him at the same time. You win.

A JA station calls you and tells you that you are the strongest signal he has heard so far that morning. Morning? It's 7:00 pm! Oh, yes . . . jet lag.

It works!

Now for a little domestic chatter. You tune further up the band. Strange . . . all of the stateside stations seem weak. Well, you guess, it must just be the conditions. Twenty meters can be a fickle band. You call CQ. No answer. Again. No answer.

A moderately strong W5 station is calling CQ. You answer. He comes back to someone else.

Several more failures transpire before you make a stateside contact. But he tells you that your signal is just S3. Imagine! What an insult!

Several evenings pass and half a Saturday before you allow yourself to wonder what's happening. DX seems great, but you'll get creamed in the sweepstakes.

No Coincidence

There's an old saying that something isn't a coincidence if it keeps on happening. Your new skyscraper antenna system just doesn't seem to work that well un-

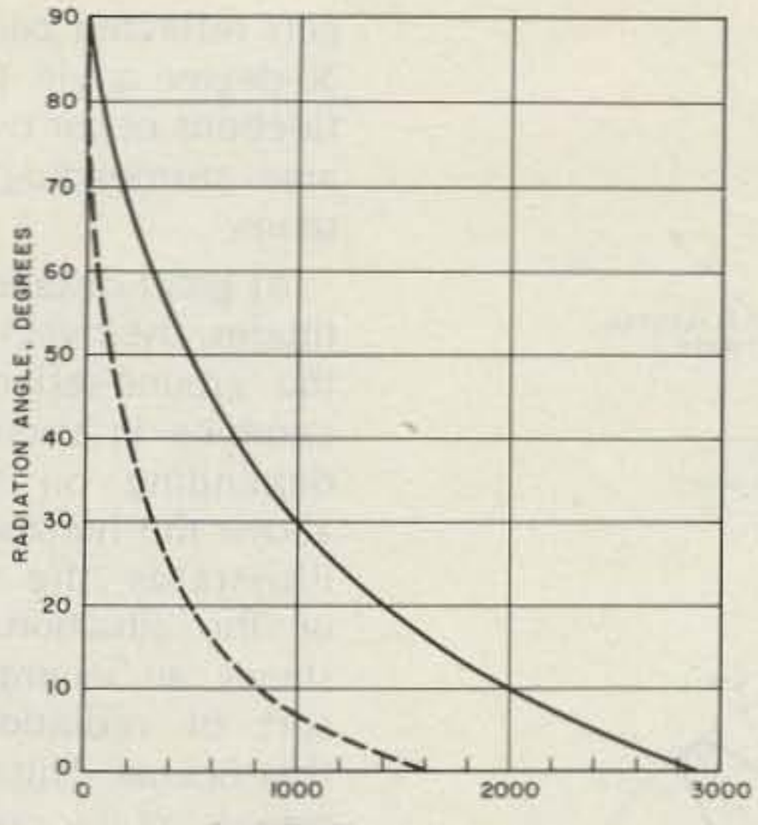


Fig. 2. The single-hop distance is related to the angle of radiation from the antenna, and also to the altitude of the ionized layer. The solid line shows the relation for the F2 region for the average altitude of 200 miles. The dotted line shows the relation for the F1-layer, for the average altitude of 100 miles.

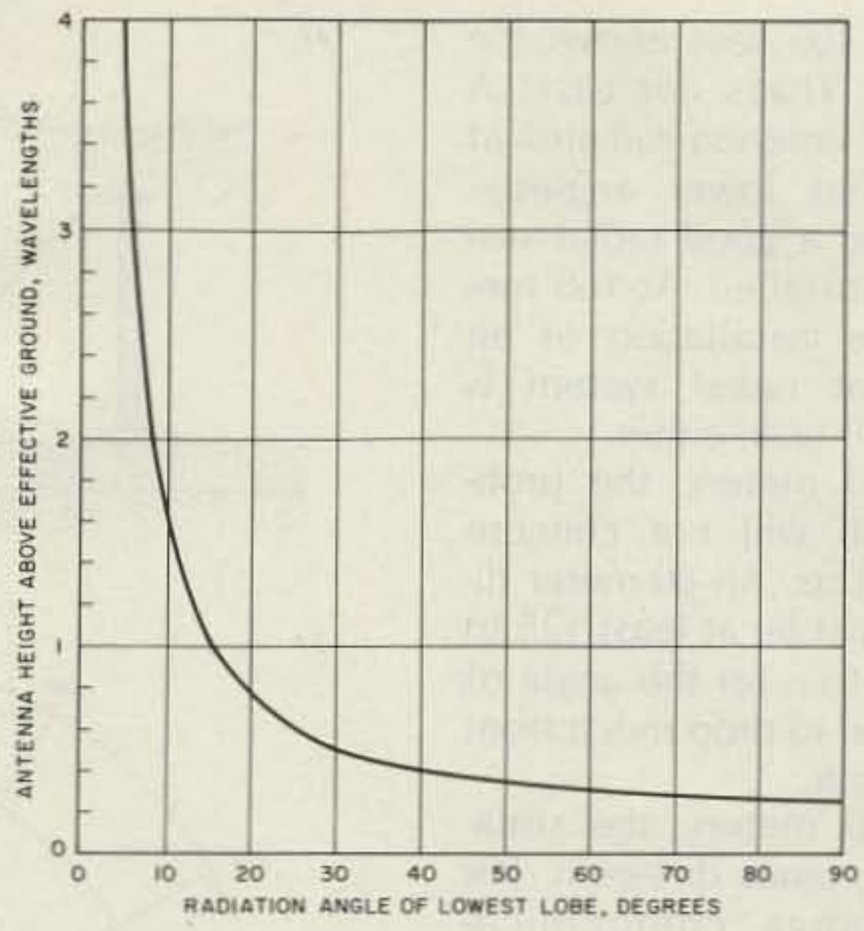


Fig. 3. The lowest lobe of radiation in the vertical plane occurs at an angle that is a function of the height of the antenna above effective ground. The lowest radiated lobe is of primary interest in most cases.

less the other station is at least a couple of thousand miles away. As the weeks pass, you begin to notice that this effect is even more pronounced on 15 meters than on 20. And on 10 meters, it is still more vivid, although it could well be the large skip zone that is responsible for the phenomenon on that band.

What causes this?

For horizontal antennas, the angle of radiation depends on the height of the antenna above the effective ground. The higher the antenna above effective ground, the lower the angle of radiation. Your antenna is high. Therefore, you can be pretty certain that the angle of radiation is low. But is that good? For DX, yes, it is good. But for contacting stations closer in, it may not be so good. Your signal might be going "over their heads."

If you are primarily a domestic contester, you can benefit from a knowledge of the way in which antenna height affects the single-hop propagation distance. By placing your antenna at just the right height so the strongest part of your signal will land in a densely populated area, you can gain an advantage over a competitor who ignores the physics of antenna height versus performance.

Single-Hop Distance

How far from your station will the strongest part of your signal come back to Earth? That depends on the altitude of the ionosphere at the time and also on the angle of radiation from your antenna.

Most propagation in the high-frequency bands takes place via the F layer of the ionosphere. This layer often breaks into two levels during the daytime; signals are then returned by a region that is about 100 miles high. At night, the F layer ranges from approximately 150 to 250 miles altitude, with the average being about 200 miles. This is shown in Fig. 1.

Since the ionized layer is usually higher at night than during the day, signal range can be expected to increase during the hours of darkness. And this is generally what does happen. If your antenna radiates most of its energy right along the horizon—that is, if the elevation angle is zero degrees—the signal will "land" about 1,600 miles away during the daytime and about 3,000 miles away at night. That's the maximum possible single-hop distance. The limiting factor is the curvature of the Earth.[1]

Of course, multiple-hop propagation makes it possible to talk with hams all over the world. In general, the lower your angle of radiation, the fewer hops are required for global propagation. That's why a low angle of radiation is favored for DX. The fewer hops your signal must take to get to the opposite side of the world, the lower the attenuation will be.

But suppose you live in Washington, DC, and want to talk with someone in New York City. If your angle of radiation is very low, most of your signal will overshoot its goal. You'll be heard very well in Greenland, perhaps, but not in the Big Apple.

The distance at which your signal "lands" after a single hop is a direct function of the angle of radiation. The lower the radiation angle with respect to the horizon, the greater the propagation distance. Fig. 2 is a graph illustrating the function of one-hop distance versus radiation angle, based on the average F1-layer (daytime) height of 100 miles and the average F2-layer (nighttime) height of 200 miles.

What Affects the Angle of Radiation?

So, you ask, how does one control the angle of radiation from an antenna at the high frequencies? The answer is that a horizontally-polarized antenna, such as a dipole or yagi, exhibits an optimum angle of radiation that varies directly with the antenna height above the effective ground plane. (A vertical antenna, assuming it has a good ground system, always radiates best at relatively low angles.)

The higher you put your antenna, the lower the angle of radiation will be, as a general rule.

We should take note that, at 160 meters, it's practically impossible to control the angle of radiation from a horizontal antenna. Unless you live in the wide-open country and still have to register your tower with the Federal Aviation Administration, you can stop worrying about the problem on that band. A horizontal antenna for 160 meters radiates most of its energy at very high angles, unless you put it at least

250 to 300 feet above the ground. That's not easy! A vertical antenna radiates at somewhat lower angles—provided a good radial system is installed. At 160 meters the installation of an excellent radial system is no small task, either.

At 80 meters, the problem still will not concern most of us. An 80-meter dipole must be at least 125 to 150 feet up for the angle of radiation to drop much from the zenith.

At 40 meters, the situation becomes different. For short-range communication, a height of 30 to 40 feet is best; for intermediate-range, 50 to 75 feet is optimum. That is not unreasonable for many hams (although for some it's an utter impossibility). For long-distance work, the old DXer's rule applies: Put the antenna up as high as you can.

At 30 meters and above, modest antenna height can result in an angle of radiation that might be lower than you want it.

How do we determine the maximum angle of radiation from a horizontal antenna, in terms of its height?

First, we must realize that the effective ground plane for radio-frequency energy usually doesn't coincide with the actual Earth surface. For flat, level ground without man-made structures, the effective radio-frequency ground plane lies several feet below the surface.[2] Obstructions such as trees, utility wires, house wiring and roofing, and steel-frame buildings can raise the effective ground plane. In an area congested with steel-frame buildings, the effective radio-frequency ground plane may be well above the level of the Earth's surface.

For the average residential dweller, the effective ground plane is probably a little bit below the actual surface. In the city where there are many tall buildings of widely varying stature, it can be difficult to estimate the level of the effective ground plane because of the irregular distribution of obstructions and because the effect of such obstructions varies with the wavelength. If your QTH is in the downtown area of a sizable metropolis, you'll probably have to resort to trial and error to find out how your antenna height affects the angle of radiation—if you have any control over the situation at all.

The effective height of an antenna is, in general, a little greater than its actual height in most suburban or rural locations. To obtain the effective height, add about 5 feet to the actual height.

Once you have determined the angle of radiation that you want, using Fig. 2, you can determine the optimum height for your antenna, in wavelengths, from Fig. 3. Where do we get Fig. 3? The signal

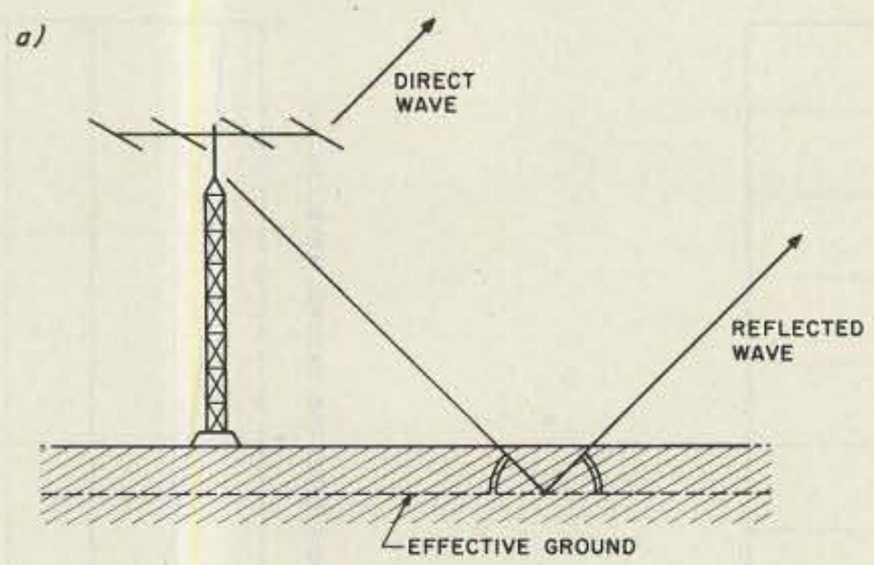


Fig. 4. The direct wave and the ground-reflected wave combine, at a distant point in the sky, in varying phase, depending on the takeoff angle. At (a) an example is shown of how these waves are emitted from a yagi antenna. At (b) a typical vertical-plane radiation pattern is illustrated for a yagi antenna at a height of a little less than 1 wavelength. (The lower lobe is of primary interest in most cases.)

from your yagi antenna goes out in all directions. Although much of the energy is propagated horizontally because of the directional nature of the antenna, some goes straight up and some goes straight down; some goes up and down at 30-degree angles with respect to the horizon. Overall, half of the energy is emitted toward points above the horizon and half is sent out toward points below the horizon—that is, toward the ground. The ground signal is reflected at the effective ground plane and is reversed in phase. It then heads back up into the sky, toward the ionosphere.

The familiar rule of optics applies to radio waves just as it applies to rays of light: The angle of reflection is equal to the angle of incidence. Ground reflection occurs at all possible angles of incidence; energy sent straight down from your antenna gets sent straight up, energy sent down at a 30-degree angle gets reflected back up at a 30-degree angle. Ground reflections occur over a large area surrounding your antenna.

At great distances and altitudes, the direct wave and the ground-reflected wave combine in varying phase, depending on the angle above the horizon. Fig. 4(a) illustrates the geometry of the situation. Fig. 4(b) shows an example of the sort of radiation pattern that occurs. This phase pattern is quite complicated, but it can be determined by simple plane geometry. The lowest lobe—the one that occurs nearest the horizon—contains the most signal energy of any lobe. The angle at which this lobe occurs, as a function of the height in wavelengths, is the lowest angle at which the direct and ground-reflected waves add in phase. It is this angle, as a function of the antenna height in wavelengths, that is shown in the graph of Fig. 3.

Optimum Angle Versus Height in Feet

Most of us have antennas that stay at the same height all of the time. Variable-height towers exist (but those of us who have "crankups" generally think of such towers more as "crankdowns"—to keep the neighbors from suing for half the gross national product because of the eyesore), and from the above discussion it should be evident that they can be used to advantage in medium-range operation.

Your antenna height in wavelengths can be determined by a simple formula, assuming you know the frequency or wavelength and the height of your antenna in feet. The following formula applies, letting h represent the height in feet above the actual ground surface, f the frequency in megahertz, and y the effective antenna height in wavelengths: $y = (h + 5)f/984$.

MADISON Electronics Supply

1508 McKinney **Houston, Texas 77010**

Call for Quotes
800-231-3057
713-658-0268
ALL ITEMS ARE GUARANTEED OR SALES PRICE REFUNDED.

VISA MasterCard

45

ACCESSORIES

SANYO AA NICADS 2 per pack $4.00
WELZ meters.....less 10%
TRIPLETT model 50 VOM.....59.00
FLUKE 77 auto-ranging digital multimeter...115.00
COBRA, MAXON 49mhz headset units 39.95
ALPHA DELTA MACC-8 surge protector.....73.00
BENCHER BY-1 paddles, black 42.95
BENCHER By-2 paddles, chrome.....54.95
VIBROPLEX.....less 10%
BIRD Wattmeter #43 & elements in stock.....CALL
COAX SEAL.....per roll.....2.00
QSL Card holders.....for 60 cards.....2.00
TRIPPLITE PR25 20 amp 12VDC regulated 99.95
TRIPPLITE PR35 as above but 35 amp.....169.95
AMECO preamps .....Less 10%
HEIL SOUND.....Less 10%

TUBES

GE 6146B.....9.95
572B.....59.95
Eimac 3-500Z.....99.95
Hard to find tubes?? Try us.....CALL

SURPLUS

New Guarntd-CDE 2PDT encl RELAY 10A 5.00
2.5A/1000PIV epoxy diode .....29¢ ea or 19.00/100
COLLINS F455J05 CW Filter(75A-4) New.....95.00

If we advertised all that we stock, we could fill more than 20 pages like this. We don't print a catalog either, we save the money so we can pass the savings on to you. Call us for any of your electronic needs, we have been in business for a long time, and our customers are our best reference.

EQUIPMENT

As you know, Madison is an authorized dealer for all the popular equipment lines such as: DRAKE, KENWOOD, YAESU, ICOM, KDK, TENTEC, SANTEC, etc. BE SURE TO CALL US FOR A PRICE BEFORE YOU MAKE ANY EQUIPMENT PURCHASE. WE WOULD LIKE YOU TO BE OUR CUSTOMER.

KDK FM4033...NEW 220mhz.....349.00
KDK FM2033.....289.95
SANTEC ST142.....++FREE GOODS++.....299.95
SANTEC ST440up.....250.00
KENWOOD TR2600.....CALL
TENTEC 2591 .....269.00
ICOM IC-02AT.....CALL
TOKYO HI POWER amps .....less 15%
MIRAGE amps .....less 12%
VOCOMM amps .....CALL
TOKYO HI POWER HC2000 tuner.....289.95
TOKYO HI POWER HC400L tuner 129.95
TOKYO HI POWER HC200 tuner.....89.95
DRAKE MN75.....125.00
WM. NYE MB-V 3KW tuner & ant switch 489.00
WM NYE 46-6 phone patch
for ICOM (8 wire).....82.00
BEARCAT DX-1000.....499.95
SIGNAL ONE MILSPEC 1030.....6295.00
ACCESSORIES AVAILABLE.....CALL
BOOKS—We stock a wide selection of books on **Electronics, Communications and Computers.**

SUPER CLOSEOUT SPECIAL–LIMITED TIME ONLY

AEA AMT-1 a great way to make any computer work AMTOR, RTTY and CW. The Terminal unit and the Software in one package. Use with any RS232 computer output and your Modem program to operate AMTOR, RTTY or CW. CW board and SOFTWARE FOR EITHER THE VIC-20 or COM-64...
WHILE SUPPLIES LAST.....$359.95
AEA MBA-RC...READER/CODE CONVERTER...259.95

POLICIES--MASTERCARDS, VISA or C.O.D.

All prices FOB Houston, Texas, except as noted. Prices subject to change without notice, subject to prior sale. Used gear sale price refunded if not satisfied. Call anytime to check status of your order. Texas residents add sales tax.

ANTENNAS

ARX2B, V2S, 2MCV-5, ISOPOLE.....$39.95
A3.....219.95
A4.....289.95
402CD.....289.95
R3.....279.95
Hustler 6BTV.....139.95
G7-144.....119.95
Butternut HF6V...80 thru 10 vertical.....125.00
HF2V....80 and 40 vertical 125.00
70CMCV-7..70cm vertical collinear.....39.00

Barker & Williamson

AV25 vertical 90.00
AR25 radial kit for above.....19.50
AS160 (160-80-40-20) 137'.....115.00
AS80 (80-40-20) 78'.....89.00
AS40 (40-20-15-10) 40'.....115.00
AS20 (20-15-10) 23'.....89.00

HyGain

TH7DXX.....429.95
HG52SS.....949.95
7-1..40 meter rotary dipole.....156.00
7-2..2 element 40M beam 349.00
Director kit for above for 3 el. 40M.....219.00
Ham 4 .....199.95
Ham T2X.....249.95

NOTE: HyGain accessories shipped prepaid from the factory with tower orders.

KLM KT34A 329.95
2M13LBA.....79.95
2M14C.....88.00
2M22C.....119.95
2M16LBX 99.95
432-30LBX.....96.00
435-18C..Incl. CS-2.....116.95
432-16LB 68.00
Larsen Kulduck 17.00
AEA Hotrod HR-1.....16.00
VALOR mobile antennas 75-10M, ea 20.00
AVANTI ASP151 3G thru the glass 2M.....33.00
ANTECO 2M...5/8 MAG MOUNT, compl. 25.00
METZ SW-1 SWL ANT..50khz to 54mhz 59.95
DB+ Enterprises 2el. Quad 279.95
W1JC 160 + 30 HD Dipole.....69.95
W1JC 160 + 40 HD Dipole.....69.95

MADISON STOCKS A WIDE SELECTION OF ANTENNAS ... PLEASE CALL FOR PRICES

ROHN 50' tower consisting of 4 sections of 25G, 1 section of 25AG-2 or 25AG-3.....269.00
ROHN FK2548 .....prepaid 799.00

SPECIAL!!! ROHN TOWER SPECIAL!!!

25G.....per section..... 46.00
45G.....per section.....107.00
55G.....per section .....CALL
GENUINE ROHN ACCESSORIES .....CALL
Alliance HD-73.....99.95
U110.....59.95

AMPHENOL

PL259 831SP silverplate.....1.25
UG176 reducer RG8X/RG59 ..... .30
4400 N Male-SO239 .....6.00
2900 BNC Male-SO239.....4.00
8261 N Male 3.00
Other Amphenol products in STOCK — CALL

BELDEN

9913 low loss, solid center conductor, foil & braid shield - excellent product.....45¢/ft
8214 RG8 foam.....43¢/ft
8237 RG8.....36¢/ft
8267 RG213 .....52¢/ft
8235 300 ohm KW twinlead.....23¢/ft
8000 14ga stranded copper ant. wire.....13¢/ft
8448 8 conductor rotor cable .....31¢/ft
9405 as above but HD—2-16ga, 6-18ga .....52¢/ft
8403 Mic cable 3 condctr & shield .....80¢/ft
100 feet 8214 w/ends installed.....45.00

COMPUTER CORNER

This month Madison Electronics Supply has two package specials for those of you that are interested in getting into the world of RTTY / AMTOR. Both of these packages include full function Morse, Baudot, ASCII and AMTOR modes of operation.

Package 1 includes a self-contained unit that plugs directly into your Commodore 64 and a spectrum analyzer type tuning indicator that is as good as a scope for tuning.

AEA MP-64/2 TU & Softwear	retail	239.95
AEA TI-1 tuning indicator	retail	119.95
AEA AC-1 12VDC power supply	retail	19.95
One Mic Connector 4 or 8 pin	retail	4.95
	TOTAL	$384.80

PACKAGE SPECIAL! $289.95 YOU SAVE $$$

Package 2 is the highly acclaimed CP-1 TU with the new MBA-TOR software, a high performance package for the more serious operator.

AEA CP-1 TU	retail	239.95
AEA MBA-TOR Software for C-64	retail	119.95
AEA TI-1 Tuning Indicator	retail	119.95
One Mic Connector 4 or 8 pin	retail	4.95
	TOTAL	$484.80

PACKAGE SPECIAL! $369.95 YOU SAVE $$$

MADISON STOCKS ALL AEA PRODUCT LINES....
PLEASE CALL FOR PRICES.....EXAMPLES.....
CP-1.....Computer Patch Interface.....199.95
CP-1/20 .....above w/MBATEXT VIC-20 .....239.95
CP-1/64.....above w/MBATEXT C-64.....239.95
MP-20 ...MICROPATCH Hardware/Software ...149.95
MP-64.....as above for COM-64.....149.95
MBATEXT Software .....VIC-20 & COM-64 .....89.95
MBA-TOR Software .....COM-64.....99.95
MARSTEXT MARS Software VIC-20, COM-64 89.95
PLUS Software for APPLE, IBM, PC, KAY-PRO, TRS-80, MOD III & IV, and HEATH H-89 .....

...**KANTRONICS** Has A New Product!! .....UTU .....
The Universal Terminal Unit works with any computer that has a RS-232 port. Contains the terminal unit and the software to work CW, RTTY, ASCII and AMTOR. All you need is a terminal communication program to drive the unit and a 12VDC power supply.
MADISON HAS IT IN STOCK!! 189.95

MADISON STOCKS THE KANTRONICS LINE—CALL FOR PRICES .....EXAMPLES .....
INTERFACE][.....239.95
HAMTEXT .....VIC-20 .....COM-64 .....89.95
AMTORSOFT.....VIC-20.....COM-64.....79.95
HAMSOFT .....VIC-20 .....39.95
PLUS Many Other Items in Stock. CALL for INFO

.....**HAL**.....
Most Items In Stock Including The New ARQ-1000 AMTOR Unit.....Call For Current Prices.....

SUPER CLOSEOUT SPECIAL !!!!! .....
AEA AMT-1 includes CW board.....359.95
AEA MBA-RC.....259.95

NEW! NEW! NEW!
AEA PACKET-PKT-1 packet controller - assembled, tested-complete incl. pwr ...ready to go ...499.95
SWLTEXT software, C-64 .....99.95
MBA-TOR software, VIC-20.....99.95

DON'S CORNER

Well, it seems like the contest season just ended yet here it is again. That means it's time to check out all the equipment and the antennas. Coax seems to be the biggest problem down here this year. So be sure that you check out the coax so you can get the last bit of gain from the antenna. BELDEN has a new affordable professional coax that is very popular with the guys in this area; it is the 9913 low loss RG-8 type coax. It is very low loss up to 1.2 Ghz. Loss below 50 Mhz. is less than .9 db/100 feet. At $.45/foot it is a real bargain. It uses the normal connectors and as always, be sure to use COAX-SEAL on all the exposed connections. Til next month, 73.

For example, suppose your antenna is 50 feet above the ground surface. Then the height in wavelengths above effective ground, at 14 MHz, is (50 + 5) × 14/984, or 0.78 wavelengths. At this height, the optimum angle of radiation from your antenna can be determined, from Fig. 3, as approximately 20 degrees.

Now, using Fig. 2 you can find the one-hop distance for F1-layer or F2-layer propagation. During the day you should expect a distance of pretty close to 500 miles via the F1-layer, assuming this layer is ionized at that time. (If not—and the F1-layer is not always ionized during the daylight hours—the propagation will occur via the F2-layer.) At night or if the F1-layer is not ionized, you can expect the propagation distance to be about 1400 miles.

Let's try this in reverse. Suppose you want to keep a schedule with a friend whom, after you have checked on a map with a ruler against the mileage scale, you have determined is 1640 miles away. You decide to try 14 MHz, since that band has been pretty good lately. How high should your antenna be, assuming you want to have the sked at 9:00 pm?

Look at Fig. 2, at the F2-layer (nighttime) line, and you can see that the optimum angle of radiation is about 15 degrees. How high should your antenna be? Checking Fig. 3, you can see that the height should be just about 1 wavelength above effective ground.

Now, we must convert this value to feet. The "inside-out" version of the above formula can be used for this purpose: $h = 984y/f - 5$. At 14 MHz, with $y = 1$, we have $h = 984 \times 1/14 - 5$, or $h = 65$ feet. This isn't terribly high. If your tower is 90 feet high, you may well overshoot your target.

Conclusion

Neither the ground nor the ionosphere is perfectly predictable. Certainly there will be exceptions, in practice, to the guidelines given here. The most notable exception is that the F1-layer may fail to ionize during the daytime and you cannot tell until you find out by trial and error. The ionized layers vary somewhat in height, as well, and thus the above formulas are not exact. The effective ground plane in your location may not be exactly 5 feet below the actual surface.

We are dealing with variables. But it is certainly better to have some idea of how high you should put your antenna, instead of no idea whatever, or a grossly erroneous notion. The above information should give you a very good idea!

Probably the best approach for optimizing antenna height is the crankup tower or, better still, a mast or tower with an electric motor so you can raise or lower your antenna by remote control from the station. This would allow you to actually listen to the signals from a certain area, and thereby optimize your antenna height empirically (after getting the general idea by using the graphs and formulas given here).

Antenna height is, at the high frequencies, only slightly less important than the direction in which it is pointed. We would not think of pointing a yagi west if we wanted to work a station to the south of us. Similarly, an antenna that is far too high (or, less frequently, not high enough) can detract from the signal strength. The contest operator, especially, should attempt to optimize the antenna height as well as its direction. A slight edge can, as we know, make a big difference. Number 2 differs from 1 by 100 percent! ■

References

1. *The ARRL Antenna Book*, 13th Edition, 4th Printing, The American Radio Relay League, Inc., Newington CT, 1977, page 17.
2. *Ibid.*, page 46.

Here's what you DON'T NEED with the

What you DO get is one compact package that TURNS ON *RTTY READY* — No program load, "SYS" commands, or rats nest of external wiring to enjoy the best in CW/RTTY operation. (AMTOR too, if added.)

The simple, uncomplicated design and ease of operation are not to imply mediocre performance. On the contrary, Microlog's years of software and hardware experience combine in the AIR-1 to provide a level of performance found only in much more expensive dedicated systems. Compare for yourself or ask an AIR-1 owner, they're our best salesmen!

- Computer-enhanced detection means extensive use of software digital filtering techniques for noise and bandwidth that track the operating speed and code.
- Full speed RTTY 60 to 132 WPM, CW to 150 WPM, & 110/300 Baud ASCII.
- Choice of full- or split-screen display with large type ahead text buffer and programmable memories.
- On-screen tuning indicators mean you never have to take your eyes off the video for perfect copy tuning. RTTY "scope" cross-hatch and "red-dot" signal acquisition monitor right on the screen.
- Keyword or manual control of VIC or Parallel printer and receive buffer storage.
- Convenient plug-in jacks for all connections.
- Single board design contains TU & ROM software that does not require external power.
- Full one-year warranty.
- WRU, UNshift On Space, Word wrap-around, Test "Quick Brown Fox" & "RYRY" in ROM. Break buffer, Random Code generator, Handkey input, Real-time clock, sturdy metal cover and more.

AIR-1 for VIC-20 or C-64 $199 (with AMTOR $279). Microlog Corporation, 18713 Mooney Drive, Gaithersburg, MD 20879 Tel: 301-258-8400

MICROLOG ↙51

INNOVATORS IN DIGITAL COMMUNICATION

John M. Franke WA4WDL
1310 Bolling Avenue
Norfolk VA 23508

A No-Holes Barred Beam

What to do when the lease says "no antennas": Turn your entire house into a broadside dipole.

Problems common to amateur-radio operators who rent homes or apartments or live in condominiums or townhouses are restrictions on antennas. I rent the house that I presently live in and miss the freedom to put up towers or antennas indiscriminately. However, I have not given up. Examples of my past solutions to this antenna problem (for the microwave spectrum) have been reported in this journal.[1]

A more recent antenna project was to improve reception of a distant channel 2 television station. The station, in North Carolina, is the only station within 150 miles that carries "Monty Python's Flying Circus"—a program to which my wife and I are thoroughly addicted. Our landlord, who has a strong distaste for Monty Python humor, will not permit a three-element beam for channel 2 to be mounted on the chimney. What does this have to do with amateur radio? Channel 2 is close in frequency to six meters, and the antenna presented here can easily be scaled for six-meter, 10-meter, and 15-meter operation or scaled up in frequency for 2-meter or 1¼-meter operation.

An essential element of the design of this antenna is the design of the house. My house meets the two design requirements. First, one side faces the television station that I wanted to receive. Second, the house has aluminum siding. Up to this time, I had considered the aluminum siding to be a drawback. What amateur-radio operator wants to live in a shielded box? But now I had a use for the siding; it forms a reflector screen for a single-element broadside antenna—see Fig. 1.

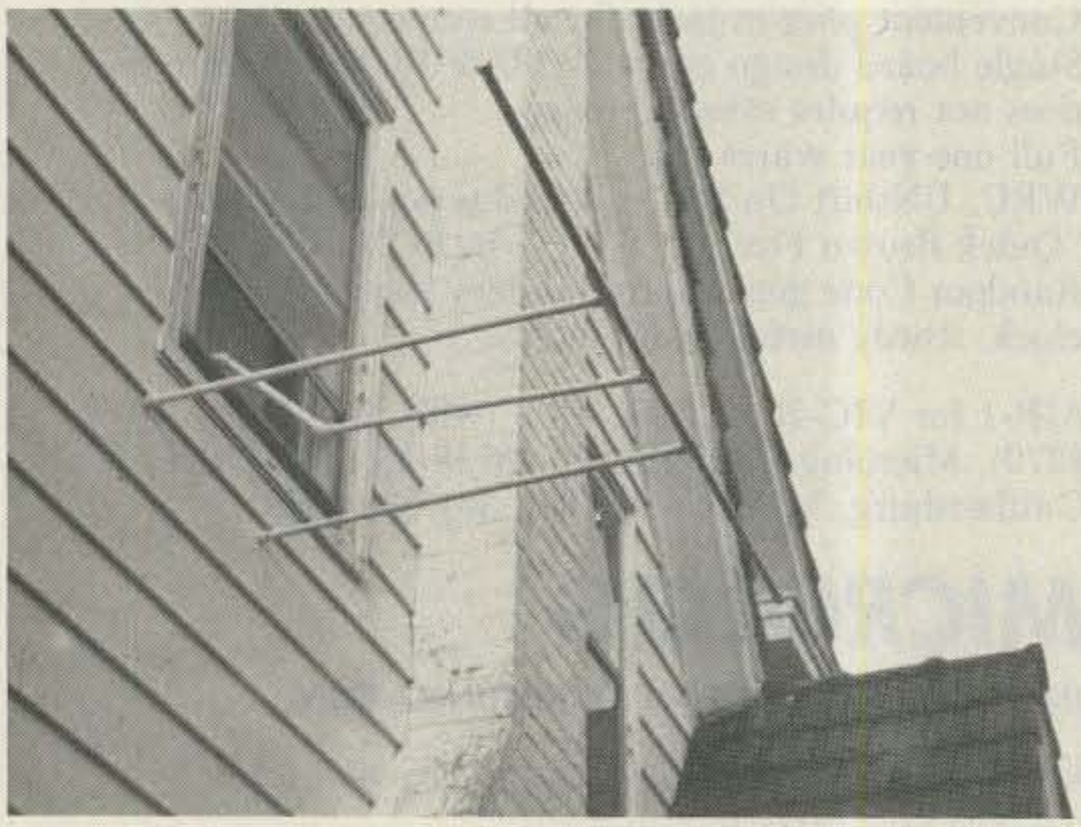
The driven element is a half-wave folded dipole. (Even though the antenna is used only for reception, the active element is called the driven element.) The folded dipole is made from 300-Ohm twinlead. The length of the folded dipole is found by: L (ft.) = 492/f(MHz) × .95 × .82. The factor 492 accounts for the speed of light in English units, fringing effects are represented by the factor 0.95, and 0.82 is the velocity factor of common television twinlead. If open-wire construction is used, omit the 0.82 factor.

The driven element is fed with twinlead although the feed impedance is probably closer to 200 Ohms. A 4-to-1 coaxial balun would probably result in a good impedance match to 50-Ohm cable. The driven element is spaced 0.2 wavelengths in front of the siding; S (ft.) = 984/f(MHz) × 0.2.

Simple enough? Yes, but the hard part is how to construct and mount the antenna without drilling holes, and still be able to rapidly erect or remove it. The solution I found is shown in Fig. 2.

A frame is constructed using PVC plumbing tubing. This modern synthetic material is cut easily with a hacksaw and spliced with a fast-curing cement. Remember when glue and paint would dry? Now it cures, hardens, fuses, or passes through some chemical metamorphosis! Anyway, T fittings, elbows, 45-degree bends, and end caps are readily available at most hardware stores.

The frame hooks onto



The window-mounted VHF antenna.

The HAM SHACK

220 N. Fulton
Evansville, IN 47710
812-422-0231
812-422-0252

Prices and Availability Subject to Change

AEA
CP 1/64 or Vic 20 Software Package $239.00
MP-64 Interface Package 129.00
144 Isopole Antena. 45.00
MBA-TOR Software 99.00

ALLIANCE
HD-73 (10.7 Sq. Ft.) Rotator $109.00
U-110 Small Elevation Rotator 49.95

ANTENNA SPECIALISTS
Avanti AP 151.3G 2 Mtr 3db on glass . $ 34.50
APR 450.5G 440 Mhz 5db on glass . . . 38.50

ASTRON
RS7A 5-7 Amp Power Supply . . . . . $ 49.00
RS10A 7.5-10 Amp Power Supply 59.00
RS12A 9-12 Amp Power Supply 69.00
RS20 A 16-20 Amp Power Supply 89.00
RS20M 16-20 Amp W/Meter 109.00
RS35A 25-35 Amp 135.00
RS35M 25-35 Amp 149.00
RS50A 37-50 Amp 199.00
RS50M 37-50 Amp 225.00

BENCHER
BY-1 Paddle . . . . . $ 39.00
ZA-1A Balun 19.00

BUTTERNUT
HF6-V 80-10M Vertical $195.00

CONNECT SYSTEM
Private Patch II (Quick Connect) . . . $419.00

CUSHCRAFT
A3 Tribander 3EL $215.00
A4 Tribander 4 EL 279.00
214B/214FB Boomers 14EL 259.00
32-19 Super Boomers 19EL 89.00
ARX-2 Ringo Ranger 39.00
AOP-1 Oscar Package 149.00

DIAWA
CN-510 1.8-60 Mhz Swr/Pwr Mtr . . . . $ 63.00
CN-620 1.8-150 Mhz Swr/Pwr Mtr . . . 105.00
CN-630 140-450 Mhz Swr Pwr Mtr . . . 125.00
CS-201 Max. Freq: 500 Mhz 2 Pos.Switch . 13.00

ENCOMM (SANTEC)
142 UP 2 Mtr $279.95
222 UP 220 Mhz 289.95
422 UP 440Mhz 295.00
Call for Accessories

HAL
CRI 100/CRI 200 Computer
Interface . . . . . $295.00 / $370.00

HYGAIN
TH7 DXS Tribander $425.00
TH5 MK2S Tribander. 389.00
Explorer 14 Tribander 289.00
CP45 8.5 Sq. Ft. Rotator 139.00
Ham IV 15 Sq. Ft. Rotator 199.00
T2X 20.0 Sq. Ft. Rotator 349.00
V2S 2 Mtr Vertical 39.00
5/8 2 Mtr Mag. Mat 22.00

Free shipping on all Crank-up Towers

ICOM
751 Ultimate Transceiver $1,199.00
745 General Coverage Xcvr . . . . . CALL
730 Great Mobile Rig. 599.00
R-71A Gen. Cov. Rcvr 649.00
271-A 2 Mtr $619.00
27H 45W 2 Mtr 359.00
471A/471H 430-450 Mhz $899.00/949.00
IC27A, 37A, 47A 2M, 220Mhz, 440 Mhz . CALL
2AT 2Mtr H.T. 215.00
3AT/4AT Handhelds 335.00
02AT, 04AT New H.T. Series . . . . . CALL
PTT or VOX Boom Mic Headsets 39.00
VERY LARGE ICOM STOCK . . . . . CALL

KDK
2033 25W Mobile $275.00
4033 220Mhz Mobile 319.95
7033 440Mhz Mobile 319.95

KLM
OSCAR Antennas in Stock . . . CALL FOR PRICES

KANTRONICS
Brand New Interface . . . . . CALL
UTU Interface $179.00
Interface II. 219.00
Large Variety of Software Available
for RTTY, CW, Ascii & Amtor
CALL FOR PRICES & INFORMATION

KEN PRO
KR-500 Elevation Rotator $185.00

LARSEN
NLA 150 MM 5/8 Wave 2M Mag. Mt. . . . $ 39.95

MFJ
949B Tuner, MTP, Switch, Balun . . . $ 89.95
1224 & 1278 Computer Interfaces . . . CALL
313 VHF Converter 36.00

VERY LARGE STOCK OF MFG PRODUCTS INCLUDING
VIDEO PRODUCTS
CALL FOR DISCOUNT PRICING

MIRAGE
B1016 10-160 Amp/Preamp $245.00
B3016 30-160 Amp/Preamp 199.00
D1010N 440 Mhz Amp 279.95

NYE
MB-2 Mag-Deluxe Tuner $459.00

SHURE
444D Hi/Lo Z Desk Mic . . . . . $ 55.00

TEN TEC
560 Corsair $1,020.00
555 Argosy 535.00
591 2 Mtr H.T. 269.95
515 Satellite Station 439.00
Century 22 CW Xcvr 359.00

TOKYO HY POWER CALL FOR DETAILS

YAESU
FT980 Computer Aided Xcvr . . . . . CALL
FT757GX Super Value . . . . . CALL
FT726R Tri-Band Xcvr $779.00
FT203R W/TT Pad 229.00
FT209R New 5W H.T. . . . . CALL

Send SASE for our new & used equipment list.
MON-FRI 9AM-6PM • SAT 9AM-3PM

ICOM, WILSON, KENWOOD and MAXON Commercial Equipment Available

USED EQUIPMENT

This list was compiled 8/1/84. Our used equipment changes daily. Please write or call for our current listing.

AEA
CP-1/64 Interface Package . . . $185.50
MBA 20 Text 59.00

AZDEN
PCS-3000 2 Mtr $209.50
PCS-4000 2 Mtr 229.50
PCS 300 . . . . . 189.50

COLLINS
KWM 380 170hz, 360hz, Processor
mic and service manual . . . CALL

DENTRON
MT 2000A $159.50
MT 3000A 225.50

DRAKE
TR7 . . . . . $675.50
PS7 . . . . . 185.50
TR7, 500hz, fan/PS7, fan . . . 899.50
7077 Desk Mic. 35.00
TR3, RV3, AC 269.00

ENCOMM
144 up 2 MTR H.T. $209.50
ST 7T 440 Mhz 169.50

HAL
CT 2200, KB2100 . . . . . $649.50
CRI-200 . . . . . 216.00

HEATHKIT
SB220 2 KW Amp $479.50
HW101, PS 269.50
SB600, Spkr 25.60
SA 2040 Roller Inductor Tuner . 139.50
PS 900 P.S. Spkr, Clocks . . . 169.50
HD15 Phone Patch 30.00

HYGAIN
HG-70HD Crank-up tower . . . $1,875.50
HDR-300 Digital Potator . . . 355.50

ICOM
720A, CW, AM $649.50
740 Xcvr 599.50
740, Keyer 629.50
740, Internal P.S. FL44 . . . . 789.50
730 Xcvr 499.50
720 Gen. Cov. Xcvr 548.50
PS-20 20A, spkr 155.00
2AT 2Mtr H.T. 185.00
R70 Rcvr 459.50
245 2MTR, TT Mic 169.50
AG-1 UHF Pre-Amp 59.50
255 2 Mtr, Xcvr 189.50

KANTRONICS
The Interface . . . . . $ 79.50
Vic 20 Hamsoft 29.50
Vic 20 Hamtext 59.50

KENWOOD
R599D Rcvr $239.50
RM 76 Remote 49.50
TR 90002M All Mode 279.50
TR2500 H.T. 195.50
Spkr/Mic 22.50
TR2400 H.T. 179.50
Leather Case 19.50
ST-1 Chgr. 55.50
TR 9130 2M All Mode 349.50
TR 7850 2M TR & SW . . . . . .

MFJ
721 SSB/CW Filter . . . . . $ 39.50
Cwf-2 Filter 35.50
Freq. Std. (Xtal Cal.) 19.50
752 Dual Filter 49.50
484 Grand Master Keyer 99.50

TEN TEC
OMNI D/B, P.S. $499.50
Triton IV, CW, N.B. 299.50
VFO Delta 129.50
280 P.S. 99.50
234 Speech Processor 69.50
OMNI C 599.00
Cent 21 . . . . . 239.00
OMNI A/B 369.50
255PS/Spkr 119.00

YAESU
FT901DM $589.50
FT101E 449.50
FT301D/FP/301D 499.50
FRG 7000 Rcvr 265.50
FT202 H.T. 99.50
FT207R H.T. 149.50
YR-901, KY-901 Reader &
Keyboard 469.50
FT301 SD Xcvr 279.00

MISC
Diawa CNA 1001 Autotuner . . . $225.50
KLM KT 34xA 6EL Tribander. . . 379.50
Galaxy 5 MK 2 P.S. 199.50
Galaxy Vfo. 69.50
DX 200 Rcvr 125.50
Nye Phone Patch 40.50
Mico Craft Reader 99.50
Mirage B-108 10/80W 124.50
Lunar PAI-144 Preamp 25.50
Lunar 2M 10-80P Amp 95.50
Astron RS 12A 55.00

Send SASE for our new & used equipment list.
30 DAY WARRANTY ON USED

the windowsill and is held spaced away from the house by two legs. The legs have end caps to prevent them from marking the siding. The folded dipole is inside the long horizontal piece. The feedline is inside the center leg. The antenna shown was constructed from ½-inch (inside diameter) white tubing. The white tubing is almost invisible against the white siding. For ten-meter or longer wavelength bands, I would recommend one-inch or larger tubing. For six-meter and higher frequencies, I would stay with the cheaper ½-inch tubing.

The central leg was fabricated first. After the feedline was threaded down the tubing, the driven element was soldered to the feedline. The driven element was laced to a long, thin wooden stick to prevent it from twisting. Then short sections were added to each side, the spacer legs added, and finally the end sections cemented on, complete with end caps. The completed antenna quickly hooks in place. When not being used, it is lowered with a cord down behind the bushes.

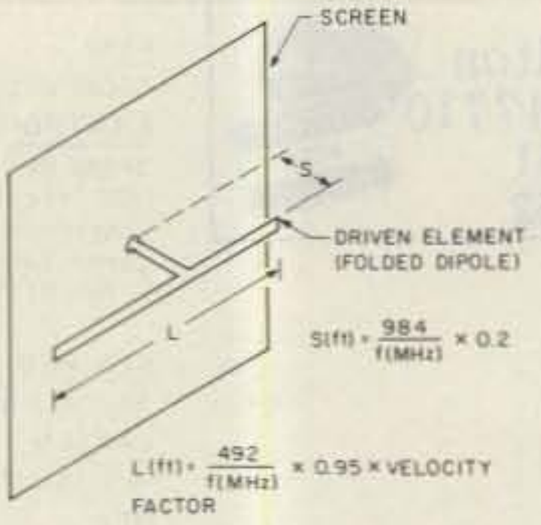


Fig. 1. Single-element broadside antenna.

The antenna has been a complete success and is still in use. The total cost including cement, tubing, and twinlead was less than fifteen dollars. The design can readily be scaled to amateur frequencies. One could be mounted on each of four walls to achieve omnidirectional coverage. The beam pattern can be widened by increasing the dipole-to-wall spacing to three-eighths wavelength. The center and spacer legs could be left uncemented and assembled with a lock pin or screw to allow the antenna to be collapsed enough to pass through the window and eliminate lowering it down after use. (Because of the way siding is mounted, this method is usable only for horizontally-polarized antennas.) Build one and let me know how you like it. ■

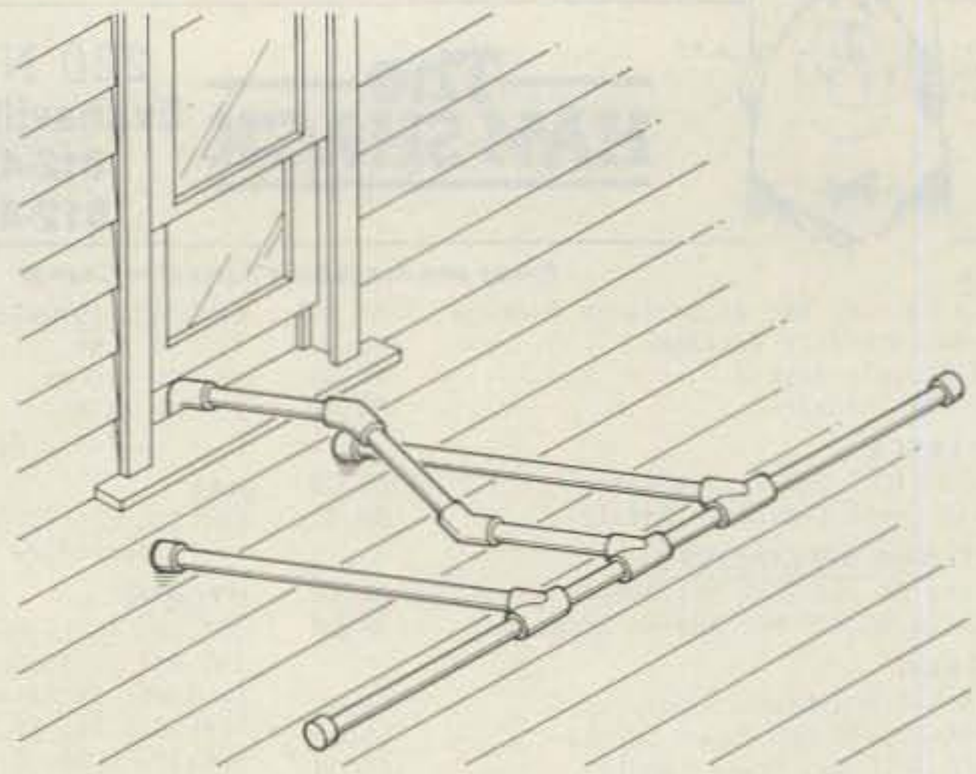
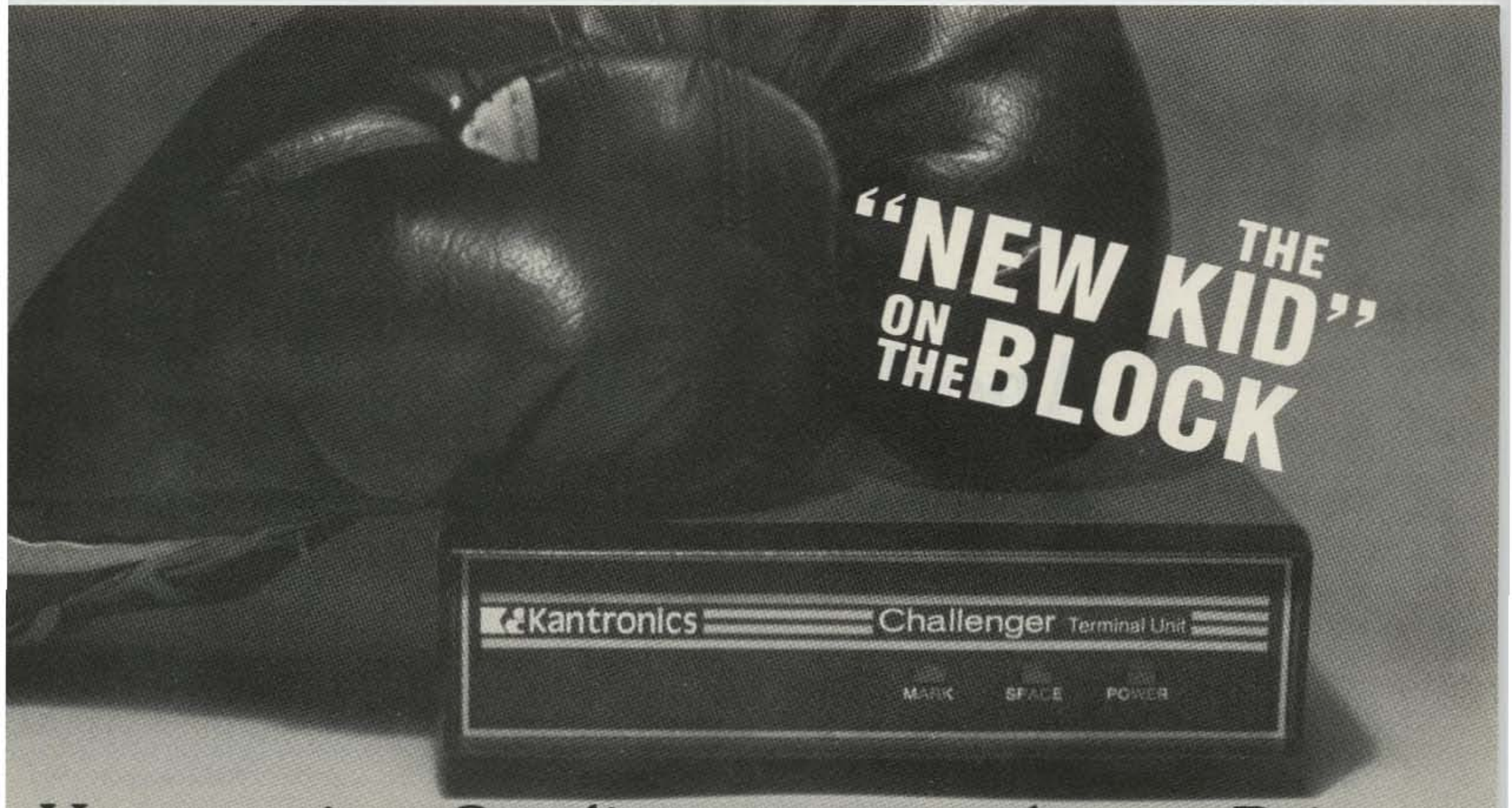


Fig. 2. PVC window mounting.

Reference

1. "Try the GHz Getter," *73*, October, 1982, pp. 50–52, and "The Amazing Cylindrabola," *73*, September, 1983, pp. 54–55.



Kantronics Quality at a Knockout Price

$99.95

The new **Kantronics Challenger** makes you the winner with superior performance at a knockout price. The **Challenger** terminal unit is designed for RTTY/ASCII/AMTOR operation with any of the Kantronics software programs. Compare our specifications with the competition, then check the price.

Challenger's four pole switched capacitance filter gives sensitivity and selectivity found in units costing much more. And with only 5mvRMS of audio required to drive **Challenger**, you can really chase the weak signals. With features like Scope Outputs, Direct FSK or Crystal Controlled AFSK, and an Extruded Aluminum Case, you know this is Kantronics quality.

If you really want to work RTTY/ASCII/AMTOR without breaking the budget, get **Challenger** and a Kantronics software program. Kantronics currently offers programs for Apple, Atari, TRS-80C, VIC-20, TI-99, and Commodore 64 computers.

Kantronics Software

Hamsoft — Send/Receive CW, RTTY, ASCII ★ Split Screen Display ★ Message Ports ★ Type-Ahead Buffer ★ Printer compatibility.

Hamtext — Includes all features of Hamsoft plus Text Editing ★ Receive Message Storage ★ Variable Buffer sizes ★ Diddle ★ Word Wraparound ★ Time and Text Transmission.

Hamsoft/Amtor — Includes all features of Hamsoft plus communication in all three modes of AMTOR.

Amtorsoft — Includes all the features of Hamtext but is for use with AMTOR ONLY. The Apple program is available only as a Hamtext/Amtorsoft combination.

Supertap — Receive Only CW, RTTY, ASCII, AMTOR ★ Decode inverted, bit inverted, and unusual bit order ★ Multiple line display ★ "SCOPE" feature for baud rate measure.

Specifications

Input Filter — Four pole Switched Capacitance Filter with 170Hz Shift RTTY bandwidth of 260Hz nominal. Copies any shift.

Audio Input — Minimum level 5mvRMS. Input impedance is 600 ohms unbalanced. Accepts baudot or ASCII code up to 300 baud. Max input level is 12VRMS.

AFSK Output — Crystal controlled. Mark-2125Hz; Space-2295Hz (170 shift). Level 100mvpp (35mvRMS) standard. Optional 500mvpp (175mvRMS). Output impedance 600 ohm unbalanced.

FSK Output — Open Collector +40 VDC Max. Polarity can be reversed.

Scope Output — 10K ohm output impedance.

PTT Output — Open Collector +40 VDC Max.

Computer Connection — TTL Compatible. Inputs also RS232 level compatible.

Power Requirements — 11 to 15 VDC (12VDC nominal) 75ma

Construction — Precision Extruded Aluminum Alloy Case

Dimensions — 1.9"H x 5.9"W x 7"D

Weight — 1¾ lbs.

Kantronics
1202 E. 23rd Street
Lawrence, Kansas 66044

Another Eggbeater

Don't be a VHF weakling. Pump up your performance with this simple 2m omni.

John Steidley WD5DNL
Rt. 2, Box 356
McAlester OK 74501

Many two-meter antenna construction articles have appeared in the past, probably more than necessary. Even so, here is my adaptation of an antenna from the April, 1971, issue of *QST*. The antenna was called an eggbeater. It is two full-wave loops mounted at right angles and fed 90 degrees out of phase to produce an omnidirectional, horizontally-polarized antenna. The round loops were changed to the more familiar square configuration. The feedline is attached to the side to produce vertical polarization. The phasing and feedlines are twinlead (300 Ohms). The balanced line is brought into the shack where a tuner is used to match to 50 Ohms.

Construction

The antenna uses a six-foot piece of wood (1″ × 1″) as its center support. Two twenty-inch cross pieces are used (I used scrap pieces of molding, but 1″ × 1″ wood will work just as well).

In preparing the center support for mounting the elements, it will be necessary to drill two holes at the top at right angles to each other. See Fig. 1. The exact size will depend on the type of wire used for the elements; just make the holes large enough for a snug fit. Measure twenty inches down from each of the top holes and drill two more holes for the bottom of the wire elements. See Fig. 1. Mount the twenty-inch cross pieces ten inches from the top holes. Use two small screws to fasten each boom to the center support. See Fig. 2.

Feedpoint insulators are Plexiglas™, three inches long and one and a half inches wide. These are attached to the cross booms with small screws. Holes are drilled one inch from each end of the Plexiglas insulators, and the feedline and wire elements are attached here. See Fig. 3. You can use solder lugs and screws to hold these wires to the insulator (or washers and screws). The first method with soldered connections is recommended.

Insert the wire for the elements in the holes and bend them into a square shape twenty inches on a side. See Fig. 4. Use #12 copper, either bare or insulated. You can use a larger size of aluminum wire, but this will make it necessary to experiment with the length to achieve resonance. The wire used in this model is #12 copper that is 81 inches long and was salvaged from a piece of electrical service wire.

The feedpoints for the antenna are attached to the insulators and the opposite sides of the loop are held to the cross booms with fishing line. See Fig. 4. Two small holes are drilled and the fishing line is wrapped around the element and the

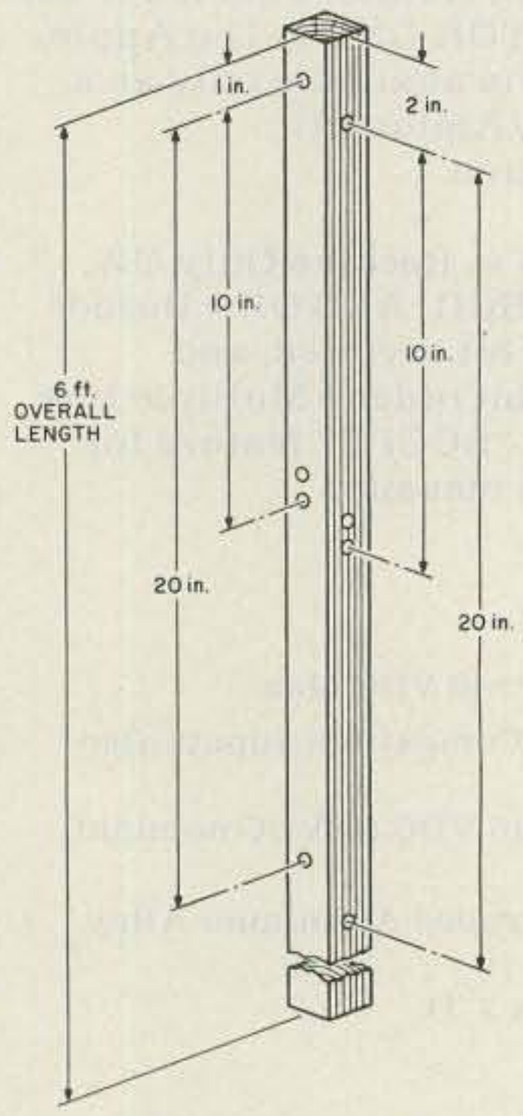


Fig. 1. Center-support drilling guide.

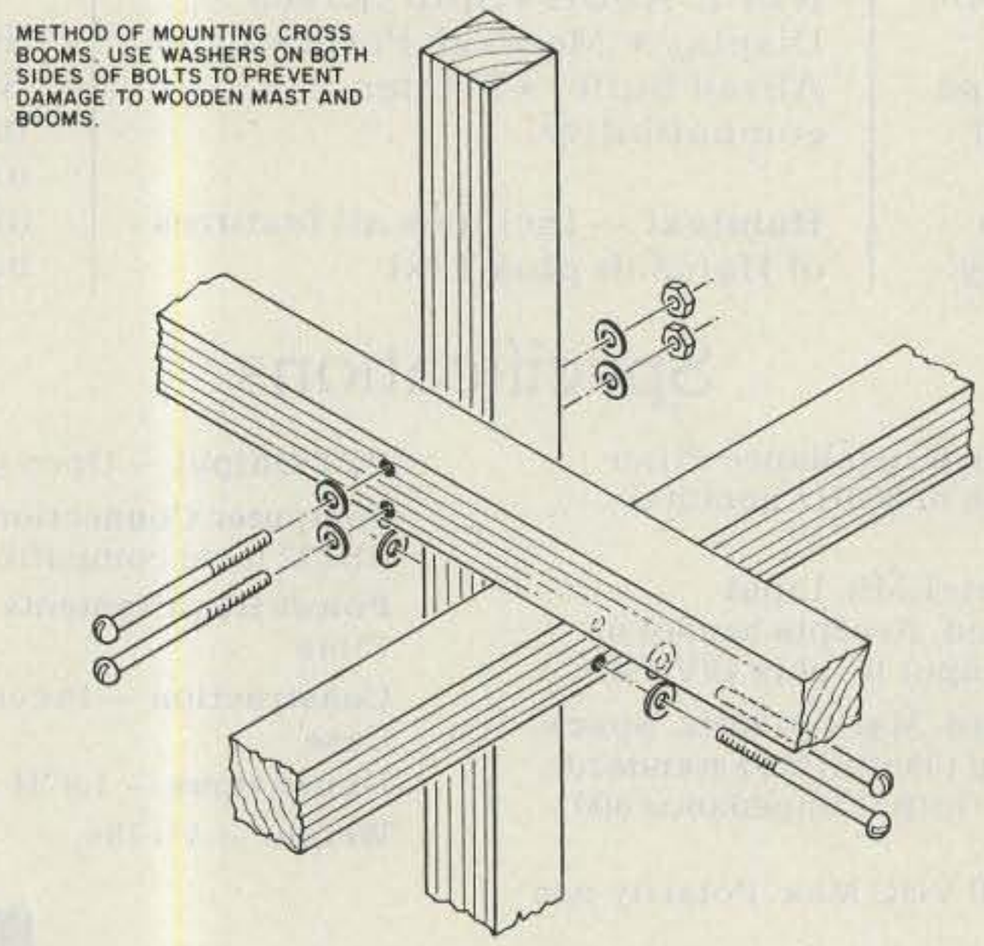


Fig. 2. Cross-boom mounting method.

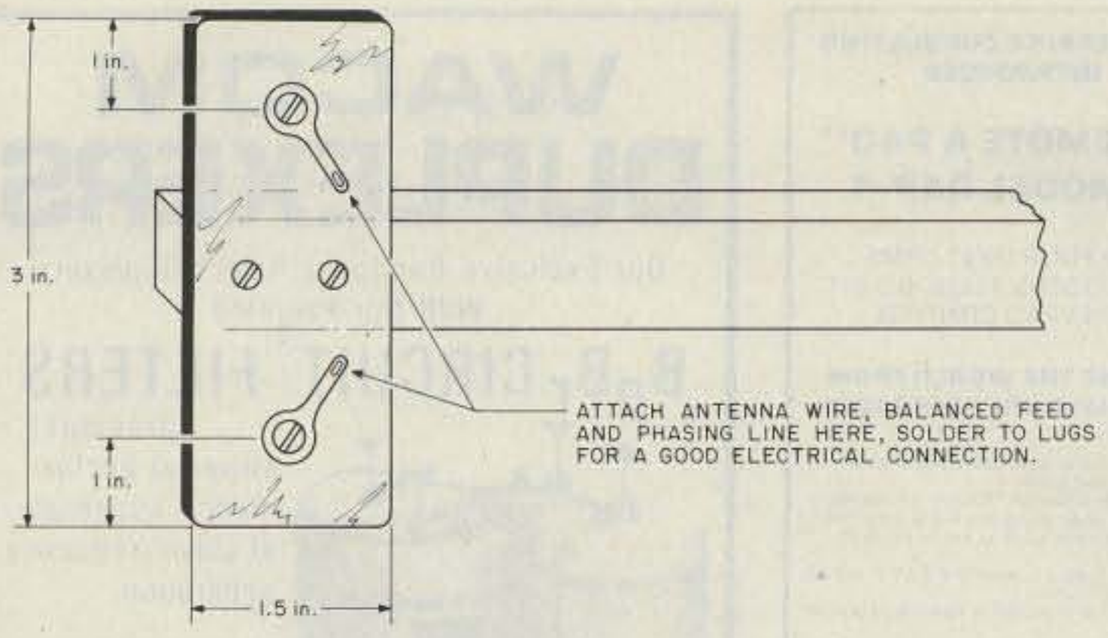


Fig. 3. A Plexiglas™ insulator.

boom about ten times at each hole. A dab of epoxy glue covers the wire and fishing line.

Attach the phasing line between the two feedpoints. I use twinlead sixteen inches long. The main feedline is also 300-Ohm twinlead and is connected to either element. The feedline is then taped to the wooden center support. See Fig. 4. Electrical tape is used to secure the phasing line also. Standoff insulators are used on the metal parts of the mast.

Conclusion

Use a good grade of twinlead and plenty of standoffs to preserve the balance of the line. Weatherproof the wood used (several coats of paint or spar varnish will do). Let me point out that it isn't necessary to use wood. One model of this antenna used PVC for the center support and cross booms. I use ten Watts of power and have encountered no problems. With higher power you may need to use the transmitting type of twinlead or open-wire line.

While the antenna won't outperform even a small yagi, it doesn't require a rotor to aim the antenna; it has been a great improvement over the various ground planes and vertical dipoles I've used in the past.

I haven't tried stacking the vertical eggbeater, but it should give some gain and a lower angle of radiation. You've got to admit the price is right, so build one or even stack two or more, and enjoy. ■

The vertical eggbeater for two meters.

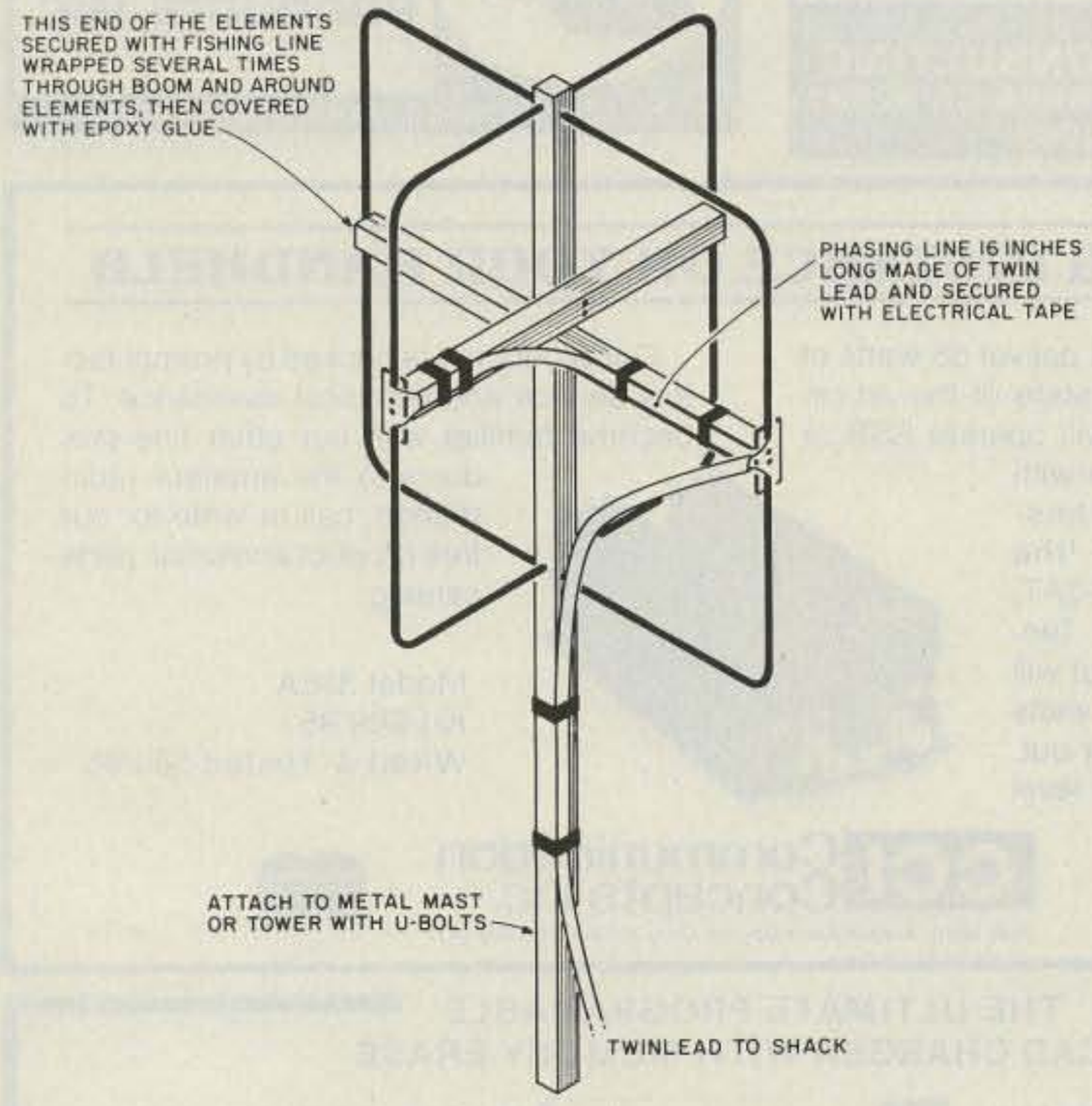


Fig. 4. The finished product.

Parts List

2 #12 copper wire—81 inches long
1 1" × 1" wood—six feet long
2 1" × 1" wood—20 inches long
2 Plexiglas™ for insulators—1.5" × 3"—use the thickest type you can find.
Screws, nuts, and washers to mount the insulators and booms
Solder lugs and standoff insulators (if balanced line is used)
U-bolts to mount center support to mast

See List of Advertisers on page 98

Give your ham friends the World!

(. . .there is an easier way,)

A subscription to 73 is a special holiday gift, a gift that lets readers communicate with the world.

You can give a gift subscription to introduce a friend to **73**. Or you can renew the subscription of a friend who already reads **73**. **73** makes a special gift for foreign hams. It lets them know what's going on in amateur radio around the globe.

For hams everywhere, **73** has the most complete amateur radio information there is:

• **Construction projects**—They're money-saving, practical, and easy to build, and we have more of them than any other ham magazine. • **New products and reviews**—**73** introduces new products and evaluates them. To keep hams up-to-date with the latest technology. • **73 International**—Amateur radio is worldwide! **73**'s international correspondents keep hams everywhere informed of amateur radio happenings around the world. • **Ham Help**—Fellow hams are the best source of help. Every month, **73** publishes readers' requests for technical advice, computer programs, help in locating equipment and parts, and more.

And **73** always has the latest on DXing, contests, satellites, and computers in the hamshack.

You can give a gift subscription to **73** for just **$19.97.** That's **20%** off the basic subscription price. (Foreign rates are slightly higher.) Call toll free for credit card orders—**1-800-258-5473.** In New Hampshire dial **1-924-9471.**

Give **73** and spread the excitement and enthusiasm of amateur radio all over the world.

Yes! I want to give the world with 73.

Send a 12 issue subscription to 73 for $19.97. ☐ Payment Enclosed ☐ MC ☐ VISA ☐ AE

Please make check payable to 73

Card #_____ Exp. Date_____

Signature_____

My Name_____

Address_____

City_____ State_____ Zip_____

Please enter a 1 year gift subscription for:

Name_____

Address_____

City_____ State_____ Zip_____

Canada & Mexico $22.97, 1 year only, US funds drawn on US bank. Foreign surface $19.97, 1 year only, US funds drawn on US bank. Foreign airmail please inquire. All gift subscriptions will begin with the January 1985 issue. 64AR6

73: Amateur Radio's Technical Journal • PO Box 931 • Farmingdale, NY 11737

FREE MFJ SOFTWARE

Free MFJ RTTY/ASCII/CW software for VIC-20 or C-64 with purchase of MFJ-1224, MFJ-1225 or MFJ-1228 from MFJ. Send/receive Baudot, ASCII, CW. Type ahead buffer. 24 hour clock. Supports VIC printer. Menu Driven. MFJ-1224/1225 cable. On tape. Available separately for $29.95.

RTTY/ASCII/AMTOR/CW INTERFACE CARTRIDGE FOR VIC-20/C-64

MFJ-1228 $69.95

FREE MFJ RTTY/ASCII/CW Software
INCLUDES MFJ-1228, SOFTWARE ON TAPE. ADD VIC-20 OR C-64 AND RIG TO ENJOY COMPUTERIZED RTTY/ASCII/CW. ORDER MFJ-1228/MFJ-1264 FOR VIC-20, MFJ-1228/MFJ-1265 FOR C-64.

Most versatile RTTY/ ASCII/AMTOR/CW interface cartridge available for VIC-20 and Commodore 64. Gives you more features, more performance, more value for your money than any other interface cartridge available.

Same interface cartridge works for both VIC-20 and Commodore 64. Plugs into user's port.

Choose from wide variety of RTTY/ASCII/CW, even AMTOR software. Not married to one on-board software package. Use MFJ, Kantronics, AEA plus other software cartridge, tape or disk.

850 Hz and 170 Hz shifts on receive **and** transmit.

Has mark and space outputs for scope tuning.

Normal/Reverse switch eliminates retuning.

True dual channel mark and space active filters and automatic threshold correction gives good copy when one tone is obliterated by QRM or selective fading.

Easy, positive tuning with twin LED indicators.

Narrow 800 Hz active CW filter. Automatic PTT.

Exar 2206 sine generator for AFSK output.

Shielded XCVR AFSK/PTT interface cable provided. Plus or minus CW keyed output. FSK out.

Powered by computer (few ma.), no power adapter to buy or extra wire to dangle or pick up/radiate RFI.

Glass epoxy PCB. Aluminum enclosure. 4½x4½x1".

UNIVERSAL SWL RECEIVE ONLY COMPUTER INTERFACE FOR RTTY/ASCII/AMTOR/CW

MFJ-1225 $69.95

FREE MFJ RTTY/ASCII/CW Software
TAPE AND CABLE FOR VIC-20 OR C-64. ORDER MFJ-1225/MFJ-1264 FOR VIC-20 OR MFJ-1225/MFJ-1265 FOR C-64.

Use your personal computer and communications receiver to receive commercial, military and amateur RTTY/ASCII/AMTOR/CW traffic.

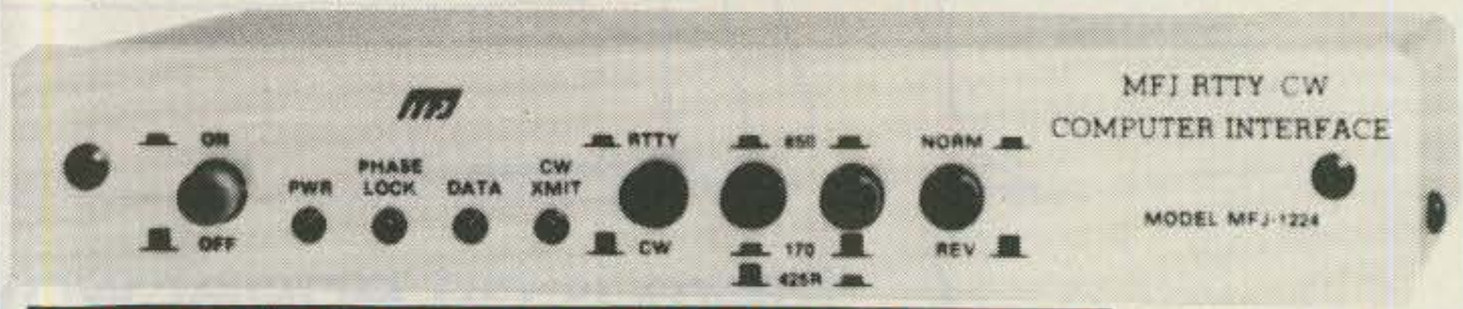
Plugs between receiver and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most other personal computers. Requires appropriate software.

Use MFJ, Kantronics, AEA and other RTTY/ASCII/AMTOR/CW software.

Copies all shifts and all speeds. Twin LED indicators makes tuning easy, positive. Normal/Reverse switch eliminates tuning for inverted RTTY. Speaker out jack. Includes cable to interface MFJ-1224 to VIC-20 or Commodore 64. 4½x1¼x4¼ inches. 12-15 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

UNIVERSAL RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE

Lets you send and receive computerized RTTY/ASCII/AMTOR/CW. Copies all shifts and all speeds. Copies on both mark and space. Sharp 8 pole active filter for 170 Hz shift and CW. Plugs between your rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 or other personal computers. Uses MFJ, Kantronics, AEA software and other RTTY/CW software.



FREE MFJ RTTY/ASCII/CW Software
COMPLETE PACKAGE INCLUDES MFJ-1224, SOFTWARE ON TAPE, CABLES. YOU NEED ONLY VIC-20 OR C-64 AND RIG TO ENJOY COMPUTERIZED RTTY/ASCII/CW. ORDER MFJ-1224/MFJ-1264 FOR VIC-20. MFJ-1224/MFJ-1265 FOR C-64.

MFJ-1224 $99.95

New MFJ-1224 RTTY/ASCII/AMTOR/CW Computer Interface lets you use your personal computer as a computerized full featured RTTY/ASCII/AMTOR/CW station for sending and receiving. Plugs between rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most others.

Use MFJ software for VIC-20, Commodore 64 and Kantronics for Apple, TRS-80C, Atari, TI-99 and most other software for RTTY/ASCII/AMTOR/CW.

Easy, positive tuning with twin LED indicators.

Copy any shift (170,425,850 Hz and all other shifts) and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII).

Copies on both mark and space, not mark only or space only, to improve copy under adverse conditions.

Sharp 8 pole 170 Hz shift/CW active filter gives good copy under crowded, fading and weak signal conditions. Automatic noise limiter suppress static crashes for better copy.

Normal/Reverse switch eliminates retuning. +250 VDC loop output drives RTTY machine. Speaker jack.

Automatic tracking copies drifting signal.

Exar 2206 sine generator gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone line: AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying output. Plus and minus CW keying. CW transmit LED. External CW key jack.

Kantronics compatible socket.

Exclusive general purpose socket allows interfacing to nearly any personal computer with most appropriate software. Available TTL lines: RTTY demod out, CW demod out. CW-ID Input, +5 VDC, ground. All signal lines are buffered and can be inverted using an internal DIP switch.

Use Galfo software with Apple, RAK with VIC-20, Kantronics with TRS-80C, TI-99, N4EU with TRS-80 III, IV. Some computers with some software may require some external components.

Metal cabinet. Brushed alum. front. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

MFJ-1223, $29.95, RS-232 adapter for MFJ-1224.

SUPER RTTY FILTER

MFJ-725 $39.95

Super RTTY filter greatly improves copy under crowded, fading and weak signal conditions. Improves **any** RTTY receiving system. 8 pole bandpass active filter for 170 Hz shift (2125/2295 Hz mark/space). 200 or 400 Hz bandwidths. Automatic noise limiter. Audio in, speaker out jacks. On/off/bypass switch. "ON" LED. 12 VDC or 110 VAC with optional AC adapter, MFJ-1312, $9.95. 3x4x1 inch aluminum cabinet.

CW INTERFACE CARTRIDGE FOR VIC-20/C-64

$39.95 MFJ-1226

High performance CW interface cartridge. Gives excellent performance under weak, crowded, noisy conditions. Works for both VIC-20 and Commodore 64. Plugs into user's port.

4 pole 100 Hz bandwidth active filter. 800 Hz center frequency. 3 pole active lowpass post detection filter. Exclusive automatic tracking comparator.

Plus and minus CW keying. Audio in, speaker out jacks. Powered by computer.

Includes Basic listing of CW transmit/receive program. Available on cassette tape, MFJ-1252(VIC-20) or MFJ-1253(C-64), **$4.95** and on software cartridge, MFJ-1254(VIC-20) or MFJ-1255(C-64), $19.95.

You can also use Kantronics, AEA other software.

Also copy RTTY with single tone detection.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT DELIGHTED, RETURN WITHIN 30 DAYS FOR PROMPT REFUND (LESS SHIPPING).
- One year **unconditional** guarantee • Made in USA.
- Add $4.00 each shipping/handling • **Call or write for free catalog, over 100 products.**

MFJ

MFJ ENTERPRISES, INC. ⌐9
Box 494, Mississippi State, MS 39762

TO ORDER OR FOR YOUR NEAREST DEALER, CALL TOLL-FREE
800-647-1800. Call 601-323-5869
In Miss. and outside continental USA
Telex 53-4590 MFJ STKV

VISA MasterCard

MFJ ACCESSORIES

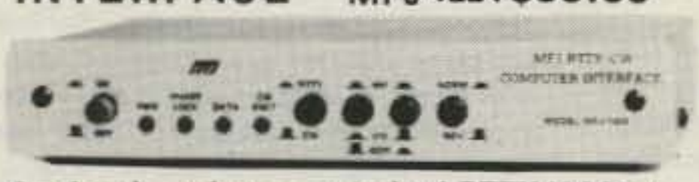
300 WATT ANTENNA TUNER HAS SWR/WATTMETER, ANTENNA SWITCH, BALUN. MATCHES VIRTUALLY EVERYTHING FROM 1.8 TO 30 MHz.

$99.95 MFJ-941D

NEW FEATURES

MFJ's fastest selling tuner packs in plenty of new features!
- **New Styling!** Brushed aluminum front. All metal cabinet.
- **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.
- **New Antenna Switch!** Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.
- **New airwound inductor!** Larger more efficient 12 position air-wound inductor gives lower losses and more watts out. Run up to 300 watts RF power output. Matches everything from 1.8 to 30 MHz: dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines. Built-in 4:1 balun for balanced lines. 1000V capacitor spacing. Black. 11x3x7 inches. Works with all solid state or tube rigs. Easy to use, anywhere.

RTTY/ASCII/CW COMPUTER INTERFACE MFJ-1224 $99.95



Send and receive computerized RTTY/ASCII/CW with nearly any personal computer (VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, etc.). Use Kantronics or most other RTTY/CW software. Copies both mark and space, any shift (including 170, 425, 850 Hz) and any speed (5-100 WPM RTTY/CW, 300 baud ASCII). Sharp 8 pole active filter for CW and 170 Hz shift. Sends 170, 850 Hz shift. Normal/Reverse switch eliminates retuning. Automatic noise limiter. Kantronics compatible socket plus exclusive general purpose socket. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

RX NOISE BRIDGE

Maximize your antenna performance! **$59.95** MFJ-202B

Tells whether to shorten or lengthen antenna for minimum SWR. Measure resonant frequency, radiation resistance and reactance.

New Features: individually calibrated resistance scale, expanded capacitance range (±150 pf). Built-in range extender for measurements beyond scale readings. 1-100 MHz. Comprehensive manual. Use 9 V battery. 2x4x4 in.

INDOOR TUNED ACTIVE ANTENNA

"World Grabber" rivals or exceeds reception of outside long wires! Unique **tuned** Active Antenna minimizes intermod, improves selectivity, reduces noise outside tuned band, even functions as preselector with external antennas. Covers 0.3-30 MHz. Telescoping antenna. Tune, Band, Gain, On-off bypass controls. 6x2x6 in. Uses 9V battery, 9-18 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

$79.95 MFJ-1020

POLICE/FIRE/WEATHER 2 M HANDHELD CONVERTER

$39.95 MFJ-313

Turn your synthesized scanning 2 meter handheld into a hot Police/Fire/Weather band scanner! 144-148 MHz handhelds receive Police/Fire on 154-158 MHz with direct frequency readout. Hear NOAA maritime coastal plus more on 160-164 MHz. Converter mounts between handheld and rubber ducky. Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls. Crystal controlled. Bypass/Off switch allows transmitting (up to 5 watts). Use AAA battery. 2¼x1½x1½ in. BNC connectors.

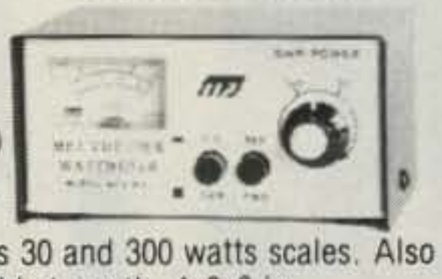
MFJ/BENCHER KEYER COMBO

MFJ-422 **$104.95**

The best of all CW worlds- a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! MFJ Keyer - small in size, big in features. Curtis 8044-B IC, adjustable weight and tone, front panel volume and speed controls (8-50 WPM). Built-in dot-dash memories. Speaker, sidetone, and push button selection of semi-automatic/tune or automatic modes. Solid state keying. Bencher paddle is fully adjustable; heavy steel base with non-skid feet. Uses 9 V battery or 110 VAC with optional adapter, MFJ-1305, $9.95.

VHF SWR/WATTMETER

MFJ-812 **$29.95**



Low cost VHF SWR/Wattmeter! Read SWR (14 to 170 MHz) and forward/reflected power at 2 meters. Has 30 and 300 watts scales. Also read relative field strength. 4x2x3 in.

1 KW DUMMY LOAD

MFJ-250 **$34.95**

Tune up fast, extend life of finals, reduce QRM! Rated 1KW CW or 2KW PEP for 10 minutes. Half rating for 20 minutes, continuous at 200 W CW, 400 W PEP. VSWR under 1.2 to 30 MHz, 1.5 to 300 MHz. Oil contains no PCB. 50 ohm non-inductive resistor. Safety vent. Carrying handle. 7½x6¾ in.

24/12 HOUR CLOCK/ ID TIMER

MFJ-103 **$34.95**

Switch to 24 hour GMT or 12 hour format! Battery backup maintains time during power outage. ID timer alerts every 9 minutes after reset. Switchable seconds readout. Elapsed timer. Just start clock from zero and note time of event up to 24 hours. Bright blue .6" digits. Alarm with snooze function. Synchronizable with WWV. Lock function prevents mis-setting. Power out, alarm on indicators. Black. 5x2x3 in. 110 VAC, 60 Hz.

DUAL TUNABLE SSB/CW FILTER

MFJ-752B **$89.95**

Dual filters give unmatched performance! The primary filter lets you peak, notch, low pass or high pass with extra steep skirts. Auxiliary filter gives 70 db notch, 40 Hz peak. Both filters tune from 300 to 3000 Hz with variable bandwidth from 40 Hz to nearly flat. Constant output as bandwidth is varied; linear frequency control. Switchable noise limiter for impulse noise. Simulated stereo sound for CW lets ears and mind reject QRM. Inputs for 2 rigs. Plugs into phone jack. Two watts for speaker. Off bypasses filter. 9-18 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT DELIGHTED, RETURN WITHIN 30 DAYS FOR PROMPT REFUND (LESS SHIPPING).
- One year **unconditional** guarantee • Made in USA.
- Add $4.00 each shipping/handling • **Call or write for free catalog, over 100 products.**

MFJ

MFJ ENTERPRISES, INC. ↙9
Box 494, Mississippi State, MS 39762

TO ORDER OR FOR YOUR NEAREST DEALER, CALL TOLL-FREE
800-647-1800. Call 601-323-5869 in Miss. and outside continental USA
Telex 53-4590 MFJ STKV

VISA MasterCard

↙ See List of Advertisers on page 98

73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KK2Y.*

AUSTRALIA

J. E. Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

Most amateurs accept "pirates" as a fact of life on the amateur bands, and some pirates have eventually become well-known amateurs after they have realized what they are missing by running unlicensed operations.

But when a well-organized pirate operation starts to put pressure on the powers that be for a slice of the twenty-meter band just above the amateur allocation, you start to wonder what's going on, and why.

I am speaking, of course, about that ever-growing band of yachtsmen and -women who are using amateur transceivers instead of (or with) their commercial gear. It has become so bad in the Pacific that they even have their own frequencies set up on twenty meters for rag-chewing, with some of them using false callsigns for contacts within the amateur bands.

It has come to the stage that the WIA and NZART have issued a joint statement, with the backing of both the Australian and New Zealand Government Communications Departments, condemning this practice.

There have been many times, of course, that amateur radio has come to the aid of yachtsmen in distress, and this may be one of the reasons why some are buying amateur gear as backup equipment for their boats. But if, as found just recently in Australia, they are buying amateur gear *instead* of the type of approved commercial gear that they should have on board, because it is cheaper, it is not only cents wise and dollar foolish but downright dangerous, as amateur gear is not designed for this type of operation—such as being caught in a howling gale and doing a couple of 360-degree loops with salt water flying everywhere. Commercial-type, approved yacht radios are built to stand this, but amateur gear is not; that is why the commercial marine radios cost more.

However, as with any occupation or endeavor, there is always the shady character out to make a fast dollar regardless of the risk to other people or the cost to the community.

One such unscrupulous dealer in New South Wales (VK2) found a good market in selling general-coverage transceivers designed for amateur use (but also converted to cover yachting frequencies) to some members of the yachting fraternity at a lot cheaper price, due to an import tax of only 2% on this type of general-coverage gear. This practice was soon noticed by a local manufacturer of radios designed for commercial application, and he complained to the Government, to protect his own business.

The reason amateur gear drew an import tariff of only 2% was that there was no manufacturer of amateur gear of this type in Australia, so it did not compete with local firms. In this case it did, and the result was that our government immediately put a 30% import duty on all amateur transceivers being imported into this country.

One sure way to get anybody to sit up and take notice is to hit him where it hurts, and with most people, including amateurs, that is in the hip pocket. Taking all the extras into account, the final price to the amateurs would have risen around 45% on all imported transceivers.

On July 6, 1983, the WIA, plus representatives of the major importers and distributors of amateur gear, a customs agent, and an editor of a local commercial amateur-radio publication held a meeting to seek facts and advice on how to handle this tariff rise. The WIA, after many submissions plus work on their members' behalf, came up with a solution agreeable to the government. The whole issue hinged on a tariff bylaw that contained the words "without substantial modification."

The submission to the government by the WIA was that they would set up a panel of paid members who have a radio engineer's background to type-approve amateur transceivers entering this country and issue compliance certificates, to enable retention of the 2% import tariff for amateur gear.

As you can imagine, this was no easy decision by the WIA, on behalf of its members, with a lot of on- and off-air discussions both for and against the WIA being involved in this type of endeavor. However, the WIA will remain impartial at all times regarding any decision made by this panel, and will not only accept but back its recommendations.

An excellent article by Bruce R. Bathols VK3UV, the Federal President of the WIA, in the February, 1984, *Amateur Radio* (the official publication of the WIA) gives the definition of what is required to cover the bylaw that states "without substantial modification," and explains how the WIA arrived at the criteria needed.

Excerpts:

1. We recognize that any piece of radio equipment can be made to operate on any frequency providing the person attempting the modification has the correct tools and equipment, and the knowledge of performing same. As a yardstick in this regard, we accept that an amateur of at least ten years' standing would have the necessary experience to analyze circuits and equipment, and perform an actual conversion.

2. Therefore, a "Difficulty Factor" can be determined in conversions. An experienced amateur, as noted above, would be expected to relate his efforts directly to the costs of the components required, time, and effort. A monetary figure would have to be placed on the time element, therefore commercial costs of repair rates and time would of necessity be applicable in this case.

3. As far as the WIA is concerned, our only requirement is to determine in the "Amateur Sense," what a substantial modification is. We are NOT concerned with commercial conversions or sales outside the Amateur Service. (We cannot stop them anyway.) A highly-experienced professional engineer would, no doubt, be able to convert any piece of equipment to be used on other bands in a very short time. As we are only responsible to the Amateur Service, only normal amateur-type methods will be used by our technical committee in determining a conversion difficulty factor.

4. The objective, therefore, is to establish whether or not a conversion by an experienced radio amateur is able to be performed at a relatively cheaper cost than the payment of the actual tariff duty on the FOB cost of the equipment under consideration. A ratio between these costs can then be determined.

5. The ratio (a "Difficulty Factor ratio") will enable the WIA to decide whether or not a certain transceiver comes within the scope of the bylaw provisions. In this respect, only transceivers and transmitters designed for use by the Amateur Service and being imported by a recognized retailer or dealer of amateur equipment will be eligible for a WIA evaluation. Bona fide travellers bringing equipment into Australia purchased from overseas for their own personal use, will also be able to be included in the above.

It can be seen by the above just how much work, plus money, is involved by a national body representing its members in fighting repressive laws, whether they be added taxes, antenna-tower legislation, or loss of amateur frequencies. This is why it is imperative that those amateurs who sit on the sidelines as nonmembers of a united national amateur body representing ALL amateurs get their priorities right, or they could be paying an extra $800 for a FTI-type transceiver—as we nearly were. A small annual subscription is small price to pay to present a united front against anything detrimental to amateur radio.

How would it be if we all sat back and did nothing? I doubt if we would, with today's commercial pressure, have an amateur-radio service.

Adilson Ribeiro PY1AKM (left), Paulo Malavota PY1OZ (LABRE RJ Director), and Paulo Roberto Domingos PY1ZT.

BRAZIL

Carlos Vianne Carneiro PY1CC
Rua Afonso Pena 49, Apt. 701
20270 Rio de Janeiro, RJ
Brazil

RADIO AMATEURS OPERATING THE HALF MARATHON

For first time in Brazil (and we never heard about this anywhere else before) two radio amateurs joined the "Race of the Bridge" and put it on the amateur-radio air.

The Race of the Bridge is a yearly competition, a cross-country "half marathon," organized by the CORJA (Rio de Janeiro Runners Association) and sponsored by the Bradesco-Atlantica organization, a bank and insurance company helping amateur sports.

This 22,400-meter-long race (a "half marathon" as it's called here) crosses the longest concrete-built bridge in the world, The President Costa e Silva Bridge, 14 kilometers long, joining Niteroi City to Rio

de Janeiro City. It is 75 meters high at its highest point over wonderful Guanabara Bay, a dream scenery never to be forgotten.

Starting from the "Boat Station" in Niteroi and finishing at the Modern Art Museum, right in the heart of Rio de Janeiro City, this year's Race of The Bridge involved 2200 participants. There were 5 age categories: 15 to 19 years, 20 to 29, 30 to 39, 40 to 49, and 50 years on.

Two enthusiastic runners, Adilson Ribeiro PY1AKM and Paulo Roberto Domingos PY1ZT, brought the idea to our radio amateur league, LABRE RJ (Rio de Janeiro branch), and it had the immediate approval from Paulo Malavota PY1OZ, Sectional Director, so plans and action made it come true; equipment, land support, and instructions were settled on to do the best.

Running together, side by side, using a portable IC-2AT perfectly tested, with completely charged batteries, operating by turns, Adilson and Paulo Roberto carried out this so-successful operation, the first in Brazil!

Land-based station PY1AA (LABRE RJ official station) was responsible for all QSO appointments and QSL managing, runners Adilson and Paulo answering only to VHF contacts during the whole race.

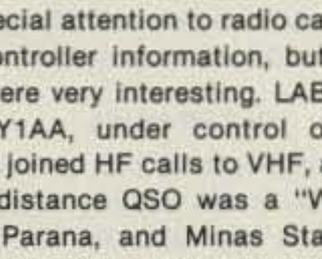
Promotion for the Race of The Bridge among radio amateurs, trying to have more of them at next year's race, and promotion for radio amateurism among the thousands of people accompanying the event, and through press and magazine publications, was the goal for this unusual initiative.

Of course runners could not worry about technical results, due to equipment care, lack of concentration at the race, and special attention to radio calls and to base-controller information, but final results were very interesting. LABRE's station PY1AA, under control of Maciel PY1ZH, joined HF calls to VHF, and many a long-distance QSO was a "WOW!" S. Paulo, Parana, and Minas States were contacted, and even an "Air Mobile" from a Boeing flying over Mato Grosso. The idea is very promising for years to come at the Races of The Bridge!

The race's scheduled time coincided with the "Patrulha Verde Amarelo" Net (Green and Yellow Patrol), a sweeping 40-meter net covering all Brazilian states, so some very interesting QSOs were realized, now and then, as PY1ZH joined 40 meters to VHF! As runners were using the PY1AA call, special interest was raised due to the possibility of QSO points for the PY1AA On-The-Air Award, sponsored by our LABRE RJ.

Well, we've read about races being described and accompanied by radio amateurs from the outside, but coming from the inside, from runners of the race themselves, it's really a first time! Special awards were presented to Paulo Roberto and Adilson—and they sure deserved it!

Adilson and Paulo Roberto near the finish line in Paris Square, Rio de Janeiro.



CYPRUS

Aris Kaponides 5B4JE
PO Box 1723
Limassol
Cyprus

NEWS FROM CYPRUS

Summertime in Cyprus usually means, for local radio amateurs, fewer voices on the air. Most amateurs over here enjoy the sea or the mountains during their summer holidays and the HF rigs are set aside. However, the VHF rigs are used quite a lot from the holiday or portable locations. Most of the 2m contacts are between local hams, but some DX is also done with 4X- or OD-lands. During the first week of June, a lot of excitement was created by sporadic-E openings on 2m where a few 5B4 DXers made contact with HA-, YO-, and YU-lands. A few of the lucky ones who managed to work on sporadic-E were 5B4MC, 5B4LP, 5B4OK, 5B4MD, 5B4IT, 5B4IE, and 5B4JE.

Many interesting contacts can be made from central and western Cyprus with SVS- and SV9-lands and some of the Greek islands in the Aegean Sea. Fellows talking simplex on 2m with SVS and SV9 were 5B4JR, 5B4JX, 5B4JZ, and 5B4MG in Paphos (western Cyprus), and from the Nicosia area (central Cyprus) were 5B4OA, 5B4IE, 5B4MC, 5B4MD, 5B4LP, 5B4IT, and others.

A very interesting experiment was done successfully in Paphos by 5B4JX, who constructed a VOX system whereby he can connect the R3 repeater in Heraklion in Crete with R5 in Cyprus, or the R4 repeater in the Paphos area with R5, which is on the highest mountain peak in Cyprus. In this way, amateurs in Crete, Rhodes, Santorini, and other Greek islands in the Aegean can be linked with Cyprus. Also contacts were made with amateurs in Athens (via this system) who could open the R3 repeater in Crete. It is hoped that the system will operate on a permanent basis during the summertime. Many thanks to Sotos 5B4JX for this service on behalf of all amateurs in SV- and 5B4-land.

Recently an enthusiastic group of young men passed their radio-amateur examinations. Amongst those were some harmonics of well-known amateurs, such as the daughter of 5B4JX, YL Florentia, the son of 5B4EI, Iacovos, and my own son, George, age 16, who has the callsign 5B4OV. We are sure that all the newcomers will do well and we welcome them to the hobby.

In Cyprus there are five active club stations in Nicosia, Larnaca, Limassol, and Paphos. These are operated for 2 to 3 hours per week. From what I know, not many people are operating from there, but the club committees are trying their best to attract more young people to the club stations. An effort is made by CARS that this be a stage of practice and experience before the written radio-amateur examination. Our club stations are still very poorly equipped, and any help coming locally or from abroad will be appreciated. Please send all donations to Cyprus Amateur Radio Society, PO Box 1267, Limassol, Cyprus.

CZECHOSLOVAKIA

Rudolf Karaba (OK3KFO ARC)
Komenskeho 1477
955 01 Topolcany
Czechoslovakia

SATELLITE RS6 (RADIO SOVIET 6)

Michal OK2BXF from Brno was interested in satellites already as OL6BDK. He established the first contact via the satellite RS6 on February 12, 1984, with the transistor output of 5 Watts (the transistor exciter 200 mW and a power amplifier with QQE 03/12) and with ground plane and HB9CV antennas. The receiver antenna is a dipole and it is on the receiver input KFW16A. With such a transmitter, QRP—5 Watts ERP, he established even 5 contacts during the one orbit.

According to OK3AU, there are further new stations on the RS satellite carriers. These are the stations OK3LW and OK3WAO from the region of East Slovakia.

WINNERS FROM 1983 OK DX CONTEST

Top five stations worldwide and points earned:

Single/Multiband	
LZ2PP	209664
UA1DZ	176630
UQ2GDQ	167258
OK2FD	120175
OK3ZWA	118545
Single—1.8 MHz	
DL1YD	6084
LZ2BE	3700
UA3PFN	2079
UP2BLF	2016
Y39XO	1986
Single—3.5 MHz	
HA8BY	8664
HA6NL	8525
Y51XE	7098
UA3QBP	6655
UB5INO	6000
Single—7 MHz	
LZ2SC	20010
LZ1GC	18336
LZ1SS	14950
LZ2RS	13608
OK2BFN	11544
Single—14 MHz	
UA9YAN	28105
HA0MM	23920
UH8EAA	22152
I2VXJ	20490
UA3TDK	19136
Single—21 MHz	
UA0SAU	14478
UA3AMB	11136
UA9MAF	10935
UW3UO	10500
OK2BEW	10430
Single—28 MHz	
RA9AKM	2940
UG6GAF	2310
HA4XX	2268
RA9UAD	2072
RA9SUV	1872
Multi-Op/Multiband	
LZ2KZA	185760
LZ1KOZ	178087
UK2BBK	162486
OK1KRG	157080
HA5KDQ	145636

GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Windes WA8 9RP
Cheshire
England

I was pleased to note that the recent D-Day Anniversary celebrations included a tribute to the role of the amateur in providing operating skills and development expertise in the field of radio during World War II. As you no doubt saw in the television coverage of the event, the beaches were visited by The Queen and Prince Philip.

The latter is the patron of the RSGB and was the recipient of a message of greeting originated by a D-Day special-event station, GB4DD, at the London Air Traffic Control Center, RAF, West Drayton, and sent to a French special station, FV6PAX. The received message, asking the Prince to convey greetings from all radio amateurs to the assembled Heads of State, was handed by FV6PAX to the Mayor for onward transmission to the Royal party.

Sometime later, GB4DD received a message, again via FV6PAX, from The Queen expressing thanks for the original message and wishing all the best to all radio amateurs in the nations involved. Needless to say, everyone concerned with GB4DD was delighted at the receipt of the message.

PRACTICAL WIRELESS

I will now digress somewhat from the general type of news and information that makes up the bulk of this column. This is because I have just come into possession

of three books recently published in the UK of which two are directly related to amateur radio and the third of which will be useful in most shacks. All three books are reprints of a number of articles originally published in *Practical Wireless*, the monthly UK publication dealing with all aspects of radio (and not necessarily of direct interest to active hams). The three books are titled *Wires and Waves*, *Introducing RTTY*, and *Are the Voltages Correct*?

Wires and Waves is subtitled "a guide to antennas, accessories, and propagation" and contains no less than 42 articles in 160 pages. The topics covered range from theory through antenna construction to swr bridge and other accessory construction. This is mostly a practical book, with the theory section limited to only five subjects, of which one is yagi design principles, anyway. The practical coverage of the book is aimed at the transmitting and receiving amateur alike and concentrates on the constructional aspects of low-cost antennas for HF and VHF bands. Most of the designs use readily-available and cheap materials.

Most of the antennas for construction seem to be based on much practical experience and not just theory. For example, a 2-meter beam is described for construction from a broom handle, car brake pipe, and aluminum tubing. In similar vein is the construction of a pseudo beam antenna suitable for installation on the balcony of a high-rise apartment block and based on two mobile whip antennas and an ingenious phasing arrangement.

Accessories described, in addition to the swr bridge already mentioned, include an ATU, an audible field strength meter, and a couple of preamps together with some notes on interference, suppression, and filtering. I found the low-pass SW-listener filter particularly useful and easy to reproduce.

Each constructional article includes a full list of components together with a cost estimate (in pounds sterling, but you would, no doubt, find it indicative) and a construction rating. This latter guide is Beginner, Intermediate, or Experienced. It's always nice to have an indication of cost and complexity before embarking on a project.

Wires and Waves is similar to but complementary to *The ARRL Antenna Anthology*.

I must confess an interest before describing *Introducing RTTY* because it is based largely on a series of articles of the same name which I wrote a year or two back and which were serialized in *Practical Wireless*. In addition to my articles introducing RTTY are some software and a number of equipment reviews.

My original aim was to explain the background of RTTY and follow that with a collection of modules that the reader could assemble in any suitable configuration he wished to form the basis of his RTTY station. RTTY is a form of data transmission based on Mr. Baudot's 5-unit code transmitted at 45.45 baud (60 wpm). The initial article illustrates the development of RTTY signals (from terrestrial TTY) and shows how FSK and AFSK signals are produced with modern transceivers.

Rather than describe a complete terminal unit (TU), the remaining sections describe a variety of circuit building blocks which may be put together as desired. These include, for example, interfaces between TTL and ±12 volts and single-and double-current 80 volts, filters, tone generators (including a crystal-controlled version), and various demodulators.

Using these building blocks, the reader can put together a basic TU for reception only or reception and transmission depending on his requirements. Having whetted his appetite, a more sophisticated TU will no doubt follow (personally I now use Dovetron, which is first class but expensive).

The third of the *Practical Wireless* books is subtitled "a guide to fault-finding with your multimeter" and provides 44 pages of detailed theory and practice regarding circuit-voltage measurements. Basic principles are explained from simple voltage dividers through the effects of meter resistance to the influence of inductance and capacitance in ac circuits.

The real benefit of the book, though, comes with the sections on applying a multimeter to fault-finding in real circuits. As, for example, a number of popular radio circuits are discussed with the voltages one can expect in both working and failed equipment.

The three books are obtainable directly from the publishers: IPC Magazines Ltd., Westover House, West Quay Road, Poole, Dorset BH15 1JG, England. Prices (including airmail postage) are: *Wires and Waves*—$6.22; *Introducing RTTY*—$2.13; and *Are the Voltages Correct*?—$3.05.

Airmail subscriptions to *Practical Wireless* magazine are $40.00 per annum (12 issues). All conversions are at $1.40 to each pound sterling.

Once again I must say that although I love to hear from readers, please *do not* write to me about these books. I have no easy means of shipping them, so please contact the publishers directly.

ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev Mobile Post Office 85530
Israel

PROPAGATION

As these lines are being written, the long hot summer is upon us. VHF conditions vary from good to excellent with the typical eastern Mediterranean tropospheric ducting facilitating daily two-meter contacts between Israel and Cyprus and sometimes the Greek islands. On HF, ten meters is all but dead, but twenty meters is the star with the band wide open to North America during the late night plus long-path propagation to Australia/New Zealand in the early morning. Fifteen meters often comes alive at night with openings to North and South America, although generally to certain areas alone and not wide-open conditions.

MOUNT CARMEL RTTY REPEATER

The newest addition to the chain of repeaters in Israel, W4FQM/4X RPT, was activated in the spring. Located on Mt. Carmel overlooking the Mediterranean Sea from a height of 350 meters, this repeater is a unique phenomenon in our region presenting the amateurs with almost endless possibilities for use. It was built, shipped over, set up, and donated to the Israel Amateur Radio Club by Ed Webb W4FQM. It is a near duplicate of a machine built and operated by Ed in Florida, and the hams here are just beginning to discover its various uses.

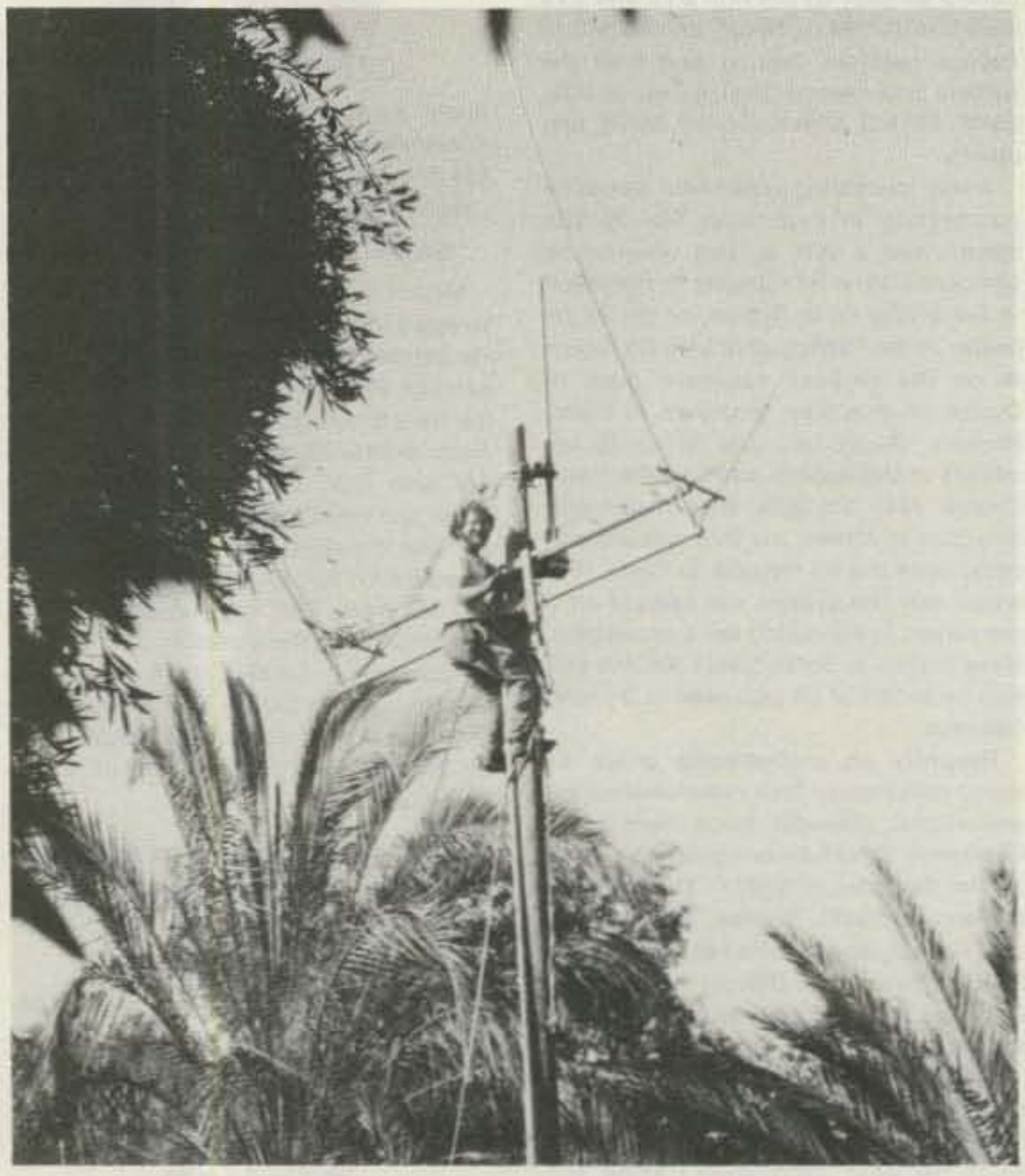
The input frequency is 144.700, the coding frequency for radioteletype in IARU Region One. The output frequency is 145.300, making the repeater compatible with standard two-meter gear using a 600-kHz split. Mark frequency is 2125 Hz and space is 2295 Hz. To activate the repeater, you must frequency-modulate your signal with the mark frequency for two seconds, and the repeater will open, leaving a tail of 15 seconds at the end of each transmission. Should the repeater fail, you reactivate it with the mark frequency.

In the RTTY mode, the machine does not operate as a typical FM repeater. Rather, it digitally encodes the signal received and reconstitutes it with a vastly-improved signal-to-noise ratio. Thus, a RTTY signal under the noise and not clear to the human ear is turned into a clean, readable signal making possible solid long-range contacts where all else might fail.

Technically speaking, the heart of the repeater is a 20-Watt Hamtronics unit with a 70-Watt amplifier, with a Wacom duplexer consisting of four cavities ahead of the antenna. At the time of writing, the repeater also functions on standard FM, although a transmission of the mark frequency will shift it over to the RTTY exclusive mode, so that the machine may be used on voice on a secondary basis. From my QTH, 200 km south of Mt. Carmel, I have succeeded under ducting conditions to make contact through the machine using an indoor hand-held rig with its rubber-duckie antenna. This testifies for the superb sensitivity of this repeater!

Lately, Israel 4X4UF has begun transmitting a nightly bulletin at 10:00 pm local time, on RTTY, of course. The bulletin is a summary of the weekly *HaGal on the Air*, IARC news magazine, edited by 4Z4RM and 4X4UF. It consists of local and international amateur news, buyers' and sellers' announcements, technical news, etc. The bulletin is updated every Wednesday, and Israel will transmit it at other times upon request.

Reportedly, Ed W4FQM is building a mailbox for the storage and retrieval of messages on the repeater. With the proliferation of home computers and amateurs using them to get on radioteletype, interest is running high. We are all grateful to Ed for his gift, and without doubt it has already made a great contribution to the technical advancement of Israeli amateurs. Amateurs in the Mediterranean basin are invited to try to work through the repeater, and it will be interesting to see what kind of DX will be possible.



Ron Gang 4Z4MK.

OSCAR NEWS

Ya'ir 4X4GI reports that at this time there are five Israeli stations making contact through the OSCAR 10 satellite: 4X4FQ, 4X4GI, 4X4IX, 4X4MH, and 4Z4AG. Ya'ir has contacted stations in Hawaii, New Hebrides, and other "rare" islands in the Pacific through the bird, accomplishments normally quite difficult from here on the HF bands.

Steve 4X6MF, who by the time you are reading this should be active on the satellite along with the other new Israeli stations, is beginning to organize a local chapter of AMSAT. Reports are that there are more satellites in the offing, and with the decreasing sunspots and poorer HF conditions, interest is mounting in the country in satellite communications.

INTERFERENCE ON TWO METERS

It is a well-known fact that the two-meter transceivers manufactured for amateurs sell for a fraction of the price of sets produced for the commercial two-way radio market. For this reason, many clandestine organizations around the world use amateur gear for their nefarious purposes, and certain dealers are more than happy at this opportunity to turn a profit, no questions asked.

For many years, until the PLO terrorists were expelled from Southern Lebanon in June, 1982, two meters in Northern Israel especially was plagued by interference from these quasi-military groups. Especially hard hit was the Haifa repeater, with its input frequency of 145.000 MHz apparently being a calling frequency for these outfits. As a result, a tone access was added to the repeater to prevent its being triggered by non-amateur signals. This feature was deleted after the 1982 war silenced the source of this QRM.

Two-meter non-amateur activity is

WHAT THE COMPETITION CALLS "NO LOST WORDS OR SYLLABLES" WE CALL NOISE

THE COMPETITION: "HI HONEY I(NOISE BURST)M FIXING YOUR (NOISE BURST)VORITE SUPPE(NOISE BURST) BARBECUE HAMB(NOISE BURST)GERS. THEY WI(NOISE BURST) BE READY AT 6:(NOISE BURST) WILL YOU MA(NOISE BURST) IT IN TIME?(NOISE BURST)"

Samples (heard as bursts of noise) displace your phone party's audio for as long as it takes your transceiver to T/R. The above example assumes a transceiver T/R time of about 150 mS (typical)

PRIVATE PATCH II: " HI HONEY I AM FIXING YOUR FAVORITE SUPPER...BARBECUE HAMBURGERS. THEY WILL BE READY AT 6:30. WILL YOU MAKE IT IN TIME?"

Thousands of PRIVATE PATCH II owners are enjoying the commercial communications quality that only a VOX based, simplex autopatch can deliver.

PRIVATE PATCH II IS PRICED AT LESS THAN HALF OF OUR COMPETITORS "FAVORITE COMMERCIAL SIMPLEX VOX PATCH"

SAMPLING VS. PRIVATE PATCH II

The performance of a sampling patch is totally dependent on the T/R speed of your radio. Such is not the case with PRIVATE PATCH II. PRIVATE PATCH II will give excellent results with any radio. Synthesized and relay switched types included.

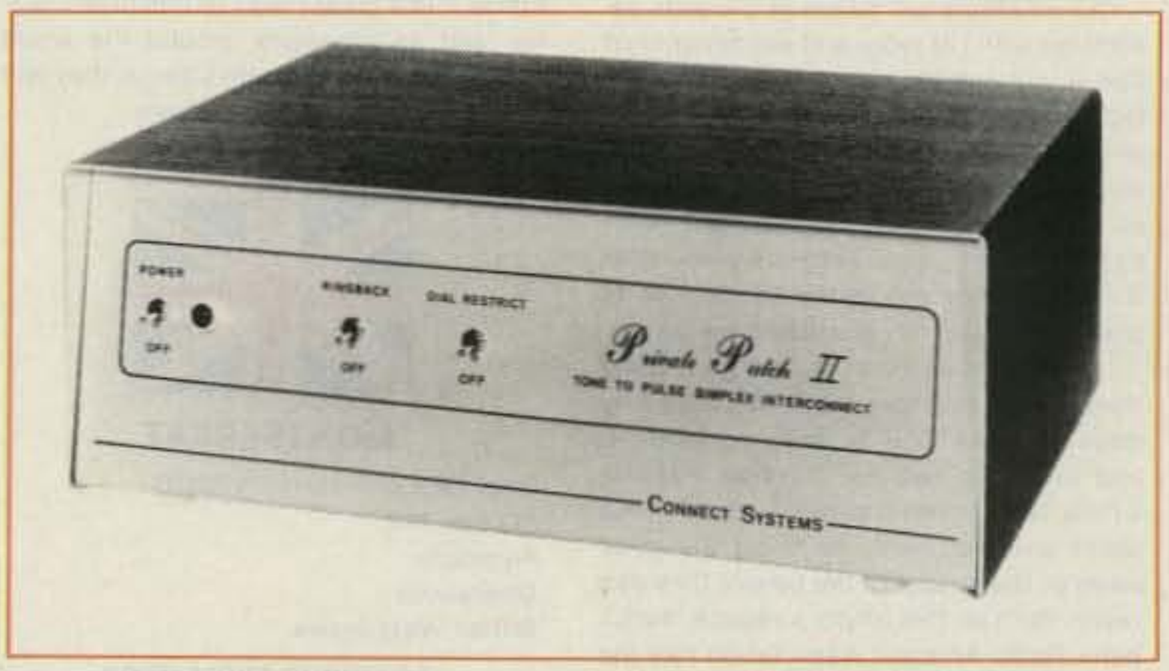
PRIVATE PATCH II requires only three connections to your radio (MIC, PTT and SPKR audio). If these connections are made inside your radio PRIVATE PATCH II does not interfere with the normal use of your radio. Otherwise for a quick and easy interface you may plug PRIVATE PATCH II Into the MIC and SPKR jacks. A 10 minute job! Unlike sampling patches, connections are not required to the squelch, discriminator or power. And best of all, modifications are never required.

Controlling and talking through PRIVATE PATCH II is almost always quicker and easier than using a sampling patch. This is because you may talk or send control commands the instant you press the PTT button. The ability to break in or take control is assured by interrupt control logic. The interrupt controller creates a window (similar to sampling) but is seldom heard in normal quick back and forth communication. With a sampling patch you press the MIC button for one to five seconds before talking on each and every transmission. This is very frustrating for the mobile, and causes confusion for each party.

The sampling process reduces the effective range of your base radio. This is because if a sample, and a signal fade coincide, the sampling patch thinks the mobile is not transmitting. This causes a sampling patch to become erratic at ranges still very useable by PRIVATE PATCH II. PRIVATE PATCH II will not diminish the range of your system.

PRIVATE PATCH II has two more range extending tricks not available to a noise sampled autopatch.

1. You may use a linear amplifier with no loss of performance
2. You can operate through any repeater from your base station.



FEATURES

• CW ID (free ID chip) • Selectable tone or pulse dialing • User programmable toll restrict • Five digit access code • Ringback (reverse patch) • Busy channel ringback inhibit (will not transmit on top of someone) • Three/six minute "time-out" timer is resettable from the mobile • 115 VAC power supply • Modular phone jack and seven foot cord...and many more.

ALSO

- 14 day return privilege — when ordered factory direct.
- One year warranty — compare to their six months.

CONTACT A LOCAL DEALER TODAY

AMATEUR ELECTRONIC SUPPLY
Milwaukee WI, Wickliffe OH, Orlando Fl, Clearwater FL, Las Vegas NV

COLES COMMUNICATIONS
San Antonio TX

ERICKSON COMMUNICATIONS
Chicago IL

HAM RADIO OUTLET
Anaheim CA, Burlingame CA, Oakland CA, San Diego CA, Van Nuys CA, Phoenix AZ,

HENRY RADIO
Los Angeles CA, Anaheim CA, Butler MO

JUNS ELECTRONICS
Culver City CA, Reno NV

MIAMI RADIO CENTER CORP.
Miami FL

MIKES ELECTRONICS
Ft. Lauderdale

N&G DISTRIBUTING CORP.
Miami FL

PACE ENGINEERING
Tucson AZ

THE HAM SHACK
Evansville IN

CANADA:
DOLLARD ELECTRONICS
Vancouver, BC

CSI CONNECT SYSTEMS INCORPORATED

23731 MADISON ST., TORRANCE, CA 90505
PHONE: (213) 373-6803

VISA MasterCard

again on the rise in Lebanon by the various organizations operating there. Now with the summer upon us and long-range tropospheric propagation present, these stations are being heard all across the two-meter band. This time, strangely enough, the main victims are the repeaters in Cyprus, especially on R2 and R5. At some times of the day, say our Cypriot counterparts, these repeaters become virtually unusable because of the clandestine operations on their input frequencies.

This time, no immediate solution is in sight. This curiosity is simply one of the by-products of political instablity in our area, and we'll have to learn to live with it.

LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
Monrovia
Republic of Liberia

CB NO PROBLEM IN LIBERIA

Our amateurs are aware of the evils associated with CB radio and are determined that it will not get out of hand here. It is legal, but at the present time a CB license is very difficult to obtain. There are those who want to get on the air without doing all the work of learning the code or of passing theory tests. They are working at it here as they are in the US and other places. To date they are losing the battle.

In the commercial broadcast band there is a lot of empty space. We have only three stations. One is really commercial and the other two are mission stations which are commercially licensed but which exist primarily to bring the good news of the gospel to the people they can reach. With all this empty airspace, the Liberia Radio Amateur Association has the bright idea of obtaining a spot on which to broadcast code much as is done by W1AW. It is not practical to do that on the amateur bands because so many of the people for whom this service is intended do not have and will not easily get an amateur radio. The Association has been working on this idea for more than a year. Things move slowly in Liberia.

In Holland, there is a great problem of unlicensed broadcasting to and for the general public on the regular commercial bands. The problem is completely out of control, much as is CB in the States. Some of our outlying mission stations are looking at that situation with interest. In one case it has gone beyond the looking stage and there is a five- or ten-Watt stereo station in operation. Everyone is happy. The station operates three or four hours a day with music and news reports and is the only thing that is available to that community. This little station, though not formally licensed, operates with the knowledge and consent of the Ministry of Telecommunications.

Another mission station is considering the possibility of a like operation. This is very interesting, and from where we sit it seems that there is nothing to lose and everything to gain. Certainly the people in those outlying communities appreciate what is being done. It is a credit to the Ministry that they do make an exception in this instance, and so long as these little outpost stations operate with proper authorization, there is little likelihood that things will get out of control.

That is a little aside. The immediate problem is that everyone wants to take a shortcut into the world of amateur radio. "No-code licensing," CB space in the amateur bands, just anything to get in without doing the work. Over and over again we find that the results are counter-productive. Japan has no-code licensing. For an evaluation of the result read *73*, August, 1983, page 73. The amateurs must be alert and they must make every effort to preserve the great hobby that is theirs. In the States they have won another round, and that is all that it is—another round. See *73*, March, 1984, page 104. When the amateurs give in or simply lose the fight, amateur radio as we know it will just fade away.

In Liberia, the Radio Amateur Association works very closely with the Ministry of Post and Telecommunications, which is the department of government under whose jurisdiction amateur radio operates. The Ministry scans the amateur bands and checks for violators. The amateurs themselves do the same in a somewhat less organized but nonetheless effective way.

Amateurs in Liberia do follow the rules and they take pride in maintaining a high standard of courtesy and technical efficiency. The same can be said of most of the amateurs of the world, but not all. I, as an outsider living in Liberia, am impressed. I think it is a great credit to this little country, and as amateurs around the world make their contacts with Liberia, they will meet with courtesy and respect.

MONTSERRAT

Errol "Bobbie" Martin VP2MO
PO Box 113
Plymouth
Montserrat
British West Indies

SCANNING FROM MARS

Well it's the official Annual Hurricane Season once more in the Caribbean area. This comes into effect on June 1st each year, and with 22 hurricane names listed for this season, it's small wonder that amateur-radio operators throughout the region are keeping a watchful eye on weather conditions as a measure of disaster preparedness.

The island of Montserrat, a British colony located in the eastern Caribbean about 268 miles southeast of Puerto Rico and only 39-1/2 miles square, has just held a three-day Disaster Preparedness and Emergency Management Workshop. This was jointly sponsored by the Pan-Caribbean Disaster Preparedness and Prevention Project Committee (PCDPPP) and the government of Montserrat, which was designed to correlate plans and actions to be taken by the various groups and organizations that are usually involved in the education and protection of the general public in times of national emergencies and disasters.

This workshop was held at the Government Training Center located in Plymouth, the capital, beginning on Wednesday, June 20, and ending on Friday, June 22. Lecturers were Mr. Jerome Lloyd—Consultant, PCDPPP, Dr. Deryck W. Heinemann—Project Manager, PCDPPP, Lt. Col. Glenn A. Mignon—Disaster Preparedness Advisor (UNDRO), PCDPPP Course Director, and Miss Eizabeth Twinch—British Red Cross Advisor, PCDPPP.

The workshop was attended by senior officials of the Executive Committee (Disaster), officials of government, statutory boards and companies, and voluntary organizations, also district and deputy chairmen. Some of the topics discussed at the workshop were:

- Preparing the community for disasters
- Role of the security forces in a disaster
- Role of the Red Cross during these times
- Role of communications, with a presentation given by the president of the Montserrat Amateur Radio Society, and role of the media
- Role and functions of the disaster management organizations
- Managing mass casualties

Many other aspects of disaster and emergency preparedness were covered, all of which incorporated the use of radio communications for efficiency because of the terrain of the island. Thus the Montserrat Amateur Radio Society plays a vital role as the organization most readily equipped to provide this service.

As previously stated (see *73*, May, 1984), the Montserrat Amateur Radio Society has a team of operators assigned the task of manning various police stations, the airport, the hospital, and the local government public broadcasting station (ZJB), thereby providing a continuous link with the Central Control which is located within the confines of the Plymouth Police Headquarters.

In addition to these stations, which will be operating via the 2-meter repeater (but with capabilities of reliable simplex operation), there are at least two additional stations delegated to operate on the HF bands with the objective of maintaining contact with the outside world in the event that all other means of communications become unavailable.

These stations are readily equipped with standby generators, batteries, dipoles, and verticals should the main antennas be lost in the expected gale-force winds usual with hurricanes. These are the stations of Dr. Konrad Hollatz VP2MF and VP2MO; the latter will be operated by Mae Martin VP2MN. Both these stations were very active during the 1979 Dominica crisis caused by Hurricane David and provided the necessary information to one of our local radio stations (Radio Antilles, a 200,000-Watt system that covers the entire Caribbean Area and beyond) and the Government Broadcast Station which covers the neighboring islands.

At this time, as has been the practice of the past years, all members of the Montserrat Amateur Radio Society's Disaster Team are maintaining a close link with each other just in case...

On the HF band, the designated standby, weather watch, and coordinating frequencies for the Caribbean area are the same as those of the Antilles Emergency and Weather Net. These frequencies are 3.815 MHz in the evenings and mornings and 7.168 MHz during the day.

This net operates twice daily, 365 days a year at 1030Z and 2230Z, normally on 3.815 MHz, and reverts to the 40-meter band only for exercises or in times of disasters. During normal nonemergency times, the net operates as follows.

Two islands are responsible to provide NCOs on a weekly rotational basis, one island doing the morning session and the other the evening session. There is a roll call for island-by-island check-ins, beginning with Venezuela in the far south to Jamaica and beyond in the north.

Weather information is provided from the Netherland Antilles, Trinidad and Tobago, Barbados, the French Antilles, Antigua and Barbuda, and The US Virgin Islands, obtained from their respective net offices, thus providing a concise weather picture throughout the Caribbean area.

The Montserrat Amateur Radio Society recently met for its annual general meeting, during which the following officers were elected for a term of one year. President: Errol "Bobbie" Martin VP2MO, Vice-president: Sydney St. C. Meade VP2MC, Secretary/Treasurer: Mrs. Ursula Sadler VP2MDY, Equipment Officer: Victor James VP2MQ, Activities Manager: Tony Glaser VP2MIX, and Executive Member-at-Large: Dr. Vernon Buffonge VP2MV.

The following persons have been reappointed to these respective positions: Awards Manager: Errol "Bobbie" Martin VP2MO, and QSL Manager: Mr. Gene Ege, Sr. WB2LCH.

Please note that Gene WB2LCH is QSL Manager for these stations on Montserrat *only*: VP2M (Special Events Station), VP2MN (Joanna "Mae" Martin), VP2MO (Errol "Bobbie" Martin), and VP2MLD (Lawton Daley). All other QSL cards should be sent to their respective owners and *not* to WB2LCH.

QSL PROBLEMS

One of the major problems that the Society (*and* VP2MO) is faced with is that of being used as a QSL Bureau, and as such we are being clobbered with cards from all over the globe. The strangest part of it is the fact that cards are coming here for countries as far away as J20 and the rest of the Caribbean area.

Please be informed that no QSL Bureau exists on Montserrat, for we are not equipped to handle this service—neither financially or otherwise. This matter is ofttimes discussed at our club meetings, and the only persons being catered to by the Society are its members and others who have made the proper arrangements with the Society. Please also note that the more active *resident operators* here each have a QSL Manager, and anyone needing a response should utilize the managers' services as much as possible, unless the operator states otherwise. This method would make things much better for all concerned.

Guest operators usually give their respective QSL route, and one has only to listen. Another situation which exists and needs to be rectified is the direct QSLer. These fall into three basic categories: (1) An enclosed SAE with return postage, (2) An enclosed SAE with no enclosed postage (sometimes no enclosed envelope), and (3) a QSL card, stamped, mailed with a request *PSE QSL TNX*.

My response to these types are as follows:

The first person does the proper thing, for even if the enclosed postage is inadequate, he deserves an immediate response with a card via first-class mail.

The second type of person has got to realize that the DX station must have worked many stations, thus if he were to send a card to everyone without the necessary postage, he would not be able to stay on the air for very long, and even were he to be able to respond to 50%, who would deserve to be that lucky half?

Regarding type 3, I think that anyone who would pay (?) to have his cards printed and then just throw them into the mails caring nothing about defacing his callsign and any other info that was so carefully put together doesn't deserve one of mine, for to me a QSL card represents something, so I think that that kind of person has no respect for his card, his call, nor the operator at the other end, for why do they make envelopes anyway? Proud of your call? Proud of your card? Then prove it!

Until we meet again, my fellow hams

new

Spectrum Introduces The Next Step In Repeater Technology. The Highly Advanced SCR2000X Microprocessor Controlled Repeater

High Performance RF Stages

Totally Microprocessor Controlled

THE NEW "INDUSTRY STANDARD"!

The SCR2000X Microprocessor controlled repeater is the newest addition to the Spectrum Hi Tech Repeater Line. It combines the latest state of the art digital techniques with the best of Spectrum's highly refined RF technology to yield "The Ultimate Repeater"! Operating convenience and flexibility are emphasized without sacrificing traditional Spectrum reliability and ruggedness. Go with the world leader in Amateur Repeaters! Call or write today for details. Sold Factory Direct or through Export Reps. only.

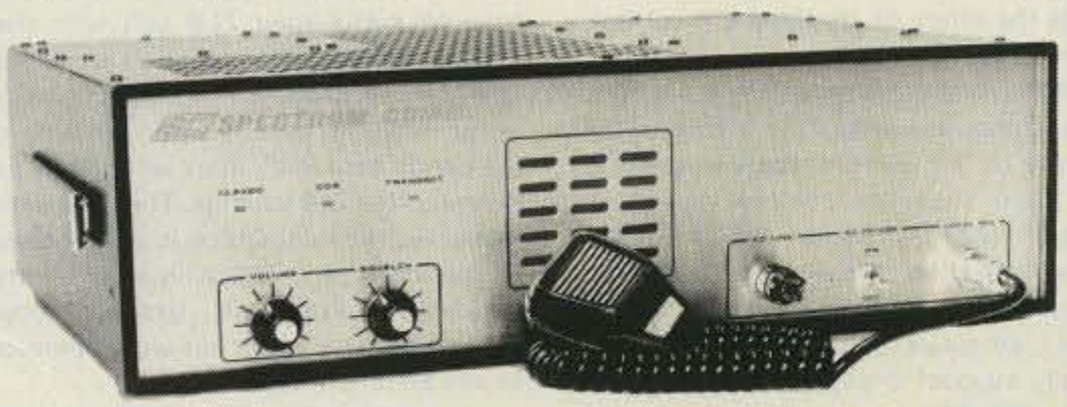
STANDARD FEATURES:

- Autopatch/Reverse Patch, W/0 & 1 Inhibit
- Dial Pulse Converter
- Autodialer
- Phone Line & "Over the Air" Command Modes. Virtually all functions may be turned On/Off Remotely.
- Touch Tone Control of 'Timeout', 'Hang Time', Patch Timeout, TX Inhibit/Reset, Patch & Reverse Patch, Inhibit/Reset, P.L. On/Off (w/optional P.L. board), etc.
- Up to 6 Auxiliary Functions. More with TTC300.
- Full 16 Digit Decoding with crystal Controlled Decoder IC
- Touch Tone Mute
- Unique Courtesy tone
- "Kerchunk Killer"
- Timeout Warning
- Automatic CW ID & ID Command
- Remote Programming of 3 Timers for 2 different timing cycles, or No Time Out
- Microprocessor Memory 'Battery Backup'
- Autopatch AGC for constant levels
- Local Status Indication via 12 Function panel LED Display
- Front Panel Touchtone Pad for Local Control
- NEW—Improved: Rcvr., UHF Xmtr., Power Supply!
- Full Panel Metering: Rcvr. & Xmtr. functions plus Voltages & Currents
- 30-75 Watt VHF & UHF Models
- 100-150 Watt Final Amps Available
- SC200X Controller & Interface Boards also available

SCR77D Desktop/Portable Repeater

APPLICATIONS

- Ideal for low power local use
- Portable/Mobile at the scene of an Emergency
- Increase coverage at parades or other Public Service events
- "Mountaintopping" with battery pack
- Full Duplex Computer/Data Links
- Export Rural Telephone
- Compact, Rugged
- Self Contained
- 10W UHF. Built-in Duplexer
- Optional Autopatch & P.L.
- AC or 12 VDC Input



SC 68

SPECTRUM COMMUNICATIONS

105 rmantown Pk, S10 • Norristown, PA 19401 • (215) 631-1710 • Telex: 846-211

out there, it's always very pleasant to meet operators (VP2MO) saying catch me on RTTY daily from about 1700Z on or near 14.084 MHz, and if you're lucky you might even run into Joe VP2MJL or Tony VP2MIX, and very soon, too, "Doc" VP2MF.

73 and gud DX as I'll be scanning from MARS.

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

This month I shall give readers a couple of examples of the close liaison between the ZL regulatory body, the New Zealand Post Office, and NZART, our amateur-radio national association.

In 1982, the NZPO decided to conduct a review of the Amateur Service as a whole in view of changes it had observed in other countries and because of submissions from NZART. The last major change to the Amateur Service was in the mid-60s when the Grade III Technician class was introduced. Since that date only minor changes have been introduced with the introduction of the New Zealand Radio Regulations 1970 (an update on the previous radio regulations).

Accordingly, NZART was invited to put forward submissions for a review of the Amateur Service as a whole which could be considered in conjunction with changes the Post Office itself saw as being advantageous. Generally, the proposals submitted had to conform with the conditions laid down by the International Radio Regulations.

In response to the invitation, our association, after several top-level discussions, submitted a 37-page document, and some discussion on the proposals took place between the Post Office and a team of NZART council members.

The Post Office then drew up a paper on the outline of a proposed structure for the Amateur Service in ZL, which included a number of proposals from remits placed before the Post Office by NZART from annual conferences over a period of time. This "paper" was then distributed to all ZL licensed amateur operators, who were given the opportunity to comment on the proposals before the regulations were amended or changed to give effect to any or all of proposed changes. At the same time, the Post Office asked all amateurs for suggestions other than those put forward in the paper, provided such suggestions conformed with the general parameters for the Amateur Service as laid down in the International Radio Regulations.

It is the intent of the Post Office that, within those constraints, the conditions under which the Amateur Service in New Zealand operates reflect the wishes of the majority of the users. It is interesting to note here that the submissions were made by NZART on behalf of its members as the "voice" for the Amateur Service in ZL, but the Post Office saw fit to circularize ALL amateurs and allow them to individually suggest changes, thus providing for the 27% of licensed amateurs who are not association members to be heard on this important subject.

A summary of the proposals follows; readers are reminded that the changes are only suggested at this stage, but as they are the result of joint consultation, it is probable the final draft will be very similar to the following.

Qualifications: 3 levels of qualified operators: Novice, Non-Morse, and General. (The titles are merely descriptive at this stage.)

Entry may be made at any one of the levels, and the Novice grade will be non-terminating. It will be possible to hold both the Novice grade and Non-Morse grade of qualification simultaneously.

The Non-Morse grade is unchanged from the present Grade III, and the General grade will replace the existing Grade II and Grade I certificates.

Examinations: Examinations will be held twice yearly and will consist of a written examination in two parts, a technical paper and a regulations and procedures paper. (Basically the same as at present.) The Morse test will remain an essential part of the Novice and General qualification examinations, the scope of the test being widened to include a knowledge of figures and common punctuation marks. It will be possible to obtain a partial pass, but credits for part passes will remain valid only for two further scheduled examination dates.

Privileges: The General qualification will attract the privileges currently granted to the holders of Grade I certificates, e.g., all bands, all modes. The Non-Morse qualification will have the same privileges as are currently available to Grade III certificate holders, e.g., 27.12 MHz, 51-53 MHz, and all bands above 144 MHz.

The Novice qualification will be non-terminating, i.e., it may be held indefinitely without a need to upgrade, and will carry the following special conditions and frequencies: Power restricted to 10 Watts dc input to the final rf stage, and operations restricted to CW and AM (including SSB) in the bands 3525-3575 kHz and 21100-21200 kHz.

Log keeping: Consideration will be given to waive the requirement that amateur operators keep a station log in accordance with regulation 53. However, amateurs will be encouraged to keep a log, recognizing that the document plays an important part in some amateur activities.

These proposals were sent to all amateurs in ZL in April this year, and we had until May 31st to forward our submissions to the Post Office. On that date, several hundred amateurs had taken the opportunity to reply to the Post Office on the paper, and to this date there have not been many objections to the document, in the main. We now await the decision of our regulatory body with interest.

The second example of cooperation and liaison resulted from two remits passed at our recent annual conference in early June this year. In just under one month from the date of the passing of the resolutions, the Post Office implemented both proposals. They concern visiting amateurs and our Grade III certificate holders.

The ZL0 visitors' call holders will not have to suffix their ZL0 call with their home callsign as was required previously; now visiting hams will not have such an awful mouthful to say when working on the bands here in ZL, they will merely use their allotted ZL0 callsign. The other remit requested the Post Office to permit Grade III operators to use CW on their allotted frequencies. Previously, Grade III could not use the CW mode but were permitted to use all other modes.

BITS 'N' PIECES

Silent Keys recorded recently were D. (Dan) McMahon, ex ZL1CM, aged 88 years, a respected, retired Auckland Radio Inspector and long-time amateur and marine operator; and M. H. (Mark) Churton ZL1TB, another old-timer and well-respected amateur operator well-known to many overseas hams.

Old-Timers Club 50-year certificates were recently presented to R. A. (Ray) Anderson ZL3JV and T. E. (Tom) Rowlands ZL3JX, and 60-year certificates went to T. R. (Tom) Clarkson ZL2AZ, ex ZL2AR and ZL1FO, and H. N. (Nev) Shrimpton ZL2AUM, ex ZL4AO and ZL2BJ. Congratulations to these operators for their long and active career in amateur radio.

Over recent columns I have been reporting on ZL offshore islands and their respective amateur activities. This month I shall briefly tell you about another ZL offshore island, but unfortunately the amateur activity would not have been of any use to overseas amateurs as the operator was confined to VHF activities.

Snares Islands, a small group of uninhabited islands 209 km southwest of Bluff (the southernmost port of ZL) at 48°S 166°36'E, were discovered independently on the same day, November 23, 1791, by Vancouver in the *Discovery*, and Broughton in the *Chatham*. The group covers an area of approximately 350 hectares and consists of coarse granite with a covering of peaty soil. The soil is densely vegetated, mainly by tupari (Olearia lyallii), which creates an almost closed canopy to 6 meters high.

The Snares Islands are administered as a nature reserve under the Reserves Act by the Lands and Survey Dept., and entry is by permit only. This is due to the absence of introduced mammals and virtually unchanged vegetation and animal life. Their pristine state gives these islands world recognition as important sanctuaries.

During the three-month period December, 1983, to February, 1984, P. J. Wilson ZL3TJD/A, ZL9TJD operated an amateur station on VHF from Snares Island. He operated on 2 and 6m with an Icom 260A into a 10-element yagi, and an Icom 505 into a 5-element yagi. Both rigs were powered by gel batteries, charged using a Honda generator.

Contacts on 6 during the three-month period included VKs 1, 2, 3, 5, and 7, and ZLs 1, 2, and 3, and ZL7OY; Chathams was heard, but unfortunately not worked; 2m contacts through repeaters at Invercargill and Queenstown were made as were five simplex contacts with ZL4 stations from the high part of the island, Signpost Hill, 82m above sea level.

The trip to Snares Islands was made by a University of Canterbury field party, ZL3TJD being employed as a technician to assist with the penguin census and banding, as well as with some entomological collecting. The visit was made possible through a research grant provided by the Lands and Survey Department. (Information for this item was supplied through the courtesy of *Break-In*, the NZART monthly official journal.)

The 24-GHz record for ZLs was broken on April 7, 1984, when Tony ZL1BHX and Russell ZL1BQK extended the communication distance to 33 km, in the Ninety Mile Beach area in the North Auckland area. They used 25-mW Gunplexers™ into 17-dB gain horns and 30-MHz homebrew (DJ7OO-designed) i-fs. Their report states the first contact was from Ahipara Lookout to Hakatere Forestry Observation Post. Then once they had established contact, Tony ZL1BHX moved up the beach, but after the distance was extended further, the salt-spray haze increased and copy was in and out quite rapidly, so they decided to quit while still ahead of the old record.

A "contest with a difference" is held annually in ZL that always causes a lot of laughs—it is the QLF activity, this year held on Wednesday, August 15, 0800Z to 1000Z. Its main object was to have a packet of fun on 80 meters. The rules are very simple, the execution a little difficult for some. The mode is CW, a straight hand key must be used, and operators use the hand not normally used, e.g., right-handed ops use their left hand and vice versa. If by chance you're ambidextrous, you must operate the key with your foot. Scoring is one point for each contact, with a bonus of one extra point for each contact where either operator is using "foot keying." In the case where both operators use foot keying, they score three points each for the contact. There's no prize, but the contestants submit their own score sheets and a winner is declared for this fun activity.

PERU

Luis E. Suarez OA4KO/YV5
Apartado 66994
Caracas 1061-A
Venezuela

I have resided in Venezuela since 1973 and have written several columns here about that country, but as a Peruvian I miss the flag of my own country in "*73* International" and that's the reason I'm now at my computer, writing about amateur radio in Peru. I hope that somebody down there in OA-land feels motivated to become a correspondent for "*73* International."

I wish you readers to know that I have little material since I left my country 11 years ago, and certainly many things must be quite different. I have tried to get some news but really have not received much. In fact, it is very difficult to receive support from readers and from radio clubs, no matter their whereabouts. People like to see their names printed and club members are delighted to see their clubs' activities published, but when you try to get information for publishing everybody says "I'll call you... !" Actually, nobody calls you back. The same with requesting pictures or any printed material.

Peru, the land of the Incas, is located in South America facing the Pacific Ocean, between Ecuador and Chile. The territory has four natural regions: the Coast, the Sierra (Andes), the Selva (jungle), and the fourth, which is the territorial sea that extends 200 miles from the coast. The Coasta is almost only a strip of sandy land (almost never rains) but it has 23 valleys, one for each river, where most coastal cities are located.

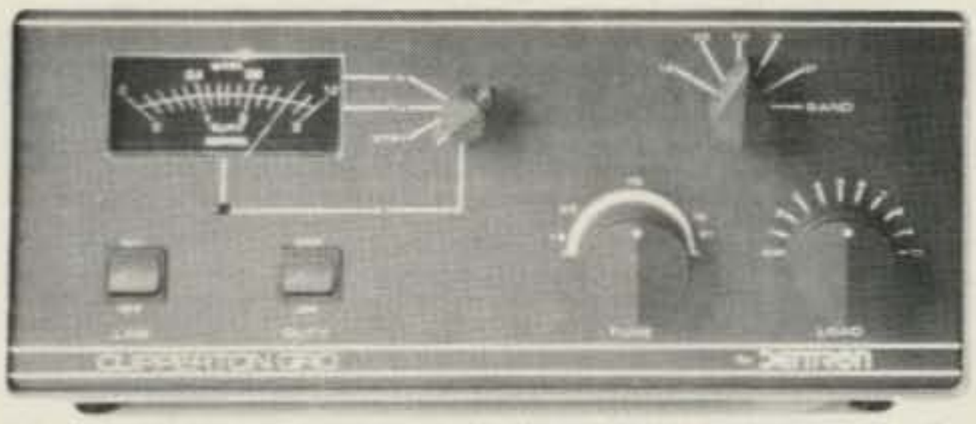
The Sierra is all the central region crossed by the Andes from north to south. In this territory is located the highest railroad and one of the highest cities of the world. Here also is located the highest lake in the world (Titicaca) and also the third highest mountain in the Americas.

Peru, for communications purposes, is divided in 9 zones (call areas) as shown on the map. I remember that the OA0 prefix was for maritime mobiles, but now the *Radio Amateur Callbook* lists several Peruvian warships with the OA4 prefix and the designation, Radio Club Naval BAP (ship name). I don't know the reason for this. There are no inhabited islands in the Peruvian sea, except those with navy installations. Thus I assume that the OA0 prefix should still be devoted to maritime mobiles.

Radio-amateur licenses are of three

Continued on page 104

DENTRON CLIPPERTON QRO



SPECIFICATIONS

2KW/ 4/572B Tubes and built-in supply w/tuned input.

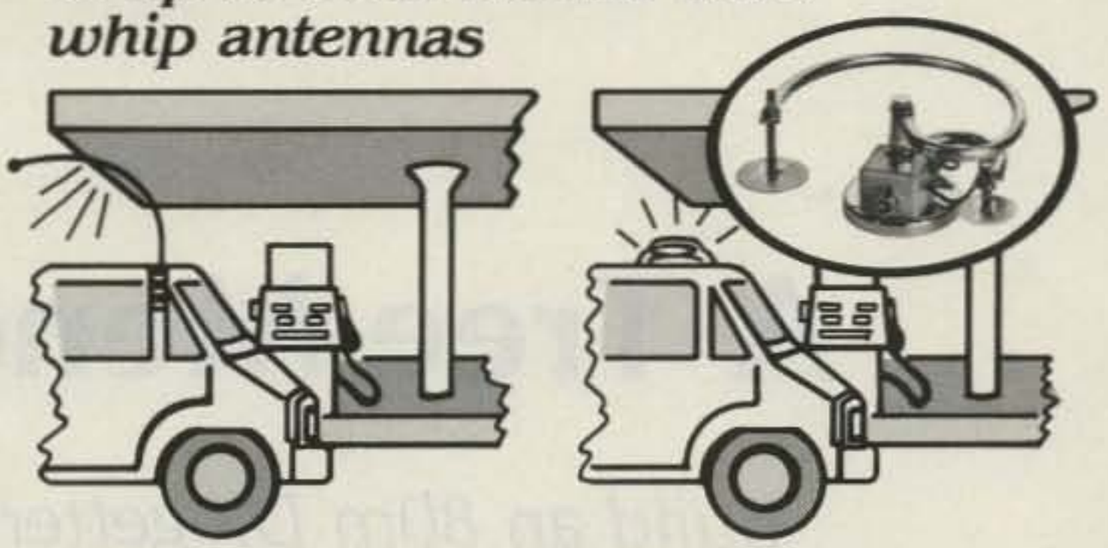
Frequency Coverage:	
160 meter band	1.8 to 2.3 Mhz
80 meter band	3.45 to 4.6 Mhz
40 meter band	6.0 to 9.0 Mhz
20 meter band	11.0 to 16.0 Mhz
15 meter band	20.0 to 23.0 Mhz
Modes of Operation:	SSB, CW, RTTY, SSTV
Power Requirements:	120 or 240 VAC, 50/60 Hz
RF Drive Requirements:	65 watts minimum, 100 watts nominal, 150 watts max. for 1 kilowatt DC input.
DC Plate Voltage	2600 volts in SSB mode, 1700 volts in CW mode
Duty Cycle:	100% in normal amateur service
Input Impedance:	50 Ohms nominal
Input VSWR	1.5 to 1 typical
Output Impedance:	50 Ohms nominal
Antenna Load VSWR:	2.0 to 1 maximum
ALC Output:	Negative polarity, level is rear panel adjustable
Spurious Outputs:	
Intermodulation	30 db or more below peak output
Harmonic output	40 db or more below peak output
Size:	14.7" wide, 6.08" high, 16.6" deep
Weight:	48 pounds net, amplifier 50 pounds gross, tube carton 5 pounds gross

DENTRON ↙287

Div. of Coilco Electronics, Inc.
223 North Michigan Avenue - P. O. Box #848
Edgerton, Ohio 43517
419-298-2346
Out Of State Call Toll FREE 1-800-922-6898

NEW Untenna™

is up to 95% shorter than whip antennas



yet it gives you better radio communication and perfect tuning!

Low profile Untenna eliminates vehicle clearance problems! Says goodbye to inter-mod: exclusive narrow band width tunes out adjacent channel interference. Gives a perfect match anywhere on the band. Eliminates mobile flutter by its rigid construction. Offers a wide choice of models: standard and customized. Untenna is unequalled for mobile, portable, or fixed radios.

Com-Rad Industries
↙301 25 Imson St. ● Buffalo, N.Y. 14210
(716) 823-0331

Distributor Inquiries Invited

here is the next generation Repeater

MARK 4CR

The **only** repeaters and controllers with REAL SPEECH!

No other repeaters or controllers match Mark 4 in capability and features. That's why Mark 4 is the performance leader at amateur and commercial repeater sites around the world. Only Mark 4 gives you Message Master™ real speech • voice readout of received signal strength, deviation, and frequency error • 4-channel receiver voting • clock time announcements and function control • 7-helical filter receiver • extensive phone patch functions. Unlike others, Mark 4 even includes power supply and a handsome cabinet.

Call or write for specifications on the repeater, controller, and receiver winners.

Create messages just by talking. Speak any phrases or words in any languages or dialect and *your own voice* is stored instantly in solid-state memory. Perfect for emergency warnings, club news bulletins, and DX alerts. Create unique ID and tail messages, and the ultimate in a real speech user mailbox — only with a Mark 4.

MICRO CONTROL SPECIALTIES ↙49
Division of Kendecom Inc.
23 Elm Park, Groveland, MA 01834 (617) 372-3442

↙ See List of Advertisers on page 98

John S. Wilcox KS4B
640 Breton Bay Drive
Leonardtown MD 20650

A Tree-Mendous Vertical

Build an 80m DX-getter that really grows on you.

Eighty meters is a fun band. Something for everyone is the byword. From the diverse nets entangling the top end, through the casual groups and rag-chews in the spectrum, to the well-populated CW band, you are challenged not to find an entertaining operation. DX, especially in the winter months, is surprisingly good. With the sunspot cycle approaching its minimum, we'll see it get even better.

For you uninitiated, tune through the 3790–3800-kHz DX window some evening from sunset until a few hours after. For the most part, I guarantee you'll hear stateside stations working DX. What I can't guarantee, with your 30-foot-high loaded dipole or ground-mounted trap vertical working against 3 radials, is whether you'll hear the DX stations.

80 meters is no different in its antenna requirements than the other HF bands. A dipole or inverted-V hung a half-wave above ground is a good performer, as is a quarter-wave vertical working against a good ground system. The only problem is that a half-wave at 3.8 MHz is over 120 feet. The opportunity to construct such antennas eludes most of us because of space restrictions or lack of green stamps to buy and plant large support structures. A forty-foot-high inverted-V might bag WAS on the 3787-kHz GERATOL net during a winter season, but it lacks the zing needed for DX competitiveness.

All is not lost! Described here is a low-angle radiator that anyone with a 40-foot-high tree in the vicinity of the ham shack can construct and use to gain that competitiveness on 80 meters.

Design of this antenna is an adaptation of the folded umbrella described by John Haerle WB5IIR.[1] I suggest you obtain John's article for further information on this superior design. Construction is simple, straightforward, and noncritical. No ground radials, base insulators, loading coils, or high-cost items are required. Approximately 100 feet of small nylon line, some assorted TV hardware, a few ground rods, and four 90-foot lengths of any wire are all that's required. I recommend no. 14 insulated house wire, but I've used no. 17 galvanized-steel electric-fence wire in one installation.

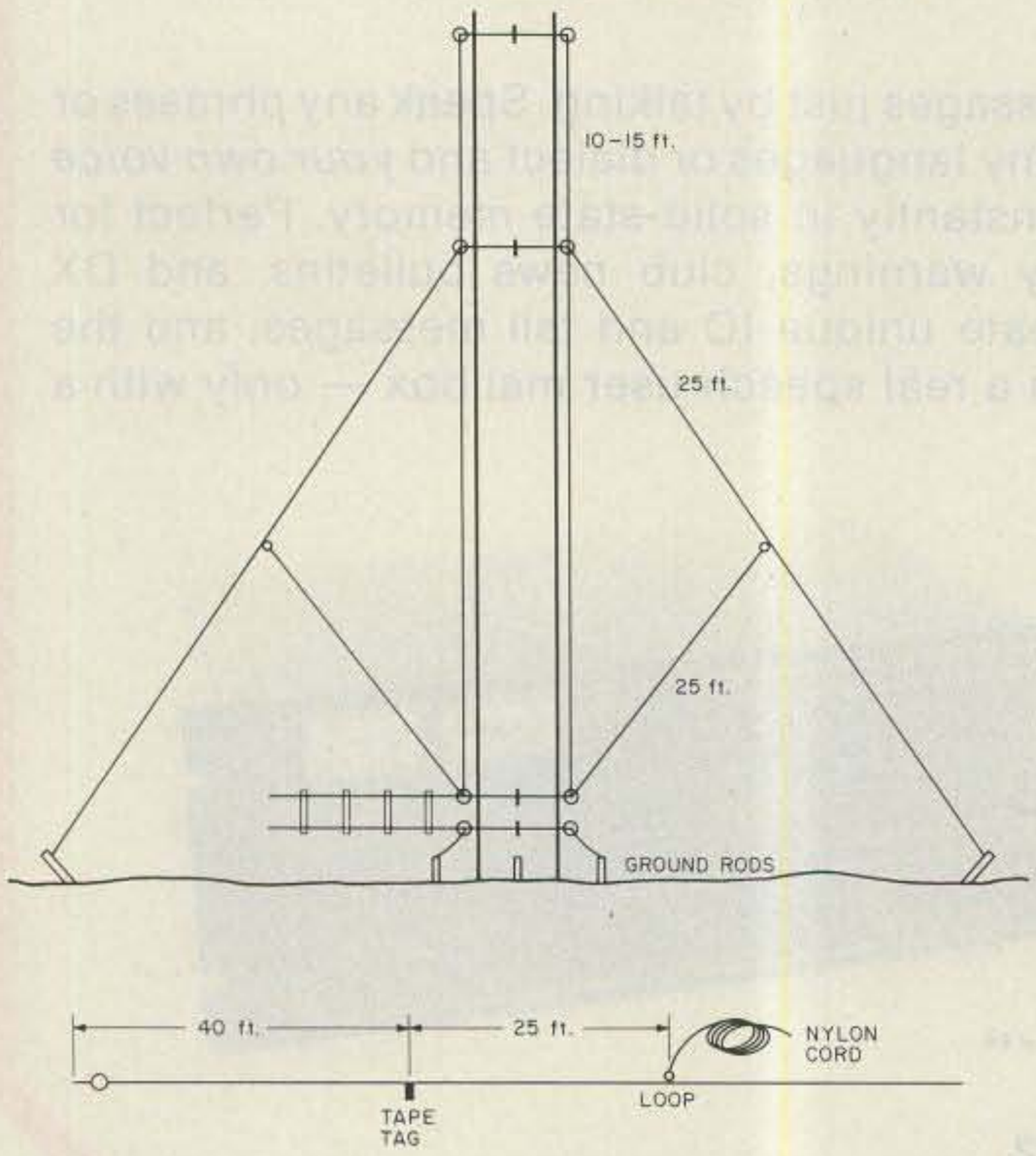


Fig. 1.

Observing Fig. 1, you can see the idea is to cage the tree with wire. I use 4 wires, but I have the feeling more vertical wires along the trunk would be an improvement. Sure, I know. Everyone says trees are great rf absorbers, but I'll say this antenna plays as well as John's folded umbrella in my backyard.

Attach four TV-standoff eyes at equal spacing around the base of the tree about a foot off the ground. Form a loop of wire through the eyes. Hammer in ground stakes by each eye and connect wire to the stake and loop by soldering or using small Servit™ connectors. This completes the ground system! A few radials will help if you have the room but are not necessary.

Place four more eyes into the tree an inch or two above the ground-ring eyes. Form a wire loop through these eyes. Roughly measure 90 feet of wire and attach an end to one of the eyes. Measure 40 feet from the eye and tag the wire with some tape. Measure 25 more feet and twist a loop

ICOM

HF Equipment

	Regular	SALE
IC-740* 9-band 200w PEP xcvr w/mic	$1099.00	899.95

***FREE PS-740 Internal Power Supply & $50 Factory Rebate** - until gone!

PS-740 Internal power supply	159.00	149.95
*EX-241 Marker unit	20.00	
*EX-242 FM unit	39.00	
*EX-243 Electronic keyer unit	50.00	
*FL-45 500 Hz CW filter (1st IF)	59.50	
*FL-54 270 Hz CW filter (1st IF)	47.50	
*FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
*FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
*FL-44A SSB filter (2nd IF)	159.00	144.95
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-12 Mobile mount	19.50	

**Options also for IC-745 listed below*

IC-730 8-band 200w PEP xcvr w/mic	$829.00	599.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band xcvr/.1-30 MHz rcvr	$1349.00	899.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
SM-5 8-pin electret desk microphone	39.00	
MB-5 Mobile mount	19.50	
IC-745 9-band xcvr w/.1-30 Mhz rcvr	$999.00	769.95
PS-35 Internal power supply	160.00	144.95
CFJ-455K5 2.8 kHz wide SSB filter	4.00	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

**See IC-740 list above for other options (*)*

IC-751 9-band xcvr/.1-30 MHz rcvr	$1399.00	1199
PS-35 Internal power supply	160.00	144.95
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-33 AM filter	31.50	
FL-70 2.8 Khz wide SSB filter	46.50	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
CR-64 High stability reference xtal	56.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	

Options: 720/730/740/745/751	Regular	SALE
PS-15 20A external power supply	$149.00	134.95
EX-144 Adaptor for CF-1/PS-15	6.50	

Options - continued	Regular	SALE
CF-1 Cooling fan for PS-15	45.00	
PS-20 20A switching ps w/speaker	229.00	199.95
CC-1 Adapt. cable; HF radio/PS-20	10.00	
CF-1 Cooling fan for PS-20	45.00	
EX-310 Voice synth for 751, R-71A	39.95	
SP-3 External base station speaker	49.50	
Speaker/Phone patch - specify radio	139.00	129.95
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
MT-100 Manual antenna tuner	249.00	224.95
AH-1 5-band mobile antenna w/tuner	289.00	259.95
PS-30 Systems p/s w/cord, 6-pin plug	259.95	233.95
GC-4 World clock	99.95	94.95

HF linear amplifier	Regular	SALE
IC-2KL w/ps 160-15m solid state amp	1795.00	1299

VHF/UHF base multi-modes	Regular	SALE
IC-251A* 2m FM/SSB/CW transceiver	$749.00	549.95

***$50 Factory Rebate** - until gone!

IC-551D 80 Watt 6m transceiver	$699.00	599.95
PS-20 20A switching ps w/speaker	229.00	199.95
EX-106 FM option	125.00	112.95
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271H 100w 2m FM/SSB/CW xcvr	899.00	799.95
IC-471H 75w 430-450 SSB/CW/FM xcvr	1099.00	Call
PS-35 Internal power supply	160.00	144.95
PS-15 20A power supply	149.00	134.95
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	619.95
AG-20/EX-338 2m preamplifier	56.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	699.95
PS-25 Internal power supply	99.00	89.95
EX-310 Voice synthesizer	39.95	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

VHF/UHF mobile multi-modes

IC-290H 25w 2m SSB/FM xcvr, TTP mic	549.00	489.95
IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	579.95

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-22U 10w 2m FM non-digital xcvr	299.00	249.95
EX-199 Remote frequency selector	35.00	

Closeout Item	Regular	NOW
IC-25H 45w, 2m FM w/up-dn TTP mic	389.00	299.95
BU-1H Memory back-up	38.50	†10.00

† BU-1H **$10** purchased with IC-25H, otherwise **$38.50**

IC-27A Compact 25w 2m FM w/TTP mic	369.00	329.95
IC-27H Compact 45w 2m FM w/TTP mic	409.00	369.95
IC-37A Compact 25w 220 FM, TTP mic	449.00	399.95
IC-47A Compact 25w 440 FM, TTP mic	469.00	419.95
UT-16/EX-388 Voice synthesizer	29.95	
IC-120 1w 1.2 GHz FM transceiver	499.00	449.95

6m portable	Regular	SALE
IC-505 3/10w 6m port. SSB/CW xcvr	$449.00	399.95
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	

Hand-held Transceivers

Deluxe models	Regular	SALE
IC-02A for 2 meters	$ 319.00	289.95
IC-02AT w/DTMF	349.00	314.95
IC-04A for 440 MHz	TBA	
IC-04AT w/DTMF	379.00	339.95

Standard models	Regular	SALE
IC-2A for 2 meters	$ 239.50	214.95
IC-2AT with TTP	269.50	219.95
IC-3A for 220 MHz	269.95	234.95
IC-3AT with TTP	299.95	239.95
IC-4A for 440 MHz	269.95	234.95
IC-4AT with TTP	299.95	239.95

Accessories for Deluxe models	Regular
BP-7 800mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger - all batteries	69.00
BC-16A Wall charger - BP7/BP8	10.00

Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CP-1 Cig. lighter plug/cord - BP3 or Dlx	9.50
DC-1 DC operation pak for standard models	17.50
LC-2AT Leather case for standard models	34.95
LC-14 Soft case for Deluxe models	17.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 (dlx only)	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier	SALE	79.95
ML-25 2m 2.3w in 20w out amplifier	SALE	179.95
3A-TTN Optional TT Pad - 2A/3A/4A		39.50
SS-32M Commspec 32-tone encoder		29.95

Shortwave receivers	Regular	SALE
R-71A 100 Khz-30 Mhz digital receiver	$799.00	689.95
FL-32 500 Hz CW filter	59.50	
EX-310 Voice synthesizer	39.95	
RC-11 Wireless remote controller	59.95	
CR-64 High stability oscillator xtal	56.00	
R-70 100 Khz-30 Mhz digital receiver	749.00	599.95
EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-63 250 Hz CW filter (1st IF)	48.50	
SP-3 External speaker	49.50	
CK-70 (EX-299) 12v DC option	9.95	
MB-12 Mobile mount	19.50	

MasterCard VISA

HOURS: Mon. thru Fri. 9-5:30; Sat. 9-3

Milwaukee **WATS** line **1-800-558-0411** answered evenings until 8:00 pm, Monday thru Thursday.

Please use WATS line for Placing Orders.
For other information, etc. please use Regular line.

Order Toll Free: 1-800-558-0411

In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

AMATEUR ELECTRONIC SUPPLY® Inc.

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 - Phone (414) 442-4200

AES BRANCH STORES

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio WATS 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (305) 894-3238
Fla. WATS 1-800-432-9424
Outside Florida 1-800-327-1917

CLEARWATER, Fla. 33575
1898 Drew Street
Phone (813) 461-4267
No In-State WATS
No Nationwide WATS

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
Outside Nevada 1-800-634-6227

Associate Store
CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
15 min. from O'Hare!

in the wire. Attach about 30 feet of nylon cord to the loop. This is shown in Fig. 1. Now climb the tree with the loose end of the wire, making sure it lays close along the trunk. When you reach the tag height, screw in four more eyes. Again, form a loop of wire through them. Thread the loose end of the wire through one eye and throw the remaining wire and nylon cord out through the branches. A weight will help. Bring up three more wires using the respective eyes. I did these one at a time to keep them from tangling. The branches of my oak tree were enough to contend with!

At the top standoff eyes, attach a 10- to 15-foot wire to each. Either continue up the tree with them to another eye and wire-loop arrangement, or if you've run out of tree, lay them out on limbs to form a semblance of a top hat.

When you're back on the ground, pull the four loose wire ends in to the tree trunk and connect them to their respective eyes as shown in Fig. 1. All connections should be soldered or connected with Servits.

Open-wire feed from an unbalanced matchbox will net you all bands from 160 through 10 meters. If you desire coax feed, you might have to adjust the top-hat length to resonate the antenna to your preferred 80-meter frequency, although you'll find it's quite broadbanded.

Now try 3790–3800 kHz some evening and enjoy *working* DX. I know it doesn't outperform W1CF's phased array, but then I haven't wired the other three trees! ■

Reference

1. John M. Haerle WB5IIR, "Folded Umbrella Antenna," *Ham Radio*, May, 1979.

AEA Announces:

A User-Friendly Software Package Designed For Easy Operation of Morse, Baudot, ASCII, and AMTOR. A Feature-Packed Program

MBA-TOR™

Now Available for the Commodore 64 Computer in Two Versions.
MBA-TOR 64 Software Package Only, at $119.95 Suggested Retail.
MAP-64/2 Software with Self-Contained Interface $239.95 Retail.

MAIN MENU SCREEN

```
                                    hh:mm:ss

MBA-TOR™
COPYRIGHT 1984 BY AEA

SELECT:
 M. MORSE
 A. ASCII
 R. RTTY
 T. AMTOR
 U. AUTO AMTOR
 X. AUTO CALL
 C. COMMANDS
 O. OPTIONS
```

Just Look At Some Of The Features:

- → CW receive and transmit at 5 to 99 wpm, auto speed track on receive.
- → 7 bit ASCII, receive and transmit at 110, 150 or 300 bauds.
- → 5 bit Baudot, receive and transmit at 60, 67, 75, 100 or 132 wpm.
- → TOR, receive and transmit ARQ (Mode A) or FEC (Mode B) and listen.
- → Beacon and WRU system, includes QRG check before XMT, won't QRM.
- → Message forwarding system, AUTO-AMTOR still functions in this mode.
- → Selects command menu.
- → Selects options menu.

+ Complete precompose split-screen display with status information.
+ Complete printer control including SELCALL/WRU printer control.

OPTIONS MENU SCREEN

```
                                    hh:mm:ss
 I. CALLSIGN          ??????
 S. SELCALL             ????
 T. ARQ TIMEOUT           30
 U. USOS                  ON
 M. MORSE FILL (BT)      OFF
 R. RTTY SYNC (NUL)      OFF
 A. AUDIO FEEDBACK       OFF
 C. AUTO CR               ON
 L. AUTO LF               ON
 B. BEACON RECORD        OFF
 W. WRAP-AROUND           ON
 K. CW BREAK-IN          OFF
 O. OUTPUT MODE         WORD
```

- → 24-hour clock, shows time in hours, minutes and seconds.
- → Allows entry of your callsign for auto operations.
- → Derived from your callsign automatically, can be changed.
- → Sets ARQ phasing calls from 1 to 99 seconds.
- → Unshift on space, toggles on or off.
- → Transmits Morse idle character during breaks in KBD activity.
- → Transmits RTTY idle character during breaks in KBD activity.
- → Produces click in monitor audio when any key is pressed.
- → Sends carriage return the first space after 65 characters.
- → Sends a line feed after each carriage return.
- → Allows the beacon to be recorded to the QSO buffer for logging.
- → Sends CR/LF if there is a space in the last 5 positions on the line.
- → Automatic transmit/receive switching during QSO.
- → Transmit in word mode (text sent on space) or character mode.

COMMAND MENU SCREEN

```
                                    hh:mm:ss

 L. LOAD
 E. EDIT
 M. MOVE
 S. SAVE
 X. SET XMT BUFFER SIZE
 C. SET COLOR
 T. SET TIME
```

+ Break-in buffer on all modes, toggle QSO buffer on or off.
+ CW speed lock and Farnsworth low-speed CW.
+ 10 soft-partitioned™ message buffers plus direct from disk or tape.

- → Allows loading of message or QSO buffers from disk or cassette.
- → Word processor type edit functions on message and QSO buffers.
- → Allows transmission of QSO buffer without disk or cassette systems.
- → Allows you to save message and QSO buffers to disk or cassette.
- → Set the transmit pre-type buffer to any size you like.
- → Choose among any of 16 colors for character, screen or border.
- → Lets you set the time of day clock.

+ Insert QSO station's call into any buffer while still copying.
+ Includes a complete manual, keyboard overlays and cables for the AEA Computer Patch™ or Micropatch™ Interface.
+ For more information call AEA, or see your AEA Dealer.

Advanced Electronic Applications, Inc.

P.O. BOX C-2160 • LYNNWOOD, WA 98036 • (206) 775-7373 • TELEX: 152571 AEA INTL

Bob Eldridge VE7BS
Erickson Road
Pemberton BC V0N 2L0
Canada

When Darkness Calls

On 160m, success means diligent planning. These tips on gray-line propagation are your key to Top-Band DXCC.

Anyone who works Top Band knows that strange and wonderful things happen around sunset and sunrise (twilight at your end of the QSO, at the other end, or at both). There are some interesting reasons for this, and if you have a better understanding of what causes the DX to emerge at these special times, you have a head start in the drive for WAC or DXCC 160.

"Sunrise" in this context may last quite a while, from sometime before the sun actually appears until sometime after it has cleared the horizon. The duration of the effect depends on the latitude of the location and the time of year. For example, in midwinter at the equator the time window is very narrow, about ±5 minutes; at 50° about ±45 minutes; at 60° about ±90 minutes. If you have watched the sun rise in the tropics, you will have noticed that it rises almost due east and zooms straight up into the sky very quickly. In polar regions it creeps out of the SSE horizon and travels almost horizontally, so it is not easy to decide just when it has actually arrived.

Finding the Times of Sunrise and Sunset

There is no problem in knowing when to expect your own sunrise and sunset, but how can you find the times for a particular DX location? Here are some of the ways:

1) The "DX Edge" is a slide-rule-type operating aid made especially for this purpose and has information on zones, prefixes, etc., as well. It is simple to use and is available for $14.95 postpaid from: The DX Edge, PO Box 384, Madison Square Station, New York NY 10159.

2) If you have a calculator which handles trigonometric functions (and you know how to use it), the times can be calculated using the formulas in Fig. 1. To use these formulas you have to know the inclination of Earth's axis with respect to the direction of the sun at that particular time of year. John Devoldere ON4UN has a table showing this in his book, *80-Meter DXing*, and can also supply a computer printout of times by prefix. An inclination table can also be found in K6UA's "Gray Line" article in *CQ*, September, 1975, p. 30.

3) If you have a Commodore computer, you can buy a collection of programs (which includes an excellent sunrise/sunset program by David Williams) for only $10.00 from Public Domain, 5025 Rangeline Road, West Milton OH 45383. If you own a Commodore 64, ask for Collection #4 and you'll get 37 other programs as well for your ten bucks—can't beat 25¢ a program! You enter the latitude and longitude of the location and the date; if you wish, it will automatically convert to UTC (GMT for the old-fashioned or Zulu for some). The computer also asks for the angle of the sun over the horizon. I enter 0°. The author of the program put in −.75° as "a widely-used figure." It makes only a few minutes difference in the calculation, but if anyone out there in *73*-land knows what this is all about, write a letter to *73* and let the rest of us know.

4) Finally, you can use Fig. 2, which is taken from a *CCIR Report* and is good for anywhere in the world at any time of the year. The time scale is in local standard time, so use the longitude of the station concerned to convert to Universal Time.

On the month axis, estimate the position of the specific day on the scale. This is very important in spring and fall; for example, you will see from the chart that at 50°S on the 1st of February, sunrise is about 4:40, but by the end of the month it is 5:25.

The Gray Line

The great circle line around Earth dividing the dark side and the sunlit side of the planet is called the "terminator." It is not a very

$$\text{Sunrise} = \frac{\text{longitude W}}{15} + \frac{\cos^{-1}(\tan a \times \tan \text{latitude N})}{15}$$

$$\text{Sunset} = \frac{\text{longitude W}}{15} - \frac{\cos^{-1}(\tan a \times \tan \text{latitude N})}{15}$$

Fig. 1. Formulas to calculate sunrise and sunset in decimal UTC where "a" is the inclination of Earth's axis with respect to the direction of the sun at that particular time of year.

sharp division except near the equator, and radio amateurs call it the gray line, a descriptor brought into radio terminology by K6UA.

On the daylight side of Earth, the D-layer of the ionosphere is heavily ionized and absorbs most of the 160- and 80-meter signals, preventing them from reaching the reflecting layers above. At night the D-layer has decayed and these signals can easily go through to the upper layers and be reflected down to more distant locations.

At the terminator, a special condition exists. Fig. 3 shows the conditions in the ionosphere which help the DXer at the eastern end of the darkness path at sunrise (European working into W, or W working into JA, for example).

Ionization builds up first in the upper layers, and in fact, never entirely disappears from them in the middle of the night. At twilight the D-layer is only partially ionized: too little to absorb the 160-meter signal, and too much to allow the signal to pass straight through to the upper layer and be reflected down to medium distances (as it does during the night).

The partial ionization causes the signal to be *refracted* (bent) in the D-layer, and it may travel hundreds or thousands of miles within the layer before going on its way to the upper layer. Not only does it go further before hitting that layer, but it also arrives at a narrower angle, making for both better reflection and a longer hop.

You can see that for a station right near the terminator, an antenna with a high-angle vertical takeoff lobe may sometimes reach out further than one with an antenna which concentrates the signal closer to the horizon, but the low-angle antenna will stay in contact for a longer period after sunrise.

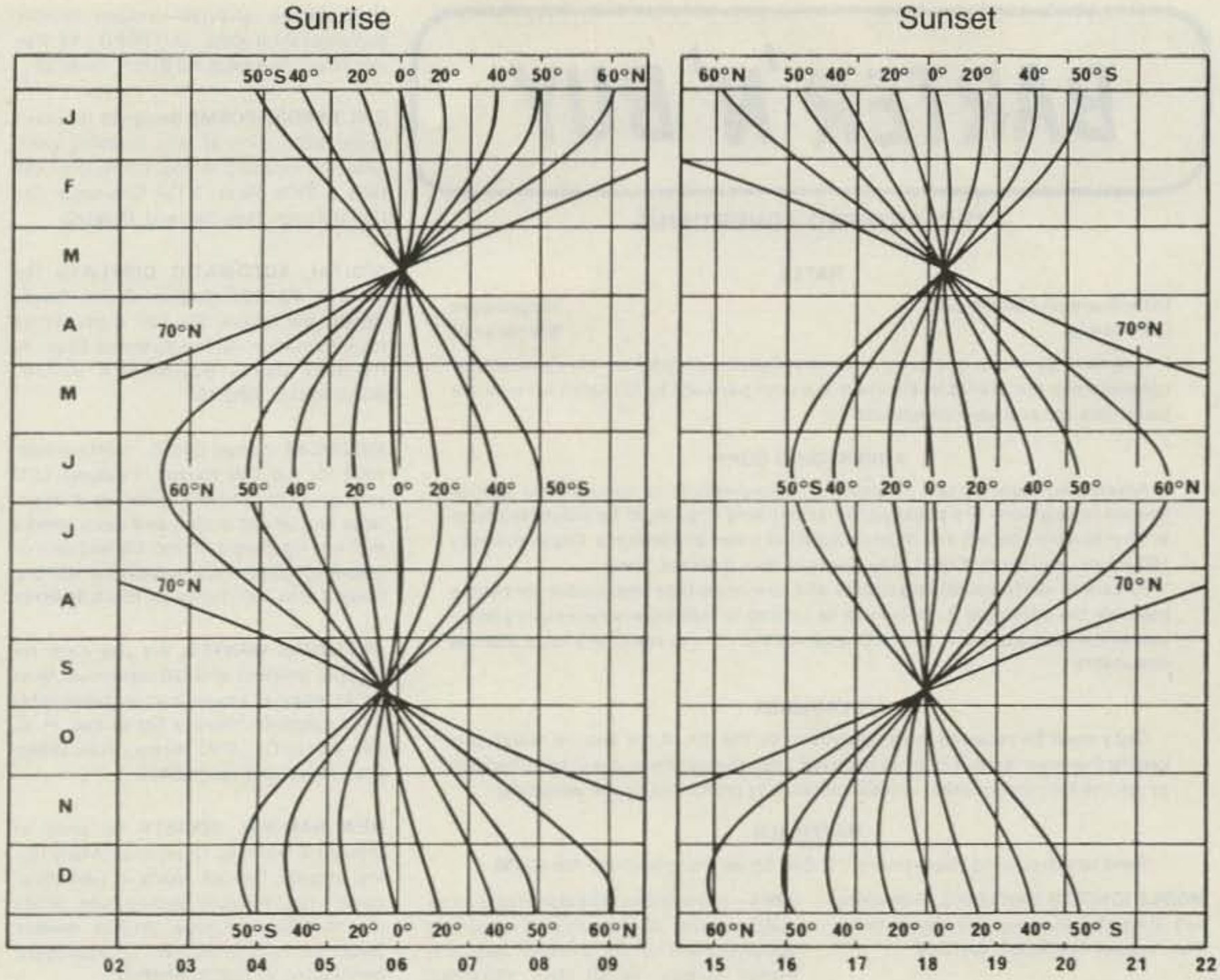


Fig. 2. Times of sunrise and sunset anywhere in the world (in local standard time).

There is another phenomenon which helps the Top Bander at sunrise. On the dark side of Earth, the F-layer is higher than it is on the sunlit side. At the terminator, where the transition from one height to the other occurs, the layer is *tilted* and signals reflected from it come down at a more useful angle for DX working. Fig. 3 illustrates this effect, which was explained in 1979 by Hortenbach and Rogler.[3]

So what do we do about it?

- At *your* sunrise, look for signals from the west of you.
- At your sunset, look for signals from the south and southeast (along the terminator) and then from the east.
- If you are in darkness, look for signals from the east at the distant station's *sunrise* or before it.
- If both you and the distant station are on the edge of the darkness path, there is an especially good chance of propagation between you. ■

References

1. John Devoldere ON4UN, *80-Meter DXing*, Communications Technology, Greenville NH 03048.
2. K6UA, W6NLZ, and K6SSS, "The Gray Line Method of DXing," *CQ*, September, 1975.
3. K. J. Hortenbach and F. Rogler, "On the propagation of shortwaves over very long distances . . .", *Telecommunication Journal*, June, 1979.

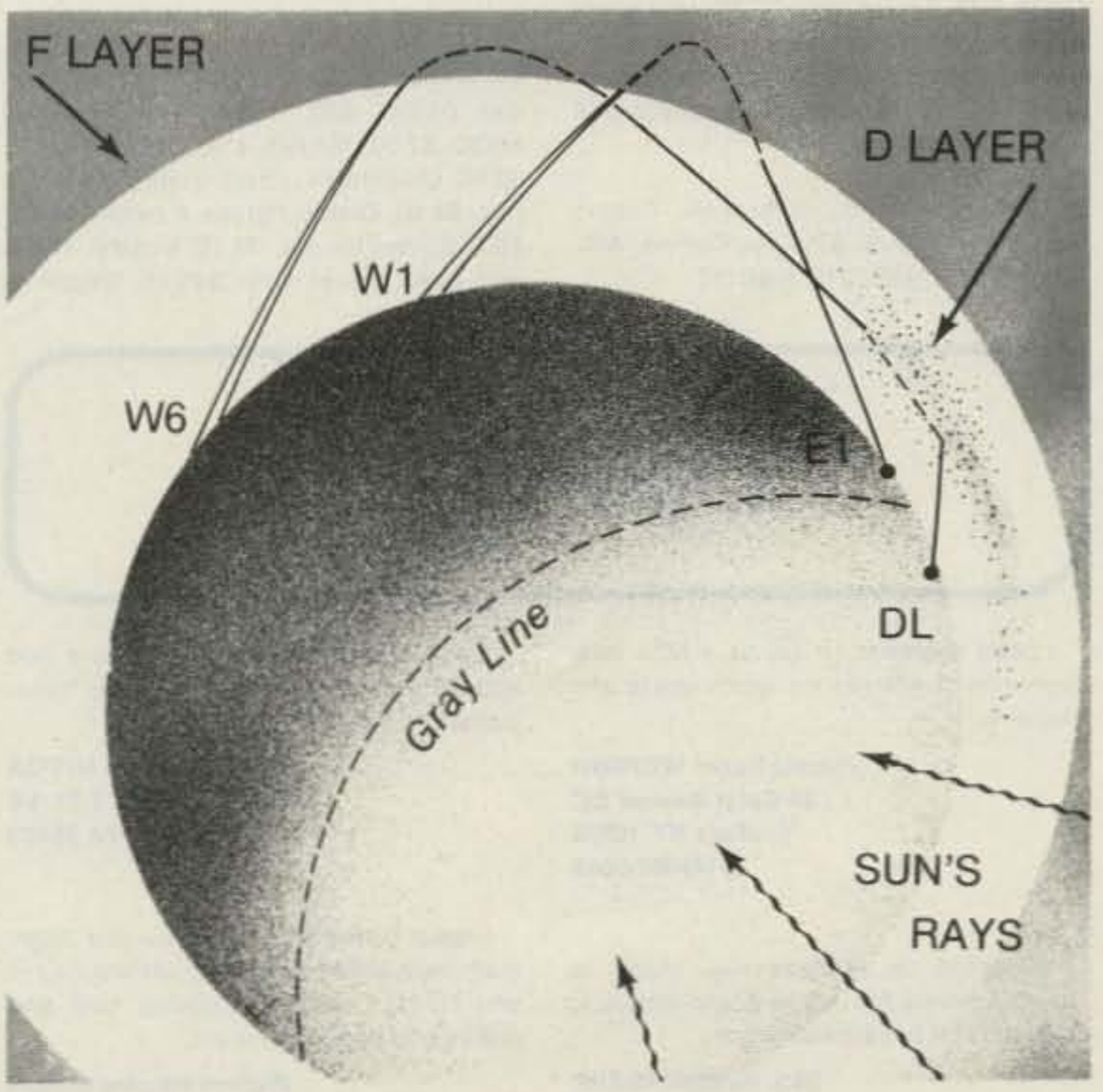


Fig. 3. Sunrise in Europe.

BARTER 'N' BUY

73 CLASSIFIED ADVERTISING

RATES

Individual (non-commercial) ..... 15¢ per word
Commercial ..... 50¢ per word

Prepayment by check or money order is required with your ad. No discounts or commissions are available. Please make your payment to *73*. Rates for multiple insertions are available on request.

ADVERTISING COPY

Advertising must pertain to amateur radio products or services. No special layouts or positions are possible. All advertising copy must be submitted typewritten (double-spaced) and must include full name and address. Copy limited to 100 words, maximum. Count only words in text. Address, free.

73 cannot verify advertising claims and cannot be held responsible for claims made by the advertiser. Liability will be limited to making any necessary correction in the next available issue. *73* reserves the right to reject any copy deemed unsuitable.

DEADLINES

Copy must be received in Peterborough by the 5th of the second month preceding the cover date. If copy is received after the deadline, it will be scheduled to run the following month, unless specifically prohibited by the advertiser.

MATERIALS

Send to Advertising Department, *73*, Elm Street, Peterborough NH 03458.

MOBILE IGNITION SHIELDING. Free literature. Estes Engineering, 930 Marine Drive, Port Angeles WA 98362. BNB006

WANTED: Cash paid for used SPEED RADAR EQUIPMENT. Write or call: Brian R. Esterman, PO Box 8141, Northfield IL 60093; (312)-251-8901. BNB030

MILITARY TECHNICAL MANUALS for old and obsolete equipment. 60-page catalog, $3.00. Military Technical Manual Service, 2266 Senasac Ave., Long Beach CA 90815. BNB045

MAGICOM RF SPEECH PROCESSORS—Add 6 dB of average output with genuine rf clipping in your transmitter's i-f stage. Custom engineered for Kenwood TS-120, TS-130, TS-430, TS-520, TS-530, TS-820; Drake T-4X, TR-7; Yaesu FT-102. Excellent speech quality, simple installation, affordable prices! SASE for data and cost. Magicom, PO Box 6552A, Bellevue WA 98007. BNB101

REPAIR, alignment, calibration. Collins written estimates, $25; non-Collins, $50. K1MAN, (207)-495-2215. BNB117

IMRA—International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900–2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont NY 10538. BNB123

ELECTRON TUBES: Receiving, transmitting, microwave...all types available. Large stock. Next-day delivery in most cases. Daily Electronics, 14126 Willow Lane, Westminster CA 92683; (714)-894-1368. BNB150

SCIENCE SOFTWARE for VIC-20 and PC-2. Radio astronomy, moonbounce, amateur satellites, etc. David Eagle, 7952 W. Quarto Dr., Littleton CO 80123; (303)-972-4020. BNB153

FREE CATALOG—computer supplies. Control Data SS/DD, $21; DS/DD, $31. Dysan SS/DD, $30; DS/DD, $40. Ribbons: MX80, $7.50; MX100, $14; Okidata 82-92, $2.50; Okidata 84, $5.00; Diablo Hytype II m/s, $4.40; Diablo Hytype II nylon, $4.80; NEC Spinwriter m/s, $4.75; 6-outlet surge and spike power strip, $49.95. Shipping, $3.00. Mastercard/Visa—include number and expiration data. OUTPRINT, 44 Forrest Road, Randolph NJ 07869. BNB159

SWL REPORT FORMS designed for maximum information at your listening post. Give real meaning to your DX reports. Details 2 IRCs. Rout. 3/137 Champion St., Christchurch, New Zealand. BNB180

DIGITAL AUTOMATIC DISPLAYS for FT-101s, TS-520s, Collins, Drake, Swan, Heath, and others. Six 1/2" digits. Write for information. Grand Systems Dept. A, PO Box 3377, Blaine WA 98230; (604)-530-4551. BNB183

VIC-20/C-64 budget-priced interface/software for full CW rcv/xmt. Features LED tuning, programmable message buffers, large type-ahead buffer, and more. Works with any rig. Specify computer and disk or cassette: $39.50. Paul Rosenkranz N5FQN, Route 4, Box 24D, Taylor TX 76574. BNB191

ANTENNAS WANTED: We pay cash for surplus amateur and CB antennas. Must be in original boxes and in reasonably good condition. Send a list or call: H. C. Van Valzah Co., 1140 Hickory Trail, Downers Grove IL 60515. BNB195

NEW HAM-SWL SOCIETY for unity of thought & learning. Open to all. Many topics, awards, free ad space in periodical, society net, museum participation. Shack pics & QSLs welcome. Writers needed. SASE for info to RCSW, 32 Applegate, Bennington VT 05201. BNB197

KT5S SUPER DX SLOPER 80–10m only $59.95. KT5B multiband dipole 160–10m only $59.95. 2-kW roller inductor (28 uH) $47.50. Weather-boot kit (PL-259) $8.95 p.p. Much more! Info available. Kilo-Tec, PO Box 1001, Oak View CA 93022; (805)-646-9645. BNB198

YOU (CAN BE) VERSUS CRIME. Security alarm systems easily learned. Employment-business terrific. Age no barrier. Get in now. Don't delay. Information package $2.00. Security Electronics International, PO Box 1456-RK, Grand Rapids MI 49501. BNB203

WANTED—MILITARY SURPLUS RADIOS. We need Collins 548L-4, 548U-1, 548T-V, 426U-2, UHF719A, 618T, ARC-94, ARC-102, RT-712/ARC-105, ARC-114, ARC-115, ARC-116, RT-823/ARC-131 or FM622, Wilcox 807A or RT-857/ARC-134, ARC-159, RT1167 or RT-1168/ARC-164, ARC-174, RT-1299/ARC-186, APX-76, APN-171, MRC-98, 718F-1/2, HF-105, Collins antenna couplers 490T-1, 490T-2, 490T-9, CU-1658A/ARC, CU-1669/GRC, CU-1402/ARC, 490B-1, CU-1239/ARC-105. Top dollar paid or trade for new amateur gear. Write or phone Bill Slep, Slep Electronics Company, Highway 441, Otto NC 28763; (704)-524-7519. BNB204

COMMODORE 64 CW INSTRUCTOR PROGRAM. Generates CW on TV speaker. Random code, keyboard input, or prerecorded CW tests. Character speed and spacing set independently. Designed for classes and increasing code speed. $15.00—diskette or cassette (specify). Dennis Olver N7BCU, 22000 S. Tonya Ct., Oregon City OR 97045. BNB205

FOR SALE: LNW System Expansion 2 $250, Holmes Sprinter $45, Langley amber CRT $50, TEK-535A manual $30, mint 51J4 $200, TEK-585A on cart w/manual & 3 plug-in units $425, 4-1000A used/tested $50. Russell L. Lawson, 124 South Grand St., West Suffield CT 06093; (203)-668-2871. BNB206

CHESS PLAYERS—Radio-chess schedules, matches, tournaments. Details: K2VJ, Box 682, Cologne NJ 08213. BNB207

COMMODORE 64 OWNERS: Now a custom CW cartridge with your name and call. Send and receive up to 30 wpm with split-screen display. Complete with instructions and schematics for home-brew interface only $39.95. Custom CW 2.0 from ALC Electronics, 718 W. Coral Ave., Ridgecrest CA 93555; (619)-375-7203. BNB208

TWO-METER QUAD—two-element plastic construction. Assembly required. $21.50 + $4.00 s&h. Michigan residents add .86 state tax. Mercury Products, Box 598, Saugatuck MI 49453. BNB209

EIMAC 8874s—New, late manufacture, $160. W9ZR, (414)-434-2938. BNB210

SES receivers & downconv. w/instr., capable of receiving between 2 GHz & 4 GHz, tunable audio, as is: $100.00/set. Call VI, (818)-765-2422. BNB211

2000+ new component parts: capacitors, resistors, diodes, transformers, etc. $1,200 or best offer. Call VI, (818)-765-2422. BNB212

CX7 REPAIRS. Mark Mandelkern, 2315 Derby St., Berkeley CA 94705; (415)-549-9210. BNB213

SCHEMATICS: Radio receivers 1920s/60s. Send name, brand, model no., SASE. Scaramella, PO Box 1, Woonsocket RI 02895-0001. BNB214

BACK ISSUES OF *73*: January 1969 through February 1982 complete except for March 1980. Prefer pickup or you pay shipping. 13 years of articles! $130.00. Steve Goldstein, 99 Charles St., Reading MA 01867; (617)-944-7102 eves before 11 EDT. BNB215

ENGINEERING SOFTWARE—Free flyer and money back guarantee. CP/M, MSDOS, TRSDOS. PLOTPRO—graph printing program. Linear/logarithmic, multiple plots, grid lines, labeling, $52.95. ACNAP—analyzes active/passive electronic circuits. Monte Carlo, worst-case, sensitivities, $52.95. SPP—signal processing, FFT, linear/nonlinear, LaPlace, transient analysis, more, $62.95. BV Engineering, 2200 Business Way, Suite 207, Riverside CA 92501; (714)-781-0252. BNB216

MAKE PRINTED CIRCUITS BOARDS without messy chemicals. Complete instructions, $2.00 postpaid. Kenneth Hand WB2EUF, PO Box 708, East Hampton NY 11937. BNB217

QSLS & RUBBER STAMPS. Top quality. QSL samples and stamp information 50¢. Ebbert Graphics D-7, Box 70, Westerville OH 43081. BNB218

HAM RADIO REPAIR, tube through solid state. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128; (408)-729-8200. BNB219

HAM TRADER YELLOW SHEETS, in our 23rd year. Buy, swap, sell ham-radio gear. Published twice a month. Ads quickly circulate—no long wait for results. SASE for sample copy. $9 for one year (24 issues). POB 356, Wheaton IL 60189. BNB220

DX HEADING MAPS for Boston, NYC, Phila., Baltimore, Detroit, Atlanta, Chicago, New Orleans, Saint Louis, Dallas, LA. 11 × 17 $1.75 pp. 22 × 34 $5.95 pp. Specify city. Bill Massey W2HOJ, PO Box 397, Hainesport NJ 08036. BNB221

HAM HELP

I need someone to adjust a Mite teletypewriter. I will pay all repair costs and shipping.

Harold Parks WB2BNH
24 Caryl Avenue 6-C
Yonkers NY 10705
(914)-963-0689

I need help locating design data and wiring information for wiring power transformers.

Howard Mullen N7FOA
166 E St. SE
Ephrata WA 98823

Telegraph or wireless key, made in South America for use in South America, wanted for a private collection.

Dick Randall K6ARE
1263 Lakehurst Rd.
Livermore CA 94550

I need schematic diagrams and alignment instructions for Hallicrafters SX117 and HT44. I will pay copying cost and postage or copy and return.

William Hartley K2RDS
1201 Paul Ave.
Schenectady NY 12306

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

OTTAWA ONT CAN
OCT 5-7

The Ottawa Amateur Radio Club will host the 16th annual Radio Society of Ontario Convention on October 5-7, 1984, at the new Westin Hotel in Ottawa. Registration is $8.00, the non-amateur program is $4.50, the Friday-night eyeball and dance is $6.00, and the Saturday banquet and dance (14-piece orchestra) is $27.00. Other features include forums, papers, commercial displays all day Saturday, and a Sunday-morning program. Talk-in on 146.34/.94. For more information, contact RSO Convention Committee, PO Box 15806, Station "F", Ottawa, Ont., Canada K2C 3S7.

WARRINGTON PA
OCT 6-7

The Pack Rats (Mt. Airy VHF ARC) cordially invite all amateurs and their friends to the 8th annual Mid-Atlantic VHF Conference which will be held on Saturday, October 6, 1984, from 9:00 am to 5:00 pm, at the Warrington Motor Lodge, Route 611, Warrington PA, and to their 13th Pack Rat Hamarama on Sunday, October 7, 1984, from 7:00 am to 4:00 pm, rain or shine, at the Bucks County Drive-In Theater, Route 611, Warrington PA. The conference will feature an all-day VHF program, a cocktail hour and get-together at 6:30 pm, and a buffet dinner ($13.00 each) at 7:30 pm. Conference registration is $4.00 in advance (before September 23rd), $5.00 at the door, and includes admission to the Hamarama. Admission to the Hamarama flea market on Sunday is $3.00 and selling spaces are $5.00 each. The gate will open at 6:00 am for sellers (bring your own tables). Food and drink will be available. Talk-in on 146.52 MHz (W3CCX). For more information, contact Hamarama '84, Post Office Box 311, Southampton PA 18966, or phone Lee A. Cohen K3MXM at (215)-635-4942.

DEERFIELD NH
OCT 6

The Hosstraders' Fall Tailgate Swapfest will be held on Saturday, October 6, 1984, sunrise to sunset, at the fairgrounds, Deerfield NH. Admission is $2.00, which includes tailgaters. For a nominal fee, camping will be available after 4:00 pm on Friday (no reserved spaces). Profits benefit the Shriners' Burn Institute and last spring's donation was $5,813. For a map or more information, send an SASE to Joe Demaso K1RQG, Star Route, Box 56, Bucksport ME 04416.

HAMILTON ONT CAN
OCT 6

The Hamilton Amateur Radio Club, Inc., will hold its 2nd annual flea market on Saturday, October 6, 1984, beginning at 8:30 am, at Marritt Hall, Ancaster Fairgrounds, 625 Highway 53 East. Admission is $2.00. Flea-market vendors' 8-foot tables are $4.00 plus admission and commercial vendors' 8-foot tables are $10.00 with admission included. There will be room for 150 vendors and setup will be from 7:00 am to 8:30 am. Coffee, soft drinks, and sandwiches will be available. Talk-in on 146.16/146.76 (VE3NCF). For space reservations, contact HARC Flea-Market Committee, PO Box 253, Hamilton, Ont., Canada L8N 3C8. For more information, contact Stan VE3GFE on VE3NCF.

BALTIMORE MD
OCT 7

The Columbia Amateur Radio Association will hold its 8th annual hamfest on Sunday, October 7, 1984, from 8:00 am to 3:30 pm, at the Howard County Fairgrounds (15 miles west of Baltimore, just off I-70 on Route 144, 1 mile west of Route 32). Admission is $3.00 and XYLs and children will be admitted free. Tables are $6.00 additional if paid by September 30th and $8.00 additional after that date. Outdoor tailgating is $3.00 additional and indoor tailgating is $6.00 additional. Food will be available. Talk-in on 147.735/.135 and 146.52/.52. For table reservations and more information, write Mike Vore W3CCV, 9098 Lambskin Lane, Columbia MD 21045, or phone (301)-992-4953.

ROME GA
OCT 7

The Rome Hamfest will be held on Sunday, October 7, 1984, beginning at 8:00 am, at the Civic Center in Rome GA. Talk-in on 147.90/.30. For more information, phone T. J. Freeman at (404)-232-2830.

BENTON HARBOR MI
OCT 7

The Blossomland Amateur Radio Association will hold its 1984 Blossomland Blast on Sunday, October 7, 1984, from 8:00 am to 3:00 pm EDT, at the Lake Michigan College Community Center, I-94 Exit 30, just west of Benton Harbor MI. Admission is $3.00 per person and tables are $5.00 each. Special features will include an Air Force MARS display, a Skywarn training program, and a radio-controlled airplane display. Talk-in on .22/.82 and .52 simplex. For more information, contact BARA, PO Box 175, St. Joseph MI 49085, or phone Paul WD8MWT at (616)-983-1710.

SANTA FE NM
OCT 7

The Northern New Mexico Hamfest will be held on October 7, 1984, from 8:00 am

↙ See List of Advertisers on page 98

to 3:00 pm, at the Terrero Group Shelter, along the Pecos River, east of Santa Fe. Admission is $3.00 for adults and $1.50 for children. Activities will include a tailgate flea market, group meetings, family games, fishing, and picnicking. There will be hot dogs, chips, soft drinks, and coffee available, as well as free Saturday-night camping. Talk-in on local repeaters and .52 simplex. For further information please send an SASE to Northern New Mexico ARC, c/o Bob Norton N5EPA, Route 3, Box 95-15, Santa Fe NM 87501, or call on 3.939 MHz at 0100 UTC.

YONKERS NY
OCT 7

The Yonkers Amateur Radio Club will sponsor the Yonkers Electronics Fair and Giant Flea Market on Sunday, October 7, 1984, from 9:00 am to 4:00 pm, rain or shine, at the Yonkers Municipal Parking Garage, corner of Nepperhan Avenue and New Main Street, Yonkers NY. Admission is $2.00 each and children under 12 will be admitted free. Gates will be open to sellers at 8:00 am and there will be a $6.00 admission per parking space which will also admit one (bring your own tables). Refreshments, free parking, and sanitary facilities will be available, as well as unlimited free coffee. There will be live demonstrations all day and a giant auction at 2:00 pm. Talk-in on 146.265T/146.865R or .52 direct. For more information, write YARC, 53 Hayward Street, Yonkers NY 10704, or phone (914)-969-1053.

SOUTH SIOUX CITY NE
OCT 12-13

The 3900 Club and the Siouxland Amateur Radio Repeater Association will sponsor the 8th annual 3900 Club Hamboree and Iowa State Convention on October 12-13, 1984, all indoors at the Marina Inn, South Sioux City NE. Admission to the flea market and convention is $6.00 each. Tickets for the Saturday-night banquet (featuring speaker Dr. Beverly Mead of Creighton University) are $10.00 in advance and $12.00 at the door. Other activities will include exhibitions, ladies' programs, forums (QRP, Air Force MARS, QCWA, UHF/VHF, ARRL, DX session, Novice session, and a Ø QSL bureau), and a Friday-night get-together. Talk-in on 146.37/146.97. For advance flea-market reservations, write Al Smith, 3529 Douglas, Sioux City IA, and for other reservations, write Dick Pitner, 2931 Pierce, Sioux City IA.

SYRACUSE NY
OCT 13

The Radio Amateurs of Greater Syracuse 1984 Hamfest will he held on Saturday, October 13, 1984, beginning at 9:00 am, at the Art and Home Center Building, New York State Fairgrounds, Syracuse NY (adjacent to Interstate 690, just 3 miles southeast of the NYS Thruway, Exit 39, and one mile northwest of Syracuse and Route 81). The hamfest will have complete indoor facilities and, weather permitting, there will be an outdoor flea market in the front courtyard. Volunteer exams will be given for Novice, Technician, and General classes. Breakfast and lunch service will be available. Commercial exhibitors may begin their setup on Friday from 7:30 pm to 10:00 pm and on Saturday from 7:00 am to 9:00 am.

MEMPHIS TN
OCT 13-14

The Mid-South Amateur Radio Association, the Delta Radio Club, and the Memphis Radio Relay Club will hold the annual Memphis Hamfest on October 13-14, 1984, in the air-conditioned Pipkin Building at the Memphis Fairgrounds. The hours on Saturday are 8:00 am to 4:00 pm and on Sunday, 9:00 am to 2:00 pm. All activities will he held inside and will include forums, ladies' programs, and a large flea market. Dealers' booths are $60.00 each for the weekend and flea-market tables are $5.00 each per day (there are two drive-in doors for unloading). Trailer hookups are available. For special rates at nearby hotels or for more information, write Clayton Elam K4FZJ, 28 N. Cooper, Memphis TN 38104, or phone (901)-274-4418 days, or (901)-743-6714 evenings.

FALLS CHURCH VA
OCT 13-14

The National Capitol DX Association will sponsor ARRL-approved DXPO '84 on October 13-14, 1984, beginning at 1:00 pm on Saturday and ending at 1:00 pm on Sunday, at the Best Western Falls Church Inn, 6633 Arlington Boulevard (Route 50), Falls Church VA. A broad variety of DX subjects will be included in the program. A banquet with speaker Father Moran 9N1MM will be held Saturday evening. For further details, contact Stuart Meyer W2GHK, DXPO Chairman, 2417 Newton Street, Vienna VA 22180, or phone (703)-525-6286 (office) or (703)-281-3806 (home).

LIMA OH
OCT 14

The Lima Hamfest will be held on October 14, 1984, at the Allen Country Fairgrounds, at the intersection of I-75 and Routes 309 and 117, Lima OH. Tickets are $3.00 in advance and $3.50 at the door; full tables are $6.00 and half tables are $3.50. For more information, tickets, or tables, send an SASE to K8TCF, c/o NOARC, Box 211, Lima OH 45802.

PARAMUS NJ
OCT 14

The Bergen ARA will hold a Ham Swap 'n' Sell on October 14, 1984, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only; bring your own table. Admission for sellers is $4.00; buyers will be admitted free. Thousands of spaces will be available. Talk-in on .79/.19 and .52. For more information, write Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855, evenings only.

WAUKESHA WI
OCT 14

The Kettle Moraine Radio Amateur Club will hold its annual Ham, Computer, Video Fest on Sunday, October 14, 1984, at the Waukesha County Expo Center, Highways F and FT, Waukesha WI. Tickets are $2.50 in advance and $3.00 at the door. Tables are $3.00 for each 4-foot length and reservations will be accepted until September 24th. Since all facilities will be indoors, the hamfest will be open rain or shine, beginning at 8:00 am. There will be food available and commercial exhibitors. For reservations, send a check (payable) to KMRA Club, PO Box 411, Waukesha WI 53187.

DOVER MA
OCT 20

The Middlesex Amateur Radio Club will hold its annual Amateur Flea Market on October 20, 1984, from 9:00 am to 3:00 pm, at Dover Town Hall, Dover MA. Admission is $1.00 and tables are $8.00 each. Refreshments and ample free parking will be available. For further information, send an SASE to Irv Geller KO1N, 1450 Worcester Road, #422A, Framingham MA 01701.

CIRCLEVILLE PA
OCT 20

The Irwin Area ARA will sponsor a Swap and Shop on Saturday, October 20, 1984, at the Circleville VFD, just off Rt. 30, 3.5 miles west of the Pennsylvania Turnpike, Exit 7. Talk-in on .325/.925 and .52. For further information, write Don Myslewski K3CHD, 359 McMahon Road, North Huntingdon PA 15642, or phone (412)-683-0570.

TAMPA FL
OCT 20

The Hillsborough Amateur Radio Society (HARS) will hold its annual one-day Amateur Radio and Computer Hamfest on Saturday, October 20, 1984, from 8:00 am to 8:00 pm, at the Ft. Hesterly Armory, corner of Cass and Howard Streets, Tampa FL (just south of I-275 exit for Howard and Armenia). Donations are $3.00 in advance and $4.00 at the door. Swap-table donations are $7.00 and commercial booths are $30.00 (advance registration is requested). Talk-in on 147.075. For advance tickets, booths, and tables, write Conrad Kibler WB4ARS, 10102 Cliff Circle, Tampa FL 33612, or HARS, PO Box 24602, Tampa FL 33623, or call Ralph Larkin AA4PM at (813)-884-4126.

GRAY TN
OCT 20

The fourth annual Tri-Cities Hamfest will be held on Saturday, October 20, 1984, at the Appalachian Fairgrounds, located five miles south of I-81 on Highway 23, Gray TN. Registration fee is $2.00. Features include a flea market, forums, and dealers. RV hookups will be available. Talk-in on 146.37/.97 and 147.87/.27. For further information, write Tri-Cities Hamfest, PO Box 3648 CRS, Johnson City TN 37601.

CHICAGO IL
OCT 21

The 3rd annual CCRL Hamfest will be held on Sunday, October 21, 1984, from 7:00 am to 2:00 pm, at American Legion Post #21, 6040 N. Clark Street, Chicago IL 60660. Admission is $1.00 in advance and $1.50 at the door. Tables are $2.00 each. Talk-in on 145.030 simplex. For more information, write Norman Geuder KA9EZA, 6345 N. Magnolia, Apt. I-1, Chicago IL 60660, John Ibes KA9FUI, 2934 N. Mobile, Chicago IL 60634, or Frank Bonnell WB9OHN, 1674 W. Hollywood, Chicago IL 60660.

CHATTANOOGA TN
OCT 27-28

Hamfest Chattanooga and the Tennessee State ARRL Convention will be held on October 27-28, 1984, at a new location, Memorial Auditorium, Oak Street, Chattanooga TN. Inside space will be available for dealers and flea-market vendors and 8-foot tables will rent for $6.00 per day or $10.00 for both days. There will be new, used, and peripheral equipment, computers, hardware and software, and genuine junk in 27,000 square feet of indoor space. Activities will include forums, contests, and non-ham programs. Amateur exams (Novice through Extra) will be given on Saturday in the West Assembly Room of the Memorial Auditorium at 8:00 am. Please send a completed 610 form with a copy of your license and a check or money order for $4.00 payable to WCARS/VEC by October 15, 1984, to: Hamfest Chattanooga, PO Box 22161, Chattanooga TN 37422. For more information, write Hamfest Chattanooga, PO Box 3377, Chattanooga TN 37404, or phone Nita Morgan N4DON at (404)-820-2065.

MARION OH
OCT 28

The Marion Amateur Radio Club will hold its 10th annual Heart of Ohio Ham Fiesta on Sunday, October 28, 1984, from 0800 to 1600, at the Marion County Fairgrounds Coliseum. Tickets are $3.00 in advance and $4.00 at the door; tables are $5.00. Food and plenty of parking will be available. Talk-in on 146.52 and 147.90/.30. For more information, tickets, or tables, contact Paul Kilzer W8GAX, 393 Pole Lane Road, Marion OH 43302.

KALAMAZOO MI
OCT 28

The 2nd annual hamfest/electronic flea market will be held on October 28, 1984, from 9:00 am to 4:00 pm, at the Kalamazoo County Fairgrounds, Kalamazoo MI. Admission is $2.00 in advance and $2.50 at the door. Four-foot table spaces and table rentals are $2.50 in advance and $3.00 at the door (spaces with power must be reserved and paid for in advance). There are 400 spaces available and dealer setup is at 8:30 am. For more information, contact Ham 10 FM Club of Kazoo, Ken Losey KA8RUA, 2825 Lake Street, Kalamazoo MI 49001.

FRAMINGHAM MA
OCT 28

The Framingham Amateur Radio Association, Inc., will hold its annual fall flea market on Sunday, October 28, 1984, beginning at 10:00 am, in the Framingham Civic League Building, 214 Concord Street (Rte. 126), downtown Framingham. Admission is $2.00 and tables are $10.00 (preregistration is required). Seller setups begin at 8:30 am. Radio and computer gear will be featured and food will be available. Talk-in on .75/.15 and .52. For more information, contact Jon Weiner K1VVC, 52 Overlook Drive, Framingham MA 01701, or phone (617)-877-7166.

ALBUQUERQUE NM
NOV 3

The UNM ARC and the Westside ARC will jointly sponsor a tailgate swapfest on November 3, 1984, from 10:00 am to 2:00 pm MST, on the UNM North Campus parking lot, corner of University Boulevard and Tucker Avenue, Albuquerque NM. Admission is free; bring your own tables as none will be furnished. Talk-in on 147.75/147.15 MHz and 449.3/444.3 repeaters. For further information, send an SASE to Gary Bonebrake K8BI, 974 Arkansas SE, Rio Rancho NM 87124, Robert Scupp WB5YYX, 648 Marquis Drive NE, Albuquerque NM 87123, or Jay Miller WA5WHN, 4613 Jupiter NW, Albuquerque NM 87107, or via 3.939 MHz, 0100 UTC daily.

WEST MONROE LA
NOV 10

The Twin City Hams will sponsor an all-indoor hamfest on Saturday, November 10, 1984, from 9:00 am to 3:00 pm, at the Convention Center, N. 7th Street, West Monroe LA. Features will include exams, swap tables, new-equipment dealers, and a ladies' program. Talk-in on 146.25/.85. For more information, contact Benson Scott AE5V, 107 Contempo, West Monroe LA 71291.

NEWMARKET ONT CAN
NOV 10

The York Region ARC will present the 8th annual Newmarket Flea Market on Saturday, November 10, 1984, beginning at 0800, at the Newmarket Community

Center, Civic Drive, Newmarket (just north of Toronto). Admission is $2.00 per person and children under 12 will be admitted free. Table rentals are $3.00 each plus general admission and will be held only until 0800 unless payment is made in advance (setup is at 0630). Refreshments will be available. For table reservations (include a check or money order made out to the York Region ARC) or more information, contact Geoffrey Smith VE3KCE, 7 Johnson Road, Aurora, Ont., Canada L4G 2A3, or phone (416)-727-6672 (evenings).

NORTH HAVEN CT
NOV 11

The Southcentral Connecticut Amateur Radio Association (SCARA) will hold its 5th annual Electronics Show and Flea Market on Sunday, November 11, 1984, from 9:00 am to 3:00 pm, at the North Haven Recreation Center, Linsley Street, North Haven CT. Admission is $1.50 and children under 12 accompanied by an adult will be admitted free. Tables are $10.00 in advance for the main hall and $12.00 at the door. (Reservations are strongly advised.) Setup will be at 8:00 am, and for new equipment vendors, a special exhibit area with setup security arrangements will be made available. There will be food both at the food booth and from a mobile cart. Features will include the latest in ham radio, computers, and electronics. Talk-in on 146.01/146.61 (W1GB). For more information, directions, and reservations (make checks payable to SCARA), send an SASE to Tony Vanacore AK1O, PO Box 81, North Haven CT 06473, or phone (203)-484-4175 (home) or (203)-239-5321, extension 311 (days).

PENANG, MALAYSIA
NOV 16-18

The Malaysian Amateur Radio Transmitters Society (MARTS) will host the 14th SEANET Convention on Friday, Saturday, and Sunday, November 16-18, 1984, at the Eastern and Oriental Hotel, Penang, Malaysia. Features will include symposiums, luncheons, tours, and rag-chewing. For more details, contact Malcolm Westwood, Organizing Secretary, SEANET, PO Box 13, Penang, West Malaysia.

GREENSBORO NC
NOV 24-25

The 4th annual Greater Greensboro Hamfest will be held on November 24-25, 1984, from 9:00 am to 5:00 pm, at the National Guard Armory, 1100 Franklin Boulevard, Greensboro NC. For advance tickets, send an SASE to Fred Redmon N4GGD, 2305 Sherwood Street, Greensboro NC 27403. For dealers' space, tables, and flea market information, contact Coy Hennis WD4NHL at (919)-294-2841.

OAK PARK MI
NOV 25

The Oak Park High School Electronics Club will hold its 15th annual Swap N Shop on Thanksgiving Sunday, November 25, 1984, from 8:00 am to 4:00 pm, at the Oak Park High School, Oak Park MI. The doors will open at 6:00 am. Admission is $2.00 and 8-foot tables are $6.00. Refreshments will be available. For more information, send an SASE to Herman Gardner, Oak Park High School, 13701 Oak Park Boulevard, Oak Park MI 48237, or phone (313)-968-2675.

HAM HELP

I need a VLF receiving converter similar to the now-discontinued MFJ-332. Its input should be 1 MHz and below, and its output should be on one of the HF ham bands, preferably 10 meters. I will buy a used MFJ-332, a kit, a circuit, or any other equipment.

Roger Coppock
2800 South 10th Ave.
Broadview IL 60153

Would someone please help me find a schematic or manual for a Communications Power, Inc., model WM-1000 wattmeter? I will gladly pay for any costs incurred.

Richard Whipkey AD6X
866 Yolo Way
Livermore CA 94550

Wanted: microwave X-band diodes. All types: detector, Schottky, and Gunn. I can evaluate unknown or unmarked diodes. Also GaAsFET wanted for 12 GHz. Write with price and description or data.

K. Boufal
244 Fitzwater Street
Philadelphia PA 19147

I need to borrow Sam's Photofacts numbers SD-13 and SD-15, so that I might photocopy the sections on the Bearcat BC-210 and the BC-250.

Scott Welch
3015 E. Bayshore Blvd. #113
Redwood City CA 94063

I need help writing a program to interface a TI-99/4A computer to a Kantronics UTU.

Bill Trojanowski N2EZG
RD #2
Alpine NY 14805
(607)-594-3544

Teachers/students—I want to get in touch with those interested in forming a net to use communications in the classroom as part of teaching/learning.

Karen KB6DDQ
PO Box 927
Camarillo CA 93011

HELP! I've inherited a Tennelec Memoryscan MS-2 without instructions. I'm looking for a service manual and code book. I'll pay copying and postage.

Gerald Ruettiger
780 So. Woodland
Orange CA 92669

I am looking for a manual for the TT299B/UG MITE Teletype® unit. Will be glad to pay any reasonable price.

Gordon Willard WA0VNK
12764 Allenhurst Drive
Bridgeton MO 63044

I own two Comtron base power amplifiers, 500-Watt model 974-A, 146-174 MHz, and am in desperate need of an operator's/service manual. I'll pay reasonable copying costs and postage.

Mr. Nick Vukelja
Apartado 6-1826
Panama, Rep. of Panama
Tel. 26-7413

I am looking for an instruction manual and schematic for a Dumont 304-A oscilloscope.

Fred Wood WB3JKC
1020 W. Lanvale St. #1
Baltimore MD 21217

I have a TRS-80C, Kantronics software, and an MFJ TU-1224. I would like to use a Model 28 as a printer. Can anyone help?

John Gill
6000 Duda Rd.
House Springs MO 63051

I need schematics, manuals, and any tips I can get for a Browning model ON-5A oscilloscope. I will gladly pay any costs for mailing and copying. Part of the trace is scrunched up on the right-hand side of the CRT.

Rick Wilson
604 South German Town Rd.
Chattanooga TN 37412

See List of Advertisers on page 98

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 6

employees brought a mass of them.

Between the people at *Byte*, WGI, and WGE in Peterborough, I'll bet there are over 500 Wayne Green people in this town of 5,000. It seems as if I get waved at and greeted by almost every other car as I putt around on my new Yamaha.

By passing along the things I have learned through the years, I've helped at least a couple thousand people learn about publishing, electronics, and computers—and that doesn't count the readers I've influenced. I visited one of the computer publishers a few days ago only to find a solid fan who got hooked while reading *73*. He claimed that my editorials pushed him to get into business—drove him to it. He's worth millions today.

We're moving along to start a magazine publishing institute as soon as we can get a building large enough to handle the project. This will be even better than the system I've used in the past, for every student will not only work at every job on a magazine (from proofreading to collecting for advertising), but will be paid for the work. They'll be working on real live publications, too, not just school stuff. No more of this Catch-22 nonsense of having to have practical experience before you can get a job that will let you get practical experience. Graduates will have a resumé citing plenty of good practical professional experience.

I'm hoping to start a yearly alumni meeting at Comdex. So, if you know of anyone who has worked for me during the last 33 years, have them get in touch. I'm having some special coffee mugs made with the logos of all our magazines as souvenirs. Who knows, I may spring for tee-shirts next year! There are lapses in my usual Yankee thrift approach to life.

The dinner will be November 15th in Las Vegas and I want every Wayne Green alumni who can make it to be there. As far as I know, with the exception of two people who betrayed me, one of whom is dead and the other who has completely disappeared from the publishing and computer scene, every alumni is still a darned good friend.

And, with the Green Publishing Institute opening soon, think how many we'll be seeing next year! The whole computer industry is desperately in need of people with publishing experience. This could help enormously to improve the output of spec sheets and instruction books, give the industry much better advertising and catalogs, and so on.

So, alumni, let's get together at Comdex and celebrate! Drop me a note so I can give you details. I'm looking forward to seeing you again, even if you're working for (sob) *Byte* or Ziff-Davis.

NEWSLETTER OF THE MONTH

MARC
MID-ATLANTIC AMATEUR RADIO CLUB

REMARCS

"All the news that fits, we print" seems an appropriate motto for *REMARCS*, chronicle of the Mid-Atlantic Amateur Radio Club. Editor Kay Craigie KC3LM realizes that no one wants to read endless minutes and committee reports month after month. After all, those who are interested in that brand of tedium can hear it all at the club meeting. Instead, Kay draws upon outside sources such as *Westlink*, *Worldradio*, and the *W5YI Report* to fill *REMARCS* with truly interesting information. For the purist, there are still plenty of club- and member-related articles, and Kay's subtle humor makes even the dreaded meeting announcement a pleasure to read.

On the mechanical side, "immaculate" sums things up. The printing is of professional quality, the pages are nicely composed, and there are no typographical errors to be found. Can you say the same for your group's publication?

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

$$ HOME-BREW III $$

Turn your hot solder into cold cash! Once again, *73* is searching for the greatest home-brewer in the land. All projects have a chance to appear in *73*, and the best of the best will be showered with fame and fortune.

Top prize is $250. Second place is worth $100, and three runners-up will each earn $50. Of course, this is in addition to the payment every author receives for publishing in *73*.

Contest Rules

1. Entries must be received by November 1, 1984.
2. To enter, write an article describing your best home-brew construction project and submit it to *73*. If you haven't written for *73* before, please send an SASE for a copy of our author's guide.
3. Here's the catch: The total cost of your project must be $73 or less, even if all parts were bought new. Be sure to include a detailed parts list with prices and sources.
4. Our technical staff will evaluate each project on the basis of originality, usefulness, reproduciblity, economy of design, and clarity of presentation. The decision of the judges is final.
5. All projects must be original, that is, not previously published elsewhere. There is no limit to the number of projects you may enter.
6. All rights to articles purchased for publication become the property of *73*.
7. Mail your entries to:

73 Magazine
Editorial Offices
80 Pine Street
Peterborough NH 03458
Attn: Home-Brew III

LETTERS

BE A VE

The American Radio Relay League is preparing to serve as a Volunteer Examiner Coordinator (VEC) in each of the 13 FCC call areas (more than one VEC may serve in a particular area). In anticipation of becoming a VEC very soon, the ARRL is recruiting licensed Advanced- and Extra-class radio amateurs to serve as Volunteer Examiners. Applicants are *not* required to be ARRL members to participate. Applicants must, however, hold a current Advanced- or Extra-class license, have no history of license suspension or revocation, and be at least 18 years of age.

The Volunteer Examiner Program covers testing for Technician-, General-, Advanced-, and Extra-class licenses. Novice exams will continue to be given by Novice Examiners under the new Novice rules (97.27 (a) and (c); 97.28 (b); et al); Novice license testing is entirely separate from the Volunteer Examiner Program.

Under the Volunteer Examiner Rules adopted by the Commission, only Advanced- and Extra-class licensees may administer exam elements above the Novice level (97.28 (a)). Extra-class licensees may administer all written and Morse-code elements; Advanced-class licensees may administer only exam Elements 1A, 2, and 3 (Elements required for the Technician license). And, of course, you must be accredited as a Volunteer Examiner by a VEC before you are authorized to administer any upgrade examinations.

If you qualify and are interested in participating as a Volunteer Examiner with ARRL's VE Program, please request an application by writing to Volunteer Examiner Accreditation, American Radio Relay League, 225 Main Street, Newington CT 06111.

Steve Place
ARRL
Newington CT

EARN IT

I agree with the editorial comment in June, 1984, that ham radio is in trouble. There are so many hams like my friend who upgraded a desire to use our designated frequencies to a "right" to those frequencies. There is no such thing as a right. We have to earn the use of the bands

we occupy. The only way I can see to earn them is through the emergency service route. I can't see how we can do it through our advances in technology like we have done in the past. Some hams claim to be advancing technology through their use of computers attached to peripherals for RTTY, CW, packet, AMTOR, and whatever. In my mind those aren't advances. Any Bash graduate who doesn't own a soldering iron can plug those store-bought boxes together and claim he's a great innovator.

But how in the world do we start from scratch and truly do some real ham-style developing? To me that is a serious question.

What's the difference between my sitting here in my shack running my keyboard on AMTOR or packet? I didn't build these things. I bought them. I feel this keyboard operating is not one step above gibbering on SSB. In fact, I think keyboard is beneath CW, particularly on a hand key or my 1939 McElroy Bug! So where do I go technically on the HF bands? (Moonbounce is something else.)

I grant you that traffic by keyboard and printer is a good emergency mode. But damn, I can't see it even after I bought the junk to do it. AMTOR? It's as dull as keyboard CW. Same for packet. No skill.

I'd like to experiment with digital voice. I know how AT&T's "T Carrier" works and their digital radio works, but I don't know how to build an experimental system or where I can get parts if I knew how to do it. So much for my innovating.

Let's test for CW proficiency. Good idea. Let's periodically examine state-of-the-art knowledge as well. Forget this grandfather business and let's make all ticket-holders prove they deserve their operating "rights" and station license.

By definition, I'm not a curmudgeon, but I'm in the retired bracket that you so labeled. I've had a ticket since 1940 and an Extra class since the days when the RI made me send the 20-wpm test on a hand key. I like to experiment, but I do use the KISS approach.

Enough of this blithering. We have to protect the frequencies that we are permitted to use. We need the energy of the young. But I don't know how to attract them. I loaned receivers to two teenagers and about three months later they gave them back and told me that hams are no different from the CBers they talk to. Now what?

I hate to see the ultimate loss of the ham bands, but unless we start earning them, no equipment manufacturers' lobby will save us.

Keep writing and I'll try to stir up some ARES type of action out here.

Ken Uthus KT7E
Nine Mile Falls WA

SUPER

Well, once again I am impressed by *73*. I took a while to type the code program in "Sounds Good to Me," June, 1984. Mike W5VKC/1 and Rick WB5AYD did a great job of putting it together. Congratulations to them for it. They at least took the trouble to translate it for both the VIC-20 and the C-64. That is not done in some magazines.

As per usual, my typing contained a multitude of mistakes. I listed the results to my printer, proofread it (I thought), and sent Mike a copy and asked him to tell me what happened. I was expecting a letter in about a month. I was surprised to receive a personal phone call from Mike (and it was not even collect!). He straightened me out on the mistakes that I had typed in and one that I missed in the translation in his printer. When I corrected my mistakes, the program worked!

Today in the mail I received an MCI Mail from Mike telling me what we discussed over the phone. What service!

Keep up the good work. I have *73*s dated to September, 1968 (73 cents yet). The collection is not complete but it is large. I read with delight your petition to the FCC about the code. I agree with you on your stand on the no-code license and the stiffer theory requirement.

Your *RUN* magazine is on my computer shelf. I have a Commodore 64 and a VIC-20 that I use for RTTY on the HF bands. I am not active on HF now because I need to work over my HF rig. It won't cooperate with me when I send RTTY tones through it. I have the C-64 capable of RTTY through the Santa Fe 147.81/.21 repeater. Not much activity except me right now. Hope I can have someone to talk to soon.

Another of your writers deserves a large pat on the back—Jim Grubbs. I followed his articles in *Commander Magazine*. I corresponded with him via word processor and he was a great help.

Thanks for lending me your ear (eye?), Wayne. Once again keep up the good work. Your people are super.

Alan F. Hill N5BGC
Santa Fe NM

BECKONING BEACON

I have had a beacon operational for over a year. The beacon is on 24 hours a day, seven days a week. Although I have received many QSLs from around the country, a little publicity of the beacon's frequency would be very helpful. I have placed the beacon high in the six-meter band so as not to interfere with local activity and thus it is not easily found. The frequency is 50.440 and the location is Burlington, Connecticut. QSL to K1NFE at PO Drawer M, Plainville CT 06062.

A. DePascale K1NFE
Plainville CT

THANKS, FRANK

I noted in your July, 1984, editorial that you have sold a bunch of your magazines. I sincerely hope this did not include *73*, or at least that you will still retain editorial control over this magazine.

I held a ham ticket from 1948 to 1975, when I let my license lapse, beginning as

See List of Advertisers on page 98

Chief Operator of XAFQ/Trieste, then W5PVE, W2MJF, W8WUN, and W4LJD. I intend to get my code speed back up a bit—I once could copy 35 wpm solid with a stick, but right now 10 wpm poses a bit of difficulty. I'll brush up on theory and take the exam again for a General-class ticket. Then I shall be QRP on CW from 40 through 10. In 1949, I put K4WAR/A4WAR on the air with separate kWs on all bands and a nice antenna farm at Camp (now Fort) Gordon GA. I had some patents issued during the 1950s resulting from electronics design for missile guidance in the 1950s, and from 1955 to mid-1959, I was first a Project Engineer and then a Senior Engineer with Heath Company, Benton Harbor MI.

In fact, I once sold you a short story, "Ed McGurk Makes WAS on Two Meters," which appeared in *CQ* in December, 1955, when you had that magazine—and it was a good magazine then, too. Incidentally, I received $35.00 for the story and Pappy Lynn got $50.00 for the cartoon illustrating it! Maybe I should have been an artist!

Sorry about the reminiscing. What I really started to say was that some months ago I subscribed to *QST, CQ,* and *73.* I am letting my subscriptions to *QST* and *CQ* run out, but I'm definitely keeping *73* because it seems to be the best ham magazine among the three at present. I particularly like the construction articles, but then, I like most everything else in the magazine, too. *CQ* isn't totally a loss, but *QST* is a far cry from the great magazine it was in the '40s '50s, and '60s, and definitely not worth the price anymore, to my way of thinking.

I was unaware that you were a Mensan until I noted your name in the *Register* a few years ago. I finally got around to joining the group in 1973 and am still a member.

Anyway, whatever you do, don't let *73* go the way of the other ham rags—I still have about a year to go on my subscription and intend to renew.

J. Frank Brumbaugh
Bradenton FL

CRISIS

I enjoyed your editorial in the June issue of *73* very much. Like your other editorials, it was a breath of fresh air compared to the usual vapid commentaries found in other publications. I completely agree with your comments about Morse code. I have on occasion "read the mail" (a most curious expression) on traffic nets on 2 meters and HF (more on the former) and have been totally amazed at how completely useless and boring it all sounds. In short, your conclusions about the present state of amateur radio are correct, in my opinion.

With the essentials of your argument granted, what can be done to correct the problem? I think it would be useless to go to the ARRL about upgrading the current state of radio technology since they appear to be the bastion of outmoded technology. What other groups in ham radio exist that are interested along these lines, and which could be used to bypass the intellectual ballast residing at the ARRL? (This is clearly, in my opinion, the only course open.)

Finally, are the normal emergency services (i.e., police, fire, civil defense, Red Cross, and National Guard) willing to interconnect with amateur radio? Or do they view amateur radio as completely useless (perhaps with justification)? These are just some of the questions that *need* to be answered. Can you suggest where I might look?

There is one point that you made which is in error. I do not believe that there are more technical graduates in Japan because they have a no-code license. What motivates an individual to go into a particular work? Interest in that field *and* the belief that it is worthwhile. If a person is taught that scientific and industrial progress (or progress alone for that matter) is good, then, if he has the interest, he'll choose such a career. But if (as he is taught in the US today) he is taught that scientific and industrial progress is evil, that reason is impotent, etc., then he will not go into those areas, even if he has the interest! After all, why become an engineer when objectivity is impossible and there are more important social concerns (I don't agree with either idea). Thus, this crisis (i.e., lack of young technical people) is just the tip of a larger philosophical crisis, in my opinion! It is a mistake to view it in any other way.

Japan, for the most part (as witness their expansion in reason-oriented areas), does not suffer to the same extent from this philosophical crisis. I believe that the Japanese have a better grasp of the essentials of this issue and are doing better, which is *why* they have a no-code license (i.e., the no-code license is a result and *not* a cause).

Thank you and keep up the good work!

Chris O'Hara N1CRA
Fairfield CT 06432

The bankruptcy of amateur radio is still a well-kept secret. Having worked on NIAC with representatives of the other communications services, I can assure you that word has not yet leaked out as to the disaster we've generated and we will still get full cooperation.—Wayne.

SOFTWARE PIRACY

There is a problem in the amateur-radio fraternity. . . software piracy. Whether by ignorance or simple disregard for the law, many amateurs are stealing copyrighted programs. Most do not consider their theft a crime or a serious problem, but unless this practice is discontinued, amateur radio will suffer.

With the influx of computers into the hobby, a degree of software piracy was inevitable. Unfortunately, the problem has become a blemish on amateur radio. Thousands of dollars have been spent in litigation involving software piracy outside the hobby, and I had hoped amateur radio would police the problem internally and not require legal action. Sadly this is not the case.

I recently confronted two hamfest exhibitors who were selling copies of a Kantronics program. These people were copying and selling our programs to any amateur willing to pay the price. I bought one of the programs for evidence and informed the seller that legal action would be taken. This person was not a ham, but those buying the programs were. We have several other examples of programs copied and sold.

There are a few simple steps we can all take as those interested in seeing the problem solved:

1. Never buy copied software.
2. Report pirates to the software manufacturer.
3. Don't allow illegal sales at your local hamfest.

Kantronics plans to prosecute those who steal our programs, as we have in the past. But without the assistance of the entire amateur community, the manufacturers will not be able to stop pirates from stealing their profits. If manufacturers are not able to sell enough product to make a profit, other new and improved programs will not be written. Don't let the greed of a few deny the hobby of future expansion. Let's throw the bad apples out before they ruin the whole barrel.

Mike Forsyth
Marketing Director
Kantronics, Inc.

SHARING IDEAS

"Perfboard and Soldertail?", which appeared in the July, 1984, issue of 73, has brought some welcome correspondence. The letters below add some important ideas to those in the article. More importantly, they illustrate one of the most important ideas in ham radio: the willingness to share freely experience and ideas that might help other hams. I want to thank both gentlemen for writing and for adding to my own stock of construction ideas. No one knows everything, and perhaps it is even true that none of us knows very much. But together, we know a lot of very useful things about many matters.—L. B. Cebik W4RNL.

I read your article in *73* for July, 1984, "Perfboard and Soldertail?", with interest. I have been a ham for over 40 years and have constructed countless projects. The ideas you described are good, and I picked up a few new thoughts from your text. Many thanks!

I'm writing to pass along a few tips that I have found helpful, in the hopes that you can use them, too. Here they are!

Cutting perfboard and PC material is easy to do without sawing. If you score both sides heavily (I take a couple of passes per side with the board held flat on an old magazine, using a heavy razor knife from the hardware store—the kind of knife that has replaceable blades—I use one made by Millers Falls that stores the blades in the heavy aluminum handle), it will break cleanly along the score. It hardly even needs touch up with a file for neatness, but that is a good finishing touch. I find it much easier than sawing, and I have never had a split or chip.

You are right about pencil marks causing leakage paths with CMOS circuits. Another maddening cause of the same thing is solder flux, which causes a problem when the humidity is high. The only cure I have found is to use a commercial flux remover on the board (Radio Shack's is OK). Isopropyl alcohol does not work well and sometimes makes the problem worse due to its water content.

Forming leads on small parts can be done beautifully with a small pair of "chain-nose" pliers. Available in good hardware stores and hobby shops, the jaws have circular cross section. They are not really as suited for gripping as regular pliers, but they do a swell job of forming nicely rounded bends. I think they were originally designed to make small chain links.

I also find it very helpful to keep one of those tapered red-plastic lead formers handy, to get the exact lead spacing on resistors, etc. I think you can get them from Radio Shack, but I have had mine so long, I am not sure.

I have had problems drilling large holes, say, over about 3/16 inch. I find the board often cracks if the hole is near an edge. I have been using two reamers instead. One is a regular T-handle 1/8-to-1/2-inch size, and the other is a model-maker's reamer (from Brookstone) that goes from almost nothing to about 1/8 inch. Perfboard material is so soft that you can often ream a super quality hole faster than setting up to drill it. It also is a good solution for that hole size for which you don't have a drill.

When mounting a PC or perfboard parallel to the chassis surface, I always have (it seems) minor problems getting all holes to line up. It seems to work better for me to not use 4-point mounting (mounts in the corners), but to use 3-point mounting instead. Generally, when things don't quite line up, only one hole need be moved. Three points determine a plane, and it works well for me.

A really neat way to mount boards, when you are pretty sure the debugging phase is over, is to mount them parallel to the front panel, supported on the front-panel controls. For example, if you have a couple of switches and a pot, it usually is possible to arrange the parts so that selected surfaces are equidistant from the panel surface. You can either epoxy (if you are really sure!) the board to the controls (such as to the back surface of a pot) or (better) solder the lugs of the switches to pads on the PC board through small access holes. It sounds cumbersome, but it often can be done and leads to a really nice looking arrangement. On occasion, I have used this technique by soldering heavier-than-usual leads on the panel controls (#16 or #18 wire) and passing these leads through the perf- or PC board, soldering them to pads, etc. With several such leads, the whole thing is surprisingly sturdy. The rest of the chassis is yours to do with as you like—it is like free additional space!

When using quite thin wire (such as wire-wrap wire), if the long runs are left quite loose, after the job is done, it can be made to look neater by pulling a loop of the long lead through an unused hole on the perfboard, just to tighten up the lead. Judicious selection of the "stitch" hole can also restore those right-angle bends to otherwise diagonal runs.

A super easy way to make PC boards from articles when you wish to etch the board conductors is to do the job backwards. Instead of etching and then drilling, make a photocopy of the board from the magazine and scotch tape it to the PC board. Using a small drill (I really prefer the hand-held battery-powered jobs; they are easier to control and more convenient than a big drill or a Dremel tool, unless you have a permanent shop setup), drill right through the photocopy and your PC board, until all holes are in place. Then remove the photocopy, deburr as necessary, and scrub the copper surface in the kitchen sink using SOS scouring wool. When the copper is bright, rinse it and leave the tiniest trace of regular dishwashing detergent on the surface. It will cause etch-resist pens to write beautifully. With little effort and practice, you can draw the conductors; you can even make a hybrid arrangement with some prepared wax patterns, IC pads, if you wish. It is also your golden opportunity to add your name, call, date, revision number, or whatever. After the board is etched, a little cleaning is all you need before stuffing. Try it, you'll like it!

As I said, I enjoyed your article and hope you find one or more of my ideas to be helpful, too.

Warren Offutt AF9Q
Geneva IL

I read your article in *73* on perfboard construction practice. Very thorough, but I would like to add my two cents:

I have gravitated away from using phenolic perfboard because it is so *fragile* and doesn't have a high enough insulation resistance for some high-impedance

circuits. The same goes for epoxy paper. They are moisture sensitive.

I prefer to use G10 or FR4 (or similar) epoxy-fiberglass perfboard. One source is Vector P pattern, available from industrial electronics parts houses. It is easily cut by scoring it on both sides with a utility knife held against a straightedge, clamping the part in a vise or between a tabletop edge and a rigid sheet of metal, etc., and then giving it a "karate chop" to get a clean break. The extra expense of the premium perfboard is well worth it in avoiding duplication of effort if the circuit is dropped or doesn't work right.

I have even used G10 perfboard for rf circuits. Vector sells a version with *continuous copper* on both sides. Isolated pad "cookie cutters" are then used to develop a circuit. These tools are available from Vector or A. F. Stahler (if they are still in business). Stahler parts were carried by Trumbull (if he is still in business). I believe I bought a "bubble etcher" from Trumbull a while ago, but I have mislaid it because I have moved several times since. I would like to locate Trumbull again or someone who has taken over the line. I use perfboard for breadboards and prototypes, and PC for finished models if it is worth the effort.

Two useful tools for working epoxy-glass perfboard are a "nibbling tool" (to cut irregularly shaped holes) and a "tapered reamer" (to enlarge round holes drilled with a hand-twist drill chuck). These are available from Sears, Radio Shack, etc.

I agree that it is wise to socket all semiconductors in a breadboard. Also, those threaded metal spacers (Mouser? et al) are very useful to aid in mounting. Masking tape and a ball-point pen can provide labels of important circuit tap points. Wiring going off the perfboard should be stranded/insulated, but solid insulated will work on-board.

Well, that's all I have to relate, now. I am not a ham yet but am an electrical engineer in telecommunications circuit design. I am working towards a Technician's license because I got interested in homebrew microwave and satellite TV links and need a ticket to transmit. MDS downconverters can be used on 2304 MHz.

Keep up the good work. With much of electronic technology going to Japan, it is difficult for a new engineer to gain practical experience. Ham radio is a useful thing to an American technician or engineer wishing to hone his skills.

Raymond Barcklow, Jr.
Columbia SC

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

WORLDWIDE AWARDS DIRECTORY

If you like to go after awards or win contests, this directory is a must! Volume 1 lists over 270 awards from all over the world with names and addresses, costs, and descriptions. $9.95 brings Volume 1 to your doorstep. Volume 2 is in production now and will cost $5.95 for an additional 130 awards. Why not order Volumes 1 and 2 for a combined price of $12.75? The *Worldwide Awards Directory* is for the amateur-radio operator who is interested in showing his proficiency at radio communications to others throughout the world. You will never know how easy it is unless you know how to go about it. You probably already have enough QSLs in your files for some of the awards. $9.95 includes all postage and handling. COD extra. Quantity discounts available.

Also, if you know some awards that you would like listed, please let Larry know and they will appear in the next volume. Write to: Larry Kebel KB0ZP, 736 39th Street, West Des Moines IA 50265.

INLAND STEEL ARA

The Inland Steel Amateur Radio Association will operate special-event station K9DWL to commemorate The Little Red School House and Hammond, Indiana's centennial year, from 1400Z to 0000Z on Saturday, October 6, 1984. Frequencies: phone—General-class portions of 10, 15, 40, and 80 meters; CW—Novice-class portions of 10, 15, 40, and 80 meters; 2-meter FM—146.42 simplex. Send legal-size SASE for certificate to Lucy Schendera N9DTG, 812 E. 40th Place, Griffith IN 46319.

ST. PETERS ARC

The St. Peters Amateur Radio Club will operate a special-event station from 1700 UTC, Saturday, October 6, to 1700 UTC, October 7, at the Daniel Boone Home, Femme Osage Valley, St. Charles County, Missouri. The event is to commemorate the place where Daniel Boone; frontiersman, judge, trapper, surveyor, builder, and family man, spent the last twenty years of his life. The weekend celebration features a black powder marksman contest for local participants. One complete 2-way contact is needed to obtain a presentation-quality certificate on aged parchment featuring a picture of the Boone Estate and an information brochure of Boone facts. SPARC will operate KB0J on plus or minus 3.915, 7.240, 14.280, 21.420 depending on conditions and band activities. A coonskin cap will also be awarded to the first operator making contact on all four bands. One dollar or 3 IRCs with calls and time of contact should be sent to Tim Haake WA0TSY, 128 Lake Point Drive, St. Peters MO 63376.

CENTER OF THE US

The Central Kansas ARC of Salina KS will operate W0KQU from the marker of the geographical center of the US in Lebanon KS. Operation will be from 1700Z October 6 till 1900Z October 7, 10 kHz up from the lower end of the General-class 10–80-meter bands. Certificate via KB0BH, 2358 Aurora Ave., Salina KS 67401.

COLUMBUS DAY

The Columbus Amateur Radio Association will be holding its second annual Columbus Day Special Event to provide a triple salute to Christopher Columbus, the City of Columbus, and amateur radio worldwide, on October 6–7, 1984. CARA's club station, W8TO, located at the Center of Science and Industry, will try to contact as many stations as possible around the world.

Eligibility

Open to all amateur-radio operators worldwide, to be divided into two groups: Columbus OH (and suburbs) amateurs; all other amateurs.

Bands

Saturday, October 6, 1984—1400Z to 2400Z—15 meters phone at 21.375 MHz ± 10 kHz.

Sunday, October 7, 1984—1400Z to 2400Z—40 meters phone at 7.240 MHz ± 10 kHz.

Exchange

Name, QTH, and RST.

Scoring

One point for each contact (excluding W8TO), six points for a W8TO contact. A final score of 10 must be submitted to be eligible for a certificate. Scores must be submitted within 120 days to be valid. Certificates will be issued to all qualifying amateurs who include an SASE (SAE and 3 IRCs for DX). SWLs may receive the certificate on a station-heard basis.

A mini contest will be in operation during the event period; the highest score from a Columbus amateur will receive a plaque.

All requests for certificates and correspondence should be sent to Amateur Radio Station W8TO, Attn. Special-Event Coordinator, 280 East Broad St., Columbus OH 42315.

CENTER OF US POPULATION

The Jefferson County Amateur Radio Club will be operating special-event station KA0IAR from De Soto MO, the center of US population, on October 13, 1984, from 1500Z to 2400Z.

Operation will be in the lower ends of the 40-, 20-, and 15-meter General bands. There will be some CW in the Novice portion of the same bands.

For a certificate, send an SASE and QSL to KA0IAR, 3009 High Ridge Boulevard, High Ridge MO 63049.

HAT ROCK

The Hermiston Amateur Radio Club will operate KC7LK from Hat Rock State Park from 1800 GMT, October 13th, to 0100 GMT, October 14th, and between 1800 and 2200 GMT on October 14th. The station is commemorating the 179th anniversary of Lewis and Clark's visit to Hat Rock and will be operating in conjunction with the Oregon QSO party.

Operation will be on the General phone and Novice CW bands. There will also be some 2-meter and 440-MHz operation. For a certificate, send on SASE and your contact number to the Hermiston Amateur Radio Club, PO Box 962, Hermiston OR 97838.

QUEEN CITY

The Clarksville Amateur Transmitting Society will be operating a special-event station celebrating the 200th anniversary of Clarksville TN, the Queen City on the Cumberland River. The dates and times are as follows: October 13, 1984, from 1400Z to 2400Z and October 14, 1984, from 1800Z to 2200Z. The call of this station will be N4GMT. Modes of operation will be SSB, CW, and RTTY. Frequencies of operation will be around 21.375 MHz, 14.280 MHz, and 7.240 MHz. A commemorative QSL certificate will be sent for every SASE received. QSL via KB4EFW, Rt. 1 Box 162A, Indian Mound TN 37079.

SUNBELT AGRICULTURAL EXPO

The Colquitt County Ham Radio Society will be operating club station WD4KOW from the site of the seventh annual Sunbelt Agricultural Exposition on October 16, 17, and 18, 1984. The hours of operation will be 0900 to 1700 EDST each day.

This annual Sunbelt Expo is held each year at Spence Field Airbase, located near Moultrie, Georgia, and is the largest agricultural show in the South. This event draws over 200,000 visitors from all over the United States and foreign countries.

Operations will be in the General portion of the HF bands. The members will also be listening for visiting hams on the local repeater 146.19/.79. Visiting hams are invited to visit the amateur booth at the Expo and operate the amateur station.

A special QSL card is available for those making contact during this event and submitting an SASE.

J. GORDON COOGLER POETRY FESTIVAL

On Saturday, November 3, 1984, K4MJN will operate a special-event station in Blythewood SC to commemorate the birthplace of J. Gordon Coogler (1865-1901).

J. Gordon Coogler has been acclaimed by literary critics as the WORST practicing poet in US literary history! His verses are now known as Cooglerisms, as is any other work since that falls into that same critical disdain. Many literary societies of today award the Coogler Award for the worst published works of the year. But here in Blythewood (Population 93) we're very proud of our native son and celebrate his accomplishments with a festival and poetry contest.

K4MJN will operate on or around 14.290 MHz from 1400Z to 1800Z and on or around 21.390 MHz from 1800Z to 2200Z. Join us!

All stations working K4MJN during this second annual festival will receive a handsome certificate with a photo of The Bard of Blythewood and some of his poetry. Send a large business-size SASE with your QSL and contact number to J. David Suggs K4MJN, Rt. 3, Box 154, Blythewood SC 29016.

BOMB SQUAD

The BOMB Squad (Best of Mt. Baldy) will operate W6HCP (Hollywood Christmas Parade) from 1600Z on November 25 to 0400Z on November 26, 1984. Operation from the parade communications center of the 1984 Hollywood Christmas Parade will be on 7.284, 14.284, and 21.284 MHz, SSB. SASE to W6GVR for special commemorative QSL.

WORKED ALL ZONES

The WAZ Award is issued to any licensed amateur station presenting proof of contact with the forty zones of the world. This proof shall consist of proper QSL cards, which may be checked by any of the authorized *CQ* checkpoints or sent directly to Mr. Leo Haijsman W4KA, WAZ Award Manager, 1044 Southeast 43rd St., Cape Coral FL 33904. Many of the major DX clubs in the US and Canada and most national amateur-radio societies abroad are authorized *CQ* checkpoints. If in doubt, consult the WAZ Award Manager. Any legal type of emission may be used, providing communication was established after November 15, 1945.

The official *CQ* WAZ zone map and zone list will be used in determining the zone in which a station is located.

Confirmation must be accompanied by a list of claimed zones using *CQ* form 1479, showing the call letters of the station contacted within each zone. The list should also clearly show the applicant's name, call letters, and the complete mailing address. The applicant should indicate the type of award for which he is applying, such as all-SSB, all-CW, or mixed. In remote locations and in foreign countries, a handwritten list may be submitted and will be accepted for processing, provided the above information is shown.

All contacts must be made with licensed, land-based, amateur stations operating in authorized amateur bands.

All contacts submitted by the applicant must be made from within the same country. It is recommended that each QSL clearly show the station's zone number. When the applicant submits cards for multiple callsigns, evidence should be provided to show that he or she also held those call letters.

Any altered or forged confirmations will result in permanent disqualification of the applicant.

Include with the application the processing fee (*CQ* subscribers—$4.00; non-subscribers—$10.00) and a self-addressed envelope with sufficient postage stamps or IRCs to return the QSL cards by the class of mail desired and indicated. *CQ* subscribers should include a recent mailing label (or copy) with application. IRCs equal in redemption value to the processing fee are acceptable. Checks should be made out to Mr. Leo Haijsman, WAZ Award Manager.

In addition to the conventional certificate for which any and all bands and modes may be used, specially endorsed and numbered certificates are available for phone and single-sideband operation. The phone certificate requires that all contacts be two-way phone; the SSB certificate requires that all contacts be two-way SSB.

If, at the time of the original application, a note is made pertaining to the possibility of a subsequent application for an endorsement or special certificate, only the missing confirmations required for that endorsement need be submitted with the later application (provided a copy of the original authorization signed by the WAZ manager is enclosed).

Decisions of the *CQ* DX Awards Advisory Committee on any matter pertaining to the administration of this award will be final.

All applications should be sent to the WAZ Award Manager after the QSL cards have been checked by an authorized *CQ* checkpoint.

Zone maps, printed rules, and application forms are available from the WAZ Award Manager. Send a self-addressed envelope (4" × 9-1/2") with 28 cents postage, or a self-addressed envelope and 2 IRCs. For rulings on borderline areas, consult the WAZ Award Manager.

Single-Band WAZ

Since January 1, 1973, WAZ Awards have been issued to licensed amateur stations presenting proof of contact with the 40 zones of the world on one of the five high-frequency bands, 80–10 meters. Contacts for a single-band WAZ award must have been made after 0000 hours GMT, January 1, 1973. Proof of contact shall consist of proper QSL cards checked by the DX Editor, the WAZ Manager, or an authorized *CQ* checkpoint. Single-band certificates will be awarded for both two-way phone (including SSB) and two-way CW. The single-band WAZ program is governed by the same rules and uses the same zone boundaries as the regular WAZ Award.

5-Band WAZ

On January 1, 1979, the *CQ* DX Department, in cooperation with the *CQ* DX Advisory Committee, announced the 5-band WAZ.

Applicants who succeed in presenting proof of contact with the 40 zones of the world on the five high-frequency bands—80, 40, 20, 15, and 10 meters (for a total of 200)—will receive a special certificate in recognition of this achievement.

These rules were in effect as of July 1, 1979, and supercede all other rules. Five-band WAZ will be offered for any combination of CW, SSB, phone, or RTTY contacts, mixed mode only. Separate awards will not be offered for the different modes. Contacts must have been made after 0000 hours GMT, January 1, 1979. Proof of contact shall consist only of proper QSL cards checked by the WAZ Award Manager. The first plateau will be a total of 150 zones on a combination of the five bands. Applicants should use a separate sheet for each frequency band, using *CQ* form 1479.

A regular WAZ or single-band WAZ will not be a prerequisite for a 5-band WAZ certificate. All applications should show the applicant's WAZ number.

After the 150-zone certificate is earned, the final objective is 200 zones for a complete 5-band WAZ. *CQ* is donating plaques for the first 5 winners, after which the applicant will have a choice of paying a fee for his plaque and/or applying for an endorsement commemorating this achievement.

The applications should be sent to the WAZ Award Manager. The 5-band Award is governed by the same basic rules as the regular WAZ and uses the same zone boundaries.

PETERBOROUGH ARC

The Peterborough (Ontario) Amateur Radio Club is offering a distinctive bicentennial certificate to amateurs contacting Peterborough amateur stations during 1984. Ontario stations must contact five Peterborough amateurs, North American stations must contact two, and DX stations must contact one. Use any band, any mode.

Send $1 and a list of contacts as well as date and time of contact (no QSLs required) to: Peterborough Amateur Radio Club, PO Box 1205, Peterborough, Ontario K9J 7H4.

ISLAND DX AWARD

The IDX Award, sponsored by the Whidbey Island DX Club, is one of the most sought after awards in the DX community. This award is available to licensed amateurs and shortwave listeners worldwide.

The IDX Award is issued for SSB, CW, RTTY, SSTV, and mixed mode, as well as for mixed- and single-band accomplishments. Applicants must work fifty (50) IDX islands for the basic award. Endorsements are given in increments of 50 islands, up to and including the maximum number of islands possible.

Only DXCC countries which are bona fide "islands" are qualifying contacts. A special IDX listing appears within this column. To be valid, all contacts must have been made after October 1, 1977.

To apply, prepare a list of qualifying contacts in prefix order. Please number your contacts 1 through 50, etc. Include the call of the station worked, IDX island name, band, mode, date, and GMT.

Do not send QSL cards! Have your list verified by two amateurs or local radio-club officials. Confirmation of each contact must be in the applicant's possession at the time it is being verified. Send list of contacts along with $4 in US funds only and a business-size SASE to the following address (foreign stations may substitute 20 IRCs for the fee): Whidbey Island DX Club, Attn: IDX Award, 2665 North Busby Road, Oak Harbor WA 98277.

Rules governing this award program are reviewed annually in the month of September. Please enclose an SASE with any enquiries regarding this award program.

The IDX Awards Program uses DXCC countries which are bona fide "islands" as recognized by the National Geographic Society. The first criterion is that each must have been a DXCC country on or after October 1, 1977, as stated on the DXCC List of the ARRL. Any "qualifying" DXCC country omitted from this list by error or which has been recognized for DXCC after the release of this listing will be added the next time it goes to press. In the meantime, applicants may count the new countries in their tally.

ISLAND DX COUNTRY LISTING

A3	HK0 (Bajo)	PY0 (Trini)	VS6
A9X	HK0 (Malp)	S7	VS9 (See 8Q)
BV	HK0 (San An)	S9, CR5	VS9K
C2	IS	SV (Crete)	VU7 (Andaman)
C6	J3, VP2G	SV (Dodecan)	VU7 (Lacca)
CE0A	J6, VP2L	T3, VR1 (Central Kiribati)	XF4
CE0X	J7, VP2D	T3, VR1 (East Kiribati)	XP (See OX)
CE0Z	JA–JR, KA	T3, VR1 (West Kiribati)	YB, YC, YD
CO, CM, KG4	JD, KA1 (Mina)	TF	YJ
CT2	JD, KA1 (Ogasa)	TI9	YV0
CT3	JD, 7J1 (Okino)	UA1, UK1 (Franz Jos)	ZD7
D4	JW	VE1 (Sable)	ZD8
D6	JX	VE1 (St Paul)	ZD9
DU	KG4 (See CO, CM)	VK (Lord Howe)	ZF
EA6	KH1, KB	VK9 (Willis)	ZK1 (North)
EA8	KH2, KG6	VK8 (Christmas)	ZK1 (South)
EI, GI	KH3, KJ	VK9 (Cocos)	ZK2
FB8W	KH4, KM	VK9 (Mellish)	ZL (New Zealand)
FB8X	KH5, KP6 (King)	VK9 (Norfolk)	ZL (Auck-Camp)
FB8Z	KH5, KP6 (Palmyra)	VK0 (Heard)	ZL (Chatham)
FC	KH6, AH6, WH6, NH6 (Haw)	VK0 (Macquarie)	ZL (Kerm)
FG (Guad)	KH6, KH7 (Kure)	VP2A	ZM7
FG, FS	KH8, KS6	VP2D (See J7)	ZS2 (Mari-Pr Ed)
FH8	KH9, KW	VP2E	1S
FK	KH0, KH2, KG6 (Mari)	VP2G (See J3)	3B6, 3B7
FM	KC6 (West)	VP2K	3B8
FO (Clipperton)	KC6 (East)	VP2L (See J6)	3B9
FO (Tahiti)	KP (Desoth)	VP2M	3C0
FP	KP1, KC4 (Navassa)	VP2S	3D2
FR (Glor.)	KP2, KV	VP2V	3Y
FR (Juan)	KP3, KS4, HK0 (Ran-Ser)	VP5	4S
FR (Reunion)	KP4, NP4 (Puerto Rico)	VP8 (Falkland)	5B, ZC
FR (Tromlin)	KX	VP8, LU (Orkney)	5R
FW	OH0	VP8, LU (Sandwich)	5W
G, GM, GW (G. Brit)	OJ0	VP8, LU (Shetland)	6Y
GC, GU (Guern)	OX, XP	VP8, LU (Georgia)	8Q, VS9
GC, GJ (Jersey)	OY	VP9	8P
GD	P29	VQ9	9H
GI, EI	PJ (Neth Ant)	VR1 (See T3)	9M6, 9M8 (See VS5)
H4, VR4	PJ (St Maarten)	VR4 (See H4)	9V
HC8	PY0 (Fern)	VR7	9Y
HH, HI	PY0 (Peter-Paul)	VS5, 9M6, 9M8	

HAROAA AWARDS

These awards are of high quality and will make a very nice addition to any radio room. The awards are available to all licensed amateurs and amateur stations. Please do not send QSL cards. A list showing full details of the contacts (log information) should be certified by one other amateur or radio-club officer. Photocopies of your QSL cards or original log will also be permitted. At your request,

special endorsements will be added such as: CW, SSB, all YL, QRP, RTTY, SSTV, one band, etc. If you so desire, you may request separate awards for each special endorsement. Contacts may be made over any period of years. Contacts made through repeaters cannot be used. Satellites are permitted. Please pass this award information along to another amateur or post it at your local club. All correspondence or applications should be sent to: HAROAA, PO Box 341, Hinckley OH 44233, Attn: Awards Manager Gary Zimmerman WB8RTR.

Application for each award must be accompanied by three US dollars to cover handling and award costs. Payment may be made by cash, personal check, money order, ten IRCs, or first-class-rate US postage stamps. DX applicants may send a money order made out in US funds, ten IRCs, or any of the above.

If at any time your award is lost, misplaced, or damaged in any way, send the date, award number, and pertinent information and we will replace it free of charge. All awards include the special HAROAA gold seal.

Great Lakes Award

This requires one contact with each state bordering the Great Lakes: New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, and Minnesota.

Super Certificate Hunter Award

This HAROAA award is designed for the serious certificate hunter. To earn this award, you must have a minimum of ten amateur-radio operating awards. Simply list the awards that have been issued to you. Special endorsements are 10, 25, 50, 75, and 100 plus.

HAROAA DX Award

This is obtained by working DX stations. It is the number of stations worked that is important. Each DX station counts as one, even if several are from the same country or area. Special endorsements for this award are 10, 25, 50, 75, 100, 200, and 500 DX contacts.

HAROAA Insomnia Award

This award is earned by communicating with one other amateur-radio station for a minimum of one hour between the hours of 1:00 and 5:00 am. A super conversation piece for your shack.

HAROAA Super Operator Award

This certificate is rendered for those providing a service on behalf of amateur radio such as weather observation, public service, emergency work, helping a new ham, providing communications for a community function, etc. The requirements are for the applicant to briefly describe the event or service. The officials of HAROAA will determine whether it deserves this special recognition.

HAROAA Official Traffic Handler Award

This award is a self-issued achievement, allowing you to display the fact that you are indeed an official handler of radio traffic.

WORKED TRUMBULL COUNTY AWARDS

The Warren (Ohio) Amateur Radio Association, Inc., announces its Worked Trumbull County (WTC), Worked Trumbull County Mobile (WTC-M), and Worked Trumbull County YL (WTC-YL) awards. These programs are designed to promote increased amateur-radio activity among and with Trumbull County amateur-radio operators. The awards also reward operating achievements.

Application: Send applications and all correspondence to: Don Lovett K8BXT, Awards Chairman, WARA, PO Box 809, Warren OH. One dollar must accompany applications from W, K, and VE amateurs; all others should send three IRCs with application. Only Trumbull County applicants must submit actual QSL cards. All others should have certification letters from two other radio amateurs which verify that they have seen and checked the applicant's QSLs. Each application must also be accompanied by a list of the calls worked, with full log data for each contact.

Requirements

WTC—For each certificate or endorsement, Trumbull County applicants must have 20 contacts with other Trumbull County amateurs. Other W, K, and VE stations must contact 10 Trumbull County amateurs, while DX applicants must have five contacts.

WTC-M—For each certificate or endorsement, Trumbull County applicants must have 20 contacts with other Trumbull County amateurs operating mobile in Trumbull County. Other W, K, and VE stations must contact 10 Trumbull County amateurs operating mobile in Trumbull County, while DX applicants must have five contacts.

WTC-YL—For each certificate or endorsement, W, K, and VE stations must contact 10 Trumbull County YL or XYL amateurs, while DX applicants must have three contacts.

Award: A certificate will be issued on each approved application but in order to appear on the certificate, special endorsements must be filed with the initial filing, each containing at least 25 percent new contacts. Initial endorsements are free of charge, but endorsements made on later dates will take the form of WTC certificates. Applications for these must contain proper filing fees. Endorsements may be all one mode, all one band, all mobile-to-mobile, or all members of the Warren Amateur Radio Association, Inc.

Net contacts, contacts made through repeaters, and contacts made before January 1, 1959, cannot be counted.

A FAR NET AWARD

The Armored Force Amateur Radio Net is a nonprofit and informal group of amateur-radio operators who are veterans or active-duty service personnel who have been assigned or attached to an armored unit of the United States Armed Forces or their allies at some time in their military careers.

The A FAR NET offers its A FAR NET Award certificate to amateur-radio operators of any nation. The 8½" × 11" certificate is printed in four colors on white on heavy stock and is intended for framing. Endorsements are available for making additional contacts and for making contacts in one mode or on one band. Application may be made for any award level, mode, or band operation at any time.

To qualify for the basic award, non-member stations must establish two-way contact with a minimum of fifteen different A FAR NET member stations. To qualify for endorsements, non-member stations must make contact with ten or thirty-five additional members on any band or in any mode. Confirmation of the required contacts must be through a copy of the non-member's log that has been certified by two other amateur-radio operators.

Applicants for the basic award certificate must submit a minimum of fifty cents along with their application to cover postage, envelopes, etc. Endorsements not mailed along with the basic certificate will require only a normal 4½" × 6" SASE. Applications for the basic award or endorsements should be sent to: Alfred G. Beutler K2DWI, A FAR NET Certificate Manager, 36 Manchester Road, East Aurora, New York 14052. Please allow from two to four weeks for mailing of the certificates or endorsements.

HONG KONG AWARDS

HARTS meets every Tuesday at 1700 local, excluding public holidays, at the China Fleet Club, Arsenal Street, Wanchai, Hong Kong Island.

Nine Dragons Award

This award is given for one contact with a country in each of the following 9 zones: 18, 19, and 24 to 30. Contact for zone 24 must be a VS6. Stations within the 9 zones require 2 contacts in each zone, with 2 VS6 contacts. Only contacts after January 1, 1979, are valid. Fees are US $3, Australia $3, 1 pound 50 pence England postal order, or 24 IRCs.

Firecracker Award

This award is given for six contacts with different VS6 stations. Stations in zones 18, 19, and 24 to 28 require 10 contacts with different VS6 stations. Only contacts after January 1, 1964, are valid. Fees are US $2, Australia $2, 1 pound England postal order, or 10 IRCs.

Usual Conditions

Certified log extracts only—no QSL cards are required. Payment to be made in cash—no bank drafts. Postal orders to be left blank. Claims to: Awards Manager, HARTS, GPO Box 541, Hong Kong.

FCC

Reprinted from the Federal Register

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 1 and 97

[PR Docket No. 83-27; RM-4229; FCC 84-324]

Use of Volunteers To Prepare and Administer Operator Examinations in the Amateur Radio Service

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: This document amends the FCC rules regarding the preparation and administration of amateur radio operator examinations above the Novice Class to permit Volunteer-Examiner Coordinators (VEC's) and volunteer examiners to design the examinations instead of the FCC. This amendment will relieve the FCC of the administrative burden of designing the examinations and permit VEC's and examiners more latitude in preparing and administering examinations. This document also amends certain other FCC rules regarding the Amateur Radio Service volunteer examiner program to clarify them.

EFFECTIVE DATE: August 31, 1984.

FOR FURTHER INFORMATION CONTACT: John J. Borkowski, Private Radio Bureau, Washington, D.C. 20554, (202) 632-4964.

Appendix

Parts 1 and 97 of the Commission's Rules (47 CFR Parts 1 and 97) are amended as follows:

PART 1—[AMENDED]

1. Paragraph (e) of § 1.925 is revised to read:

§ 1.925 Application for special temporary authorization, temporary permit or temporary operating authority.

* * * * *

(e) Unless the FCC otherwise prescribes, an applicant already licensed in the Amateur Radio Service, upon successfully completing the amateur radio operator examination(s) required for a higher class, may operate his/her amateur radio station consistent with the rights and privileges of that higher class for a period of one year from the date of the most recently completed examination(s) for that operator class in accord with the provisions of § 97.35.

PART 97—[AMENDED]

2. The Table of Contents for Part 97 is amended as follows:

a. The heading of § 97.517 is revised to read "Examinations."

b. The heading of § 97.523 is removed.

3. Paragraphs (a), (b), and (d) of § 97.27 are revised to read:

§ 97.27 Examination preparation.

(a) Element 1(A) shall be prepared by the examiner. The preparer must hold an Amateur Extra, Advanced or General Class operator license. The test shall be such as to prove the applicant's ability to transmit correctly by hand (key, straight key, or, if supplied by the applicant, any other type of hand operated key such as a semi-automatic or electronic key, but not a keyboard keyer) and to receive correctly by ear texts in the international Morse code at a rate of not less than five (5) words per minute during a five-minute test period. Special procedures may be employed in cases of physical disability. (See § 97.26(g).) The applicant is responsible for knowing and may be tested upon the twenty-six letters of the alphabet, the numerals 0–9, the period, the comma, the question mark, AR, SK, BT, and DN. (See § 97.29(c).)

(b) Elements 1(B) and 1(c) shall be prepared by the examiners or be obtained by the examiners from the VEC. The preparer must hold an Amateur Extra Class license. The test shall be such as to prove the applicant's ability to transmit correctly by hand (key, straight key, or, if supplied by the applicant, any other type of hand operated key such as a semi-automatic or electronic key, but not a keyboard keyer) and to receive correctly by ear texts in the international Morse code at not less than the prescribed speed during a five-minute test period. Special procedures may be employed in cases of physical disability. (See § 97.26(g).) The applicant is responsible for knowing and

may be tested upon the twenty-six letters of the alphabet, the numerals 0–9, the period, the comma, the question mark, AR, SK, BT and DN. (See § 97.29(c).)

* * * * *

(d) Elements 3, 4(A) and 4(B) will be designed by the VEC. The VEC will select questions for each test from the appropriate list of questions approved by the Commission (either PR Bulletin 1035 B, C or D, latest date of issue). The VEC must select the appropriate number of questions from each category of the syllabus (PR Bulletin 1035) as specified in PR Bulletin 1035 B, C or D. These questions must be taken verbatim from the appropriate PR Bulletin in the form in which they have been approved by the Commission. Beginning January 1, 1987, volunteer examiners may also design Elements 3, 4(A) and 4(B) in accord with the provisions of this paragraph. Each VEC and each volunteer examiner is required to hold current examination designs in confidence.

* * * * *

4. Paragraphs (a) and (e) of § 97.28 are revised to read:

§ 97.28 Examination administration.

(a) Unless otherwise prescribed by the Commission, each examination for an amateur radio operator license (except the Novice Class operator license) shall be administered by three accredited (see § 97.515) volunteer examiners. An examiner administering telegraphy examination element 1(A) or written examination element 2 (in conjunction with an examination other than a Novice Class examination) or written examination element 3 must hold an Amateur Extra Class or Advanced Class radio operator license. An examiner administering telegraphy examination element 1(B) or 1(C) or written examination element 4(A) or 4(B) must hold an Amateur Extra Class radio operator license.

* * * * *

(e) When the candidate scores a passing grade on an examination element, the examiners (except for examinations for the Novice Class operator license) must issue a certificate of successful completion of the examination. This certificate may be used for a period of one year for examination credit for telegraphy elements 1(A), 1(B) or 1(C). (See § 97.25(b).)

* * * * *

5. Paragraph (b) of § 97.31 is revised to read:

§ 97.31 Volunteer examiner requirements.

* * * * *

(b) Any person who owns a significant interest in, or is an employee of, any company or other entity which is engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur station operator licenses, is ineligible to be a volunteer examiner for purposes of administering an amateur radio operator examination. However, a person who does not normally communicate with that part of an entity engaged in the manufacture or distribution of such equipment, or in the preparation or distribution of any publication used in preparation for obtaining amateur operator licenses, is eligible to be a volunteer examiner.

* * * * *

6. Section 97.35 is revised to read:

§ 97.35 Temporary operating authority.

Unless the FCC otherwise prescribes, an applicant already licensed in the Amateur Radio Service, upon successfully completing the amateur radio examination(s) required for a higher class, may operate an amateur radio station consistent with the rights and provileges of that higher class for a period of one year from the date of the most recently completed examination for that operator class provided that the applicant retains the certificate(s) for successful completion of the examination(s) (see § 97.28(e)) at the station location, provided that the applicant uses the identifier code of the new class of license for which the applicant has qualified (KT for Technician Class, AG for General Class, AA for Advanced Class and AE for Amateur Extra Class) as a suffix to the present call sign (see § 97.84), and provided that the FCC has not yet acted upon the application for a higher class of license.

7. Paragraph (f) of § 97.84 is revised to read:

§ 97.84 Station identification.

* * * * *

(f) When operating under the temporary operating authority permitted by § 97.35 with privileges which exceed the privileges for the class of operator license currently held by the licensee, a licensee must identify in the following manner:

(1) On radiotelephony, by the transmission of the station call sign, followed by the word "temporary", followed by the identifier code for the new class of license for which the licensee has qualified (see § 97.35).

(2) On radiotelegraphy, by the transmission of the station call sign, followed by the fraction bar DN, followed by the identifier code for the new class of license for which the licensee has qualified (see § 97.35).

* * * * *

8. Paragraph (a) of § 97.503 is revised to read:

§ 97.503 Definitions.

* * * * *

(a) *Volunteer-examiner coordinator* (VEC). An organization which has entered into an agreement with the Federal Communications Commission to coordinate the efforts of volunteer examiners in preparing and administering examinations for amateur radio operator license.

* * * * *

9. Section 97.505 is revised to read:

§ 97.505 Applicability of rules.

These rules apply to each organization that serves as a volunteer-examiner coordinator.

10. Section 97.509 is revised to read:

§ 97.509 Conflicts of interest.

An organization engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur radio station operator licenses may be a VEC only upon a persuasive showing to the Commission that preventative measures have been taken to preclude any possible conflict of interest.

11. Section 97.511 is revised to read:

§ 97.511 Agreement required.

No organization may serve as a VEC until that organization has entered into a written agreement with the Federal Communications Commission to do so. The VEC must abide by the terms of the agreement.

12. Section 97.517 is revised to read:

§ 97.517 Examinations.

A VEC will design (see § 97.27(d)), assemble, print and distribute written examination Elements 3, 4(A) and 4(B). A VEC may design, assemble, print and distribute examination Elements 1(B) and 1(C). A VEC is required to hold examination designs in confidence.

§ 97.523 [Removed]

13. Section 97.523 is removed and reserved.

47 CFR Part 97

[PR Docket No. 82-83; RM Nos. 3705, 3729, 3734, 3778, 3831, 3833, 3860; FCC 84-345]

Radiotelephony Expansion High Frequency Amateur Bands; RM-4228 Petition for Telephony Operations on Frequencies Between 7075-7100 kHz in Hawaii and in Areas Near Region 3

AGENCY: Federal Communications Commission.
ACTION: Final rule.

SUMMARY: This document amends the rules by expanding telephony privileges on frequencies 3750–4000 kHz, 21200–21450 kHz, 28300–29700 kHz, and 7075–7100 kHz (Hawaii and in areas near Region 3). These amendments are necessary so that amateur radio operators will have additional radiotelephone frequencies on which to operate. The result of this action is to relieve the overcrowding on the presently-allocated frequencies for radiotelephony in the Amateur Radio Service.

EFFECTIVE DATE: 0001, Universal Coordinated Time (UTC), September 1, 1984.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR INFORMATION CONTACT: Maurice J. DePont, Private Radio Bureau, Washington, D.C. 20554, (202) 632–4964.

Appendix

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

1. Section 97.7(a) is revised as follows:

§ 97.7 Privileges of operator licenses.

(a) Amateur Extra and Advanced Class. All authorized amateur privileges including exclusive frequency operating authority in accordance with the following table:

Frequencies	Class of license authorized
3500-3525 kHz	Amateur extra only.
3750-3775 kHz	Do.
7000-7025 kHz	Do.
14,000-14,025 kHz	Do.
14,150-14,175 kHz	Do.
21,000-21,025 kHz	Do.
21,200-21,225 kHz	Do.
3775-3850 kHz	Amateur extra and advanced.
7150-7225 kHz	Do.
14,175-14,225 kHz	Do.
21,225-21,300 kHz	Do.

2. In § 97.61(a), that portion of the table under the heading "kHz" is revised to read as follows. The entries in the table under the headings "MHz" and "GHz" remain the same.

§ 97.61 Authorized frequencies and emissions.

(a) * * *

Frequency band	Emissions	Limitations (see paragraph (b))
Kilohertz		
1800 to 2000	A1, A3	
3500 to 4000	A1	
3500 to 3750	F1	
3750 to 4000	A3, A4, A5, F3, F4, F5	4
4383.8	A3A, A3J	13
7000 to 7300	A1	3, 4
7000 to 7150	F1	3, 4
7075 to 7100	A3, F3	11
7150 to 7300	A3, A4, A5, F3, F4, F5	3, 4
14000 to 14350	A1	
14000 to 14150	F1	
14150 to 14350	A3, A4, A5, F3, F4, F5	
21000 to 21450	A1	
21000 to 21200	F1	
21200 to 21450	A3, A4, A5, F3, F4, F5	
28000 to 29700	A1	
28000 to 28300	F1	
28300 to 29700	A3, A4, A5, F3, F4, F5	

See List of Advertisers on page 98

3. Secton 97.61(b) (11) is revised to read as follows:

§ 97.61 Authorized frequencies and emissions.

* * * * *

(b) * * *

(11) The use of A3 and F3 in this band is limited to amateur radio stations located outside Region 2 and amateur radio stations located within Region 2 which are west of 130 degrees West longitude.

* * * * *

47 CFR Part 97

[PR Docket No. 84-265; FCC 84-322]

Reimbursement of Out-of-Pocket Costs for Volunteer Administered Amateur Radio Examinations

AGENCY: Federal Communications Commission.
ACTION: Final rule.

SUMMARY: This document amends the rules to provide for reimbursement of out-of-pocket costs incurred by volunteer examiners and volunteer examiner coordinators in connection with administering or coordinating amateur operator license examinations. The rules are necessary so that the volunteers can recover their prudently-incurred expenditures. The effect of this action is to establish regulations which permit reimbursement to volunteers for their necessary expenses.

EFFECTIVE DATE: August 31, 1984.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT: Maurice J. DePont, Private Radio Bureau, Washington, D.C. 20554, (202) 632–4964.

Appendix

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

* * * * *

1. Section 97.31(c) is revised to read as follows:

§ 97.31 Volunteer examiner requirements.

* * * * *

(c) Volunteer examiners may not be compensated for services. They may be reimbursed for out-of-pocket expenses, except for Novice class examinations (see § 97.36).

* * * * *

2. Section 97.33 is revised to read as follows:

§ 97.33 Volunteer examiner conduct.

No volunteer examiner shall give or certify any examination by fraudulent means or for monetary or other consideration. Violation of this provision may result in the revocation of the amateur radio station license and the suspension of the amateur radio operator license of the volunteer examiner. This does not preclude a volunteer examiner from accepting reimbursement for out-of-pocket expenses under § 97.36. Reimbursement in any amount in excess of that permitted may result in the sanctions specified herein.

3. New § 97.36 is added as follows:

§97.36 Reimbursement for expenses.

(a) Each volunteer examiner coordinator and each volunteer examiner may be reimbursed by examinees for out-of-pocket expenses incurred in preparing, processing or administering examinations for amateur station operator licenses above the Novice class. The volunteer examiner coordinator or the volunteer examiners must collect the reimbursement fee, if any, from the examinees. No reimbursement may be accepted for preparing, processing or administering Novice class examinations.

(b) The maximum amount of reimbursement is $4.00 for 1984 and will be adjusted annually each January 1 thereafter for changes in the Department of Labor Consumer Price Index. Changes in the maximum amount of reimbursement will be announced by the Commission in a Public Notice. The amount of such reimbursement fee from any examinee for any one examination at a particular session regardless of the number or examination elements taken must not exceed the published maximum.

(c) Each volunteer examiner coordinator and each volunteer examiner who accepts reimbursement must maintain records of out-of-pocket expenses and reimbursements for each examination session. They must certify on or before January 31 of each year to the Commission's office in Gettysburg, PA 17325 that all expenses for the period from January 1 to December 31 of the preceding year for which reimbursement was obtained were necessarily and prudently incurred.

(d) The expense and reimbursement records must be retained by each volunteer examiner coordinator and each volunteer examiner for 3 years and made available to the FCC upon request.

(e) Each volunteer examiner must forward on or before January 15 of each year the certification concerning expenses to the volunteer examiner coordinator who coordinated the efforts of the volunteer examiner and for which reimbursement was received. The volunteer examiner coordinator must forward all such certifications and its own certification concerning expenses to the FCC on or before January 31 of each year.

(f) The volunteer examiner coodinator must disaccredit any volunteer examiner who fails to provide the annual certification. The volunteer examiner coordinator must advise the FCC on January 31 of each year of the volunteer examiners that it has disaccredited for this reason.

4. Section 97.507(e) is revised to read as follows:

§ 97.507 VEC qualifications.

* * * * *

(e) Agree not to accept any compensation from any source for its services as a VEC, except reimbursement for out-of-pocket expenses permitted by § 97.36; and

* * * * *

5. The introductory text preceding paragraph (a) in § 97.515 is revised to read as follows:

§ 97.515 Coordinating volunteer examiners.

A VEC will accredit amateur radio operators licensed by the Federal Communications Commission as volunteer examiners (see § 97.30). A VEC will seek to recruit a broad representation of amateur radio operators to be volunteer examiners. A VEC may not discriminate in accrediting volunteer examiners on the basis of race, sex, religion or national origin. A VEC may not refuse to accredit volunteer examiners on the basis of membership (or lack thereof) in an amateur radio organization. A VEC may not discriminate in accrediting volunteer examiners based upon their accepting or declining to accept reimbursement. A VEC must not accredit an amateur radio operator volunteering to be an examiner if:

* * * * *

SATELLITES

USING THE AO-10 APOGEE PREDICTIONS

Apogee predictions for the month of October are provided for three sections of the United States: Washington DC at 39N 77W, Kansas at 39N 95W, and California at 38N 122W. Times are in UTC and apogee in this case is mean anomaly 128 rounded to the nearest whole hour. Use the chart as a guide in aiming your antenna, then fine-tune the azimuth and elevation values to peak the satellite's beacon signal. If you require more accurate orbital predictions, contact AMSAT at PO Box 27, Washington DC 20044.

AMSAT ANNUAL MEETING

The yearly AMSAT technical symposium and general-membership meeting is slated for Saturday, November 10 at the Amfac (formerly Airport Marina) Hotel on the north side of Los Angeles International Airport. A block of convention-rate rooms has been set aside—for reservations, contact the hotel at (213)-670-8111.

Technical presentations on present and future amateur-satellite projects will be given during the morning and afternoon sessions. The general-membership meeting will be held in the evening following a banquet dinner. For detailed conference information and registration, send an SASE to Dennis Dinga N6DD, PO Box 4111, Diamond Bar CA 91765.

Thanks to Amateur Satellite Report *for this month's news.*

AMSAT-OSCAR 10 APOGEE PREDICTIONS

OCTOBER 1984

			WASH		KANSAS		CALIF	
ORBIT	DAY	TIME	AZ	EL	AZ	EL	AZ	EL
1309	1	0800			184	10	269	32
1310	1	2200	96	17	84	3		
1311	2	0700			280	11	264	33
1312	2	2000	81	8				
1313	3	0700	285	3	274	17	257	40
1315	4	0600	279	12	268	27	247	50
1317	5	0600	274	16	262	30	238	53
1319	6	0500	263	25	254	40	222	61
1321	7	0400	261	35	245	50	196	67
1323	8	0400	254	38	235	53	180	66
1325	9	0300	244	48	218	61	151	64
1327	10	0200	231	57	193	66	128	58
1329	11	0100	211	65	162	67	113	50
1331	12	0100	195	64	150	62	110	44
1333	13	0000	166	66	129	57	100	35
1335	13	2300	140	62	114	49	91	26
1337	14	2300	132	56	111	43	90	20
1339	15	2200	116	49	100	34	82	12
1341	16	2100	105	40	92	25	75	3
1343	17	2100	103	34	90	19		
1344	18	0800					278	13
1345	18	2000	101	28	82	11		
1346	19	0800					272	16
1347	19	1900	86	17	75	3		
1348	20	0700			282	4	266	26
1349	20	1900	84	11				
1350	21	0600	287	0	276	14	259	36
1351	21	1800	77	3				
1352	22	0600	282	3	271	17	252	39
1354	23	0500	276	12	265	27	243	49
1356	24	0400	270	22	257	37	229	58
1358	25	0400	264	25	250	40	216	60
1360	26	0300	257	35	240	49	191	65
1362	27	0200	248	44	225	58	162	65
1364	28	0200	240	47	213	59	151	61
1366	29	0100	226	56	189	63	130	55
1368	30	0000	205	62	161	63	115	47
1370	30	2300	178	66	136	59	103	39
1372	31	2300	165	62	130	53	101	33

HAM HELP

I need a manual and plug-in memory modules for a Memory-Matic 8000 keyer by Data Engineering, Inc.

K. D. Benton K4FHQ
333 Crosshill Lane
Warrior AL 35180

I'd like information on interfacing a Motorola speaker/mike to a Yaesu FT-208R. I have it hooked up but the speaker/mike overheats.

Art Oates K9GBN
122 Arrow Drive
Pekin IL 61554

Help! Where can I get a 10m SSB conversion kit for my Sears 663-3810.0050 CB transceiver before I go back to Europe?

Klaus Stichternath N2EHQ
68 Mandalay Drive
Poughkeepsie NY 12603

I am interested in starting a club for overseas American hams. This would include publishing a newsletter for the members to exchange ideas, equipment, and information, running a weekly net, helping individuals get licensed in some countries, and assisting individuals in getting equipment air-shipped to remote locations. If you are interested in forming such a club, please contact me at the following address.

Charles E. Martin AB4Y
AmEmbassy MAPUTO
Dept. of State
Washington DC 20520

I need to know where I can buy parts and have a high-voltage transformer repaired for a General Electric television, model 810. I also need a schematic for a Grundig Universal Music-Boy, model K-74.

William Deramo
51 Suffolk Ave.
Revere MA 02151

I am trying to locate Advanced Communications International, a manufacturer of watches, whose last current address was 2411 Lincoln Avenue, Belmont CA 94002. If this company is still in business, I would like their new address.

Ernesto Hormillosa
Det. 5 AFSCF (116)
APO San Francisco 96334

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Let's plunge into some questions this month, which I think are broad enough to apply to a good many of us involved in RTTY.

Rick Thomas of Okemos, Michigan, asks about the use of optoisolators to pick off a signal from a RTTY loop (hmm...nice phrase) for inputting to a computer. Well, Rick, the use of isolating devices between a teleprinter loop, typically running 150 to 300 volts at 60 mA, and the sensitive input of a computer is a very good idea. As you suggest in your letter, optoisolators are one such device which can be used. Fig. 1 is a simple scheme to pick the signal off a loop and output the data through an optoisolator. One feature of this scheme is the use of a bridge rectifier to extract the signal from the loop, thus making the circuit immune to the polarity of the loop.

Another way to derive the RTTY signal but remain isolated electrically from the loop is with the use of a magnetic reed relay. Fig. 2 is a way to interface a reed relay into a loop. In this case, the current limiting on the loop should keep the relay coil from burning out despite being supplied more voltage than is normally used. I would use this type of a circuit if I had to key another loop that didn't use TTL voltage levels.

Rick also expresses concern over lightning-induced voltage transients getting into his loop or equipment. Well, you might take a look at a new little wonder, the metal-oxide varistor. These MOVs look like a disc capacitor but are truly little MORvels, pardon the pun. Radio Shack carries two versions: The V8ZA1 (276-569) protects digital and linear circuits operating at five volts and below, and the V130LA10A (276-570) is for line-operated equipment. Fig. 3 is a simple diagram of how to hook one of these up to a piece of line-operated equipment. It should be relatively easy to adapt this to whatever you like.

Here's a note from Harvey Wenzel KA8CUB in Brunswick, Ohio. Harvey has just gotten hold of a Model 33 ASR Teletype® machine and would like to hook it up. Way to go, Harvey! Unfortunately, a lot depends on just what "guts" your machine has, as different call-control units, that's the circuitry in the panel on the right, require different hookups. However, here's something to get you started. Look inside of your machine for a nine-conductor screw-type terminal strip. It should be near the back and, if you're lucky, labeled 151411. Now, look at Fig. 4 and try to use these hookups to run your printer and keyboard. Good luck, and if you can determine the exact call-control unit or send me whatever information you can derive, I will see if I can help out.

For years we called them either terminal units or demodulators. Now, they are marketed as receiving interfaces. Still the same thing, folks. That's why this note, from Kris Cena in Hamilton, Ontario, rings a bell. Kris would like to know what the best interface is to go between a receiver and his microcomputer. Kris, you don't want to know what the best interface is because, as the saying goes, if you have to ask, you can't afford it. The bottom line is that about any terminal unit will do just fine, not necessarily one that is directed at the computer crowd. If you are lucky, a pass or two at hamfest tables may turn up just what you need. The essentials should be a stable, preferably fairly-modern unit that is capable of putting out a TTL-level signal. Of course, you could always use one of the isolation circuits from above to adapt a "loop only" bargain. Any of them should work just fine.

Kaypro owners, listen up! We said a few months back that I had seen nothing for that machine. Well, I still haven't but Tyler Parsons WB7DDL says that he has something for you. Tyler is running a RTTY terminal program, written in Pascal, on his Kaypro II. He is offering the program at $29.95, including the program and instructions on disk. He also indicates that he would consider adapting the program for the Kaypro 4 if there is sufficient interest. Write him for more information at 1915 S.E. Stone Street, Corvallis, Oregon 97333, and tell him you are interested in the Kaypro RTTY program mentioned in "RTTY Loop."

Another new member of the club is Harry J. Przekop, Jr. WB9EDP near Chicago, Illinois. Harry is interested in talking to other users of the Drake Theta 7000E communications terminal. Sorry to say, Harry, I have no personal information on this terminal. As I mentioned last month, what information I get, I print. If the manufacturers are interested, I am available. Anyway, if you want to share your experiences with Harry, drop him a line at 332 S. Cuyler, Oak Park, Illinois 60302. Send me a copy, too, and I will share the information with the multitudes!

To those who have written asking where the printouts of the winners of this year's SCATS RTTY art contest are—they didn't send them to me this year. Sorry. Maybe next time?

A letter from Ray Smalley NB2W in South River NJ has me a bit confused. Ray relates that he is "trying to use Clay Abrams' NEWRTTY program on the CoCo* but would like to use the RS-232 port instead of the ROM port." Ray, let's define a few terms, then look at the program. On the back of the CoCo is a four-pin DIN connector, commonly called the RS-232 port. This serial port is not a true, hardware, serial port, but rather a "bit banger" which uses one bit of a parallel port for input, one bit for output, and a software serial-input routine. In some respects, this resembles the RTTY program for the 6800 published here about six or seven years ago. Now, on the side of the CoCo behind a spring-loaded door is an edge connector, commonly called the ROM port. This is, in fact, an extension of the CoCo's address and data bus. Several manufacturers take advantage of this fact by building short extension buses, kind of mini mother boards, which allow several ROMpack-type devices to be plugged in at once.

Now, with that said, let's look at NEWRTTY. This program sends RTTY data out and receives demodulated RTTY data in through the bit-banger RS-232 port. The software driving the port has been changed so that instead of expecting ASCII, it expects Murray and does the necessary conversion before presenting the data to you. So, as you can see, the standard RS-232 port is all you need use with this program; you need never touch the ROM port. Perhaps someday Clay will come up with a disk version of the program, and that ROM port will be needed to run the disk. Hope this clears things up a bit.

Okay east coasters, here we go inundating another amateur. Lowell F. Lind K4AWQ is willing to give away a Model 28 ASR. If it has not been grabbed up by the time this sees print, you might want to drop him a note at 1308 N. Tuckahoe Street, Falls Church, Virginia 22046. Remember that this column is written in July and published in late September if it's gone when you try. No guarantees, I just pass along what I get.

Thanks for the interesting comments and kudos from some more of our readers: Glenn Perry W7RJD, in Mountain Home, Idaho; John A. Kiefer KA6SHT, in Sunnyvale, California; John Sater W3LJW, Union Bridge, Maryland; Alfred Forte III WD4PQN, Ocala, Florida; and Tom Glaza KC8AE, in Filion, Michigan. I appreciate all of your comments and suggestions and shall try to include some of them in future columns.

Quite a potpourri this month. Don't you love the suspense to see what comes next month? Be sure your subscription is current so you won't miss anything in "RTTY Loop."

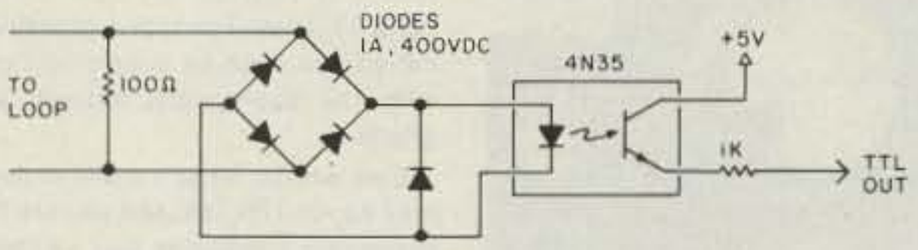


Fig. 1. Using an optoisolator in the loop.

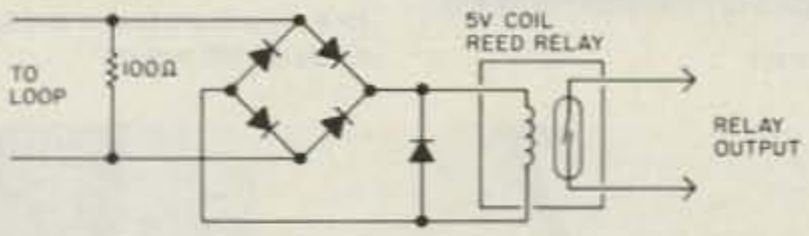


Fig. 2. Using a reed relay in the loop.

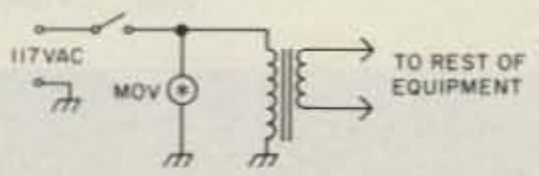


Fig. 3. Connecting an MOV across the line.

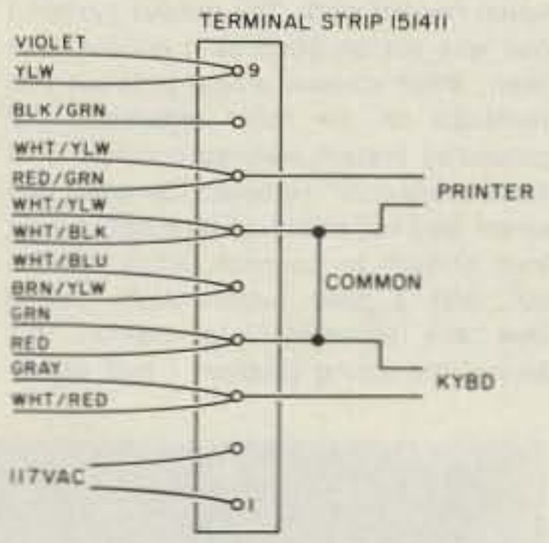


Fig. 4. Terminal strip in a Model 33.

REVIEW

TEN-TEC MODEL 4229 ANTENNA TUNER

Awhile back, I saw advertised in *73* the Ten-Tec Model 4229 Antenna Tuner kit (Photo A). After some plain and fancy dancing, I managed to snare the checkbook away from the XYL to order it. As I am a rather new ham, she didn't realize the tradition-setting this order entailed.

Despite the slowness of the military mail system, in about three weeks a large box arrived from Sevierville, Tennessee. Only three weeks to get an order from the United States to Guantanamo Bay, Cuba, can be likened to same-day service.

Fortunately, I did not have duty the weekend the kit arrived. So, clearing a space at the dining room table, I carefully opened the box and began. Oops! Look at all those parts! This is a lot different from the few Heathkits® I've assembled in the past. Instant doubt. Did my ambition overload my ability? Did I bite off more than I could chew? (Gasp) Do I need to roust out my Elmer and admit I need help? Tune in tomorrow for the next episode in the exciting adventures of a new ham.

On closer reading of the instruction manual and a calming cup of coffee, I decided to go on until I got stuck and only then yelp for help. The assembly instructions included with the kit said average assembly time was about eight hours. Not being as experienced, knowledgeable, and skillful as the average kit builder, and since I have always relied heavily on the blow-up drawings and pictures in the Heathkit manuals, it took me about 18 hours to complete the kit. Granted, some of this 18 hours involved finding the silly mistakes I'd made and the time it took to regroup. It was my several errors and not the fault of Ten-Tec or the manual.

The roller inductor is pre-wound and formed when the kit arrives. The variable capacitor is the kit builder's assembly project (Photo B). All those stator and rotator plates and spacers! Do NOT lose a spacer! The remainder of the kit's assembly is straightforward. The assembly instructions are more or less divided into sections. Read each section thoroughly before starting. Work slowly and carefully.

Yes, a Novice and a novice kit builder can, with a little thought and a lot of care, assemble this tuner without too much trouble and without the assistance of an Elmer. It may take longer than the eight-hour average of the more experienced

builder, but the results are well worth the time.

Technical Data

The Ten-Tec Model 4229 is an adjustable reactive network used for matching the unbalanced 50-Ohm output of a transmitter to a variety of loads, either balanced or unbalanced. It covers a frequency of 1.8 to 30 MHz, with a dual-range power and swr meter included. Provision is made for selecting between four antennas (Photo C), one of which may be either longwire, balanced line, or for bypassing the matching network.

The circuit is a modified L network with an 18-uH silver-plated roller inductor capable of handling 2 kW of rf power. The capacitor voltage rating is 3.5 kV, and the matching-output range is at least 10:1 swr, any phase angle, 1.8 to 30 MHz.

The assembly instructions are well thought out. All of the problems I encountered were because I was careless in reading instructions, I tried to hurry, or I did not pay close attention to what I was doing. Granted the Ten-Tec manual does not have all the pictures and drawings of a Heathkit, but even a kit builder with minimal expertise can assemble a good-looking, functional antenna tuner.

Great, you are saying. This Novice has been rambling on about the assembly manual and how to put it together, but how about after the kit is complete? Then what?

Glad you asked. This is my first experience with Ten-Tec. The operator's manual is well written, nicely laid out, and tells you everything you might need to know about the tuner, the circuits, adjusting the swr/power meter—if it ever needs adjusting—and how and why the tuner works. After talking with other hams at Guantanamo Bay, I found out that the operator's manual is standard Ten-Tec—in other words, high quality.

Unplanned Benefit

An unexpected bonus of using the tuner was that it showed that my ground installation needed work. The ground system I had was not as good as it should have been, which caused arcing between two terminals on the roller assembly. The grounding system adopted consists of a 1k-uF capacitor soldered between the center lead and shield on each end of coax long enough to connect radios, tuners, etc., with a good outside earth ground (see back issues of *73* for details). This solved the arcing problem I had experienced. Properly grounded, the tuner loads nearly everything, and very nicely, too.

Final Remarks

If you already own a "Super Whiz-Bang Automatic Antenna Tuner/Dog Walker/Coffee Maker Deluxe," the Ten-Tec Model 4229 Antenna Tuner kit would make an excellent spare for use during Field Day or emergencies. If you don't own a Super Whiz Bang, etc., and you want a good-looking, functional antenna tuner that you can assemble yourself without the hassles of scrounging parts and without a wallet-smashing cash outlay, try the American-made Ten-Tec Model 4229 Antenna Tuner kit.

Thanks for the photographic processing go to John Howard, President of the GTMO Reflex Photo Club, Guantanamo Bay; thanks also to my Elmer, Tim Miller WB0RXX/KG4TM, who was never too busy to answer my dumb questions.

For more information, contact *Ten-Tec, Inc., Sevierville TN 37862.*

James Sackey KA2SHH/9
Great Lakes IL

DOCTOR DX FROM AEA

It was Saturday morning, and the *CQ* WW DX Contest was in full swing. As my wife walked past the shack, she voiced her familiar "Are you going to be on that radio all weekend?" complaint. Moments later she remembered that I didn't have an antenna up! Obviously something strange was going on, for the sound of a raging contest was pouring out of the station speaker even though the rig was turned off!

I've been blessed with an understanding mate. I explained that, yes, I would be contesting all day Saturday, and no, I wasn't planning to use a radio—in fact, all of the hams I had been talking with were random bits inside a computer's brain. This, of course, confirmed her earlier assessment of my mental faculties.

Eight hours later I had worked 541 stations in 105 countries and had amassed a total score of 641,125 points. Without a radio.

This was my introduction to Doctor DX, the latest product from AEA. Doctor DX is a contest simulator. It's designed for the Commodore 64 and requires only an external CW key to operate. And I do mean operate!

After plugging the board into the back of your C-64 and powering up, a sleek transceiver is displayed on the screen. The rig features full ham-band coverage (10–160 meters), variable power output, and a digital frequency display. A volume control and bandpass filter are also included. After setting the real-time clock and defining your station's location (more about this in a moment), you are plunged into the incredible world of computer simulation.

The contest is recreated in intricate detail. As in real life, you have the option to either sit on a frequency and call CQ or hunt-and-pounce. In both instances, stations will interact with you during the course of an exchange. Here's an example, where ON7TC is calling CQ on 14.028 MHz:

ON7TC: CQ TEST DE ON7TC K
KK2Y: TC DE KK2Y
ON7TC: KK2Y ??? 14(I missed the report)
KK2Y: RST?
ON7TC: 579 579 BK
KK2Y: R 5NN 05 GL
ON7TC: QSL TU QRZ DE ON7TC

Note that the simulated station responded to my query. Stations will also honor requests to QRS or QRQ and will repeat any part of the exchange that you happen to miss. They will occasionally ask you for a repeat when QRM is heavy or you are sending too fast.

Tuning up and down the band is accomplished by pressing one of four keys on the C-64. The higher end of each band is occupied by slow, inefficient stations. Dropping into the Extra-class segment will allow you to contact super-stations running 30–40 wpm. No sloppy fists here—everyone sends computer-generated code!

Earlier I mentioned the real-time clock. The program uses the time of day and your location in a propagation model that creates the conditions you might expect to hear on the bands. For example, I worked ZL and VK stations on 10 meters early in the morning, and later that afternoon moved to 15 meters, which was open to Europe. During the daylight hours, 80 and 160 meters yielded nothing but static, but excellent DX openings occurred on both of these bands after local sunset. Of course 20 meters was crowded with stateside big guns endlessly pounding out "CQ DX". The model seems to be very realistic and can be verified by comparing Doctor DX's band conditions with the real thing.

Possibly one of the most exciting aspects of Doctor DX is the ability to operate from any location on Earth. As mentioned above, the propagation model uses both time and location to create band conditions. You have the option to define any location you wish by supplying Doctor DX with the appropriate latitude and longitude.

Ever wonder what it's like to live in Burma? Key in 17N, 96E and you are there, experiencing conditions just as they would be if you made the trip. Like to activate Albania? Try 41N, 20E and work the pileups! I took a trip to the Sudan and worked scores of VUs on 160 meters!

Photo. A. Front view of completed kit.

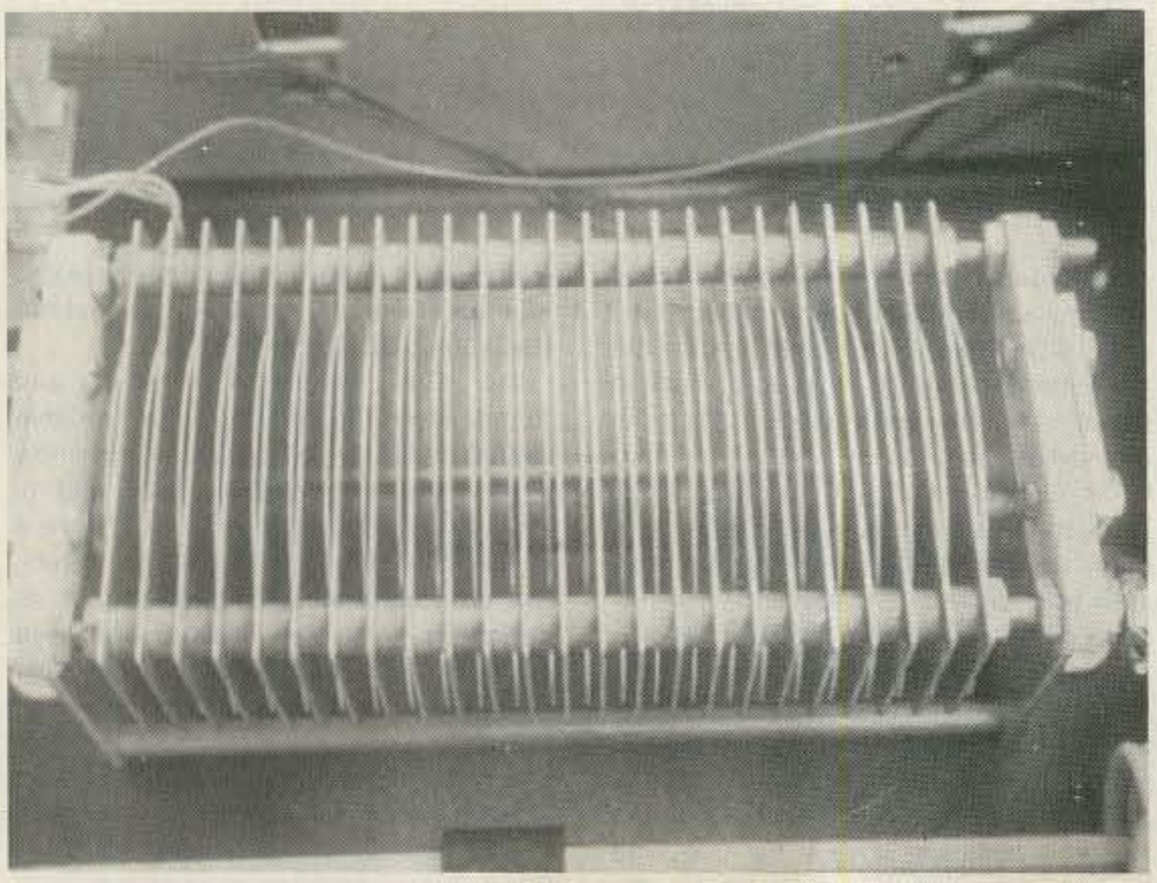


Photo B. Variable capacitor has many parts to assemble.

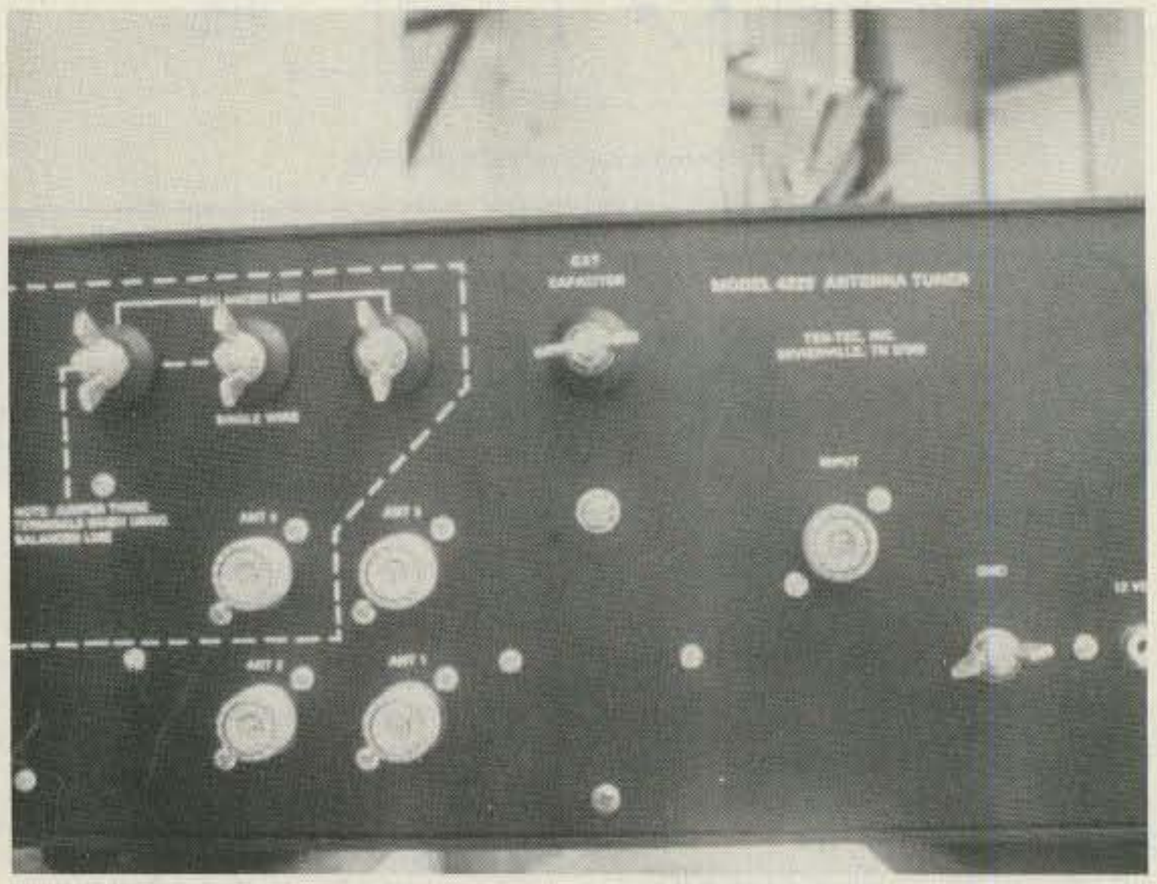


Photo C. Your choice of 3 coax-fed antennas and a longwire or balanced-line antenna.

On-screen scoring information is another outstanding feature. Doctor DX is, after all, a contest simulator/trainer. Complete statistics are displayed in real time and include countries/zones worked per band, aggregate countries/zones worked, number of QSOs, points, and total score. Your contact rate, in QSOs per hour, is also given as an indication of your relative skill—at one point I was clipping along at 136 QSOs per hour while working a string of JAs on 15 meters. This detailed information allows you to compare your operating skill with that of others and to measure the improvement in skill that comes with practice.

You may also use the scoring information to participate in the AEA awards program. As in the real world, you can earn AEA-CC for 100 DX countries worked, AEA-AZ for contacting all 40 zones, 5-band AEA-CC, or be admitted to the AEA Honor Roll for working 250 DX countries or more. A special coding system generates a checksum figure that verifies your achievement—no QSLs are required! In addition, AEA plans to publish a list of the high-scoring stations in their magazine ad each month.

This single program is incentive to buy a C-64. I know it's tough to believe that a piece of software could so realistically simulate amateur radio, but it does. You absolutely must hear it—a few times I caught myself reaching up for a knob to tweak!

I could talk myself blue trying to convince you that this product is the most exciting thing I've seen in my eleven years as a ham, but it isn't the same as experiencing it yourself. My final advice? Buy this program *now*!

For detailed information on Doctor DX, contact *Advanced Electronic Applications, PO Box C-2160, Lynwood WA 98036.*

Perry Donham KK2Y
73 Staff

BILAL ISOTRON 40

When the box arrived in my office last Wednesday, I remember thinking: "Even Ralph Bilal couldn't fit a 40-meter antenna into a package only 33" × 6½" × 3"...why, that's smaller than the boxes most model airplanes come in!"

Ralph had promised to send me the latest version of this Isotron 40, a small, versatile antenna designed for limited spaces such as apartments, condos, campers, and the like where it is almost impossible, for either legal or physical reasons, to put up a full-sized antenna. It's also recommended, from the standpoint of size alone, to serve as an emergency, mobile, or portable antenna that can be used in motel rooms, at a disaster site, or even bracketed to the bumper of an automobile.

"All well and good," I thought, "but does it work?"

Unpacking

On Friday, after work, I took the box out of the trunk of my car and carried it into the workshop, wondering if I'd be able to get it on the air before dark. When I opened the box, the first thing I noticed was the neat packaging job done by Bilal. There were two plastic bags containing hardware—good quality, plated hardware or aluminum hardware, depending on the use. I wondered if there was enough to go around; it has been my experience in the past to be shortchanged on nuts, bolts, and washers. But not this time, as you'll see.

Each component or group of components was neatly wrapped and protected with brown paper and packaging tape. There were four pre-drilled and bent aluminum plates, one with an SO-239 UHF connector and a small standoff insulator already mounted on it; there was a 31" length of clear plastic tubing, partly wound with #12 insulated wire, with a nice foot-long lead and terminal soldered in place, and a piece of clear plastic tubing about 20" long, pre-drilled with holes; there were a couple of pieces of Lucite® with holes in them, a piece of 1"-square aluminum tubing, and several other, smaller pieces that I couldn't immediately identify. Nothing elaborate or fancy, either—just plain vanilla—and good old-fashioned workmanship. I began to believe that when Ralph Bilal told you something, you had better believe it. My confidence was increasing by the moment.

Assembly

The instructions include diagrams, step-by-step assembly comments, and a final tune-up procedure. After reading and rereading the instructions (something I seldom do because the drawings are clear, but in this case the antenna components seemed so different in size and shape from anything I had ever seen before that I figured that I had better read them carefully), I began the assembly. Surprisingly, it went smoothly and without any problems at all: a new first for me! Everything fit into place and all the holes lined up perfectly with no bending, binding, or mismatches anywhere.

Good heavens! So that's what this thing looks like! (See photo.) I couldn't imagine anything that ever looked less like an antenna! Oh, well, Ralph has been at this for over five years, so I had better trust him. He knows more about this thing than I do.

The "far" ends of the parallel rods were pre-drilled to accept typical TV-mounting hardware, and the hardware itself was included: U-bolts, washers, nuts, and plates of good, plated quality. Even the plastic bar had a dowel inserted in one end for reinforcement—the result of experience and cut-and-try engineering.

The instructions suggested mounting the antenna on a short length of 1¼"-diameter TV-mast tubing, and I just happened to have a five-foot length in the garage. I mounted the Isotron "antenna" to the TV mast with the help of my XYL who held things straight while I tightened the clamps. After all was square and aligned, I did the final tightening of the hex nuts, and there it was! Clearly, something different.

The weight was negligible and the wind loading laughable. Gosh, this thing could fit on top of almost any chimney bracket, on a mast alongside a trailer, or even in the shack in the middle of the floor! Yep, that's what I did. I happened to have a military-surplus wooden tripod that had been used to mount a transit. The short length of TV mast exactly fit into the central collar, so I set it up in the shack (read spare bedroom) between the beds. A ten-foot piece of RG-8/U was enough to reach the operating desk and B&W coaxial switch mounted there.

Tune-Up and Operation

Here is where things usually begin to go very wrong, with my usual luck, and I had little confidence that this ugly duckling would ever be a swan in spite of Ralph Bilal's confidence. Nevertheless, only 45 minutes had elapsed between opening the box and carrying the contraption to my shack...sort of a new record for me. There it sat on its tripod, daring me to fire up the rig and see what would happen. Okay, here goes.

Wow: signals—and quite loud, too! Putting the rig on the lowest possible output power, just enough to get a vswr reading, I was astonished to get a reading of below 2:1, and by careful adjustment of the small, parallel "tuning" plates attached to the upper and lower "diamond" plates, I was able to get a reading of below 1.5:1 at 7025 kHz. That is better than the standard trapped vertical I had been using was able to give me. I switched back and forth between the vertical (roof mounted, with 12 radials) and the Isotron 40, noticing that the QRN was appreciably lower on the Bilal antenna, whereas the received signals were not much if any different in strength. Once again, I was impressed with this little critter. Now if it would only transmit, I'd be happy.

Proof of the Pudding

Rather than timidly call a CQ, I decided to be brave and answer someone else. After all, if he didn't come back to me it wouldn't be my fault—or as disappointing—as if I had called and been found wanting. Okay, let's see...here's a good strong signal at 7031 kHz...KU1G...nice CW...there, he's signing...

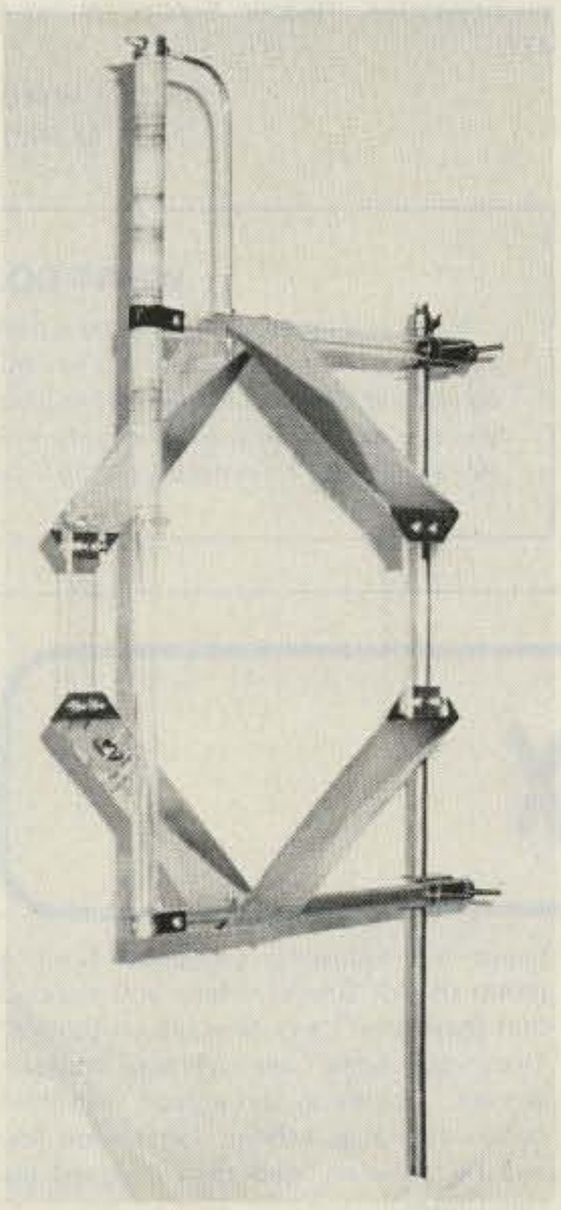
KU1G KU1G, de W1XU, W1XU, K.
W1XU de KU1G; R, R, Tnx call OM; ur sigs 599, 599 hr in Monroe, CT; name is John. Hw copy? AR. W1XU de KU1G, K.

Wow! 599 in Connecticut! Well, maybe that's just an exception. Let's finish here with John and try another.

At 0020Z (twenty after seven, local time) I heard WX4L calling CQ. A quick shout and he came back: 559 in Gaffney, South Carolina. Name is Ed. Well, that is more reasonable, I thought, but still, all the way to South Carolina on an indoor "lump" ain't too shabby!

Next, I called Steve K4CXJ in Nashville, Tennessee, and we compared antennas. The trapped vertical gave me a 569 with QSB and the Bilal Isotron gave me a 569 with no QSB! The band wasn't great, but it was active.

Along about twenty before 9 I heard Bill K2SVC in Ithaca, New York, and he gave me a 599 with some QSB. A quick comparison showed the outdoor vertical at S9 and the indoor Isotron at S8. Not bad, I'd settle for that any day.



The Isotron 40.

After signing with Bill, I worked Jim KX8E in Highland, Michigan. Jim said I was 599 there and claimed very little if any difference between the vertical and the Isotron. It was obvious that the band was improving and that the mid-range stations were skipping in loudly.

I wonder if I ought to try a "local" to see what happens, I thought. There was Paul KB1MJ/BS with his brand-new Extra-class ticket on 7024 kHz. Giving Paul a quick call, I got a 589 from him. He was down a bit, I thought, but the 569 I gave him was still a good report. When he told me he was running 20 Watts to a home-brew *station* (not just a transmitter), I perked up. It seems that Paul actually loves to build gear, and his receiver is about 9 months along in development...with a few more to go until he is satisfied. The keying was very nice, home-brew, of course, and Paul said he made the paddles, too!

The transmitter was a combined solid-state vfo with a tube final. Nice. I suggested to Paul that when his station was completed to his satisfaction, maybe he ought to write it up for a magazine...hint, hint! Let's hope he does.

Well, it was getting late; maybe a couple more and then to bed. Tuning around, I discovered Frank VE2GG in Dorval, Quebec, on 7021 kHz. He came right back to my call: "599, OM." He was about a 589 at my station. Comparing antennas, Frank mentioned to me that the Isotron was S9+10 dB, whereas the outside antenna was only S9+5 dB! Here, the Isotron actually put out a better signal than the regular antenna! Probably skip angle, etc., but who cares? The performance of the Isotron 40 is just plain phenomenal.

My last QSO of the evening was with Chuck N8FNZ in Detroit. He gave me a 589 and I gave him a 579 at 0354Z, six minutes before eleven o'clock local time. Chuck was using his new Icom 751 and a dipole, sloping toward the east.

Well, time for hitting the sack soon, so I signed with him after a pleasant rag-chew and switched off the rig. Well satisfied with the evening's work, I decided to try SSB on Saturday morning. After all, with 75 Watts output, CW is a lot easier to cut the mustard than phone, I realized, so phone would be the final proof I needed to see if the Isotron was really an antenna.

On Saturday morning at 9:50 local time, I heard W3DWI calling CQ. His signal was loud and I wanted to call him, but I had not changed the setting of the antenna to adjust it for lowest vswr up here on phone. Nevertheless, I decided, what the heck; I'll just call anyway; no harm if he doesn't hear me. A short two-by-two, and Ed in Chambersburg, Pennsylvania, came right back with a 5/7 report...very little QSB...nice steady signal. We exchanged the usual information and had a pleasant half-hour chat right in the midst of the Saturday morning QRM.

When the QSB took me almost out, I switched over to the outside antenna and was able to finish the QSO. So—we found out that under poor conditions, the outside BIG antenna is a bit better than the small (tiny) indoor one. Well, what's so surprising about that? That's what one would expect...but I was still very satisfied with the Isotron 40. Ralph hadn't lied to me yet; he hadn't overstated his performance figures; the antenna worked just as he said it would. Not only that, I firmly believe that if the Isotron 40 were placed at the same height as my vertical and outdoors, it would work equally well! That's a lot to say, but I think it is a true statement...and I'm going to prove it soon.

Later, after a long weekend of testing

the antenna (during which time, nearly 100 stations were worked on phone and CW), a pattern became quite clear: Under good conditions the Isotron 40 nearly equalled the much higher outdoor vertical. Under poor conditons, it was nearly three S-units poorer. On the average, the Isotron was only one to two S-units down compared with the vertical.

It will be desirable to mount the antenna outdoors at the same height as the vertical for further comparisons. I strongly believe, based on tests so far, that it could be almost as effective as the vertical.

Other stations contacted in the US were K4JE (589), W4LRD (579), and W2JUF (579). During the European Field Day, we worked the following foreign stations using the Isotron 40: ON7AR/P (589), G3WKX (589), DLØET (559), DLØOS (379), DLØAU (559), G4GXK (579), DKØTU (599), DFØCN (599), PI4RT? (599), and GM3USL (599). Later, I heard NQ6E in San Francisco, and Bob gave me a 569. Of course everyone knows that all contest reports are not exact, but at least the antenna can work DX without a terrific disadvantage.

Many times my signal would be S8 on the Bilal antenna and S9 on the vertical. In only one case, reported before, was the Isotron better than the vertical.

Almost every station contacted in the US and Canada was very interested in knowing more about the Isotron. One operator even said he was going to buy the 80-meter version after hearing what the 40-meter version could do. So, there you have it, fans. Try one for yourself and see what *you* think.

Theory of Operation

The Isotron antennas may be capacitive hats on a loading coil...because that's what they appear to be electrically. However, there is a large radiating surface (according to Ralph) that would seem to make the Isotron antennas the equivalent *in surface area* to full-size antennas. This does not imply that the "capture area" of the Isotron is the equivalent of the larger antenna, however. In spite of the small size (31" × 18" × 12", approximately), it appears to be radiating quite efficiently—something that I had not thought possible with merely a loading coil with capacity hat as a radiator of rf energy.

The claimed bandwidth between 2:1 vswr limits is 200 kHz, according to Ralph's measurements. I was able to verify this approximately by swinging between roughly 7050 and 7250 kHz without retuning the antenna. However, for really critical work, it would be best to retune the antenna when moving from the low end CW portion to the high end SSB portion of the band.

Ralph mentions the fact that it is necessary to be very careful in adjusting and tuning the antenna because the surroundings can affect its impedance drastically. He gives some good counsel in the instructions about this, and several recommendations to follow in case tuning up is a problem. An rf noise bridge or similar device to help tuning is strongly recommended when setting up the Isotron for best performance.

Other Antennas by Bilal

Ralph Bilal can furnish a 160-meter Isotron, an 80-meter version, and a 20-meter version also. I would like to say that the one that looks most interesting to me is the combination 80/40 Isotron—actually two antennas, tuned to the bands, mounted back-to-back on a single mast, and fed with two separate feedlines. Living as I do in a home that rests in a small clearing in the woods, that would really solve my antenna problem. I have used a chimney mount for several different verticals and small beams, so I think it would be very practical, simple, and nearly ideal in my location to solve the problem with the Isotron system.

Conclusion

I really like the Isotron 40 and am going to be very interested in trying out the other versions to see if they perform as well on their respective bands as this one does on 40 meters. Certainly the price is reasonable, considering what you get: the 160-meter version that stands only 5 feet high and weighs only 12 pounds (smaller than most two-meter beams) for $149.95 plus shipping; the 80-meter version at 4½ feet and 7 pounds at $63.95; the 40-meter at 31 inches and 4 pounds for $52.95, and the 20-meter Isotron, on special sale at $39.95, measuring only 21 inches and weighing in at a mere 3 pounds. Finally, the 15-meter version at 21 inches and 2 pounds, goes for $32.95. All of these must have shipping costs added, varying between $3.50 and $8.50.

The 80/40 "Special" Isotron comes for only $110 plus $8.50 shipping cost, and there are also 15-meter and 10-meter versions for hams, as well as an 11-meter version for CB.

For your own Isotron, whatever it may be, call or write to the *Bilal Company, S.R. 2, Eucha OK 74342; (918)-253-4094*. Tell Ralph that *73* sent you, with a strong recommendation. Reader Service number 477.

Jim Gray W1XU
73 Staff

BARKER & WILLIAMSON'S AP-10 PORTABLE ANTENNA

Nothing that simple will ever work.

That was my first thought on viewing the Barker & Williamson AP-10 Portable Antenna. I had seen ads in ham publications from B & W but had always just glanced at them.

Now, however, for the first time in 15 years, I was faced with living in an apartment. I had changed jobs and moved from Ohio to Wisconsin, and I discovered that our new apartment complex allowed absolutely no outdoor antennas.

My father (K8MC), a veteran DXer of many seasons, had purchased the B & W antenna for me as a Christmas present. He did his best to convince me that this was better than no antenna at all. I decided to give it a try. It was a either that or face the unpleasant withdrawal symptoms associated with lack of exposure to Morse code.

The antenna had arrived in a neat little box with all of the parts inside. The parts included a 22½-inch whip which telescoped to 57 inches, coils for 10 meters through 40 meters (including 30 meters), a wire counterpoise, coax, and assorted screws and bolts. (*We've heard that the AP-10 will load on 2 and 6 meters without additional hardware. —Ed.*)

Also included was a very clearly written instruction booklet. Then again, the antenna was so simple that the instruction booklet necessarily was very basic and well written.

Assembly time was about 5 minutes and required only a screwdriver and a pair of pliers. To a seasoned DXer and this second-generation ham, it seemed too good to be true.

Not content to wait until I returned to Wisconsin, we put the antenna on the air at my father's old homestead in Ohio. Since the weather was a little nasty outside, we decided to clamp the antenna to a wooden table in the ham shack.

To make a long story short, the antenna worked. It's true we didn't work any exotic country on the first try, but our CQ calls produced solid contacts on 40 meters with hams in several east-coast states.

Since both of us use antenna tuners for all of our antennas, the B & W indoor whip was run through an MFJ tuner with 1000-Watt capacity. The swr was virtually a flat 1.1:1.

Upon arriving back in Wisconsin, I began to have second thoughts about the antenna loading up properly with my Triton 4. After all, that was a rugged antenna tuner we'd used in Ohio. However, my worries evaporated when I tuned the little whip attached to a wooden dresser in the bedroom with my DenTron Jr. Monitor tuner. Swr could be adjusted down to 1.4:1 throughout the CW portion of the 40-meter band. I called CQ and worked stations from Colorado to New York that first evening.

Summoning up all of my courage several evenings later, I attached the 20-meter coil. The swr on this band could be adjusted to 1.1:1, and I worked stations from California to New Hampshire.

Of course, I was very pleased and surprised by this kind of performance from a little indoor whip. In addition, I felt confident this little B & W product would keep me on the air even in the apartment-complex environment.

Needless to say, there are some compromises and shortcomings one faces up to when using this kind of antenna. You can't put out a booming, dominating DX signal, and you don't always get 599 signal reports. In addition, I have not tried the whip on SSB because I work 100% CW. I'm sure the results on voice transmissions would be disappointing with all of those 1-kW (and 5-kW, too, I suspect) signals on the air.

Working with this antenna on CW is very similar to working QRP. It takes a little more effort to hear the incoming signals and a little patience when transmitting, too. However, the proof is in the pudding, and the B & W whip has proved it can keep me on the air. Unless the bands are totally quiet, I can QSO just about any time I want to.

For example, I have worked 30 states on the 40-meter band, including California, Oregon, Utah, and Maine. While signal reports are not always good, the fact still remains that hams in those places actually heard me well enough to QSL.

The 20-meter band has been even better, and I've actually worked a little DX. I have QSL cards from Haiti, France, and the Virgin Islands. I have many more cards from all over the United States.

While I'm not saying the B & W model AP-10 antenna should be considered as a primary station radiator when better gear can be installed, I am saying that it apparently does the job it was designed to do. It keeps hams in my situation on the air. I'm grateful, because I'd hate to face those horrible symptoms of withdrawal brought on by the lack of exposure to Morse code.

For further details, contact *Barker & Williamson, 10 Canal Street, Bristol PA 19007*.

Rick Cochran WB8ULZ/9
Kenosha WI

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

AMATEUR RADIO IN WEST AFRICA

While tuning across 15 meters looking for a clear frequency to call CQ, I overheard the following complaint from a group of W2 DXers: "Have you noticed that there aren't any Africans on the air? There are never any African stations around." I broke in and agreed with their observation that African hams were few and far between. And then I signed my call, C5AAQ!

While those DXers got their wish of working an African station, many other DXers continue to lament the difficulty of working many of the countries on the African continent. A recent conversation with Tom Gregory N4NW gives some of the reasons behind this difficulty. Tom was stationed in the Ivory Coast for a tour of duty with the State Department, and he signed TU2NW during his stay in West Africa. Tom cites two major problems for hams in West Africa: the drought and the instability of many of the military governments in the region.

The drought in the region began more than five years ago. The westerly winds which sweep across the continent from the Indian Ocean seldom bring much rain to the inland areas, which is why the world's largest desert forms the bulk of the land area of these countries. But climatic changes have made the water problem much worse in recent years.

The drought affects amateur radio through the production of hydroelectric power. There isn't any. For many of the countries in the region, including Ivory Coast, Niger, Nigeria, Ghana, and Upper Volta, the lack of rain has run the reservoirs dry, and that means little or no electricity in these countries.

Obviously, the lack of electricity makes amateur radio much more difficult. While many of the families which are wealthy enough to afford ham radio can also af-

ford a gas-driven electric generator, that generator finds more use powering the drinking water distillery and keeping the refrigerator going than handing out QSOs to deserving DXers.

Even when the power is on, the cost of operating a radio can be extremely high in West Africa. When I was last in the region (1978), an American stationed in the region could count on an electricity bill of $500–1000 per month, just for household needs. You can imagine the bill for running a high-powered ham station for several hours a day!

However, the high cost (and frequent unavailability) of electric power is not the only problem facing West African amateurs. Tribal conflicts, political corruption, and staggering economic difficulties contribute to the highly volatile political situation in the region. Military coups and other changes in government are commonplace, and ham radio often loses out.

In the atmosphere of suspicion and intrigue, anyone with sophisticated communications gear, such as a multiband amateur transceiver, might be a threat to the existing government. And amateur radio is probably out of the experience of many of the people making policy decisions in these countries, which simply adds to the suspicion.

Let's look at what happened in Ghana as an example of the problems facing ham radio in the region. During the military coup in 1982, some of the Americans working in Ghana eavesdropped on the action with a Bearcat 250 VHF scanner. Living through a coup is a terrifying experience. Most official forms of news are cut off by one side or the other, and what you do hear is simply what they want you to hear, not necessarily what is actually happening. So this small group of Americans used their scanner to monitor the military and government VHF frequencies.

Unfortunately for ham radio in Ghana, a local African noticed this eavesdropping and reported the incident to the new powers that be. The new government was horrified to hear that someone could listen in on their supposedly-private radio communications and promptly arrested the Americans as spies!

Based on this incident, which really had nothing whatsoever to do with amateur radio, the new government banned all amateur radio in Ghana and confiscated all the rigs! When was the last time you heard a 9G station on the air?

The local amateur-radio club is working to get the ban rescinded, but it is a long, slow process to convince all the appropriate officials that amateur radio is a plus for their country. One amateur, 9G2XX, was a good enough friend of the Chairman of Ghana to get on the air, so perhaps normal ham radio will return to Ghana soon.

Even in countries where amateur radio has not been completely banned, written licenses are hard to come by. While the appropriate officials in the PTT or other telecommunications authority might be agreeable to issuing a license, such a request must also win the approval of the internal security people, a much more difficult task.

Whether this latter group goes under the name of Ministry of the Interior, Internal Affairs, or the Secret Police, their function is the same: keep the present government in power. And permitting unrestricted worldwide communications via ham radio is seldom part of their efforts.

So a person applying for an amateur-radio license in Ghana, Niger, Upper Volta, Benin, etc., will usually find his request sitting on the desk of some official in the Internal Affairs department, probably indefinitely.

Niger is a good example. DXpeditioners Carl and Martha Hansen traveled to Niger in an attempt to activate this hard-to-work country. Tom Gregory happened to be in the country at the same time, but even their combined efforts proved fruitless. Neither party could get the required permission to operate.

On the other hand, as long as no written license is needed, it is possible to get verbal permission to operate. Nobody's job (or head) is on the line (if the ham does turn out to be a spy) if there are no written documents. And ham radio does have great value for emergency and backup communications, especially away from the larger cities. The MARS-like operation of several French stations in Chad is a good example. These "amateur" stations are running health and welfare traffic from outlying military posts back to France. But don't bother to break in; their documentation won't pass ARRL DXCC muster. Unfortunately for DXers, contacts with these amateurs usually do *not* count for DXCC credit.

Working West Africa

So much for the bad news. Fortunately, there is some good news about amateur radio in West Africa. First, the region is ideally suited to excellent propagation. Sticking out into the Atlantic Ocean in the tropical latitudes around the equator, West Africa offers some super radio locations.

Propagation to the States and Europe is top-notch for many hours a day, and even the Japanese come through loud and clear along the all-water long path, around the tip of South America.

Tom Gregory suggests the months of September and October as good times to look for the West Africans. What rain they get inland falls mainly during that time, and electricity supplies are more reliable. Good radio propagation continues through the winter months, if the hydro power hasn't dried up.

As for the best time of day to look for stations in this region, Tom reminds DXers that local time in West Africa is UTC. As with stateside DXers, early-evening local time is when most of the amateurs sit down in front of their rigs. So search out those Africans in the 1600–2200 UTC range.

Tom spent a good deal of time on the lower frequencies, handing out contacts with his Kenwood TS830 and Alpha linear. Using a vertical on 40, Tom had good success working split frequency on 40-meter SSB. 7070 kHz is a good spot to look for the Africans on 40, coupled with a listening frequency between 7150 and 7200. 7167 is an especially good "hole" in the heavy interference in that part of the world. 2300 UTC is a good time to try 40.

75 meters is a difficult band in Africa because of the extensive use of the 3800-kHz band for RTTY and other point-to-point communications in ITU Region 1. Sometimes you can't even hear the static crashes because the interference level is so high! With the recent expansion of the US phone bands, Advanced licensees will get a crack at the 75-meter DX window of 3775–3800. Tom made about 1000 contacts on 75 during his stay as TU2NW.

While 160 meters is not an amateur band in Region 1, many countries have granted operating permission on Top Band. Tom wrangled 160-meter operating privileges, but had little success on the band. Dragging himself out of bed at 5:30 in the morning, Tom slugged it out on 160 to the tune of 5–10 contacts per night. Even the *CQ* Worldwide contest only yielded 6 160-meter QSOs. Tom transmits in the DX window and listens at 1818 kHz.

Tom made about 12,000 contacts during his tour as TU2NW, and he will be missed by those looking to confirm Ivory Coast. Anyone who hasn't yet confirmed their contact with TU2NW can do so through Tom's QSL manager, AK3F. *Do not* send cards to TU2NW through the bureau system. As with many visitors and DXpeditioners, the cards won't arrive in the country until long after the operator has departed. The chances of your bureau card catching up with the operator are very slim. Tom also operated as TU73 during the spring of 1984 (a special callsign granted for WPX contests). If you missed TU2NW, you still can work Ivory Coast. Tom reports that there are about 20 active amateurs in Ivory Coast now, mostly French visitors. Assid TU1BS is one of the more active hams, and TU2JD occasionally runs pileups in English.

DXpeditioners might find some of the rarer countries very difficult to activate for DXCC, but other countries in the region are good DXpedition spots. In Mauritania, for example, Tom got his 5T5NW license in six minutes! Mauritania is somewhat unique in the region in that it only issues amateur-radio licenses to expatriates, not to locals! Other possibilities are Senegal, The Gambia, and Gabon. As with many of the French-speaking countries in the region, a letter written in French has the best chance of gaining a valid license.

For anyone traveling to the area, Tom suggests writing (in French) to the PTT giving the usual information about your operation: passport information, dates, location, rigs, etc. A copy of your stateside license and a couple of photographs are also necessary. A letter from your local Chief of Police attesting to your good character is a valuable addition.

Since many of the amateur licensing authorities in the region work closely with the local amateur-radio club, it would be a good idea to include the local club in your plans. A letter to the radio club at the same time as your letter to the PTT licensing group can help speed your application.

Meanwhile, Tom Gregory is back in Africa, this time stationed in Pretoria, South Africa. He reports that he should be on the air as N4NW/ZS6 by September. Then he expects to take the South African amateur exam to get his own ZS call by the end of the year.

Since Tom's work for the State Department has him traveling around the region, he might show up from another country at any time. In addition to his TU2NW license, Tom holds 5T5NW and J5NW. Current plans call for an operation from Swaziland 3D6 for the *CQ* Worldwide SSB at the end of October.

In addition to the low-band frequencies mentioned above, you can look for Tom around 14155 or 14180, and 21255 or 21280. He runs RTTY with his Commodore 64 computer and he is often found on CW as well.

While in southern Africa, Tom has high hopes of breaking the logjam of amateur licensing in Mozambique. C9 amateurs have been nonexistent since the communist-leaning present government took power. However, recent breaks between the Soviets and Mozambique suggest that some changes might be in the offing.

QSL Manager Wanted

With his change in location, Tom is looking for a new QSL manager to handle his ZS contacts and other operations in the region. Since he keeps his log on a disk with his Commodore 64, a manager with the same computer equipped with a disk drive would be ideal. Tom can then send a floppy disk up once a month for the confirmations. If you are interested in this job, contact Tom Gregory at the Department of State, Pretoria, Washington DC 20520.

Meanwhile, enjoy the good propagation of the fall months. The next few summers are likely to be as lousy for DXing as the summer of '84, so concentrate on working what you can when the bands are open. And look for T32AW from Christmas Island in the Pacific at the end of the month (including *CQ* Worldwide SSB). That's yours truly out there. QSL T32AW via K1RH.

DR. DIGITAL

Robert Swirsky AF2M
PO Box 122
Cedarhurst NY 11516

THE DR. DIGITAL POLL

It's hard to judge what interests the typical Dr. Digital reader solely from the mail I receive. Only certain people are motivated to write letters; for most, the process takes too much time or effort. I am going to get around this problem by conducting a poll. While John Edwards' "FUN!" poll revealed some information about the computer habits of amateur-radio operators, it was not specific enough for my needs. So grab a pencil and answer the following questions.

Send your responses to the address listed at the top of this column. You may keep your responses anonymous.

1) Which microcomputer(s), if any, do you own?
- a) Apple
- b) Atari
- c) Commodore
- d) Epson
- e) Franklin
- f) IBM PC
- g) Osborne
- h) TRS-80
- i) S-100 (IEEE-696)
- j) Other

2) Which computer language(s) are you *proficient* in?
- a) Assembly language
- b) Ada
- c) Basic
- d) C
- e) COBOL
- f) Forth
- g) LISP
- h) Pascal
- i) PL/I
- j) Other

3) Do you have any experience with mini- or mainframe computers?
- a) Yes
- b) No

RESPONSE FORM

Read each question and mark your response by circling the appropriate letter next to the number of the question.

1) a b c d e f g h i j	6) a b c d e	11) a b	16) a b	21) a b c d e
2) a b c d e f g h i j	7) a b c d	12) a b	17) a b	22) a b
3) a b	8) a b	13) a b	18) a b	23) a b
4) a b c d e f g h	9) a b	14) a b	19) a b	24) a b
5) a b c d	10) a b	15) a b	20) a b	25) a b c
				26) a b

Comments: _____

_____

_____

4) What amateur-radio applications do you have for your computer?
- a) RTTY
- b) Control of amateur-radio equipment
- c) Record keeping (logs, contests, DXCC list, etc.)
- d) Number crunching (filter design, coordinate calculations, etc.)
- e) Satellite tracking
- f) Morse-code training
- g) SSTV
- h) Other

5) If you use computerized RTTY, which mode(s) do you use?
- a) Murray or Baudot
- b) ASCII
- c) AMTOR
- d) CITOR

6) How much have you spent on computer equipment?
- a) Under $500
- b) $500 to $1499
- c) $1500 to $2999
- d) $3000 to $5000
- e) Over $5000

7) What percentage of your computer programming is done in assembly language?
- a) None
- b) Under 33%
- c) Between 33% and 66%
- d) Over 66%

8) Have you ever built any computer hardware?
- a) Yes
- b) No

9) Have you ever designed any computer hardware?
- a) Yes
- b) No

10) Have you ever made any repairs or modifications to your computer system?
- a) Yes
- b) No

11) Do you own any computer test equipment (i.e., logic probes, scopes, etc.)?
- a) Yes
- b) No

12) To which hobby do you devote more time?
- a) Computers
- b) Amateur radio

13) Do you belong to a computer club?
- a) Yes
- b) No

14) Do you belong to an amateur-radio club?
- a) Yes
- b) No

15) Are you in favor of a digital-class license in the United States?
- a) Yes
- b) No

16) Which hobby have you been involved with longer?
- a) Amateur radio
- b) Computers

17) Do you own a modem?
- a) Yes
- b) No

18) Have you ever used a data base program, such as dBase II, for amateur-radio purposes?
- a) Yes
- b) No

19) If you had to choose only one hobby, which would you pick?
- a) Amateur radio
- b) Computers

20) Are you planning on purchasing more computer equipment in the near future?
- a) Yes
- b) No

21) What is your age?
- a) 15 or below
- b) 16–21
- c) 22–39
- d) 40–59
- e) 60 or above

22) Have you ever written any amateur-radio computer software?
- a) Yes
- b) No

23) Have you ever purchased any amateur-radio computer software?
- a) Yes
- b) No

24) Do you own a microprocessor-controlled rig?
- a) Yes
- b) No

25) What would you like to see emphasized in this column?
- a) Hardware
- b) Software
- c) Equal empasis on both

26) Have you ever used a packet repeater?
- a) Yes
- b) No

Feel free to add any additional thoughts or comments. It is hoped that the information I receive will assist me in choosing topics for the column.

ANOTHER APPROACH TO COMPUTER INTERFACING

Whenever I discuss computer-to-amateur-radio interfacing, I always assume that the reader has a computer with a programmable parallel port or some TTL output lines available. Many computers, however, have only an RS-232 serial port available. This type of port is meant to carry ASCII data and is not suited to control devices.

To get around this problem, a number of companies have developed serial I/O controllers. These devices interpret certain ASCII characters from a serial port and use them to control relays or other switching devices. With a serial I/O controller, for example, a TRS-100 can be used to control electronic equipment without an extra I/O port.

One serial I/O controller is the Sias Engineering CIP/35. This device will interface to any computer that has an RS-232 port. Using certain ASCII characters, the host computer can switch any one of eight relay-controlled outputs on or off. The CIP/35 also has eight inputs that can be read through the serial port.

A controller such as the CIP/35 has some interesting uses. If, for example, a CIP/35 is used to control a repeater, it can be connected with an auto-answer modem to a phone line. The computer does not have to be located at the same site as the controller. This way, one does not have to dedicate a computer for control purposes.

Each output on the CIP/35 can handle 6 Amps. The eight inputs are optically isolated from the board. For more information on the CIP/35, contact Sias Engineering, Inc., R.R. 1, Box 315, Salina, Kansas 67401; (913)-823-8027.

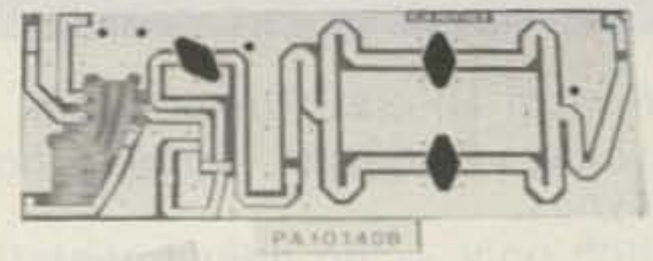
TIPS ON CHIPS

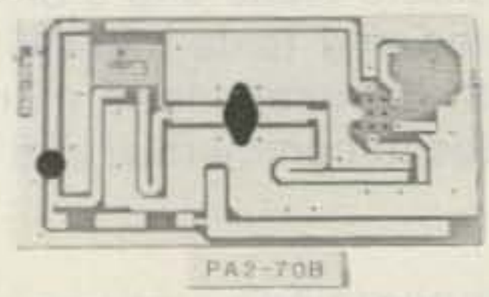
A good way to learn digital electronics is to learn about the various types of digital integrated circuits on the market. Every manufacturer of integrated circuits publishes spec sheets and data books describing their product line. These publications, which are usually available at modest cost, contain a great deal of useful information.

One reference which I use often is the National Semiconductor *Databook*. This publication lists many types of digital logic circuits ranging from simple NAND gates to complex multiplexers and shift registers. Chips are described using pinout diagrams, truth tables, timing diagrams, logical equations, and electrical characteristics. Applications notes are also given. For more information on this *Databook*, as well as other publications from National Semiconductor, contact National Semiconductor Corporation, 2900 Semiconductor Drive, Santa Clara, California 95051.

Some other companies that have low-cost publications available are: Intel Corporation, 3065 Bowers Avenue, Santa Clara, California 95051; Rockwell International, Electronic Devices Division, 1842 Reynolds, Irvine, California 92626. When writing to these companies, ask for their "literature guide." Intel and Rockwell also have many free publications available. These, too, are listed in their literature guides.

✓ See List of Advertisers on page 98





EIMAC 4CX10,000D/8171 with SK300 and SK1306	$1200.00	KLM ELECTRONICS,INC. VHF AMPLIFIER PC BOARDS AND RF TRANSISTOR KITS.
SK300 and SK1306 Only.	$ 350.00	Model PA2-70B RF power input 2watts at 144 to 148MHz output 70watts 13.5vdc at 10amps.
(These are all new not used.) Limited Supply.		$49.99 with data PC Board Only $14.99
		MODEL PA10140B RF power input 10watts at 144 to 148MHz output 140watts 13.5vdc at 18amps.
		$89.99 with data PC Board Only $19.99

GENEVA CALCULATOR WATCH

This attractive watch has the following modes:
Normal Time Setting,
Calendar Setting,
Daily Alarm Time Setting,
Weekly Alarm Time Setting,
Chronograph,
Calculator.

Featured in Black Plastic **$18.99** or **Featured in Stainless Steel** $29.99

SILICON DIODES

MR751	100vdc	6Amps	10/$5.00	100/$38.00
MR510	1000vdc	3Amps	10/$3.75	100/$24.00
HEP170	1000vdc	2Amps	20/$2.00	100/$15.00
1N3209	100vdc	15Amps	$2.00	10/ $15.00
BYX21/200	200vdc	25Amps	$2.00	10/ $15.00
1N2138A	600vdc	60Amps	$5.00	10/ $40.00
DS85-04C	400vdc	80Amps	$10.00	10/ $80.00
1N3269	600vdc	160Amps	$15.00	10/$120.00
275Z41	300vdc	250Amps	$20.00	10/$175.00
7-5754	300vdc	400Amps	$30.00	10/$250.00
RCD-15	15KVDC	20ma.	$3.00	10/ $20.00
SMFR20K	20KVDC	20ma.	$4.00	10/ $30.00
1N4148	signal		30/$1.00	100/ $3.00

FEED THRU SOLDER RF CAPACTORS

470pf +-20%

5/$1.00 or 100/$15.00 or 1000/$100.00

1000pf/.001uf +-10%

4/$1.00 or 100/$20.00 or 1000/$150.00

E PROMS

2708 1024x1	$2.00 each
2716 2048x8	$4.00 each
27L32/25L32	$10.00 each

FAIRCHILD 4116 16K DYNAMIC RAMS 200ns. Part # 16K75

25 For $25.00 or 100 For $90.00 or 1000 For $750.00

HEWLETT PACKARD MICROWAVE DIODES

1N5711	(5082-2800)	Schottky Barrier Diodes	$1.00 or 10 for $ 8.50
1N5712	(5082-2810)	" " "	$1.50 or 10 for $10.00
1N6263	(HSCH-1001)	" " "	$ .75 or 10 for $ 5.00
5082-2835		" " "	$1.50 or 10 for $10.00
5082-2805	Quad Matched	" " " per set	$5.00 or 10 for $40.00

For information call: (602) 242-3037

Toll Free Number
800-528-0180
(For orders only)

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

MHz electronics

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

"MIXERS"

WATKINS JOHNSON WJ-M6 Double Balanced Mixer

LO and RF 0.2 to 300MHz	IF DC to 300MHz	$21.00
Conversion Loss (SSB)	6.5dB Max. 1 to 50MHz 8.5dB Max. .2 to 300MHz	WITH DATA SHEET
Noise Figure (SSB)	same as above 8.5dB Max. 50 to 300MHz	
Conversion Compression	.3dB Typ.	

NEC (NIPPON ELECTRIC CO. LTD. NE57835/2SC2150 Microwave Transistor

NF Min	F=2GHz	dB 2.4 Typ.	MAG	F=2GHz	dB 12 Typ.	$5.30
	F=3GHz	dB 3.4 Typ.		F=3GHz	dB 9 Typ.	
	F=4GHz	dB 4.3 Typ.		F=4GHz	dB 6.5 Typ.	

Ft Gain Bandwidth Product at Vce=8v, Ic=10ma. GHz 4 Min. 6 Typ.
Vcbo 25v Vceo 11v Vebo 3v Ic 50ma. Pt. 250mw

UNELCO RF Power and Linear Amplifier Capacitors

These are the famous capacitors used by all the RF Power and Linear Amplifier manufacturers, and described in the RF Data Book.

5pf	10pf	18pf	30pf	43pf	100pf	200pf	1 to 10pcs. $1.00 ea
5.1pf	12pf	22pf	32pf	51pf	110pf	220pf	11 to 50pcs. $ .90 ea
6.8pf	13pf	25pf	33pf	60pf	120pf	470pf	51 up pcs. $ .80 ea
7pf	14pf	27pf	34pf	80pf	130pf	500pf	
8.2pf	15pf	27.5pf	40pf	82pf	140pf	1000pf	

NIPPON ELECTRIC COMPANY TUNNEL DIODES

		MODEL 1S2199	1S2200 $7.50
Peak Pt. Current ma.	Ip	9min. 10Typ. 11max.	9min. 10Typ. 11max.
Valley Pt. Current ma.	Iv	1.2Typ. 1.5max.	1.2Typ. 1.5max.
Peak Pt. Voltage mv.	Vp	95Typ. 120max.	75Typ. 90max.
Projected Peak Pt. Voltage mv.	Vpp Vf=Ip	480min. 550Typ. 630max.	440min. 520Typ. 600max.
Series Res. Ohms	rS	2.5Typ. 4max.	2Typ. 3max.
Terminal Cap. pf.	Ct	1.7Typ. 2max.	5Typ. 8max.
Valley Pt. Voltage mv.	VV	370Typ.	350Typ.

FAIRCHILD / DUMONT Oscilloscope Probes Model 4290B

Input Impedance 10 meg., Input Capacity 6.5 to 12pf., Division Ratio (Volts/Div Factor) 10:1, Cable Length 4Ft. , Frequency Range Over 100MHz.
These Probes will work on all Tektronix, Hewlett Packard, and other Oscilloscopes.

PRICE $45.00

MOTOROLA RF DATA BOOK

Listsall Motorola RF Transistors / RF Power Amplifiers, Varactor Diodes and much much more.

PRICE $7.50

For information call: (602) 242-3037

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

MHz electronics

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

RF TRANSISTORS, MICROWAVE DIODES

TYPE	PRICE
2N1561	$ 25.00
2N1562	25.00
2N1692	25.00
2N2957	1.55
2N2857JANTX	4.10
2N2857JANTXV	4.10
2N2876	13.50
2N2947	18.35
2N2948	13.00
2N2949	15.50
2N3375	17.10
2N3553	1.55
2N3632	15.50
2N3733	11.00
2N3818	5.00
2N3866	1.30
2N3866JAN	2.20
2N3924	3.35
2N3927	17.25
2N3950	25.00
2N4012	11.00
2N4041	14.00
2N4072	1.80
2N4080	4.53
2N4127	21.00
2N4427	1.30
2N4428	1.85
2N4430	11.80
2N4957	3.45
2N4959	2.30
2N5090	13.80
2N5108	3.45
2N5109	1.70
2N5160	3.45
2N5177	21.62
2N5179	1.04
2N5216	56.00
2N5583	3.45
2N5589	9.77
2N5590	10.92
2N5591	13.80
2N5637	15.50
2N5641	12.42
2N5642	14.03
2N5643	15.50
2N5645	13.80
2N5646	20.70
2N5651	11.05
2N5691	18.00
2N5764	27.00
2N5836	3.45
2N5842/MM1607	8.45
2N5849	20.00
2N5913	3.25
2N5916	36.00
2N5922	10.00
2N5923	25.00
2N5941	23.00
2N5942	40.00
2N5944	10.35
2N5945	11.50
2N5946	14.40
2N6080	10.35
2N6081	12.07
2N6082	12.65
2N6083	13.25
2N6084	15.00
2N6094	11.00
2N6095	12.00
2N6096	16.10
2N6097	20.70
2N6105	21.00
2N6136	21.85
2N6166	40.24
2N6201	50.00
2N6304	1.50
2N6459	18.00
2N6567	10.06
2N6680	80.00
2SC703	3.00
2SC756A	7.50
2SC781	2.80
2SC1018	1.00
2SC1042	12.00
2SC1070	2.50
2SC1239	2.50
2SC1251	12.00
2SC1306	2.90
2SC1307	5.50
2SC1424	2.80
2SC1678	$ 2.00
2SC1729	20.00
2SC1760	1.50
2SC1909	4.00
2SC1946	36.00
2SC1946A	40.00
2SC1970	2.50
2SC1974	4.00
2SC2166	5.50
2SC2237	32.00
2SC2695	47.00
A50-12	25.00
A209	10.00
A283	5.00
A283B	6.00
AF102	2.50
AFY12	2.50
BF272A	2.50
BFR21	2.50
BFR90	1.00
BFR91	1.65
BFR99	2.50
BFT12	2.50
BFW16A	2.50
BFW17	2.50
BFW92	1.50
BFX44	2.50
BFX48	2.50
BFX65	2.50
BFX84	2.50
BFX85	2.50
BFX86	2.50
BFX89	1.00
BFY11	2.50
BFY18	2.50
BFY19	2.50
BFY39	2.50
BFY90	1.00
BLX67	15.24
BLX68C3	15.24
BLX93C3	22.21
BLY87A	8.94
BLY88C3	13.08
BLY94C	21.30
BLY351	10.00
BLY568C/CF	30.00
C458-617	25.00
C4005	20.00
CD1899	20.00
CD2188	18.00
CD2545	25.00
CTC3005	100.00
Dexcel GaAs FET	
DXL3501A-P100F	49.30
Fujitsu GaAs FET	
FSX52WF	58.00
GMC290A	2.50
HEP76	4.95
HEPS3002	11.40
HEPS3003	30.00
HEPS3005	10.00
HEPS3006	19.90
HEPS3007	25.00
HEPS3010	11.34
Hewlett Packard	
HFET2204	112.00
35821E	38.00
35826B	32.00
35826E	32.00
35831E-H31	30.00
35831E	30.00
35832E	50.00
35833E	50.00
35853E	71.50
35854E	75.00
35866E	44.00
HXTR3101	7.00
HXTR3102	8.75
HXTR5104	30.00
HXTR6104	68.00
HXTR6105	31.00
HXTR6106	33.00
J310	.70
TRW	
JC2000	10.00
JC2001	25.00
JO4045	25.00
Motorola Comm.	
M1131	8.50
M1132	11.95
M1134	$ 16.90
M9579	7.95
M9588	7.50
M9622	7.95
M9623	9.95
M9624	11.95
M9625	17.95
M9630	18.00
M9740	29.90
M9741	29.90
M9755	19.50
M9848	37.00
M9850	16.90
M9851	20.00
M9887	5.25
MEL80091	25.00
MM1550	10.00
MM1552	50.00
MM1553	50.00
MM1614	10.00
MM1943/2N4072	1.80
MM2608	5.00
MM3375A	17.10
MM4429	10.00
MM8000	1.15
MM8006	2.30
MM8011	25.00
MPF102	.45
MPSU31	1.01
MRA2023-1.5	42.50
MRF208	16.10
MRF212	16.10
MRF223	13.25
MRF224	15.50
MRF231	10.92
MRF232	12.07
MRF233	12.65
MRF237	3.15
MRF238	13.80
MRF239	17.25
MRF245	35.65
MRF247	35.65
MRF304	43.45
MRF309	33.81
MRF314	28.52
MRF315	28.86
MRF316	POR
MRF317	63.94
MRF420	20.00
MRF421	36.80
MRF422A	41.40
MRF427	17.25
MRF428	46.00
MRF433	12.07
MRF449/A	12.65
MRF450/A	14.37
MRF453/A	18.40
MRF454/A	20.12
MRF455/A	16.00
MRF458	20.70
MRF463	25.00
MRF472	1.00
MRF475	3.10
MRF476	2.00
MRF477	14.95
MRF492	23.00
MRF502	1.04
MRF503	6.00
MRF504	7.00
MRF509	5.00
MRF511	10.69
MRF515	2.00
MRF517	2.00
MRF559	2.05
MRF605	20.00
MRF618	25.00
MRF628	8.65
MRF629	3.45
MRF644	27.60
MRF646	29.90
MRF816	15.00
MRF823	20.00
MRF901 (3) Lead	1.00
MRF901 (4) Lead	2.00
MRF904	2.30
MRF911	3.00
MRF961	2.30
MRF8004	2.10
MS261F	POR
MSC1720-12	225.00
MSC1821-3	$125.00
MSC1821-10	225.00
MSC2001	40.00
MSC2223-10	200.00
MSC3000	50.00
MSC3001	50.00
MSC73001	50.00
MSC82001	40.00
MSC82014	40.00
MSC82020	40.00
MSC82030	40.00
MSC83001	50.00
MSC83005	100.00
MT4150	14.40
MT5126	POR
MT5596/2N5596	99.00
MT5768/2N5768	95.00
MT8762	POR
NEC2136	2.50
NE13783	POR
NE21889	POR
NE57835	5.70
NE73436	2.50
TRW	
PRT8637	POR
PT3190	POR
PT3194	POR
PT3195	POR
PT3537	7.80
PT4166E	POR
PT4176D	POR
PT4186B	POR
PT4209	POR
PT4209C/5645	POR
PT4556	24.60
PT4570	7.50
PT4577	POR
PT4590	POR
PT4612	POR
PT4628	POR
PT4640	POR
PT4642	POR
PT5632	4.70
PT5749	POR
PT6629	POR
PT6709	POR
PT6720	POR
PT8510	POR
PT8524	POR
PT8609	POR
PT8633	POR
PT8639	POR
PT8659	POR
PT8679	POR
PT8708	POR
PT8709	POR
PT8727	29.00
PT8731	POR
PT8742	19.10
PT8787	POR
PT9783	16.50
PT9784	32.70
PT9790	56.00
PT31962	POR
PT31963	POR
PT31083	POR
PTX6680	POR
RCA	
40081	5.00
40279	10.00
40280	4.62
40281	10.00
40282	20.00
40290	2.80
40292	13.05
40294	2.50
40341	21.00
40608	2.48
40894	1.00
40977	10.00
62800A	60.00
RE3754	25.00
RE3789	25.00
RF110	25.00
S50-12	25.00
S3006	5.00
S3031	5.00
SCA3522	5.00
SCA3523	5.00
PRICE ON REQUEST = POR	

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

For information call: (602) 242-3037

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

MHz electronics

GaAs, TUNNEL DIODES, ETC.

* R F TRANSISTORS *

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
THOMSON CSF						SD1453-1	$48.00
SD345	$ 5.00	SD1119	$ 5.00	SD1278-5	$18.00	SD1454-1	48.00
SD445	5.00	SD1124	50.00	SD1281-2	8.00	SD1477	48.00
SD1004	15.00	SD1127	3.50	SD1283	10.00	SD1478	21.00
SD1009	15.00	SD1133	14.00	SD1289-1	15.00	SD1480	60.00
SD1009-2	15.00	SD1133-1	14.00	SD1290-4	15.00	SD1484	1.50
SD1012	9.90	SD1134-1	3.00	SD1290-7	15.00	SD1484-5	1.50
SD1012-3	9.90	SD1135	8.00	SD1300	3.00	SD1484-6	1.50
SD1012-5	9.90	SD1136	15.00	SD1301-7	3.00	SD1484-7	1.50
SD1013-3	13.50	SD1136-2	15.00	SD1305	3.00	SD1488	39.00
SD1013-7	13.50	SD1143-1	12.00	SD1307	3.00	SD1488-1	28.00
SD1014	11.00	SD1143-3	17.00	SD1308	3.00	SD1488-7	27.00
SD1014-6	11.00	SD1144-1	3.00	SD1311	1.00	SD1488-8	28.00
SD1016	15.00	SD1146	15.00	SD1317	10.00	SD1499-1	39.00
SD1016-5	15.00	SD1147	15.00	SD1335	3.00	SD1520-2	18.00
SD1018-4	15.00	SD1188	10.00	SD1345-6	5.00	SD1522-4	33.00
SD1018-6	15.00	SD1189	24.00	SD1365-1	2.50	SD1528-1	24.00
SD1018-7	15.00	SD1200	1.50	SD1365-5	2.50	SD1528-3	34.00
SD1018-15	15.00	SD1201-2	10.00	SD1375	7.50	SD1530-2	38.00
SD1020-5	10.00	SD1202	10.00	SD1375-6	7.50	SD1536-1	41.00
SD1028	15.00	SD1212-11	4.00	SD1379	15.00	SD1545	34.00
SD1030-2	12.00	SD1212-12	4.00	SD1380-1	1.00	SD1561	79.00
SD1043	12.00	SD1212-16	4.00	SD1380-3	1.00	SF4557 Mot.	25.00
SD1043-1	10.00	SD1214-7	5.00	SD1380-7	1.00	SK3048 RCA	5.00
SD1045	3.75	SD1214-11	5.00	SD1405	40.00	SK3177 RCA	15.00
SD1049-1	2.00	SD1216	12.00	SD1409	18.00	SMS7714 Mot.	2.50
SD1053	4.00	SD1219-4	15.00	SD1410	22.00	SRF750 Mot.	36.00
SD1065	4.75	SD1219-5	15.00	SD1410-3	21.00	SRF1018 Mot.	5.00
SD1068	15.00	SD1219-8	15.00	SD1413-1	18.00	SRF2147 Mot.	22.00
SD1074-2	18.00	SD1220	8.00	SD1416	50.00	SRF2356 Mot.	38.00
SD1074-4	28.00	SD1220-9	8.00	SD1422-2	24.00	SRF2378 Mot.	16.00
SD1074-5	28.00	SD1222-8	16.00	SD1428	33.00	SRF2584 Mot.	40.00
SD1076	20.00	SD1222-11	7.50	SD1429-2	15.00	SRF2821 Mot.	25.00
SD1077-4	4.00	SD1224-10	18.00	SD1429-3	15.00	SRF2857 Mot.	20.00
SD1077-6	4.00	SD1225	18.00	SD1429-5	15.00	TA8894 RCA	15.00
SD1078-6	24.00	SD1228-8	POR	SD1430	12.00	TIS189/MRF966	3.55
SD1080-8	6.00	SD1229-7	13.00	SD1430-2	18.00	TP312	2.50
SD1080-9	3.00	SD1229-16	13.00	SD1434-5	30.00	TP1014 TRW	5.00
SD1084	8.00	SD1232	4.00	SD1434-9	30.00	TP1028 TRW	15.00
SD1087	15.00	SD1240-8	15.00	SD1438	26.00	01-80703T04/	
SD1089-5	15.00	SD1244-1	14.00	SD1441	91.00	458-949 Mot.Comm.	65.00
SD1095	15.00	SD1262	12.00	SD1442	15.00	TXVF2201 H.P.	450.00
SD1100	5.00	SD1263	15.00	SD1444	6.00	62803 RCA	100.00
SD1109	18.00	SD1263-1	15.00	SD1444-8	6.00	TA7205/2N5921	80.00
SD1115-2	8.00	SD1272	13.00	SD1450-1	28.00	TA7487/2N5920	75.00
SD1115-3	8.00	SD1272-2	15.00	SD1451	18.00	TA7995/2N6267	150.00
SD1115-7	2.50	SD1272-4	15.00	SD1451-2	18.00	SRF2092 Mot.	18.00
SD1116	5.00	SD1278	20.00	SD1452	20.00	MRF479	8.05
SD1118	22.00	SD1278-1	18.00	SD1452-2	20.00		

We Can Cross Reference Most RF Transistors, Diodes, Hybrid Modules And Any Other Type Of Semiconductor.

* DIODES (HOT CARRIER,MICROWAVE,PIN,SCHOTTKY,TUNNEL,VARACTOR,GUNN) *

1N21	$ 3.40	1N21B	$ 3.40	1N21BR	$ 3.40	1N21C	$ 3.40
1N21D	4.00	1N21DR	4.00	1N21ER	6.00	1N21RF	5.00
1N21WE	5.80	1N21WG	5.80	1N22	5.00	1N23A	10.00
1N23B	3.40	1N23C	3.40	1N23CR	3.40	1N23D	4.95
1N23DR	4.00	1N23WE	5.00	1N25	7.50	1N25AR	18.00
1N28WE	10.00	1N29	10.00	1N32	20.00	1N53A	55.50
1N76	26.00	1N76R	28.00	1N78	26.00	1N78A	20.00
1N78B	26.00	1N78D	28.00	1N78DR	28.00	1N78R	28.00
1N149	6.00	1N150MR	18.00	1N415	4.00	1N415C	4.00
1N415G	15.00	1N416D	5.00	1N416E	6.00	1N446	10.00
1N831	10.00	1N833	10.00	1N950	4.00	1N1084	2.00
1N2930	15.00	1N2932	15.00	1N3540	15.00	1N3712	11.00
1N3713	18.00	1N3714	11.00	1N3715	16.00	1N3716	10.00
1N3717	14.00	1N3718	10.00	1N3721	14.00	1N3733	10.00
1N3747	21.00	1N4386	20.00	1N4396	15.00	1N4785	11.00
1N4812B	9.00	1N5139A/B	4.25	1N5140A/B	4.25	1N5141A/B	4.25
1N5142A/B	4.25	1N5143A/B	4.25	1N5144A/B	4.25	1N5145A/B	4.25
1N5146A/B	4.25	1N5147A/B	4.25	1N5148A/B	4.25	1N5167	5.50
1N5453	3.75	1N5465	7.65	1N5711	1.00	1N5711 JAN	2.00
1N5713	5.00	1N5767	2.00	1N6263	1.00	1S2199	15.00
1S2200	15.00	1S2208/9	1.00	8B1087/48R869558	65.00	8D3020	65.00
A2X116M Aertech	50.00	BB105B	1.00	BB105G	1.00	BD4/4JFBD4 G.E.	15.00
BL161 Bomac	5.00	CMD514AB C.M.	POR	D4060 Alpha	POR	D4159 Alpha	POR
D4233B Alpha	POR	D4900 Alpha	POR	D4959 Alpha	POR	D4987M Alpha	POR
D5047C Alpha	POR	D5147D Alpa	POR	D5503 Alpha	POR	D5506 Alpha	POR
DGB6158-98 Alpha	POR	DMD6022 Alpha	POR	DMD6460A Alpha	POR	DP20054 Crown	POR
GC1691-89 GHZ	31.35	GC1602-89 GHZ	31.35	GC1607-40 GHZ	31.35	GC2531-88 GHZ	37.40
GC2542-46 GHZ	37.40	GC3208-40 GHZ	37.40	GC17044 GHZ	50.00	HP33644A-H01	125.00
HP5082-0112	14.20	HP5082-0241	75.60	HP5082-0253	105.00	HP5082-0320	58.00
HP5082-0375	POR	HP5082-0386	POR	HP5082-0401	POR	HP5082-0438	POR
HP5082-1028	POR	HP5082-1332	POR	HP5082-2254	POR	HP5082-2302	10.70
HP5082-2303	5.20	HP5082-2696	POR	HP5082-2711	23.15	HP5082-2727	POR
HP5082-2800	1.00	HP5082-2805	4.45	HP5082-2835	1.00	HP5082-2884	POR
HP5082-3039	6.70	HP5082-3040	36.00	HP5082-3080	2.00	HP5082-3188	1.00
HP5082-3379	1.50	HP5082-6459	POR	HP5082-6462	POR	HP5082-6888	POR
HP5082-8016	POR	HP5082-8323	POR	K3A Kemtron	7.00	MA450A	POR
MA475	POR	MA40008	POR	MA41487	POR	MA41765	POR
MA41766	POR	MA43004	48.00	MA43589	POR	MA43622	POR
MA43636	POR	MA45104	27.00	MA47044	POR	MA47051	25.50
MA47100	3.05	MA47202	30.80	MA47771	POR	MA47838*	POR
MA47852	POR	MA49106	37.95	MA49558	POR	MA86731	125.00

* OUR STOCK CHANGES DAILY SO CALL IF IF THE PART YOU NEED IS NOT LISTED

For information call: (602) 242-3037

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

MHz electronics

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

COAXIAL RELAY SWITCHES SPDT

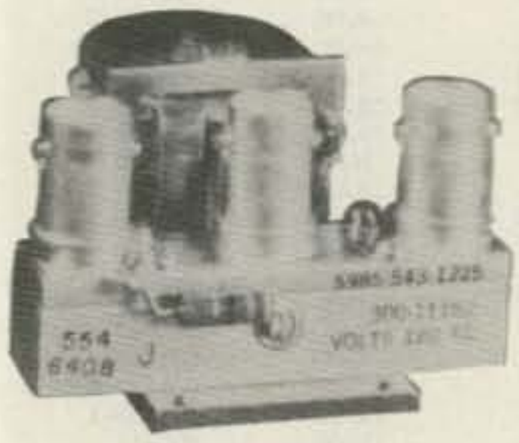
Electronic Specialty Co./Raven Electronics FSN 5985-556-9683 $49.00
Part # 25N28 Part # SU-01
26Vdc Type N Connector, DC to 1 GHz.

Amphenol
Part # 316-10102-8
115Vac Type BNC DC to 3 GHz.

$29.99

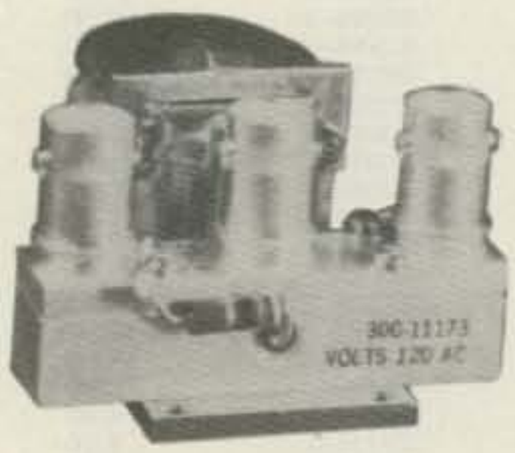
FXR
Part # 300-11182
120Vac Type BNC DC to 4 GHz.
FSN 5985-543-1225

$39.99



FXR
Part # 300-11173
120Vac Type BNC Same
FSN 5985-543-1850

$39.99



BNC To Banana Plug Coax Cable RG-58 36 inch or BNC to N Coax Cable RG-58 36 inch.

$7.99 or 2 For $13.99 or 10 For $50.00 $8.99 or 2 For $15.99 or 10 For $60.00

SOLID STATE RELAYS

P&B Model ECT1DB72 5vdc turn on 120vac contact at 7amps or 20amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
PRICE EACH $5.00

Digisig, Inc. Model ECS-215 5vdc turn on 240vac contact 14amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
PRICE EACH $7.50

Grigsby/Barton Model GB7400 5vdc turn on 240vac contact at 15amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
PRICE EACH $7.50

NOTE: *** Items may be substituted with other brands or equivalent model numbers. ***

For information call: (602) 242-3037

MHz electronics

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

Toll Free Number
800-528-0180
(For orders only)

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

RECALL PHONE MEMORY TELEPHONE WITH 24 NUMBER AUTO DIALER

The Recall Phone Telephone employs the latest state of art communications technology.It is a combination telephone and automatic dialer that uses premium-quality,solid-state circuitry to assure high-reliability performance in personal or business applications. $49.99

ARON ALPHA RAPID BONDING GLUE

Super Glue #CE-486 high strength rapid bonding adhesive.Alpha Cyanoacrylate.Set-Time 20 to 40 sec.,0.7fl.oz.(20gm.)
$2.00

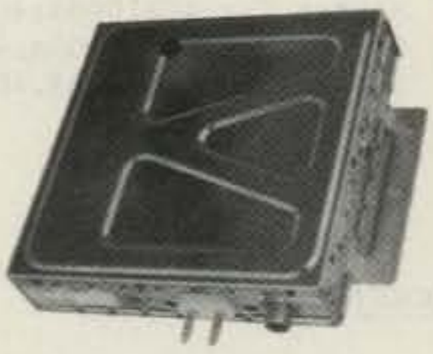
TOUCH TONE PAD

This pad contains all the electronics to produce standard touch-tone tones. New with data.

$9.99 or 10/$89.99

MITSUMI UHF/VHF VARACTOR TUNER MODEL UVE1A

Perfect for those unscrambler projects. New with data.



$19.99 or 10/$149.99

INTEGRATED CIRCUIT

		1 to 10	11up
MC1372P	Color TV Video Modulator Circuit.	$ 4.42	$2.95
MC1358P	IF Amp.,Limiter,FM Detector,Audio Driver,Electronic Attenuator.	5.00	4.00
MC1350P	IF Amplifier	1.50	1.25
MC1330A1P	Low Level Video Detector	1.50	1.15
MC1310P	FM Stereo Demodulator	4.29	3.30
MC1496P	Balanced Modulator/Demodulator	1.50	1.25
LM565N	Phase Locked Loop	2.50	2.00
LM380N14	2Watt Audio Power Amplifier	1.56	1.25
LM1889N	TV Video Modulator	5.00	4.00
NE564N	Phase Locked Loop	10.00	8.00
NE561N	Phase Locked Loop	10.00	8.00

FERRANTI ELECTRONICS AM RADIO RECEIVER MODEL ZN414 INTEGRATED CIRCUIT.

Features:

1.2 to 1.6 volt operating range.,Less than 0.5ma current consumption. 150KHz to 3MHz Frequency range.,Easy to assemble,no alignment necessary. Effective and variable AGC action., Will drive an earphone direct. Excellent audio quality.,Typical power gain of 72dB.,TO-18 package. With data. $2.99 or 10 For $24.99

NI CAD RECHARGEABLE BATTERIES

AA Battery Pack of 6 These are Factory New. $5.00

SUB C Pack of 10 2.5Amp/Hr. $10.00

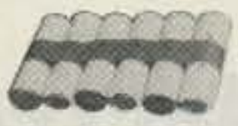
Gates Rechargeable Battery Packs

12vdc at 2.5Amp/Hr.	$11.99
12vdc at 5Amp/Hr.	$15.99

MOTOROLA MRF559 RF TRANSISTOR

hfe 30min 90typ 200max.
ft 3000mhz
gain 8db min 9.5typ at 870mhz
13db typ at 512mhz
output power .5watts at 12.5vdc
at 870mhz.

$2.05 or 10/$15.00



MHz electronics

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

For information call: (602) 242-3037

Toll Free Number
800-528-0180
(For orders only)

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

"SOCKETS AND CHIMNEYS"

EIMAC TUBE SOCKETS AND CHIMNEYS

SK110	Socket	$POR
SK300A	Socket For 4CX5000A,R,J, 4CX10,000D, 4CX15,000A,J	$520.00
SK400	Socket For 4-125A,250A,400A,400C,4PR125A,400A,4-500A,5-500A	260.00
SK406	Chimney For 4-250A,400A,400C,4PR400A	74.00
SK416	Chimney For 3-400Z	36.00
SK500	Socket For 4-1000A/4PR1000A/B	390.00
SK600	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	51.00
SK602	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	73.00
SK606	Chimney For 4CX250B,BC,FG,R,4CX350A,F,FJ	11.00
SK607	Socket For 4CX600J,JA	60.00
SK610	Socket For 4CX600J,JA	60.00
SK620	Socket For 4CX600J,JA	66.00
SK626	Chimney For 4CX600J,JA	10.00
SK630	Socket For 4CX600J,JA	66.00
SK636B	Chimney For 4CX600J,JA	34.00
SK640	Socket For 4CX600J,JA	36.00
SK646	Chimney For 4CX600J,JA	71.00
SK700	Socket For 4CX300A,Y,4CX125C,F	225.00
SK711A	Socket For 4CX300A,Y,4CX125C,F	225.00
SK740	Socket For 4CX300A,Y,4CX125C,F	86.00
SK770	Socket For 4CX300A,Y,4CX125C,F	86.00
SK800A	Socket For 4CX1000A,4CX1500B	225.00
SK806	Chimney For 4CX1000A,4CX1500B	40.00
SK810	Socket For 4CX1000A,4CX1500B	225.00
SK900	Socket For 4X500A	300.00
SK906	Chimney For 4X500A	57.00
SK1420	Socket For 5CX3000A	650.00
SK1490	Socket For 4CV8000A	585.00

JOHNSON TUBE SOCKETS AND CHIMNEYS

124-111/SK606	Chimney For 4CX250B,BC,FG,R, 4CX350A,F,FJ	$ 10.00
122-0275-001	Socket For 3-500Z, 4-125A, 250A, 400A, 4-500A, 5-500A	(pair)15.00
124-0113-00	Capacitor Ring	15.00
124-116/SK630A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
124-115-2/SK620A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
	813 Tube Socket	20.00

TUBE CAPS (Plate)

HR1, 4	$11.00
HR2,3, 6 & 7	13.00
HR5, 8	14.00
HR9	17.00
HR10	20.00

CHIP CAPACITORS

.8pf	10pf	100pf*	430pf
1pf	12pf	110pf	470pf
1.1pf	15pf	120pf	510pf
1.4pf	18pf	130pf	560pf
1.5pf	20pf	150pf	620pf
1.8pf	22pf	160pf	680pf
2.2pf	24pf	180pf	820pf
2.7pf	27pf	200pf	1000pf/.001uf*
3.3pf	33pf	220pf*	1800pf/.0018uf
3.6pf	39pf	240pf	2700pf/.0027uf
3.9pf	47pf	270pf	10,000pf/.01uf
4.7pf	51pf	300pf	12,000pf/.012uf
5.6pf	56pf	330pf	15,000pf/.015uf
6.8pf	68pf	360pf	18,000pf/.018uf
8.2pf	82pf	390pf	

PRICES: 1 to 10 - .99¢ 101 to 1000 .60¢ * IS A SPECIAL PRICE: 10 for $7.50
11 to 50 - .90¢ 1001 & UP .35¢ 100 for $65.00
51 to 100 - .80¢ 1000 for $350.00

WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator $110.00

Frequency range 3.6 to 4.2GHz, Power ouput, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic (nf_0), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +-0.05 volts @ 55mA, Max.

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

MHz electronics

For information call: (602) 242-3037

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

TUBES

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2C39/7289	$ 34.00	1182/4600A	$500.00	ML7815AL	$ 60.00
2E26	7.95	4600A	500.00	7843	107.00
2K28	200.00	4624	310.00	7854	130.00
3-500Z	102.00	4657	84.00	ML7855KAL	125.00
3-1000Z/8164	400.00	4662	100.00	7984	14.95
3B28/866A	9.50	4665	500.00	8072	84.00
3CX400U7/8961	255.00	4687	P.O.R.	8106	5.00
3CX1000A7/8283	526.00	5675	42.00	8117A	225.00
3CX3000F1/8239	567.00	5721	250.00	8121	110.00
3CW30000H7	1700.00	5768	125.00	8122	110.00
3X2500A3	473.00	5819	119.00	8134	470.00
3X3000F1	567.00	5836	232.50	8156	12.00
4-65A/8165	69.00	5837	232.50	8233	60.00
4-125A/4D21	79.00	5861	140.00	8236	35.00
4-250A/5D22	98.00	5867A	185.00	8295/PL172	500.00
4-400A/8438	98.00	5868/AX9902	270.00	8458	35.00
4-400B/7527	110.00	5876/A	42.00	8462	130.00
4-400C/6775	110.00	5881/6L6	8.00	8505A	95.00
4-1000A/8166	444.00	5893	60.00	8533W	136.00
4CX250B/7203	54.00	5894/A	54.00	8560/A	75.00
4CX250FG/8621	75.00	5894B/8737	54.00	8560AS	100.00
4CX250K/8245	125.00	5946	395.00	8608	38.00
4CX250R/7580W	90.00	6083/AZ9909	95.00	8624	100.00
4CX300A/8167	170.00	6146/6146A	8.50	8637	70.00
4CX350A/8321	110.00	6146B/8298	10.50	8643	83.00
4CX350F/8322	115.00	6146W/7212	17.95	8647	168.00
4CX350FJ/8904	140.00	6156	110.00	8683	95.00
4CX600J/8809	835.00	6159	13.85	8877	465.00
4CX1000A/8168	242.50*	6159B	23.50	8908	13.00
4CX1000A/8168	485.00	6161	325.00	8950	13.00
4CX1500B/8660	555.00	6280	42.50	8930	137.00
4CX5000A/8170	1100.00	6291	180.00	6L6 Metal	25.00
4CX10000D/8171	1255.00	6293	24.00	6L6GC	5.03
4CX15000A/8281	1500.00	6326	P.O.R.	6CA7/EL34	5.38
4CW800F	710.00	6360/A	5.75	6CL6	3.50
4D32	240.00	6399	540.00	6DJ8	2.50
4E27A/5-125B	240.00	6550A	10.00	6DQ5	6.58
4PR60A	200.00	6883B/8032A/8552	10.00	6GF5	5.85
4PR60B	345.00	6897	160.00	6GJ5A	6.20
4PR65A/8187	175.00	6907	79.00	6GK6	6.00
4PR1000A/8189	590.00	6922/6DJ8	5.00	6HB5	6.00
4X150A/7034	60.00	6939	22.00	6HF5	8.73
4X150D/7609	95.00	7094	250.00	6JG6A	6.28
4X250B	45.00	7117	38.50	6JM6	6.00
4X250F	45.00	7203	P.O.R.	6JN6	6.00
4X500A	412.00	7211	100.00	6JS6C	7.25
5CX1500A	660.00	7213	300.00*	6KN6	5.05
KT88	27.50	7214	300.00*	6KD6	8.25
416B	45.00	7271	135.00	6LF6	7.00
416C	62.50	7289/2C39	34.00	6LQ6 G.E.	7.00
572B/T160L	49.95	7325	P.O.R.	6LQ6/6MJ6 Sylvania	9.00
592/3-200A3	211.00	7360	13.50	6ME6	8.90
807	8.50	7377	85.00	12AT7	3.50
811A	15.00	7408	2.50	12AX7	3.00
812A	29.00	7609	95.00	12BY7	5.00
813	50.00	7735	36.00	12JB6A	6.50

NOTE * = USED TUBE

NOTE P.O.R. = PRICE ON REQUEST

"ALL PARTS MAY BE NEW, USED, OR SURPLUS. PARTS MAY BE SUBSTITUTED WITH COMPARABLE PARTS IF WE ARE OUT OF STOCK OF AN ITEM.

NOTICE: ALL PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

For information call: (602) 242-3037

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

MHz electronics

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

"FILTERS"

COLLINS Mechanical Filter #526-9724-010 MODEL F455Z32F

455KHZ at 3.2KHz wide. May be other models but equivalent. May be used or new. $15.99

ATLAS Crystal Filters

5.595-2.7/8/LSB, 5.595-2.7/LSB
8 pole 2.7KHz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-2.7/8/U, 5.595-2.7/USB
8 pole 2.7Khz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-.500/4, 5.595-.500/4/CW
4 pole 500 cycles wide CW. Impedance 800ohms 15pf In/800ohms 0pf out. 19.99

9.0USB/CW
6 pole 2.7KHz wide at 6dB. Impedance 680ohms 7pf In/300ohms 8pf out. CW-1599Hz 19.99

KOKUSAI ELECTRIC CO, Mechanical Filter #MF-455-ZL/ZU-21H

455KHz at Center Frequency of 453.5KC. Carrier Frequency of 455KHz 2.36KC Bandwidth.
Upper sideband. (ZU) 19.99
Lower sideband. (ZL) 19.99

****

CRYSTAL FILTERS

NIKKO	FX-07800C	7.8MHz	$10.00
TEW	FEC-103-2	10.6935MHz	10.00
SDK	SCH-113A	11.2735MHz	10.00
TAMA	TF-31H250	CF 3179.3KHz	19.99
TYCO/CD	001019880	10.7MHz 2pole 15KHz bandwidth	5.00
MOTOROLA	4884863B01	11.7MHz 2pole 15KHz bandwidth	5.00
PTI	5350C	12MHz 2pole 15KHz bandwidth	5.00
PTI	5426C	21.4MHz 2pole 15KHz bandwidth	5.00
PTI	1479	10.7MHz 8pole bandwidth 7.5KHz at 3dB, 5KHz at 6dB	20.00
COMTECH	A10300	45MHz 2pole 15KHz bandwidth	6.00
FRC	ERXF-15700	20.6MHz 36KHz wide	10.00
FILTECH	2131	CF 7.825MHz	10.00

****

CERAMIC FILTERS

AXEL	4F449	12.6KC Bandpass Filter 3dB bandwidth 1.6KHz from 11.8-13.4KHz	10.00
CLEVITE	TO-01A	455KHz+-2KHz bandwidth 4-7% at 3dB	5.00
	TCF4-12D36A	455KHz+-1KHz bandwidth 6dB min 12KHz, 60dB max 36KHz	10.00
MURATA	BFB455B	455KHz	2.50
	BFB455L	455KHz	3.50
	CFM455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 50dB	6.65
	CFM455D	455KHz +-7KHz at 3dB , +-10KHz at 6dB , +-20KHz at 50dB	6.65
	CFR455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 60dB	8.00
	CFU455B	455KHz +-2KHz bandwidth +-15KHz at 6dB, +-30KHz at 40dB	2.90
	CFU455C	455KHz +-2KHz bandwidth +-12.5KHz at 6dB , +-24KHz at 40dB	2.90
	CFU455G	455KHz +-1KHz bandwidth +-4.5KHz at 6dB , +-10KHz at 40dB	2.90
	CFU455H	455KHz +-1KHz bandwidth +-3KHz at 6dB , +-9KHz at 40dB	2.90
	CFU455I	455KHz +-1KHz bandwidth +-2KHz at 6dB , +-6KHz at 40dB	2.90
	CFW455D	455KHz +-10KHz at 6dB , +-20KHz at 40dB	2.90
	CFW455H	455KHz +-3KHz at 6dB , +-9KHz at 40dB	2.90
	SFB455D	455KHz	2.50
	SFD455D	455KHz +-2KHz , 3dB bandwidth 4.5KHz +-1KHz	5.00
	SFE10.7MA	10.7MHz 280KHz +-50KHz at 3dB , 650KHz at 20dB	2.50
	SFE10.7MS	10,7MHz 230KHz +-50KHz at 3dB , 570KHz at 20dB	2.50
	SFG10.7MA	10.7MHz	10.00
NIPPON	LF-B4/CFU455I	455KHz +-1KHz	2.90
	LF-B6/CFU455H	455KHz +-1KHz	2.90
	LF-B8	455KHz	2.90
	LF-C18	455KHz	10.00
TOKIN	CF455A/BFU455K	455KHz +-2KHz	5.00
MATSUSHIRA	EFC-L455K	455KHz	7.00

****

SPECTRA PHYSICS INC, Model 088 HeNe LASER TUBES

POWER OUTPUT 1.6MW. BEAM DIA. .75MM BEAM DIR. 2.7MR 8KV STARTING VOLTAGE DC
68K OHM 1WATT BALLAST 1000VDC +-100VDC At 3.7MA $59.99

ROTRON MUFFIN FANS Model MARK4/MU2A1

115 VAC 14WATTS 50/60CPS IMPEDENCE PROTECTED-F 88CFM at 50CPS $ 7.99
105CFM at 60CPS

THESE ARE NEW

MHz electronics

Toll Free Number
800-528-0180
(For orders only)

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

For information call: (602) 242-3037

HEWLETT PACKARD SIGNAL GENERATORS

606A	50KHz to 65MHz in 6 bands +-1%,Output level adjustable 0.1uV to 3V into 50 ohms.Built-in crystal calibrator.400 -1000Hz modulation.	$ 650.00
606B	Same as above but has frequency control feature to allow operation with HP 8708A Synchronizer.	$1100.00
608C	10MHz to 480MHz,0-1uV-1V into 50 ohms,AM,CW,or pulse modulation, calibrated attenuator.	$ 500.00
608D/ TS510	10MHz to 420MHz, 0.1uV-0.5V into 50 ohms,+-0.5% accuracy, built-in crystal calibrator, AM-CW or pulse output.	$ 375.00
608E	Improved version of popular 608C.Up to 1V output.Improved stability,low residual FM.	$1450.00
608F	10MHz to 455MHz in 5 bands +-1% frequency accuracy with built-in crystal calibrator.Can be used with HP 8708A Synchronizer. Output continuously adjustable from .1uV to .5V into 50 ohms.	$1100.00
612A	450-1230MHz ,o.1uV-0.5V into 50 ohms,calibrated output.	$ 750.00
614A	900-2100MHz with many features including calibrated output and all modulation characteristics.	$ 500.00
616A/ TS403	Direct reading and direct control from 1.8 to 4.2GHz. The H.P.616A features +-1.5dB calibrated output accuracy from -3127dBm to -dBm.The output is directly calibrated in microvolts and dBm with continuous monitoring. Simple operation frequency diad accuracy is +-1% and stability exceeds 0.005%-/ C change in ambient temperature. Calibrated attenuator is within +-1.5dB over entire output band. 50 ohm impedance unit has internal pulse modulation with rep rate variable from 40 Hz to 4KHz,variable pulsewidth(1 to 10usec)and variable pulse delay(3 to 300usec).External modulating inputs increas versatility.	$ 375.00
616B	Same as above but later model.	$ 600.00
618B	3.8 to 7.6GHz range,with calibrated output and selection of pulse-FM or square wave modulation.	$ 600.00
618C	Same as above but later model.	$2200.00
620A	7 to 11GHz range,with calibrated output and selection of pulse-FM or square wave modulation.	$ 750.00
620B	Same as above but later model.	$2200.00
626A	10 to 15GHz,10mw output power with calibrated output and pulse-square wave or FM modulation.	$4200.00
8708A	Synchronizer used with 606B,608F.The synchronizer is a phase-lock frequency stabilizer which provides crystal-oscillator frequency stability to 430MHz in the 608F signal generator.Phase locking eliminates microphonics and drift resulting in excellent frequency stability.The 8708A includes a vernier which can tune the reference oscillator over a range of +-0.25% permitting frequency settability to 2 parts in 10 to the seventh.Provides a very stable signal that satisfies many critical applications.	
	(With HP 606B or 608F)	$ 350.00
	(Without)	$ 450.00
EMC-10	ELECTROMETRICS EMC-10 RFI/EMI RECEIVER Low frequency analyzer covering 20Hz to 50KHz frequency range.Extendable to 500 KHz in wideband mode.	$2500.00
NF-105F	Empire Devices Field Intensity Meter. Has NF-105/TA,NF-105/TX,NF-105/T1,NF-105/T2,NF-105/T3. Covers 14KHz to 1000MHz.	$2100.00

ALL EQUIPMENT CARRY A 30 DAY GUARANTEE.

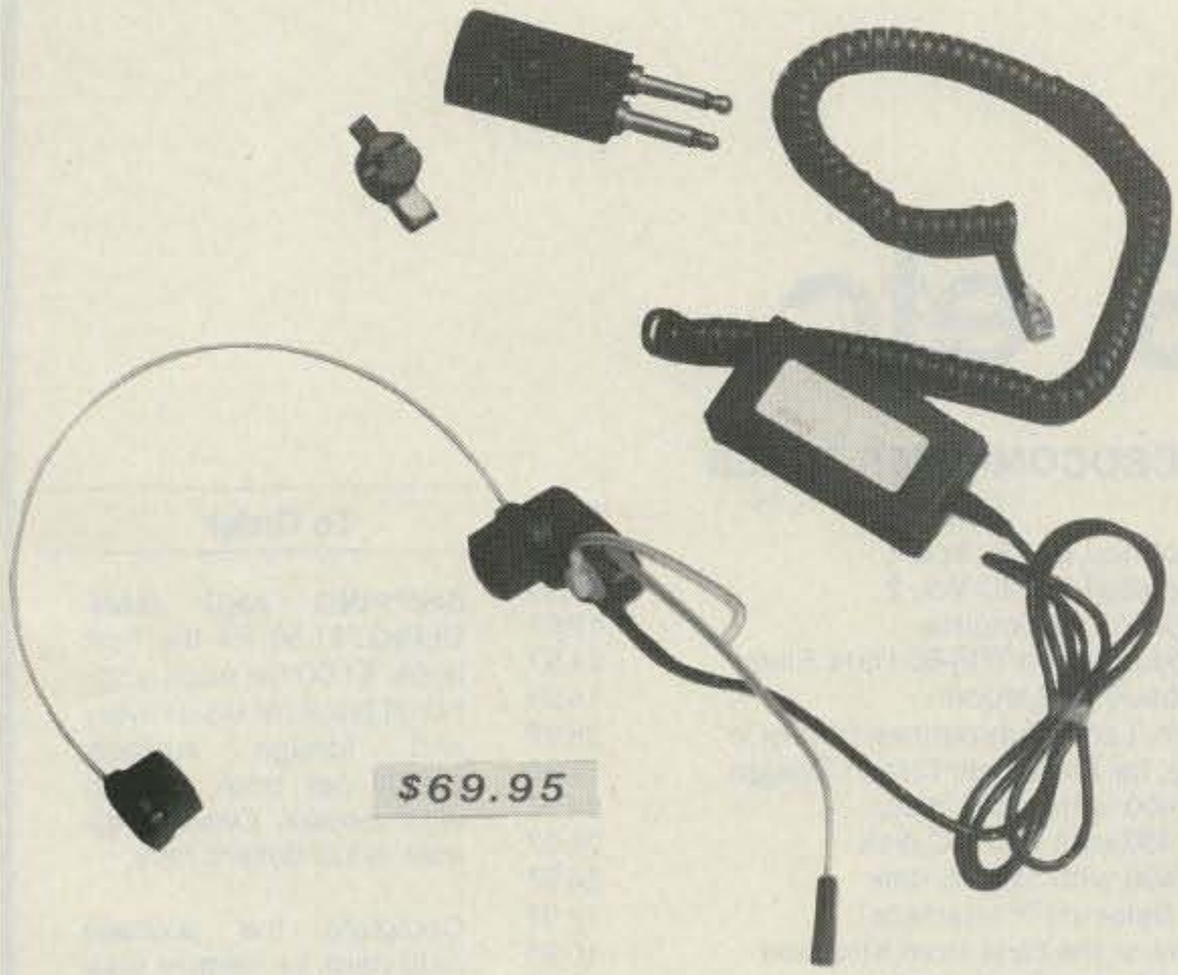
EQUIPMENT IS NOT CALIBRATED.

UNEX LABORATORIES THS-2 FLEXICOM HEADSET.

these headsets come with data to hook up to a ICOM radios and many other equipment.

Perfect for Airplanes , Helicopters , Mobile Radios , or Just the Telephone.

These Are Factory New In Sealed Boxes. Limited Supply Only $69.95



TERMS: DOMESTIC: Prepaid, C.O.D. or Credit Card
FOREIGN: Prepaid only, U.S. Funds, Money Order, or Cashier's Check Only.

C.O.D.' Acceptable by telephone or mail. Payment from customer will be by Cash, Money Order, or Cashier's Check. We are sorry but we cannot accept personal checks for C.O.D.'s. C.O.D.'s are shipped by air only and thru United Parcel Service.

CONFIRMING ORDERS: We would prefer that confirming orders not be sent after a telephone order has been placed. If company policy necessitates a confirming order, please mark "CONFIRMING" boldly on the order. If problems or duplicate shipments occur due to an order which is not properly marked, the customer will be held responsible for any charges incurred, plus a 15% restock charge on the returned parts.

CREDIT CARDS: We are now accepting MASTERCARD, VISA, AND AMERICAN EXPRESS

DATA SHEETS: When we have data sheets in stock on devices we will supply them with the order.

DEFECTIVE MATERIALS: All claims for defective materials must be made within 30 DAYS after receipt of the parcel. All claims must include the defective material (for testing purposes), a copy of our invoice, and a return authorization number which must be obtained prior to shipping the merchandise back to us. This can be obtained by calling (602) 242-8916 or sending us a postcard. Due to Manufacturer warranties we are unable to replace or issue credit on items which have been soldered to or have been altered in any way. All return items must be packed properly or it will void all warranties. We do not assume responsibility for shipping and handling charges incurred.

DELIVERY: Orders are usually shipped the same day they are placed or the next business day, unless we are out of stock on an item. The customer will be notified by post card if we are going to backorder the item. Our normal shipping method is UPS or U.S. Mail depending on size or the weight of the package. Test Equipment is shipped only by air and is freight collect, unless prior arrangements have been made and approved.

FOREIGN ORDERS: All foreign orders must be prepaid with a Cashier's Check, or Money Order made out in U.S. FUNDS ONLY. We are sorry but C.O.D. is not available to foreign countries and letters of credit are unacceptable as a form of payment. Further information is available on request.

HOURS: Monday thru Friday 8:30 a.m. to 5:00 p.m. Saturdays 8:30 a.m. to 4:00 p.m.

INSURANCE: Please include 25¢ for each additional $100.00 over $100.00, UPS ONLY. All insured packages are shipped thru UPS only. If you wish to have it shipped through the post office there is a $5.00 fee which is additional to the shipping, handling and insurance.

OPEN ACCOUNTS: We regret that we do not issue open accounts.

ORDER FORMS: New order forms are included with each order for your convenience. Additional order forms are available on request.

PARTS: We reserve the right to substitute or replace any item with a part of equal or comparable specification.

POSTAGE: Minimum shipping and handling in the U.S., Canada, and Mexico is $3.00 for ground shipments, all other countries is $5.50. Air rates are available at the time of your order. All foreign orders please include 25% of the ordered amount for shipping and handling. C.O.D.'s are shipped AIR ONLY.

PREPAID ORDERS: Orders must be accompanied by a check.

PRICES: Prices are subject to change without notice.

PURCHASE ORDERS: We accept purchase orders only when they are accompanied by a check.

RESTOCK CHARGES: If parts are returned to MHZ ELECTRONICS, INC. due to customer error, the customer will be held responsible for all fees incurred and will be charged a 15% RESTOCK CHARGE with the remainder in CREDIT ONLY. The following must accompany any return; A copy of our invoice, return authorization number which must be obtained prior to shipping the merchandise back. Returns must be done within 10 DAYS of receipt of parcel. Return authorization numbers can be obtained by calling (602) 242-8916 or notifying us by post card. Return authorizations will not be given out on our 800 number.

SALES TAX: ARIZONA residents must add 6% sales tax, unless a signed ARIZONA resale tax card is currently on file with us. All orders placed by persons outside of ARIZONA, but delivered to persons in ARIZONA are subject to the 6% sales tax.

SHORTAGE OR DAMAGE: All claims for shortages or damages must be made within 5 DAYS of receipt of parcel. Claims must include a copy of our invoice, along with a return authorization number which can be obtained by contacting us at (602) 242-8916 or sending a post card. Authorizations cannot be on our 800 number. All items must be properly packed. If items are not properly packed make sure to contact the carrier so that they can come out and inspect the package before it is returned to us. Customers which do not notify us within this time period will be held responsible for the entire order as we will consider the order complete.

OUR 800 NUMBER IS STRICTLY FOR ORDERS ONLY (800) 528-0180. INFORMATION CALLS ARE TAKEN ON (602) 242-8916 or (602) 242-3037.

MHz electronics ↙48

2111 W. CAMELBACK ROAD
PHOENIX, ARIZONA 85015

"All parts may be new or surplus, and parts may be substituted with comparable parts if we are out of stock of an item."

Toll Free Number
800-528-0180
(For orders only)

For information call: (602) 242-3037

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

↙ See List of Advertisers on page 98

ADVERTISERS

*Please contact these advertisers directly.
To receive full information from our advertisers please complete the postage-paid card.

R. S. No.		Page
*	AEA/Advanced Electronic Applications	16, 17, 65, 82, 109
297	A.G.W. Enterprises, Inc.	46
20	All Electronics	27
*	Amateur Communications, Etc.	19
*	Amateur Electronic Supply	23, 63
334	Amidon Associates	107
71	Applied Invention	107
293	Arcomm	14
266	Azimuth Communications Corp.	79
*	Barker & Williamson	64, 84
305	Barry Electronics	31
152	Bencher, Inc.	19
477	Bilal Company	83
298	Bilal Company	86
*	Bill Ashby & Son	107
*	Butternut Electronics	50
462	CES, Inc.	114
290	CMC Communications, Inc.	87
111	CeCo Communications	105
287	Coilco Elect., Inc.	61
301	Com-Rad Industries	61
14	Communications Concepts, Inc.	50
296	Communications Electronics	13
15	Communications Specialists, Inc.	8, 9
280	*Computer Trader*	103
*	Connect Systems, Inc.	57
25	Control Products Unltd.	50
*	Crumtronics	71
*	dataLOG	71
346	Data Service	99
425	Doppler Systems	24
*	EGE	36
400	Engineering Consulting	50
99	Faxscan	4
304	Fox-Tango Corporation	73
139	Fox-Tango Corporation	109
269	GLB Electronics	105
281	Glen Martin Engineering	107
352	Grove Enterprises	103
167	H. Stewart Designs	86
31	Hal-Tronix	64
271	Ham MasterTapes	35
*	Ham Radio Outlet	3
485	Hamtronics, NY	100
288	Hamtronics, NY	110
33	Hamtronics, NY	111
*	Horizon Printing Co.	99
123	Hustler, Inc.	4
291	Hustler, Inc.	107
274	ICOM	Cov. II
486	ICOM	101
*	J. L. Industries	87
481	J. L. Industries	100
*	KLM Electronics	105
165	K & S Enterprises	69
*	Kantronics	47
*	Kenwood	7, Cov. IV
482	Larsen Antennas	100
322	Larsen Antennas	37
9	MFJ Enterprises	52, 53
48	MHz Electronics	88–97
45	Madison Electronics Supply	41
54	Magnum Distributors, Inc.	15
49	Micro Control Specialties	61
51	Microlog Corp.	43
*	Mirage Communications	42
254	National Comm. Group	24
412	Nemal Electronics	79
137	*Nuts & Volts*	71
*	*Orbit* Magazine	78
*	P.C. Electronics	64
4	Parsec Communications	108
306	Philadelphia Resins Corp.	19
148	Public Domain	24
277	RF Products	101
61	Radio Amateur *Callbook*, Inc.	109
454	Radiokit	69
268	Ramsey Electronics	113
*	Roensch Microwave	101
500	*73* Back Issues	69
	Dealer Ad	109
	Mailing List	87
	Moving	78, 87
	Subscriptions	18, 51, 99
65	S-F Amateur Radio Sales	87
68	Spectrum Communications	59
436	Spectrum International	46
*	Spider Antenna	24
*	The Ham Shack	45
104	Trionyx, Inc.	23
203	Unicorn Electronics	25
300	Uniden Bearcat	5
149	Unique Comm. Corp.	99
179	Universal Electronics	49
*	University Microfilms	99
*	Vid-Com	71
*	W.H. Nail Company	99
*	W9INN Antennas	71
79	Wacom Products	50
80	Western Radio Electronics	99
*	Wheeler Applied Research Lab	99
*	Williams Radio Sales	99
83	Yaesu Electronics	Cov. III

BOOKS, etc.

AMATEUR RADIO/ELECTRONICS TITLES

Catalog #	Item	Price
BK7307	Behind the Dial	$ 4.95
CT7305	5 WPM Code Tape	4.95
CT7306	6+ WPM Code Tape	4.95
CT7313	13+ WPM Code Tape	4.95
CT7320	20+ WPM Code Tape	4.95
CT7325	25+ WPM Code Tape	4.95
CT7394	Code Tapes (any four above)	15.95
BK7308	Contest Cookbook	5.95
BK7321	A Guide to Ham Radio	4.95
BK7322	Hobby Computers Are Here	2.49
BK7393	Living on a Shoestring	7.97
BK7312	The Magic of Ham Radio	4.95
BK7340	The New Hobby Computers	2.49
BK7383	The New Weather Satellite Handbook	8.95
BK7310	Owner Repair of Radio Equipment	7.95
BK7302	Propagation Wizard's Handbook	6.95
BK7351	SSB...The Misunderstood Mode	5.50
BK7368	VHF Antenna Handbook	5.95
SG7357	Study Guide-Novice Class	4.95
SG7358	Study Guide-General Class	6.95
CT7300	Novice Study Tapes (Set of 3)	15.95
LB7360	Test Equip. Lib. V2—Audio Tester	1.95
LB7361	Test Equip. Lib. V3—Radio Equip.	1.95
LB7362	Test Equip. Lib. V4—IC Test Equip.	1.95
LB7365	Test Equip. Lib. V0—Vols. 2, 3, & 4	4.95
BK7315	World Repeater Atlas	2.00

MICROCOMPUTER TITLES

Catalog #	Item	Price
BK7384	Annotated BASIC Vol. 1	10.95
BK7385	Annotated BASIC Vol. 2	10.95
BK7390	Inside Your Computer	12.97
BK7398	Introduction to TRS-80 Data Files	24.97
BK7386	Kilobaud Klassroom	14.95
BK7404	Mach. Lang. Subroutines for CoCo	29.97
BK7400	Prog. for Electronic Circuit Design	14.95
CC740011	BK7400 with Apple disk	24.97
CC740012	BK7400 with IBM PC disk	24.97
CC740013	BK7400 with TRS-80 disk	24.97
BK7388	The Selectric™ Interface	12.97
BK7311	Some of the Best from Kilobaud	10.95
BK7394	TRS-80 as a Controller	12.97
BK7395	TRS-80/Z80 Assembly Lang. Library	34.97
BK7382	Understanding & Prog. Microcomputers	10.95

SHELF BOXES

Catalog #	Item	Price
BX1000	Shelf box—1	2.00
BX1001	Shelf boxes—2-7	1.50 ea.
BX1002	Shelf boxes—8 and up	1.25 ea.

To Order

SHIPPING AND HANDLING: $1.50 for the first book. $1.00 for each additional book for US delivery and foreign surface. $10.00 per book for foreign airmail. Orders payable in US dollars only.

Complete the postage paid card, or itemize your order with payment or complete credit card information (include postage and handling) to: **WG Books, ATTN. Retail Sales, Rte. 101 and Elm St., Peterborough, NH 03458.**

ALL BAND TRAP ANTENNAS!

PRETUNED - COMPLETELY ASSEMBLED - ONLY ONE NEAT SMALL ANTENNA FOR ALL BANDS! EXCELLENT FOR CONDO'S - APARTMENTS - LIGHT - STRONG - ALMOST INVISIBLE!

FOR ALL MAKES & MODELS OF AMATEUR TRANSCEIVERS! GUARANTEED FOR 2000 WATTS SSB INPUT FOR NOVICE AND ALL CLASS AMATEURS! IMPROVED DESIGN!

COMPLETE with 90 ft. RG58U-52 ohm feedline, and PL259 connector, insulators, 30 ft. 300 lb. test dacron end supports, center connector with built in lightning arrester and static discharge - molded, sealed, weatherproof, resonant traps 1"X6" - you just switch to band desired for excellent worldwide operation - transmitting and receiving! Low SWR over all bands - Tuners usually NOT NEEDED! Can be used as inverted V's - slopers - in attics, on building tops or narrow lots. The ONLY ANTENNA YOU WILL EVER NEED FOR ALL BANDS - WITH ANY TRANSCEIVER - NEW - NO BALUNS NEEDED!

80-40-20-15-10 - 2 trap - 104 ft. - Model 998BUC . $99.95
40-20-15-10 — 2 trap — 54 ft. - Model 1001BUC . . $98.95
20-15-10 meter - 2 trap - 26ft. - Model 1007BUC . . $97.95

SEND FULL PRICE FOR POSTPAID INSURED. DEL. IN USA. (Canada is $5.00 extra for postage - clerical - customs etc.) or order using VISA - MASTER CARD - AMER. EXPRESS. Give number and ex. date. Ph 1-308-236-5333 9AM - 6PM week days. We ship in 2-3 days. ALL PRICES MAY INCREASE ORDER NOW! All antennas guaranteed for 1 year. 10 day money back trial if returned in new condition! Made in USA. FREE INFO.
AVAILABLE ONLY FROM
WESTERN ELECTRONICS ↙80
A7-10
Kearney, Nebraska, 68847

SANTEC handhelds

ST-142 For 2-Meters **279.00**

Free $9.95 Mob. Quick Charge Cable

ST-222 H/T (220 mHz) $289
ST-442 H/T (440 mHz) $299
LS-202 (2-M FM/SSB-H/T) $239

KDK KDK

FM-2033 25 Watt 2-Meter FM **279.00**

FM-4033 (220 mHz) $339
FM-6033 (6-Meters) $289
FM-7033 (440 mHz $339

FREE UPS Brown Shipping-Add $1.65 for COD
N.C. Res. Add 4½% Sales Tax. Sorry No Cards.

The Nation's Largest Mail Order Santec Dealer

WILLIAMS RADIO SALES
600 LAKEDALE ROAD, DEPT. C
COLFAX, N.C. 27235
(919) 993-5881 Noon to 10 P.M. EST

IT'S INCREDIBLE!

Master code or upgrade in a matter of days. **Code Quick** is a unique breakthrough which simplifies learning Morse Code. Instead of a confusing maze of dits and dahs, each letter will magically begin to call out its own name! Stop torturing yourself! Your amazing kit containing 5 power-packed cassettes, visual breakthrough cards and original manual is only **$39.95!** Send check or money order today to WHEELER APPLIED RESEARCH LAB, P.O. Box 3261, City of Industry, CA 91744. Ask for **Code Quick #103**, California residents add 6% sales tax.

One User Comments:
"First new idea in code study and the darn thing works! So much fun you don't realize how much you're learning."

M.S. Greneda, Miss.

Hundreds of satisfied customers!
You can't lose! Follow each simple step. You must succeed or return the kit for a total immediate refund!

Subscription Problem?

73 does not keep subscription records on the premises, therefore calling us only adds time and doesn't solve the problem.

Please send a description of the problem and your most recent address label to:

73 Amateur Radio's Technical Journal

Subscription Dept.
PO Box 931
Farmingdale, NY 11737

Quality
Service
Low Price

$20.00/1000

4 Choices of colored card stock
Send SASE for samples & ordering information

Horizon Printing Co.
315 South Craig Pl.
Lombard, IL. 60148

MICROWAVE PREAMPLIFIERS

Ampire 1690N:
- 1.6 to 1.8 GHz
- 25 dB gain
- 3.0 dB noise figure
- N connectors standard
- Use on GOES & METEOSAT systems

Ampire 2001:
- 2.0 to 2.6 GHz
- 20 dB gain
- 3.5 dB noise figure
- BNC connectors standard
- DC & RF cables included
- Use with microwave TV converters

Ampire 1690N $139.95
Ampire 2001 . . . . . $129.95
Ampire 2001N $149.95
Shipping: USA . . . $2.00 Foreign . . . $10.00

Data Service Company
3110 Evelyn Street ↙346
Roseville, MN 55113
612-636-9469

MasterCard VISA

this publication is available in microform

University Microfilms International

300 North Zeeb Road
Dept. P.R.
Ann Arbor, MI 48106
U.S.A.

18 Bedford Row
Dept. P.R.
London, WC1R 4EJ
England

EGBERT][+
RTTY - CW - XFER

for the Apple II, II+, IIe
Transmit & Receive with Software Only

NO TU REQUIRED

The Egbert][+ has RTTY/CW/XFER on the same disk! and features: split screen operation, type ahead buffer, selectable mark, space, shift and speed, change modes and speeds from menu, mailbox with selective call and save to disk. Provisions for up to 9 canned messages on each data disk, and much more.

FOR MORE INFO, OR ORDER, CALL OR WRITE:

W.H. NAIL COMPANY
275 Lodgeview Drive
Oroville, Ca. 95965
(916) 589-2043

M/C VISA

Egbert][+ =69.95 includes program, back up & documentation. USA Residents add $2.50 for shipping. All others add $6.00. Ca. Res. add 6% sales tax.

INCLUDE CALL SIGN WITH ORDER!

Telephones & Accessories

AT LOWEST PRICES

- Cordless Phones
- Memory Phones
- Answerers
- Dialers
- Hardware
- Speaker Phones
- Call Diverters
- Feature Phones

Send $2.00 for Complete Catalog

UNIQUE COMMUNICATIONS, INC.
181 E. Longview, P.O. Box 5234
Mansfield, Ohio 44901
↙149 (419) 526-6996

↙ See List of Advertisers on page 98

NEW PRODUCTS

LARSEN NMO ANTENNAS, PO-K MOUNTING KITS

The Larsen PO-K mounting kit features SO-239-style mounting hardware that can be installed entirely from outside the vehicle. The PO series mount looks like the SO-239 connector (sometimes called a female UHF connector), but unlike the SO-239, it can be installed from outside the vehicle. Its two O rings and one gasket offer super moisture sealing.

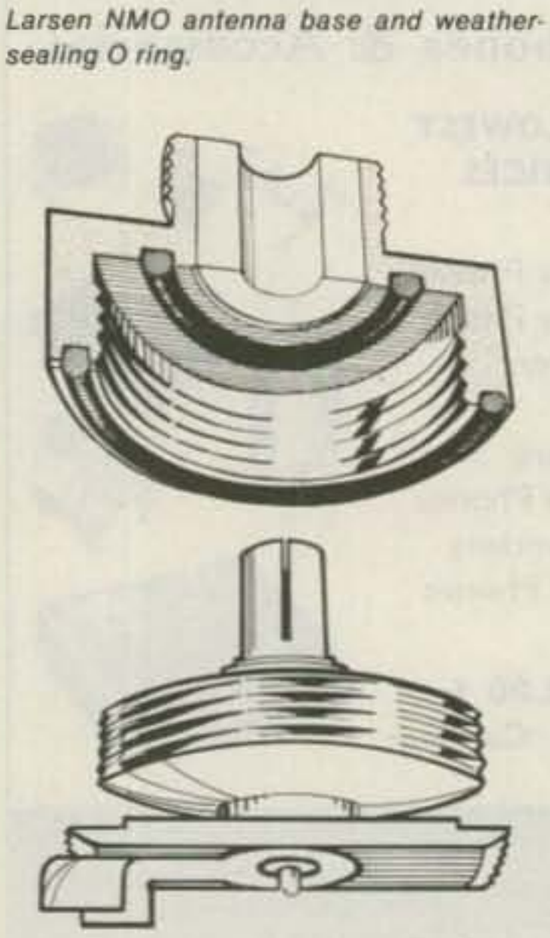
Larsen's PO-K includes complete mounting kit and coax; the PO-B contains mounting hardware only.

Larsen NMO series antennas offer improved weather protection. The improved NMO coil features an extra lip around the bottom, providing a place for an O ring. The ring surrounds the threads that tighten to the vehicle surface, eliminating the chance that water may be drawn through the threads and decrease performance or corrode mounting hardware.

All NMO series VHF and UHF products now include this change. LM and NLA series are equipped with a neoprene gasket around mounting hardware for a weathertight seal.

For more information, contact *Larsen Electronics, PO Box 1799, Vancouver WA 98668; (206)-573-2722.* Reader Service number 482.

A Larsen NMO antenna.



Larsen NMO antenna base and weather-sealing O ring.

Cutaway of Larsen PO-K antenna mount.

ANTUNER AND HAM-ANTUNER

J. L. Industries has introduced Antuner, an automatic antenna tuner with no moving parts. Antuner covers a wide spectrum of frequencies from .1 MHz to 100 MHz. An antenna system with Antuner in which 50 feet of wire is attached to the hot end of the unit and a minimum of 25 feet is attached to the ground side of the unit will produce an swr of no higher than 1.5 to 1. For frequencies above 12 MHz, it rarely exceeds 1.2 to 1.

The Transi-Trap surge protector from Alpha Delta Communications, Inc.

To achieve these results, Antuner incorporates the use of sophisticated circuitry for tuning as well as input-impedance stabilization. All this is accomplished by the use of a three-port circulator. The system is phased so that there is minimal attenuation in the feed direction and a much greater attenuation in the reverse direction. Currents in the feed direction induce currents in the windings that are in phase, while currents in the reverse direction induce currents that are out of phase. A wideband instantaneous antenna tuner without moving parts is the result. Completely passive, it is an efficient coupling system for an asymmetrical dipole antenna. If desired, a longwire could be connected to the hot end of Antuner and a good ground to the ground side of Antuner. Antuner can be used for marine installations (sailboats and commercial ships), oil rigs, ham radio for airplanes, and for special situations in which unobtrusive horizontal antennas are needed.

The Antuner can handle 1000 Watts PEP. A 300-Watt version, called the Ham-Antuner, is also available.

For more information, contact *J. L. Industries, PO Box 547, Hallandale FL 33009; (305)-458-6094.* Reader Service number 481.

SURGE PROTECTOR FROM ALPHA DELTA

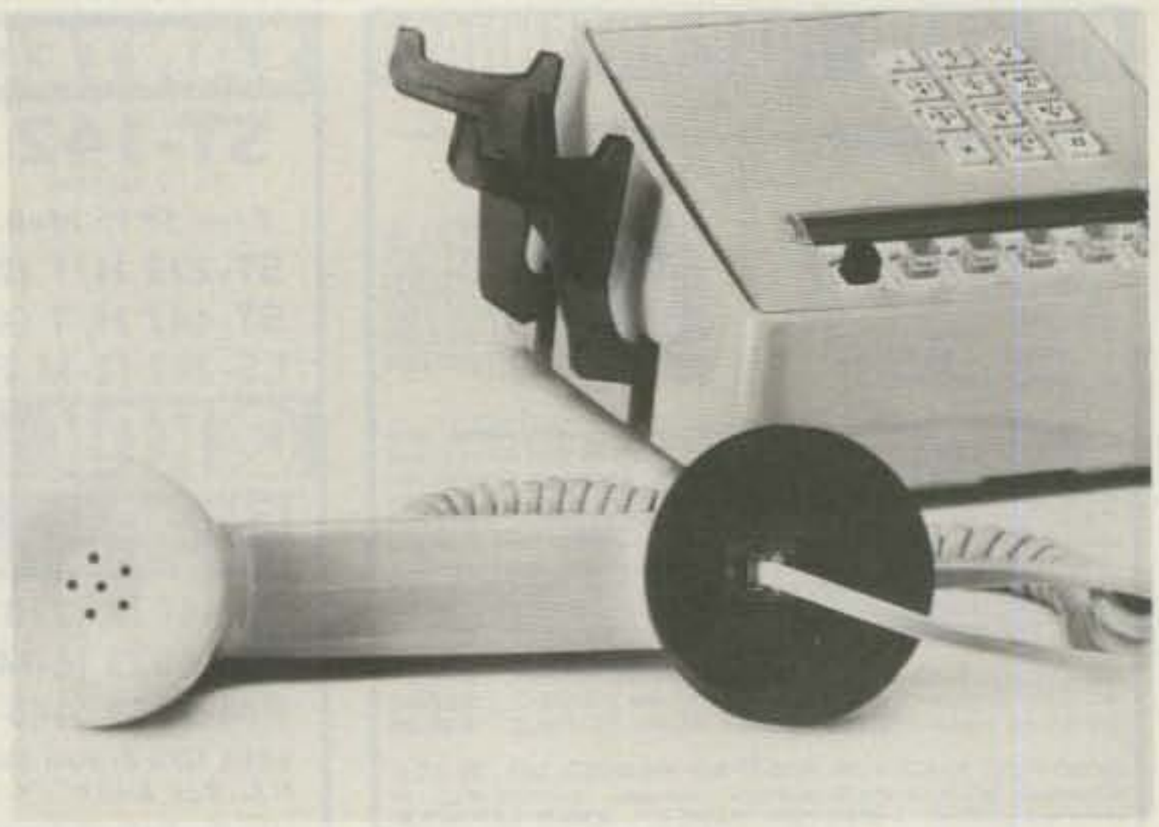
The new Alpha Delta Communications, Inc., Model ACTT ac Transi-Trap™ is a direct plug-in-the-wall ac surge protector which includes two 120-V-ac sockets, status light, circuit breaker, and a unique 3-stage automatic surge-protection circuit.

The Model ACTT provides both transverse- and common-mode protection with a hot-to-neutral, neutral-to-ground, and hot-to-ground 6000-volt, 2000-Amp surge discharge self-restoring high-speed circuit. (Several typical competitive devices use only a single-stage, 100-Amp protector.)

The configuration of the Model ACTT also protects equipment plugged into any other common-branch ac wall outlet down line from the ACTT.

The unit is UL listed and is available at Alpha Delta dealers or direct from the manufacturer.

For more details, contact *Alpha Delta Communications, Inc., PO Box 571, Centerville OH 45459; (513)-435-4772.* Reader Service number 478.



The Black Jack portable modular-telephone jack attachment for computer telecommunications.

PORTABLE MODULAR JACK FOR MODEMS

The Microperipheral Corporation has announced a new portable modular-telephone jack attachment for computer telecommunications. The product is marketed under the trade name Black Jack™.

The Black Jack solves telephone and computer interface problems encountered by growing numbers of portable-computer owners and direct-connect modem users. Most hotels, offices, and other locations from which computerized telecommunications are desirable and necessary do not have modular (RJ11C) jacks. Unless special equipment is installed or the bulky old-fashioned carbon acoustical coupler cups are used, telecommunications are not an option from many locations.

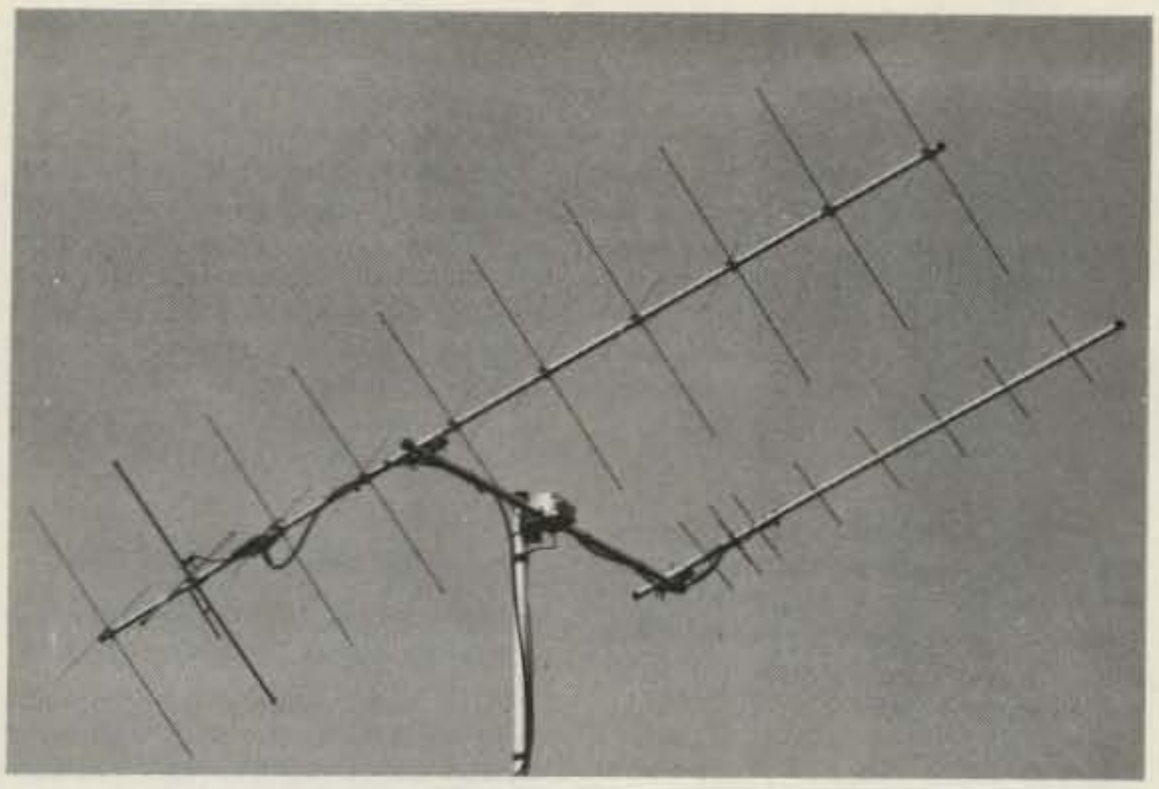
The Black Jack is constructed of rubber with a built-in circuit card and modular jack. Its unique connectors make it compatible with single- or multi-line telephone handsets such as those manufactured by Bell, ITT, and GTE. The unit requires no power. Modems equipped with touch-tone™ dialing may dial directly through the Black Jack. Pulse dialing is accomplished on the telephone set itself.

In addition to solving the problems associated with hard-wired telephones lacking modular jacks, the Black Jack eliminates the loss of line sensitivity associated with the use of acoustical couplers. The new direct-connect modems result in sensitivity gains of approximately 20 dB over the old-fashioned acoustical couplings. The Black Jack lets the modem user keep these line-sensitivity gains while improving telecommunications performance.

For additional information, contact *The Microperipheral Corporation, 2565 152nd Avenue NE, Redmond WA 98052; (206)-881-7544.* Reader Service number 483.

HAMTRONICS OUTDOOR SCANNER ANTENNA

Hamtronics, Inc., a manufacturer of low-noise receiving equipment for amateur radio, has announced a new antenna for scanner and monitor buffs to serve a need for a scanner antenna which is halfway between a built-in whip on a scanner and a large outdoor antenna requiring roof mounting with some sort of mast arrangement. Hamtronics has designed a compact "Power Antenna" which may be installed easily on the side of a house, outside a window, in an attic, etc., without any special mast or brackets.



Cushcraft's new amateur satellite antenna system.

The ACT-1 Power Antenna is a broadband whip antenna with a low-noise preamplifier in its base. Although much smaller than a full-size outdoor antenna (25 inches tall), it provides good coverage of distant signals and is capable of outperforming larger antennas because of the active booster amplifier. The built-in preamp has a gain of up to 15 dB.

A low-noise microwave transistor in the preamp covers from 30 MHz through the new 800-MHz band, and it covers low-band, high-band, and UHF. It is a good outdoor antenna for the 800-MHz band. The problem of large losses in the coax cable is solved by the amplifying of the weak signal from the antenna before the coax cable run can degrade it. There is a benefit from this effect even on UHF and VHF reception. In this regard, the ACT-1 can outperform an outdoor antenna with a separate preamp at the radio.

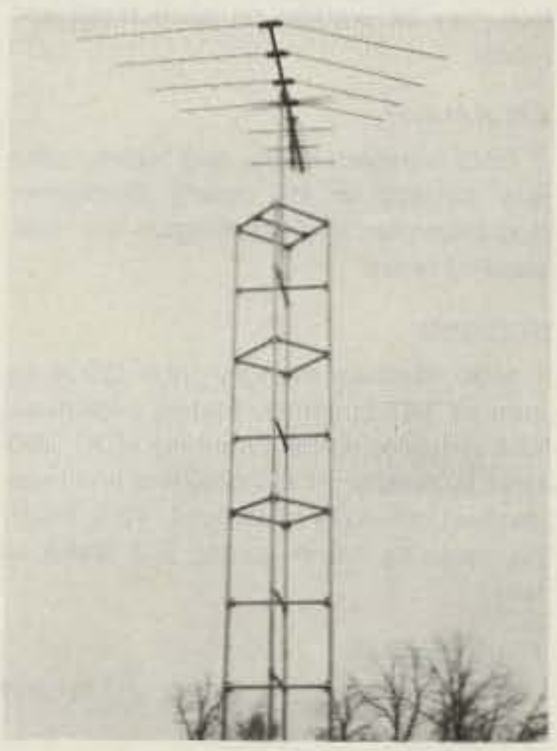
The simple installation required for an ACT-1 antenna and the fact that it is shipped fully assembled make it easy to improve on the performance of radio-mounted whips. Four wood screws mount it to any flat vertical surface. The 50-foot cable plugs directly into the "antenna" and "12-V" jacks on the rear of most scanner radios. If your particular scanner doesn't have a 12-V terminal, a simple 12-V-dc plug-in adapter is available.

For more information, contact *Hamtronics, Inc., 65-F Moul Road, Hilton NY 14468-9535; (716)-392-9430.* A complete catalog is also available for purchase. Reader Service number 485.

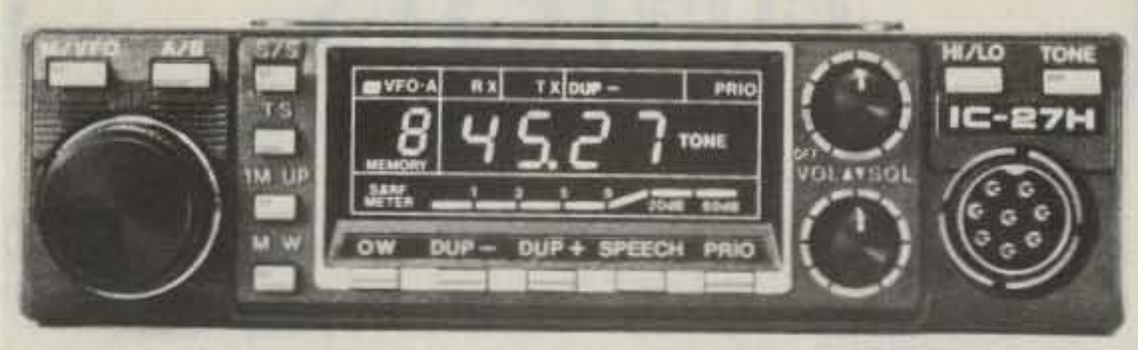
CUSHCRAFT SATELLITE ANTENNA SYSTEM

Cushcraft has introduced a new complete amateur satellite antenna system featuring two high-gain, circularly-polarized yagi antennas. The 70-cm, 16-element uplink and 2-meter, 20-element downlink antennas are fixed to a common mounting boom. The entire array is lightweight with reasonable dimensions for quick installation.

For more information, contact *Cushcraft Corporation, PO Box 4680, Manchester NH 03108; (603)-627-7877; telex 953050 Cushsig Man.* Reader Service number 480.



An antenna tower constructed with FrameMaker clamps.



The IC-27H 2-meter mobile transceiver from Icom.

BUILD YOUR OWN TOWER WITH FRAMEMAKER CLAMPS

Build a sturdy, professional-looking tower for a TV, CB, or ham-radio antenna out of common 3/4-inch electrical conduit and plated-steel FrameMaker Clamps.

The only tools needed are a hacksaw (or tube cutter) to cut the conduit and a couple of wrenches. Conduit sections are simply placed into the openings of the clamps, and the plated nuts and bolts are tightened, locking the clamp jaws securely around the conduit.

To avoid the pitfalls of "one-clamp-does-all" designs, several kinds of FrameMaker clamps are made: 4-way fixed and adjustable, 3-way T, 2-way adjustable, and parallel. No locking collars or set screws are needed to prevent slippage. Unlike towers whose joints are welded or brazed, a tower made with FrameMaker clamps can easily be taken down, and the clamps and conduit can be used to build any number of other projects.

Free project idea brochure is available from *Bullseye Products, Dept. DY, 28506 Hayes, Roseville MI 48066.* Reader Service number 479.

IC-27H

Icom has introduced another in its line of ultra-compact mobiles: the IC-27H 45-Watt, 2-meter mobile transceiver.

Standard features include compact size (1-5/8"H × 5-1/2"W × 9-3/8"D), built-in internal speaker for easy mounting, nine full-function memories, 32 built-in PL™ frequencies, IC-HM23 DTMF microphone with up/down scan buttons, three scanning functions (memory scan, band scan, and priority scan), internal lithium-battery memory backup to maintain memories for up to five years, and the IC-MB27 mobile mount.

A variety of options are also available, including an IC-UT16 speech synthesizer and IC-SP4 and SP5 external speakers.

For more information, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue WA 98004.* Reader Service number 486.

ANTENNA DESIGN SOFTWARE

Smith Software Systems has released their latest ham-related software package for the Apple II+ and IIe computers. Antenna Design Software is a menu-driven program composed of twenty-six submodules to help in the design of HF/VHF/UHF antennas and transmission lines.

Capabilities include design of antenna types such as dipole, folded dipole, vertical, longwire, 2- and 3-element quad, parabolic dish, and loop. Help is also provided with calculating feedline losses, phasing lines, transmission-line transformers, and swr. There are also several related topics such as propagation and component design.

The package was developed with the newcomer to ham radio and computers in mind, but it will be an excellent asset to the expert in helping with long and tedious calculations. The package includes a diskette (not copy protected) and an extensive user's manual.

For additional information, contact *Smith Software Systems, 3767 Cold Spring Creamery Road, Doylestown PA 18901.* Reader Service number 484.

✓ *See List of Advertisers on page 98*

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

COLUMBUS DAY INTERNATIONAL DX CONTEST
Starts: 1200 GMT October 13
Ends: 2400 GMT October 14

The first DX contest in commemoration of Columbus Day will be sponsored by the Miami Havana Lions Club. The official contest operators will identify themselves with their QRA, callsign, and with their official number as contest operators. Suggested frequencies will be US amateur bands in 10, 15, 20, 40, and 80 meters, phone and CW.

An amateur station making five contacts with official radio-club DX member operators during the two days will be eligible to apply for the Miami Havana Lions Club QSL Award. Contacts with official operators must be made during the contest period, exchanging RS(T) and QTH. English, Spanish, and Portuguese languages will be used.

SWLs may also apply for this award on a heard basis. Send QSLs or log along with $2.00 in US funds or 6 IRCs for this special award to: Miami Havana Lions Club, Columbus Day International DX Contest, Box 674, Miami FL 33155.

At the start of the contest, members of the contest committee will read the names and assigned numbers of the official operators on the following frequencies: 7230, 14250, 21250, and 28915.

RIO CW DX PARTY
Starts: 1500 GMT October 13
Ends: 1500 GMT October 14

Sponsored by the Pica-Pau Carioca (Rio Woodpeckers CW Group), PO Box 2673, 20001 Rio de Janeiro, RJ, Brazil (with the cooperation of all other Brazilian CW groups). The purpose is to promote 2-way CW contacts between Brazilian and DX stations, enabling DX stations to obtain QSLs valid for several Brazilian Awards. The event is held twice each year on the last full weekend in March and the second full weekend in October.

The general call is "CQ RIO DX PTY". Use all HF amateur bands within your own station-license authority. Exchange RST, name and QTH. There are no logs, but quick QSLing (via bureau or direct) is essential.

Reference frequencies are as follows: 3510/3520, 7020/7030, 14030/14050, 21030/21050, 21130/21150, and 28030/28050.

OREGON QSO PARTY
1700 GMT October 13
to 0800 GMT October 14
1500 GMT October 14
to 0000 GMT October 15

The Hermiston Amateur Radio Club invites all amateurs to participate in the Oregon QSO Party. Each station may be worked once per band and once per mode. Crossband and crossmode contacts are not permitted.

EXCHANGE:

Signal report and state, province, country, or OR county.

FREQUENCIES:

Phone—1810, 3929, 7260, 14300, 21370, and 28600; CW—60 kHz up from bottom of each Novice band; VHF—contacts on simplex only, excluding 146.52.

SCORING:

Count one point per QSO. OR stations multiply QSO points by the sum of states, provinces, countries, and OR counties. All others multiply by the sum of OR counties worked (36 maximum).

ENTRIES AND AWARDS:

All entries must have a log and summary sheet, and if more than 200 contacts are made, a dupe sheet should be included. Entries may be disqualified if logs are incomplete or too many errors are detected. You must sign the summary sheet stating that you observed all the rules. You may photocopy log and dupe sheets or you may obtain extras from the HARC (please send SASE). Logs must be received by November 12th and should be addressed to the Hermiston Amateur Radio Club, PO Box 962, Hermiston OR 97838. Include a large SASE for a copy of the results.

RHODE ISLAND QSO PARTY
1700 GMT October 13
to 0500 GMT October 14
1300 GMT October 14
to 0100 GMT October 15

This contest is sponsored by the East Bay Amateur Wireless Association. RI stations work other RI stations and the rest of the world. All others work only RI stations. The same station may be worked twice on each band: once on phone and once on CW.

EXCHANGE:

RS(T) and state, province, country, or RI city.

FREQUENCIES:

Phone—3900, 7260, 14300, 21360, 28600, 50.110, 144.2, and 146.52; CW—1810, 3550, 3710, 7050, 7110, 14060, 21050, 21110, 28050, and 28110. Use FM simplex; no repeaters.

SCORING:

All stations score 2 points per phone QSO, 3 points per CW QSO, and 5 points for QSOs with Novices and Technicians. RI stations multiply QSO points by the number of states, provinces, and countries worked. Others multiply total QSO points by the number of different RI cities and towns worked (39 maximum).

AWARDS:

Certificates awarded to top-scoring station in each state, province, country, and RI county; plus top-scoring Novice and Technician in RI and out of state. There will also be a certificate for the top RI multi-operator station.

ENTRIES:

Logs must show date/time in GMT, call, exchange, band, and mode. Include your name, call, mailing address, club affiliation if any, total QSO points, multipliers claimed, and final score. Entries must be postmarked no later than November 15th and should be sent to East Bay Amateur Wireless Association, PO Box 392, Warren RI 02885. Include an SASE for results.

MARYLAND-DISTRICT OF COLUMBIA QSO PARTY
Starts: 1800 GMT October 13
Ends: 2100 GMT October 14

Sponsored by the Columbia Amateur Radio Association, the contest is open to all single-operator stations. The same station may be worked on each band and mode.

EXCHANGE:

QSO number; RS(T); and state, province, country, or MD county. Remember that Baltimore and Washington are independent cities!

SCORING:

MDC stations multiply total QSOs by sum of MD counties, states, provinces, and countries. Others multiply MDC QSO total by number of MD counties and independent cities (25 maximum). Also, multiply score by 1.5 if running 200 Watts or less.

FREQUENCIES:

Phone—3950, 7250, 14290, 21390, and 28590; CW—60 kHz up from low end; Novice—3720, 7120, 21120, and 28120.

AWARDS AND ENTRIES:

Maintain a continuous log for phone and CW, but indicate on entry which category (phone, CW, or mixed) you are entering. Certificates for top scorers in each category will be awarded. Mail logs, dupe sheets (for over 200 contacts), and summary by November 30th to CARA, c/o Robert K. Nauman WA3VUQ, 4017 Font Hill Drive, Ellicott City MD 21043.

JAMBOREE ON THE AIR
0001 Local Time October 20
to 2400 Local Time October 21

JOTA is Scouting's annual ham-radio event, held during the third weekend of October. This is the 27th year it has been held, with thousands of stations around the globe participating. If propagation is right, it is common to work Scouting DXCC. In past JOTAs, Scouts in some remote areas like Antarctica, Ascension Island, Christmas Island, Gough, and Seychelles were heard.

In the USA, many Scout Councils and Districts hold camporees to coincide with JOTA. Hams set up Field-Day-type operations, giving campers a chance to exchange greetings with Scouts everywhere.

Generally, the exchanges include typical information like name, QTH, Scout rank, hobbies, etc., with some leading to long-lasting pen-pal friendships and the exchange of photos, badges, and patches. SSTV and ATV give some a chance to have a "look-see" at the other guy. Other QSOs reported were via RTTY, EME, and even OSCAR.

Look for K2BSA (the BSA Headquarters station in Dallas TX), HB9S (the World Scout Headquarters in Switzerland), and for other special callsigns from many countries.

Boy Scouts and Girl Scouts of all ages, Scouters, former members, ham-radio operators, and anyone interested in doing a good turn for Scouting and ham radio are invited to participate. The contest period is given in local time, though some activity flops over from Friday to Monday to take advantage of DX time differences.

Suggested frequencies are 3590, 7030, 14070, 21140, and 28190 on CW; 3940, 7290, 14290, 21360 and 28990 on phone; RTTY, SSTV, and ATV on usual frequencies. Check the Novice frequencies and please move off these calling frequencies to avoid QRM.

No reports in the form of logs are necessary, this is really not a contest. Exchanges should be relaxed and relate to Scouting and ham radio as much as possible. Brief reports, however, are appreciated, giving Scout unit numbers, ham calls used and heard/worked, numbers of participants, interesting incidents and exchanges, etc. Photos with captions especially welcome for the BSA report to the World Bureau. Send them to JOTA Coordinator W2GND, 216 Maxwell Ave., Hightstown NJ 08520.

Radio amateurs are encouraged to invite Scouts or even Scout units to their shacks. If you do not know any, contact your local Scout office for the name of the unit leader in your area. You or your radio club may volunteer to participate in a district or council camporee that weekend. Phone books list council offices as Boy Scouts of America. Call "CQ Jamboree" or respond to such calls and observe all FCC regulations. Consider a fox hunt for more fun.

If you are not a ham or do not have one in your unit, contact one in your area for

CALENDAR

Oct 6–7	ARRL QSO Party—CW
Oct 13–14	ARRL QSO Party—Phone
Oct 13–14	Rio CW DX Party
Oct 13–14	Columbus Day International DX Contest
Oct 13–14	Maryland-DC QSO Party
Oct 13–15	Oregon QSO Party
Oct 13–15	Rhode Island QSO Party
Oct 20–21	Jamboree on the Air
Oct 20–21	Worked All Y2 Contest
Oct 20–21	CLARA Ac/Dc Contest
Oct 27–28	CQ Worldwide DX—Phone
Nov 3	DARC Corona 10-Meter RTTY Contest #4
Nov 3–4	ARRL Sweepstakes—CW
Nov 11	International OK DX Contest
Nov 17–18	ARRL Sweepstakes—Phone
Nov 24–25	CQ Worldwide DX—CW
Dec 1–2	ARRL 160-Meter Contest
Dec 8–9	ARRL 10-Meter Contest
Dec 26–Jan 1	QRP Winter Sports—CW
Dec 30	Canada Contest
Jan 12–13	Hunting Lions in the Air Contest

help. If you need help finding one, contact Leo Kluger, American Radio Relay League, 225 Main St., Newington CT 06111. Make reports as indicated above, coordinating with your ham helper.

Certificate cards the size of a postcard are available to anyone participating in any way. They may be ordered beforehand for presentation during JOTA or they may be awarded at Scout or club meetings later. Send requests to Jamboree On The Air, 1325 Walnut Hill, Irving TX 75062, along with an SASE large enough to hold the cards ordered. Affix postage at 20 cents for the first 20 cards and 17 cents for each 8 cards thereafter.

A temporary insignia to wear on the Scout uniform or on jackets is available at $1.25 from the TX address above. Separate orders for certificates and patches will get them to you faster.

The World Scout Bureau, sponsor of JOTA, holds a QSL card contest with 5 prizes for the best handmade cards and 5 prizes for the best printed cards. Entries must be designed by registered Scouts (boy or girl) 18 years of age or less. They must be in standard postcard size and be marked on the back with name, age, Scout unit, and full home address (include USA). Send entries to JOTA QSL Contest, World Scout Bureau, PO Box 78, 1211 Geneva 4, Switzerland. They must be received by December 31st and entries will not be returned. Winners will be notified by March 31st. It would help if radio amateurs would suggest ideas about QSL-card design, including Scout and ham-radio cartoons, etc.

RESULTS

1984 TWO-LAND QSO PARTY

In Two-Land

Call	County	QSOs	QSO Points	Multipliers	Score
NC2V	Salem NJ	618	1290	198	249,480
W2EZ/M	Various	138	413	41	16,933
WA29SQ/M	Various NJ	84	252	54	13,606
K2HPV	Gloucester NJ	102	216	58	12,528
N2CQ	Gloucester NJ	63	189	49	9,261
AB2W	Gloucester NJ	51	102	32	3,466
KD2EZ	Mercer NY	56	112	26	2,912
WB2IPX	Cayuga NY	30	79	19	1,501
K2DNN	Chemung NY	20	60	19	1,140
K2PF	Somerset NJ	9	25	6	150
W2CC	Bergen NJ	1	2	1	2
		Outside Two-Land			
KA1CLV	MA	27	81	21	1,701
W5WG	LA	29	60	19	1,140
W8RYP	OH	21	63	18	1,134
N0CLV	KS	29	75	17	1,275
K1VUT	MA	18	47	15	705
W5NR	TX	10	30	10	300
WA7FKD	WY	10	30	7	210
K0HQE	IA	6	18	6	108
K9JIG	WI	7	14	7	98
K8KIR	MI	6	18	5	90
W3IJT	WV	5	10	5	50
KA7T	ID	6	9	3	27

WORKED ALL Y2 CONTEST
Starts: 1500: GMT October 20
Ends: 1500 GMT October 21

The Radioclub of the German Democratic Republic (RKDDR) is pleased to invite radio amateurs all over the world to participate in and commemorate the anniversary of the founding of the German Democratic Republic. Operating sections include single- and multi-operator stations as well as SWLs. Each Y2 station may be worked once per band on phone and once per band on CW.

EXCHANGE:

RS(T) plus serial number starting at 001. Y2 stations will send a two-digit number of "Kreiskenner" instead of a QSO number.

FREQUENCIES:

Use all amateur bands, 3.5 thru 28 MHz, with the first 10 and last 25 kHz of the 3.5- and 14-MHz bands to remain contest-free.

SCORING:

Count 3 points per Y2 QSO. Multiplier is the sum of the number of different Y2 districts worked on each band (maximum of 15 per band). The districts are indicated by the last letter of the call. Final score is the sum of QSO points multiplied by the total multiplier.

SWLs count 1 point on phone and 3 points on CW for each Y2 call with sent RS(T), 2-digit number, and call of station worked with the Y2.

AWARDS:

Certificates awarded to the leading stations in each section of each country.

ENTRIES:

Separated logs are required for each band. Summary sheet showing multiplier and QSO worked on each band also required. Each log must be accompanied by the following signed and dated declaration: "I declare that my station was operated in accordance with the rules of the contest, and in accordance with the requirements of my amateur-radio license." Logs should be mailed within 30 days following the contest to: Y2 Contest Bureau, RKDDR, Hosemannstr. 14, DDR 1055 Berlin, German Democratic Republic. In the case of any dispute, the decision of the Y2 Contest Bureau shall be final. Applications for awards issued by the RKDDR fulfilled in the contest may be sent together with the contest log and indicated fee.

CLARA AC-DC CONTEST
Starts: 1800 GMT October 20
Ends: 1800 GMT October 21

Sponsored by the Canadian Ladies Amateur Radio Association, the Ac-Dc Contest is open to all YL and OM amateurs. Each station may be worked twice, either once on CW and once on phone, or on two different bands.

EXCHANGE:

Signal reports, QTH, and name. Bonus stations will be operating and will identify as such. Each bonus station may be worked twice, once on CW and once on phone, but it *must* be on different bands.

FREQUENCIES:

Phone—3900, 3775, 7150, 14280, 14160, 21300, 28588, and 28488; CW—3690, 7035, 14035, 21035, and 28035.

SCORING:

CLARA members score 1 point per contact with nonmembers, 2 points per CLARA-member contact, and 3 points per bonus station. Multiply by two for contacts made on CW. Multiply total of the above by the number of Canadian provinces/territories worked for total score. Non-CLARA members count points the same except only CLARA-member contacts are to be counted.

AWARDS:

First-place CLARA cup and certificate to first-place CLARA winner, certificates to second and third. Plaque and certificate to first-place non-CLARA winner, certificates to second and third.

ENTRIES:

All logs submitted are eligible for the mini prize drawing. Mail all logs and scores with your name, call, address, and postal code by December 15th to: Muriel Foisy VE7LQH, RR #1, Pender Island, BC, Canada V0N 2M0.

~ See List of Advertisers on page 98

73 INTERNATIONAL

from page 60

classes: A, up to 1 kW; B, up to 250 W, and C, up to 100 W. All stations may be either fixed, mobiles, or portables and of three other categories: land, maritime, or airborne. Operators are classified as belonging to any of three categories:

- Superior: able to operate class A stations on all authorized bands.
- Intermedia: authorized to operate class B stations on 160, 80, 40, 10, 6, and 2 meters, and in the portions 14.000 to 14.200 and 21.000 to 21.250 MHz.
- Novicio: authorized to operate class C stations in 160, 80, 6, and 2 meters, and in the portion 7.100 to 7.150 MHz.

It is compulsory for all amateur-radio stations to have operational equipment in the 40-meter band. This is to be able to participate at any moment in case of emergency. In this context, it also is mandatory for all clubs and amateur-radio organizations to maintain a schedule of radio watch and frequency control on all bands, under supervision of government authorities.

To get a license you must be Peruvian, either by birth or nationalization. If you are under 18 years old, you must get legal permission. Foreigners also can get licenses if their residence in the country is for more than 5 years, or 3 years if married to a Peruvian citizen or have Peruvian children.

The first license is issued for the Novice class after an examination on elementary electronics and communications and practical station operation. You must remain in that class until you get 100 QSL cards. To upgrade to the next category, you must apply for another examination on radio communications: You must be proficient in radio station operation and must be able to receive and transmit CW at 5 wpm.

You also must remain in that category until you receive another 100 QSL cards. Then you may apply for another examination on advanced electricity and electronic fundamentals, proficiency in radio station operation, and must be able to transmit and receive CW at 10 wpm.

The Novice license is issued for a period of 3 years, not renewable. Thus, you must attend an examination within the next three years for upgrade or your license is cancelled. The other two categories also are issued for periods of three years but are renewable for similar periods. Licenses under a reciprocity agreement are valid for up to 90 days only.

The Direccion de Telecomunicaciones can authorize the installation and operation of amateur-radio stations to the military, radio clubs, and amateur-radio institutions, Peruvian Red Cross, Civil Defense, and scientific institutions in the areas of seismology, meteorology, and geophysics, to be operated *only* by licensed radio amateurs.

Of all the above, it is relevant to note that foreign operators can apply for a reciprocity-agreement license for only 90 days, but if he is a resident, he will get OA prefixes without restriction. Unfortunately not all countries have this prerogative. Also interesting is that amateur-radio stations installed at institutions like Civil Defense or Red Cross must be operated by licensed radio amateurs. In some countries, there are even citizens-band organizations or Civil Defense stations with amateur-radio stations operated by anybody able to press the PTT button.

The above information is based on current regulations, Decreto Supremo 009-74-TC, dated April 31, 1974.

That's all. I hope some fellow Peruvian will continue this writing from here on. In doing so, we'll see again the red and white flag waving in "73 International."

PHILIPPINES

Leo M. Almazan WA6LOS/DU2
10098 Knight Drive
San Diego CA 92126

In my last column I wrote about the amateur-radio scene in the Philippines today. After a rather nice lengthy QSO with a W7 ham from Seattle, Washington, who happened to be in the Philippines before World War II, he not only told me how they used to DX on 40 meters with RCA's CW rigs, and Arc-88 receivers coupled to high zepp antennas, he also sparked my curiosity about the history of amateur radio in the Philippines.

After talking to the local OT hams in the country, I came up with pieces of information that any wireless nostalgia buff may find rather interesting. In this column I will talk about the history of amateur radio from World War I right up to World War II. In a subsequent column I will deal with the history from World War II right up to the early sixties.

The first wireless station in the Philippines was the powerful US Army spark station on Corregidor Island (made famous by General Douglas MacArthur's last-stand battleground) which was used to guide ships in and out of Manila Bay. The second famous station was the NPO, a US Navy spark station near their Sangley Point Naval Base. Both of these were built about or just before the US had entered World War I.

From this time till late 1919, the amateurs here followed US regulations since the Philippines was a US territory, and transmissions were considered illegal. Not till 1920 (even when the Philippines Legislature did not pass any radio laws till 1924) was anyone given permission by the Bureau of Post to start transmission. Even then, due largely to confusion, amateurs were still using their initials as callsigns. Before the 1920s, the local hams and US service personnel were on the air using whatever parts they could scrounge. Some were using old Ford spark coils, coherers, and galena detectors that were bought stateside from H. Gernsback's E. I. Co. catalog, then considered as the "bible of wireless."

In the early twenties, American hardware stores were selling "wireless toys" made by the famous A. C. Gilbert Co. of New York, the maker of the also-famous Erector sets. Each set consisted of an untuned crystal detector, headphones, an indoor aerial kit, ground connector, a key, and a single-circuit heavy-duty buzzer for the transmitter instead of the two-circuit, spark coil. With such sets, neighboring amateurs could play wireless and learn the code by actual communication. No license was required.

In the thirties, several ham stations sprouted in the country. The most notable was KA1HR, a multi-op, 1-kW station at a US Army base in Fort MacKinley. (The "KA" prefix was used since the country was still a US territory.) In the early thirties, the 1-V-2 "superwasp" was considered the standard station receiver. Other home-brewed receivers were built using the type-30 battery tubes. Commercial receivers also were available, like the National SW-2, SW-5, and the HROs.

Most Americans were already using multi-stage, crystal-controlled transmitters as required by US regulations, but the locals were still using self-excited, single-stage rigs.

Antennas were mostly half-wave sky wires, like the voltage-fed zepps with tuned feeders. Some used current-fed Hertz, or the single untuned, off-center-fed Windom antenna.

AM phone started appearing in the mid-thirties, exclusively operated by American hams mostly on 40 and 20 meters, though some were experimenting on 160 meters. Most transmitters were home-brewed and the receivers used were high-quality superhets to ensure stateside reception and to avoid QRM.

DXing remained on 40 meters even though competition from SW broadcasters was appearing in the band. The 40-meter CW bandwidth had been cut from 300 to 150 kHz during the International Radio Conference in Cairo in 1938, but CW DXing was still done primarily in this band. The US west coast came around 10:00 pm, South Africa around midnight, followed by the Europeans in the early morning. The top DX certificate then was the WAC, and many CW DXers had won it during the thirties.

Well this is it for now. Also, words are circulating that the Class B licensees will be sporting a "DW" prefix, so watch out for this new one.

POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

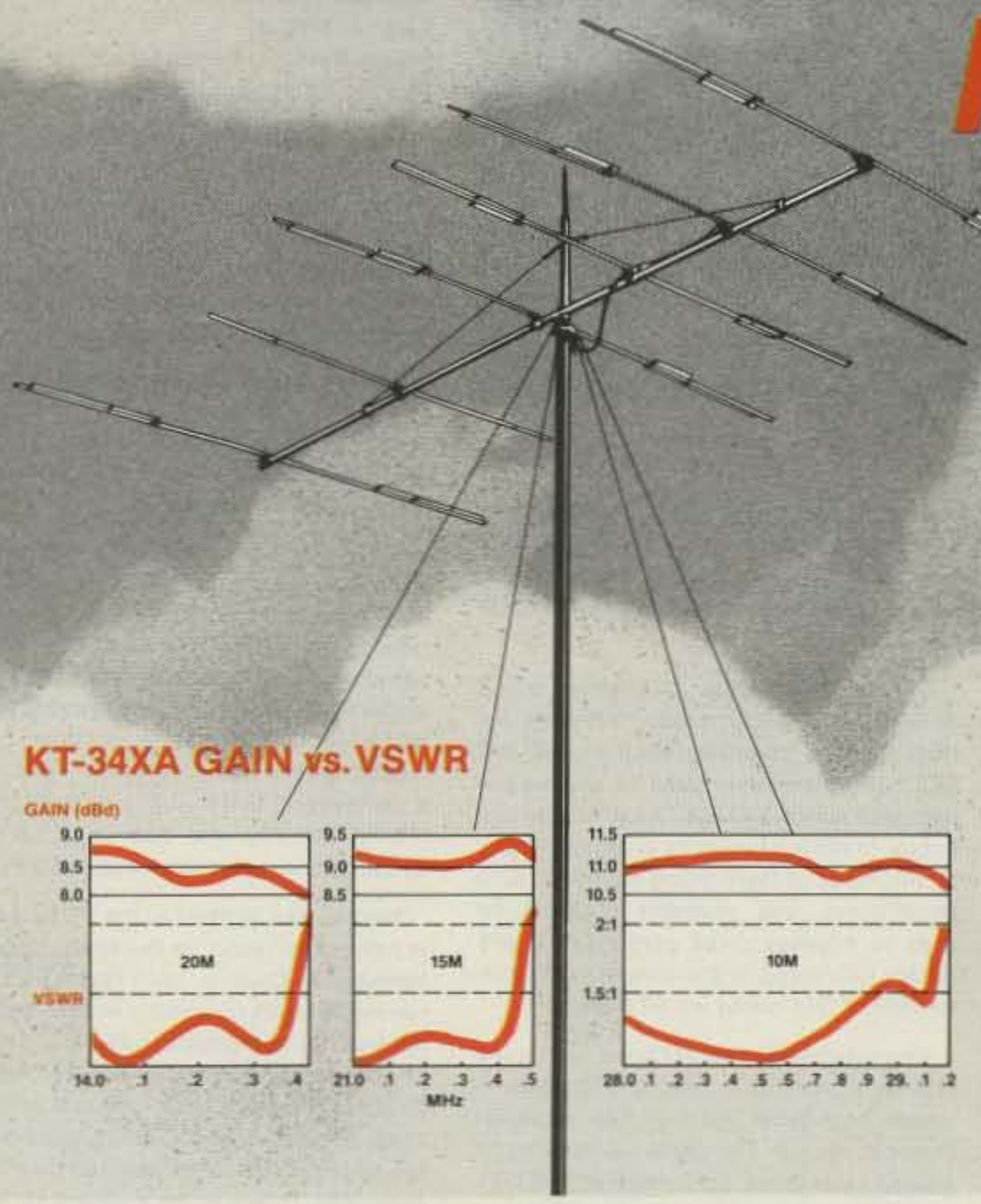
The Board of the SP DX Club issued 18 member diplomas recently. The last diploma number is 323. Every candidate for the diploma must produce QSL cards confirming mutual radio contacts with his own radio station with 75 countries on 6 continents. After a 6-month period, he can receive the diploma if he produces QSLs from 101 countries. Actually, 25 candidates are waiting for the diplomas.

There are 1710 honorary members of SP DX Club. To every European sender who establishes mutual communication with 15 full members, and to every extra-European ham who possesses at least 10 such QSLs, this honor can be done.

The SP DX Club celebrates its 25th anniversary in June this year. Eight SP senders have over 300 confirmed countries. There are 112 SP symbols on SP DX honor list for establishing 200 confirmed radio contacts. Leading radio amateurs of the SP DX Marathon are: SP3DOI (4334 points), SP3AGE (4235 points), SP7HT (4086 points), and SP5EWY (4054 points).

The first Polish winner of the WAC Satellite diploma suggests that Polish senders publish the 10 most-interesting QSOs of every year. On his own first list, he put, among others: the first QSO (April 3, 1983, on 7 MHz CW with SP9EVP, after martial law break), the first Polish contact via OSCAR 10 (August 15, 1983, with DJ2RE), and the first contact with Australasia via satellite.

KT-34XA Triband Performance



Takes you through the sunspot lull with solid QSO's and exciting DX.

The unequalled performance of the KT-34A and KT-34XA Triband Antenna Systems are the result of *KLM's* uncompromising approach to antenna performance and reliability.

Our unique design utilizes lossless linear loading techniques with High Q Air Capacitors for peak efficiency. Dual driven elements deliver "Monobander" gain and low VSWR to make even barefoot solid state rigs work like kilowatts.

The four element KT-34A is expandable to the latest KT-34XA using the available KT-34XA upgrade kit.

See the complete line of ***KLM's*** *antennas and equipment at your local dealer, or write for our catalog.*

KT-34XA GAIN vs. VSWR

KLM electronics, Inc.
P.O. Box 816
Morgan Hill, CA 95037

HIGH PERFORMANCE PRESELECTOR-PREAMP

The solution to most interference, intermod, and desense problems in **AMATEUR** and **COMMERCIAL** systems.

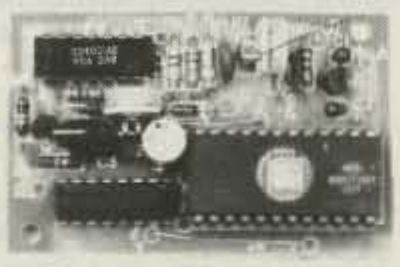
- 40 to 1000 Mhz - tuned to your frequency
- 5 large helical resonators
- Low noise - High overload resistance
- 8 dB gain - ultimate rejection> 80 dB
- 10 to 15 volts DC operation
- Size - 1.6 x 2.6 x 4.75" exc. connectors
- **FANTASTIC REJECTION!**

Typical rejection:
±600 Khz@144 Mhz: –28dB
±1.6 Mhz@220 Mhz: –40dB
±5 Mhz@450 Mhz: –50dB

Price - **$89.95** bipolar w/RCA jacks
Connector options: BNC $5, UHF $6, N $10
SUPER HOT! GaAs Fet option $20

AUTOMATIC IDENTIFIERS

ID-1



ID-2

- For transceivers and repeaters - **AMATEUR** and **COMMERCIAL**
- Automatic operation - adjustable speed and amplitude
- Small size - easy installation - 7 to 15 volts DC
- 8 selectable, reprogrammable messages - each up to 2 min. long
- Wired, tested, and programmed with your message(s)
  Model ID-1 - **$49.95** Model ID-2 w/2 to 10 minute timer - **$69.95**

We offer a complete line of transmitter and receiver strips and synthesizers for amateur and commercial use.
Request our free catalog. *Allow $2 for UPS shipping - Mastercard and VISA welcome*

GLB ELECTRONICS
1952 Clinton St. Buffalo, NY 14206
716-824-7936, 9 to 4

269

Your Ham Tube Headquarters !

TUBES BOUGHT, SOLD AND TRADED
SAVE $$$—HIGH $$$ FOR YOUR TUBES

Call Toll Free 800-221-0860

Tubes

3-400Z	$85.00	7360	$10.00
3-500Z	85.00	7735A	27.50
4-400A	80.00	8122	110.00
4CX250B	55.00	8156	12.50
572B	55.00	8643	82.50
811A	12.00	8844	26.50
813	30.00	8873	175.00
6146B	7.00	8874	195.00
6360	4.25	8877	495.00
6883B	6.75	8908	12.50

Semiconductors

MRF 245/SD1416	$30.00	MRF 644	$23.95
MRF 454	14.95	SD1088	19.95
MRF 455	10.95	2N3055	.75
		2N6084	12.50

RF Connectors

PL259	10/$4.95	M358	2.50 ea.
PL258	10/8.95	M359	1.75 ea.
UG175/176	10/1.60	Type "N" Twist on	
UG255/u	2.50 ea.	(RG8/u)	$4.75 ea.
UG273/u	2.25 ea.	Minimum Order $25.00	

Allow $3.00 min. for UPS charges

CeCo COMMUNICATIONS, Inc.
111 **2115 Avenue X Brooklyn, NY 11235**
SERVING THE INDUSTRY SINCE 1922 **Phone (212) 646-6300**
Call CECO For Your CCTV Security And Color Production Requirements

Twenty Polish amateur stations took part in the All Asian DX Contest SSB 1983. The best were SP8EMO on 3.5 MHz, SP9EMI on 7 MHz, SP5LM on 14 MHz, SP7AWA on 21 MHz, SP6DNS on 28 MHz, and SP9ALM on SOMB and SP7KTE on MOMB. Diplomas are awarded these stations.

Polish Scouts radio amateurs are always on the go. On the occasion of the 70th anniversary of Scouting, the Scouts Communication Club organized the Leszno Contest UHF '84 that took place in December, 1983. Sixty UHF radio stations took part in the contest. The best individual stations were: SP6GZZ (2712 points), SP3JBI (1917 points), and SP9MM (1817 points). The best club stations: SP6WCY (1066 points), SP2KFE (169 points), and SP3ZHW (115 points). UHF radio amateurs from Leszno were informed that every Friday (2200 local time) has been set up as an activity day of Leszno stations using radiotelephones. Most of them work on 145.200 MHz with antennas with both vertical and horizontal polarization.

A new Scouts diploma, CZUWAJ, has been established recently. It is awarded by the Wroclaw team, SP6ZDA. To get this diploma one must acquire 50 points and assemble all the letters belonging to the word CZUWAJ (WATCH!). Selected stations send individual letters. Stations with stationary QTHs grant 4 points, and with local QTHs 6 points for every QSO. Eight points are awarded for QSLs with Scouts ceremonial stations. Contacts on UHF are counted double points.

In February this year, the first Polish repeater UHF-FM was set in motion. It has omnidirectional antennas with vertical polarization. The repeater works on the R channel. It receives signals on 145.000 MHz and transmits on 145.600 MHz. A 100-km range for the repeater has been estimated. Its callsign is SR9E.

TRINIDAD AND TOBAGO

John L. Webster 9Y4JW
c/o Department of Soil Science
University of the West Indies
St. Augustine
Trinidad
West Indies

9Y4RD COMES HOME

On March 24, 1984, Roger de Weever 9Y4RD returned home for a well-deserved three-week vacation. Many of the DXers out there will be familiar with Roger's callsign, which has popped up in the past two years from such good DX locations as SU and ST0, and they may have received his attractive and amusing QSL.

At the monthly general meeting of the TTARS held on April 2nd, Roger was our guest of honor and addressed us for about one hour on his experiences in the Middle East. I was also privileged to have a lengthy (six-hour!) and very interesting eyeball with him about one week later.

Roger, now 35 years old and married to a very attractive lady, Carmen, began his career in commercial radio in 1969 as a ship's radio officer, after graduating from college in England. In 1970, he changed jobs to become a radio technician with TEXTEL (Trinidad and Tobago External Telecommunications). In the ten years that followed, he worked his way up through the company to the position of Acting Maintenance Engineer at the Satellite Earth Station located at Matura, in the northeastern part of the island.

Roger de Weever 9Y4RD.

1979 was the year that Roger made the decision to become a ham. On the strength of his experience both as a ship's radio officer and his technical experience as a communications engineer, he applied for the license and was issued the callsign 9Y4RD—his initials. (Here in Trinidad we are allowed to choose our callsigns, provided it has not previously been issued or otherwise reserved.)

Roger, in 1980, took up a job with the United Nations as a Field Service Officer in communications, to serve in the Middle East, and was based in Jerusalem, Israel. However, in the year prior to his departure, Roger, although only involved in limited activity on the air—mainly local 2m and some 10m DX—devoted considerable time to the training program of the TTARS and helped prepare about 30 students for the annual City and Guilds RAE Exam. Most of the students were successful in the examination, and needless to say, after Roger's departure, he was sorely missed by the TTARS.

In his new UN job Roger found the challenge he had been seeking! He has had to visit and work in such countries as Egypt, South Sudan, and Lebanon and is based in Israel—the world's hot spots! He has been involved in recommendations, design, and establishment of a variety of communications systems, both HF and VHF, in these countries, to assist both the local governments and the UN in their law-enforcement and peace-keeping activities. He is not involved in military communications and says that in spite of being based in one of the world's most turbulent areas, he has always been well treated and shown great respect and never felt that his life was in danger.

Roger's amateur-radio activity from the Middle East began in September, 1982, from Jerusalem, with a /4X callsign. His operation from SU commenced in October, 1982, and when in 1983 he was stationed in ST0 for about 7 months, once again his ham equipment was lugged along. The equipment that Roger has used in his activity consists simply of a Yaesu 902 DM and a four-band trap dipole.

One of his ambitions from each of the QTHs he has operated has been to get a DXCC, and he has so far achieved this from: ST0—about 2500 QSOs and 130 countries; SU—9000 QSOs and 185 countries, and 4X—1500 QSOs and 150 countries. Whereas Roger enjoys ham-radio operation from comparatively rare DX locations and will always try to comply with another ham's request for skeds, etc., he detests his operations being referred to as DXpeditions. He does not go on DXpeditions in the Middle East. He is simply working in whatever country he is QRV from, and all his amateur-radio activities are done in his spare time as a form of relaxation.

Incidentally, Roger has been doing quite a bit of badly needed PR work for ham radio in countries such as SU and ST0, where amateur radio is neither understood nor encouraged as a worthwhile hobby. In his job he works alongside many locals, most of them being qualified radio technicians, and wherever possible he tries to educate these persons and any others interested in the benefits and usefulness of this hobby we all enjoy.

One interesting fact revealed during the course of our discussion was the way in which ham-radio activity has assisted Roger in his job. The practical experience gained in antenna performance and construction, propagation conditions both on HF and VHF, and even just the way hams get things done when others fail, have all combined to make him successful in his job. It is especially for this reason that he has always made a point of lugging along his trusty 902 DM, as heavy as it is, wherever he has traveled.

By the time this article appears in print, he will long since have returned to continue his tour of duty in the Middle East. Roger's plans in the coming months include stints in SU and ST0. He already has re-equipped himself with new radio gear. From his home QTH he will be using the new FT-980 by Yaesu and a Cushcraft R3 triband vertical—the one that's ideal for apartment dwellers as it needs no radials! His portable operations will be made with a much more compact and lightweight transceiver, the Icom IC-730, and his old 4-band trap dipole.

Roger has indicated that the following are some of his favorite operating frequencies and times:

14.220 MHz	0700Z
21.157 MHz (DK9KE Net, mainly weekends)	1000Z
21.335 MHz	1800Z
28.550 MHz	1300Z
14.332 MHz (YL system)	Occasionally

All QSLs for 9Y4RD/... should be sent directly to his QSL Manager, KA2DDJ, as he does not have the time nor QSL cards to handle QSLs himself.

Wherever Roger is QRV, you should have no difficulty identifying him, since, as a patriotic Trinidadian, he plans always to retain his 9Y4RD callsign and operate as a portable.

VENEZUELA

Luis E. Suarez OA4KO/YV5
Apartado 66994
Caracas 1061-A
Venezuela

CIRCUITO 2 (YV2)

In Venezuela, call area 2 is composed of the states of Tachira, Merida, and Barinas. The first two are Andean, with cities at altitudes ranging from 100 to 3100 meters. Barinas state, however, is located in the plains on the eastern side of those states and faces the Andes.

San Cristobal is the capital city of Tachira. It is located in a hilly terrain, almost like that of San Francisco. It is a modern city with all the traffic and noise that civilization carries on.

Down the Andes there is another city with a funny name: La Fria (the Cold). When you arrive in that city you will experience tropical heat, but La Fria earned its name from a type of malaria which caused terrible chills and continuous chattering of the teeth. At first it was just some black humor, but the name remained. Today it is a prosperous zone with a superhighway linking this city and San Cristobal. San Cristobal's nearest airport is at La Fria.

Merida, the highest state in the Andes is called the Techo de Venezuela (Roof of Venezuela). Captain Juan Rodriguez Suarez (no relation) founded it in 1558. In fact, he was not authorized to found cities, so he was rushed to Bogota, arrested, judged guilty of the usurpation of Royal prerogatives, and sentenced to be dragged by the tail of his horse until dead and then to be quartered. However, he escaped to Venezuela and got asylum.

In Merida is located the highest mountain of Venezuela: Pico Bolivar. This mountain is 5,700 meters high and wears a perpetual snow dress. It has the highest and the longest cable car in the world; it takes one hour if you go straight to the top. There is some skiing here, but it is not recommended unless you are professional. "It is out of this world, and astronaut training is recommended for the successful Pico Espejo skier" (*Ve Venezuela*).

Driving from Merida city down the plains, and heading to Barinas, is something you'll never forget in your life. At first you go up the mountains to the Andean paramo. It is as inhospitable, cold, cloudy, and damp in the rainy season as it is dry and drab in the dry season. It is so isolated that you feel you are between life and death. You feel the necessity to stop your car and listen to the silence. I did and was surprised to know that the only plants in the zone, the frailejones, are really fragrant and they perfume the paramo.

At Apartaderos, midway between Merida and Barinas, you may visit CIDA, an astrophysical institute, with its four telescopes, among which are Coude Cassegrain, a double astrograph and a great reflector, as well as a Schmidt Camera. Visitors are welcomed.

Continuing to Barinas, you may have direct radio contact now via 2m FM repeaters with Caracas or Maracaibo, as I explained in a past column. Continuing with the trip and heading to Santo Domingo, you see the vegetation begin to change. After Santo Domingo, a snaking road heads you down to the plain. The mountains become green and you see small wa-

↙ See List of Advertisers on page 98

terfalls coming near the road. Temperature increases and tropical vegetation breaks all around as you approach Barinas, the capital city of Barinas state.

Barinas is flat and becomes inundated during the rainy season. Since the northwest part of this state is toward the Andes, most of the towns are located in the rolling foothills at the edge of the mountains.

In my next column, I will begin describing call area 3: Lara, Yaracuy, and Portuguesa.

MAP EXCHANGE

I like city maps; if anybody out there is interested in maps, too, let me know. Send me a map of your city and I will enchange with the map of Caracas. Please be sure it is a detailed map with all streets. (Cannot use those which advertise relative locations of historical or interesting places, like tour maps or souvenir maps.) From the USA, Rand McNally is preferred; Dolph is OK. If you know your Maidenhead grid locator (with 6-character precision), please mark your QTH. Otherwise please don't. Let me find it myself!

COMUNICA BULLETIN

Also I wish to mention that I'm publishing a Spanish newsletter named *COMUNICA*. If there is anybody wishing to spread any information to Venezuelan and Latin American radio amateurs, let me know. The bulletin is distributed monthly in all Latin American countries. Subscription is US$15.00 first-class Air Mail per twelve issues. As far as I know this is the first communications bulletin in Spanish ever published and distributed in 19 countries.

If you would like to take a look, send me your address and I will forward you a sample. Maybe you would like to include, with your request, news from your radio club for publication. If somebody is publishing something similar, an exchange is desired. Polish, Chinese, and Swahili bulletins are accepted.

FEEDBACK

I wish to thank all those colleagues who sent cards and letters. All those that requested information and services were replied to or the request accomplished. I have published in *COMUNICA* the requests I couldn't answer in the hope that somebody was able to reply directly.

Regarding the article on parabolic antennas (*73*, May, 1984), I wish to mention that the article was intended to be as tutorial as possible. Really, I have no plans or drawings for construction and the intention was that you personally develop your own design. If you don't have the ability to construct a parabola, neither a drawing or a picture will help.

I guess the best solution is to make the drawing yourself and find somebody who feels comfortable with mechanical structures to help you in construction. Another approach is to get an already-made parabola and to experiment with different feeders. With the information in the article you would be able to know what you get and what you need for your particular application. The last recommendation is that you start with a 1-meter dish and then go ahead with a larger one if necessary.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

CALLSIGNS

What does your callsign mean to you? I know my call means a lot to me. On the air, it's my name. When I visit hamfests, my callsign badge lets people know who I am. There may be hundreds of thousands of John Edwardses on this sad old planet, but only one KI2U. Thank heaven.

Unlike my name, I've held a number of calls over the years, including WB2IBE (my original), WR2APG, WA2DCS, and of course KI2U. When I upgraded from Advanced to Extra back in 1980, I had to do some serious soul searching before changing my call. My old ID had served me well over the years and, naturally, I was reluctant to make such a drastic change in my amateur-radio lifestyle. Still, a snappy 2 × 1 call has its advantages in pileups, so I reluctantly turned in my old 2 × 3 trademark for KI2U.

ELEMENT 1
MULTIPLE CHOICE

1) Before the FCC reshuffled the amateur callsign allocation process in 1978, what did a WT prefix signify?
   1) A Technician-class licensee
   2) A temporary license
   3) Nothing in particular
   4) A ham in the third radio district
2) WN prefixes were formerly reserved for:
   1) Novices
   2) Interim licensees
   3) Secondary licenses
   4) Repeaters
3) Tuning around 20 meters one night, you hear a station signing KA@QRM. Why do you suspect he is a bootlegger?
   1) The FCC doesn't usually issue call suffixes that are also Q-signals
   2) KA calls aren't allowed on 20 meters
   3) The FCC doesn't issue calls with a Qxx suffix
   4) You don't know
4) What's wrong with WR2APG, New York's favorite 220-MHz slow-scan TV repeater?
   1) It's using an expired call
   2) Repeaters aren't allowed on 220 MHz
   3) Slow-scan TV isn't allowed on repeaters
   4) Nothing
5) What was the callsign of the ARRL's first headquarters station?
   1) W1AW
   2) 1AW
   3) W1ARRL
   4) W1MK

ELEMENT 2
FILL IN THE BLANKS

Fill in the calls of these prominent hams of the past and present:

1) Arthur Godfrey _____
2) King Hussein _____
3) Barry Goldwater _____
4) Mahmud Reza Pahlavi _____ (Shah of Iran's son; now the current Shah)
5) Tom Christian _____

ELEMENT 3
TRUE-FALSE

	True	False
1) The FCC programs its computer so it won't issue obscene or suggestive amateur callsigns.	_____	_____
2) All broadcast stations east of the Mississippi have W callsigns.	_____	_____
3) WHAS is located in Louisville, Kentucky.	_____	_____
4) A broadcast station may select its callsign.	_____	_____
5) OSCAR 8's callsign was W12OSC.	_____	_____
6) Lee DeForest, famed radio inventor, held amateur call 1DF.	_____	_____
7) The FCC issued the first K calls to continental US hams during 1946.	_____	_____
8) W2XAM is *not* a ham callsign.	_____	_____
9) The Federal Radio Commission began issuing W and K calls in 1948.	_____	_____
10) KCBS is located in Los Angeles CA.	_____	_____
11) Hiram Percy Maxim's first callsign was SNW.	_____	_____
12) Marconi once received an FCC citation for failing to properly identify his station.	_____	_____

ELEMENT 4
MATCHING

Match the prefixes in Column A with the countries in Column B.

Column A	Column B
1) CP	A) Grenada
2) LU	B) Sikkim
3) 5H1	C) Philippines
4) LZ	D) Malawi
5) J3A	E) Colombia
6) GU	F) Iran
7) 8R	G) Zanzibar
8) DU	H) Switzerland
9) 3D2	I) Mauritania
10) 5T5	J) Papua New Guinea
11) AC3	K) Ireland
12) VR6	L) Soviet Union
13) HK	M) Sudan
14) M1	N) Bolivia
15) EP	O) Turkey
16) D4C	P) Fiji Islands
17) EI	Q) Guyana
18) CE	R) Bulgaria
19) 7Q7	S) Cape Verde
20) 9V1	T) Singapore
21) 5U7	U) Argentina
22) P29	V) San Marino
23) TA	W) Chile
24) HB	X) Guernsey
25) ST	Y) Pitcairn Island
	Z) Niger

THE ANSWERS

Element 1:
1—2 Usually issued by the local field office when Gettysburg screwed up an application.
2—1 Also KN prefixes for a while.
3—1 Sort of helps to prevent confusion.
4—1 All WR prefix repeater calls have expired.
5—4 It got wiped out in a 1936 flood.

Element 2:
1—K4LIB
2—JY1
3—K7UGA
4—ex-EP1MP
5—VR6TC

Element 3:

1—True	All the funny ones.
2—False	Most, but not all (e.g., KDKA in Pittsburgh).
3—True	All 50 kW of it.
4—True	But hams can't. Not fair, really.
5—False	Satellites don't require a call.
6—False	DeForest wasn't a ham.
7—True	During the fall.
8—True	It's a call for experimental stations.
9—False	The year was 1929.
10—False	It's in San Francisco.
11—True	Around 1911, the days when you could make up your own call.
12—False	Marconi's radio experiments were completed by the time the FCC came into being.

Element 4:
1—N, 2—U, 3—G, 4—R, 5—A, 6—X, 7—Q, 8—C, 9—P, 10—I, 11—B, 12—Y, 13—E, 14—V, 15—F, 16—S, 17—K, 18—W, 19—D, 20—T, 21—Z, 22—J, 23—O, 24—H, 25—M.

SCORING

Element 1:
Five points for each correct answer.
Element 2:
Five points for each call correctly filled in.
Element 3:
Two points for each correct answer.
Element 4:
One point for each correct match.

How did you do?
1–20 points—Called out
21–40 points—Call for help
41–60 points—Call back
61–80 points—On call
81–99 points—A call to remember!

TS430S FILTERS

For superior performance at lower cost, use top-rated 8-pole Fox Tango crystal filters to fill the optional spots in your rig. For example, our 1800 Hz FT2808 equivalent of the YK88SN has 60/6dB shape factor of 1.7 compared with 2.0, a price of $55 vs $63, and squarer shoulders at the top with steeper skirts all the way down to more than -80dB!

For more pleasant audio use our 2100Hz for SSB and/or our 6000Hz for AM. For CW, our 400Hz unit is better than the YK88C, while our 250Hz is sharper than the YK88CN.

BIGGER IS *BETTER!*

Fox Tango filters are better because of their *discrete crystal* (not monolithic) construction. This makes them slightly larger than YK filters so they are patched into the circuit with short lengths of coax. Installation is easy—no drilling or circuit changes. Order with confidence.

COMPLETE FILTER KITS — $60 EACH

AM—FT2811 (6000Hz Bandwidth)
SSB—FT2808 (1800Hz); FT2809 (2100Hz)
CW—FT2801 (250Hz); FT2802 (400Hz)

Kits include all needed cables, parts, detailed instructions. **Specify the type(s) desired:**

NEW! FILTER CASCADING KIT $85

Extra tail end I-F filter improves SSB/CW selectivity and dynamic range while reducing RX noise. No effects on TX, AM/FM. Price includes 2.1 FT filter, new PC board, teflon coax, detailed instructions, etc. Shipping: $3, Air, $5 (if COD add $1). Overseas $10. FL tax 5%.

FOX TANGO CORPORATION
Box 15944T, W. Palm Beach, FL 33416 ↙139
Phone: (305) 683-9587

ATTENTION

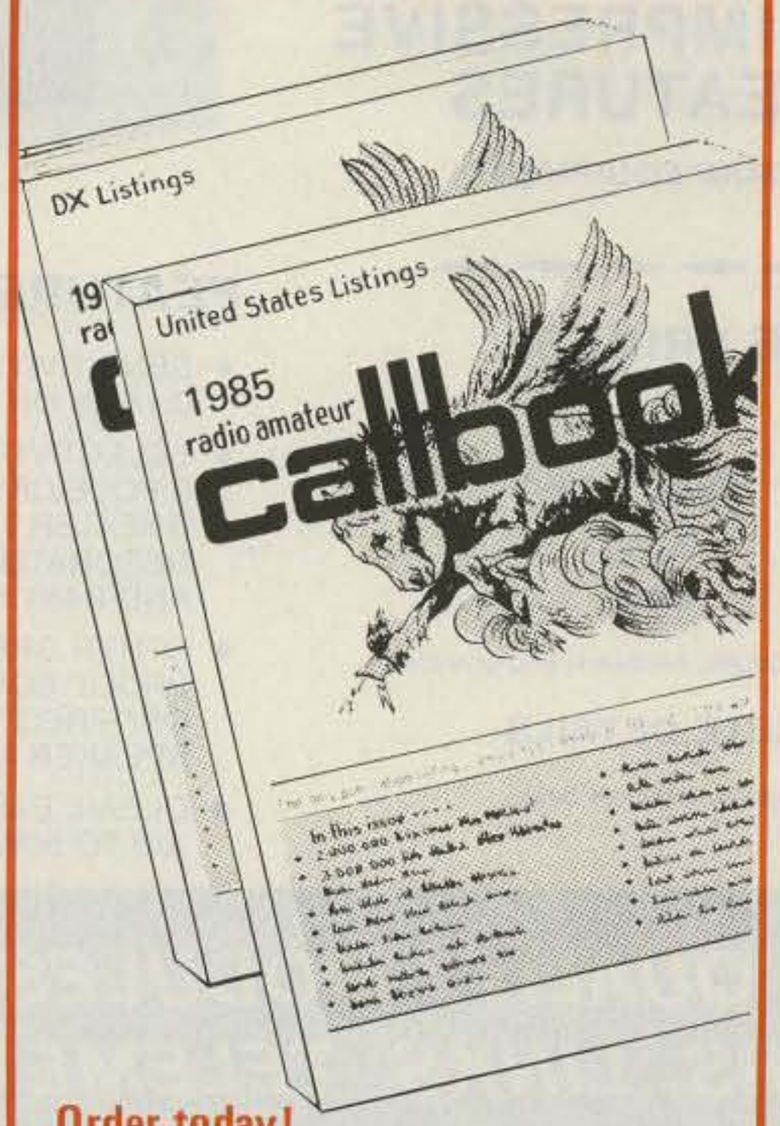
Foreign Computer Stores/ Magazine Dealers

You have a large technical audience that speaks English and is in need of the kind of microcomputer information that CW/Peterborough provides.

Provide your audience with the magazine they need and make money at the same time. For details on selling **Microcomputing, 80 MICRO, inCider, HOT CoCo, RUN, jr** contact:

SANDRA JOSEPH
WORLD WIDE MEDIA
386 PARK AVE., SOUTH
NEW YORK, NY 10016
PHONE (212) 686-1520
TELEX—620430

1985 CALLBOOKS



Order today!
NEW 1985
RADIO AMATEUR CALLBOOKS
READY DECEMBER 1st!

Known throughout the world for accuracy, the 1985 Callbooks list the names and addresses you need for your QSL's. Arranged for easy reference, the U.S. Callbook contains over 433,000 listings; the Foreign Callbook has over 413,000. More than 100,000 changes have been made in each edition since last year. Special features include call changes, Silent Keys, census of amateur licenses, world-wide QSL bureaus, international postal rates, prefixes of the world, and much more. Why settle for less than the very best? Order your 1985 Callbooks now for earliest delivery.

	Each	Shipping	Total
□ U.S. Callbook	$21.95	$3.05	$25.00
□ Foreign Callbook	20.95	3.05	24.00

Order both books at the same time for $45.00 including shipping within the USA.

Order from your dealer or directly from the publisher. Foreign residents add $4.55 for shipping. Illinois residents add 6% sales tax.

Keep your 1985 Callbooks up to date.

The U.S. and Foreign Supplements contain all activity for the previous three months including new licenses. Available from the publisher in sets of three (March 1, June 1, and September 1) for only $15.00 per set including shipping. Specify U.S. or Foreign Supplements when ordering. Illinois residents add 6% sales tax. Offer void after November 1, 1985.

RADIO AMATEUR **callbook** INC. ↙61
Dept. B
925 Sherwood Dr., Box 247
Lake Bluff, IL 60044, USA

Tel: (312) 234-6600 VISA MasterCard

AEA Brings You The PACKET Breakthrough!

PACKET RADIO lets you share a simplex channel error-free with up to 20 simultaneous users at 1200 Baud.

AEA introduces the MODEL PKT-1 PACKET CONTROLLER. Through an arrangement with TAPR (Tuscon Packet Radio, Inc.), AEA brings you the proven performance of the TAPR kit board and software in a rugged metal package, fully wired and tested with a full year's warranty and with all the free applications assistance you can stand.

Using only your existing radio and RS232 terminal (or computer), you can join the rapidly expanding packet radio community. Operate on VHF, HF or satellite and talk to more than 1000 existing packet users. Store messages addressed to you automatically and read them from your printer or monitor later. Easy to hook-up!! Easy to use!!

Call today for the rest of the story: 206-775-7373!!

Better yet, see your favorite AEA dealer.

Advanced Electronic Applications
P.O. Box C-2160
Lynnwood, WA 98036

All right, AEA, send me info fast!

To: AEA, P.O. Box C-2160,
Lynnwood, WA 98036

Name

Address

City, State, Zip

Phone Date

↙ See List of Advertisers on page 98

THE MOST AFFORDABLE REPEATER

ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES

(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)

JUST LOOK AT THESE PRICES!

Band	Kit	Wired/Tested
10M,6M,2M,220	$680	$880
440	$780	$980

Both kit and wired units are complete with all parts, modules, hardware, and crystals.

CALL OR WRITE FOR COMPLETE DETAILS.

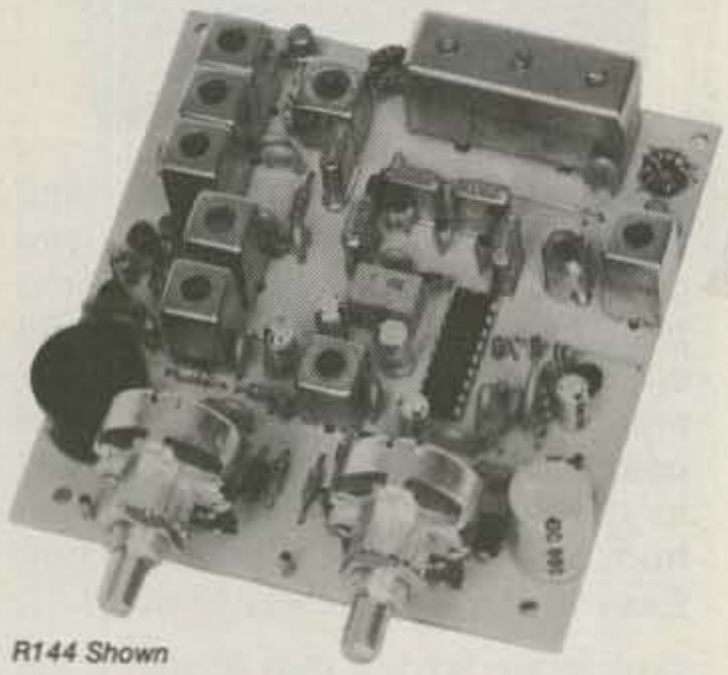
Also available for remote site linking, crossband, and remote base.

FEATURES:

- SENSITIVITY SECOND TO NONE; TYPICALLY 0.15 uV ON VHF, 0.3 uV ON UHF.
- SELECTIVITY THAT CAN'T BE BEAT! BOTH 8 POLE CRYSTAL FILTER & CERAMIC FILTER FOR GREATER THAN 100 dB AT ± 12KHZ. HELICAL RESONATOR FRONT ENDS. SEE R144, R220, AND R451 SPECS IN RECEIVER AD BELOW.
- OTHER GREAT RECEIVER FEATURES: FLUTTER-PROOF SQUELCH, AFC TO COMPENSATE FOR OFF-FREQ TRANSMITTERS, SEPARATE LOCAL SPEAKER AMPLIFIER & CONTROL.
- CLEAN, EASY TUNE TRANSMITTER; UP TO 20 WATTS OUT (UP TO 50W WITH OPTIONAL PA).

HIGH QUALITY MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.

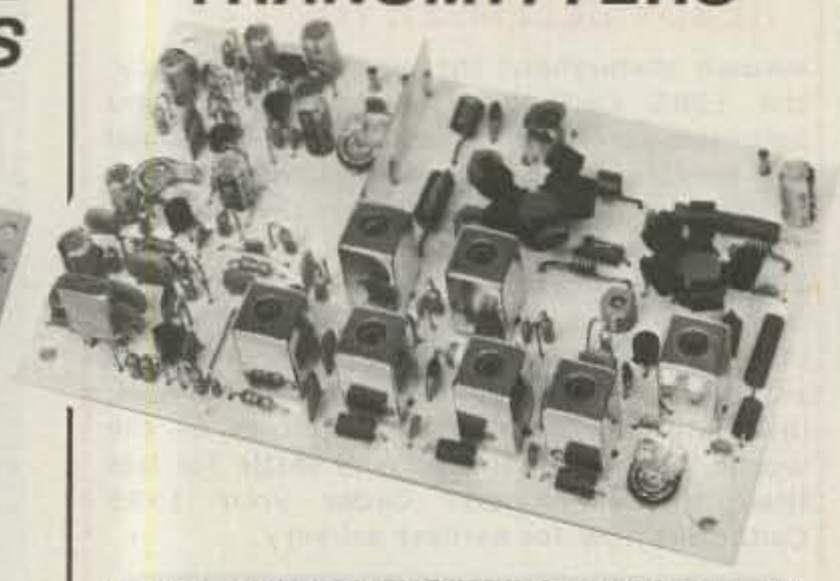
HIGH-PERFORMANCE RECEIVER MODULES



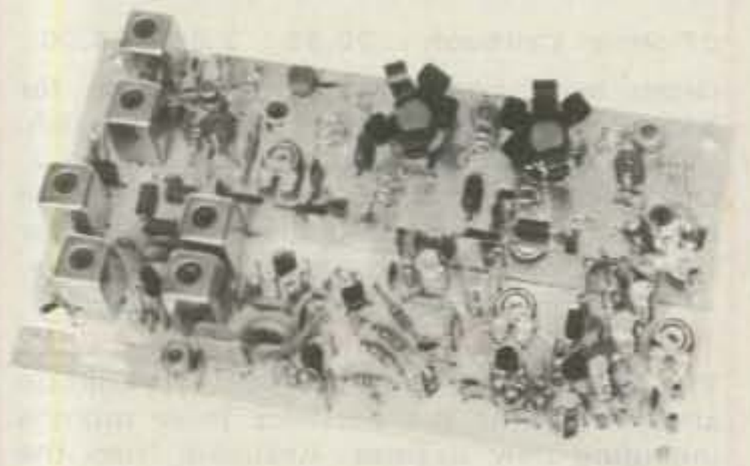
R144 Shown

- **R144/R220 FM RCVRS** for 2M or 220 MHz. 0.15uV sens.; 8 pole xtal filter & ceramic filter in i-f, helical resonator front end for exceptional selectivity, more than −100 dB at ±12 kHz, best available today. Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit only $138.
- **R451 FM RCVR** Same but for uhf. Tuned line front end, 0.3 uV sens. Kit only $138.
- **R76 FM RCVR** for 10M, 6M, 2M, 220, or commercial bands. As above, but w/o AFC or hel. res. Kits only $118.
  Also avail w/4 pole filter, only $98/kit.
- **R110 VHF AM RECEIVER** kit for VHF aircraft band or ham bands. Only $98.
- **R110-259 SPACE SHUTTLE RECEIVER,** kit only $98.

TRANSMITTERS

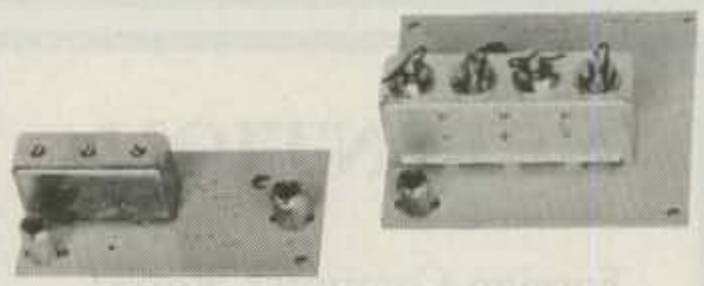


- **T51 VHF FM EXCITER** for 10M, 6M, 2M, 220 MHz or adjacent bands. 2 Watts continuous, up to 2½ W intermittent. $68/kit.



- **T451 UHF FM EXCITER** 2 to 3 Watts on 450 ham band or adjacent freq. Kit only $78.
- **VHF & UHF LINEAR AMPLIFIERS.** Use on either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Several models. Kits from $78.
- **A16 RF TIGHT BOX** Deep drawn alum. case with tight cover and no seams. 7 x 8 x 2 inches. Designed especially for repeaters. $20.

ACCESSORIES



- **HELICAL RESONATOR FILTERS** available separately on pcb w/connectors.

  HRF-144 for 143-150 MHz $38
  HRF-220 for 213-233 MHz $38
  HRF-432 for 420-450 MHz $48

- **COR-2 KIT** With audio mixer, local speaker amplifier, tail & time-out timers. Only $38.
- **COR-3 KIT** as above, but with "courtesy beep". Only $58.
- **CWID KITS** 158 bits, field programmable, clean audio, rugged TTL logic. Kit only $68.
- **DTMF DECODER/CONTROLLER KITS.** Control 2 separate on/off functions with touchtones®, e.g., repeater and autopatch. Use with main or aux. receiver or with Autopatch. Only $90
- **AUTOPATCH KITS.** Provide repeater autopatch, reverse patch, phone line remote control of repeater, secondary control via repeater receiver. Many other features. Only $90. Requires DTMF Module.
- **NEW – SIMPLEX AUTOPATCH**
  Use with any transceiver. System includes DTMF & Autopatch modules above and new Timing module to provide simplex autopatch and reverse autopatch. Complete patch system only $200/kit. Call or write for details.

hamtronics® ✓288

NEW LOW-NOISE PREAMPS

Hamtronics Breaks the Price Barrier!

*

No Need to Pay $80 to $125 for a GaAs FET Preamp.

FEATURES:

- Very Low Noise: 0.7 dB VHF, 0.8 dB UHF
- High Gain: 18 to 28 dB, Depending on Freq.
- Wide Dynamic Range for Overload Resistance
- Latest Dual-gate GaAs FET, Stable Over Wide Range of Conditions
- Rugged, Diode-protected Transistors
- Easy to Tune
- Operates on Standard 12 to 14 Vdc Supply
- Can be Tower Mounted

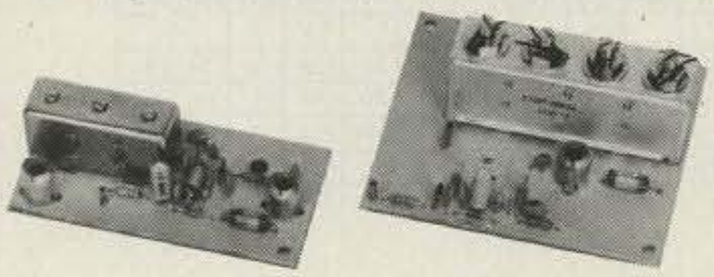
MODEL	TUNES RANGE	PRICE
LNG-28	26-30 MHz	$49
LNG-50	46-56 MHz	$49
LNG-144	137-150 MHz	$49
LNG-220	210-230 MHz	$49
LNG-432	400-470 MHz	$49
LNG-40	30-46 MHz	$64
LNG-160	150-172 MHz	$64

ECONOMY PREAMPS

Our traditional preamps, proven in years of service. Over 20,000 in use throughout the world. Tuneable over narrow range. Specify exact freq. band needed. Gain 16-20 dB. NF = 2 dB or less. VHF units available 27 to 300 MHz. UHF units available 300 to 650 MHz.

- P30K, VHF Kit less case $18
- P30W, VHF Wired/Tested $33
- P432K, UHF Kit less case $21
- P432W, UHF Wired/Tested $36

HELICAL RESONATOR PREAMPS



Our lab has developed a new line of low-noise receiver preamps with helical resonator filters built in. The combination of a low noise amplifier and the sharp selectivity of a 3 or 4 section helical resonator provides increased sensitivity while reducing intermod and cross-band interference in critical applications. See selectivity curves at right. Gain = approx.12 dB.

Model	Tuning Range	Price
HRA-144	143-150 MHz	$49
HRA-220	213-233 MHz	$49
HRA-432	420-450 MHz	$59
HRA-( )	150-174MHz	$69
HRA-( )	450-470 MHz	$79

RECEIVING CONVERTERS

Models to cover every practical rf & if range to listen to SSB, FM, ATV, etc. NF = 2 dB or less.

	Antenna Input Range	Receiver Output
VHF MODELS	28-32	144-148
	50-52	28-30
Kit with Case $49	50-54	144-148
Less Case $39	144-146	28-30
Wired $69	145-147	28-30
	144-144.4	27-27.4
	146-148	28-30
	144-148	50-54
	220-222	28-30
	220-224	144-148
	222-226	144-148
	220-224	50-54
	222-224	28-30
UHF MODELS	432-434	28-30
	435-437	28-30
Kit with Case $59	432-436	144-148
Less Case $49	432-436	50-54
Wired $75	439.25	61.25

SCANNER CONVERTERS Copy 72-76, 135-144, 240-270, 400-420, or 806-894 MHz bands on any scanner. Wired/tested Only $88.

SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

FM-5 PC Board Kit – **ONLY $178**
complete with controls, heatsink, etc.
10 Watts, 5 Channels, for 2M or 220 MHz.

Cabinet Kit, complete with speaker, knobs, connectors, hardware. Only $60.

REPEAT OF A SELLOUT!

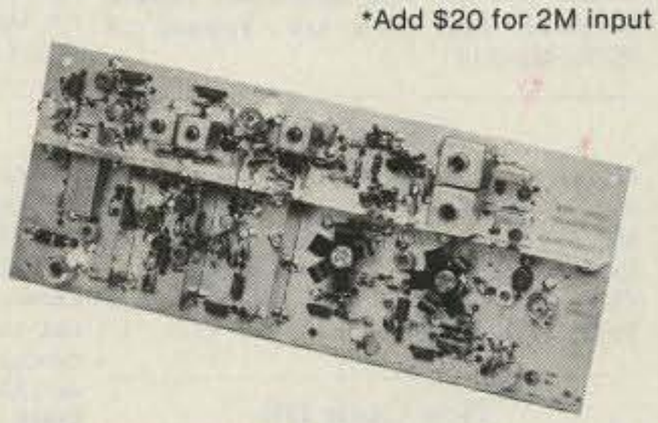
While supply lasts, get $60 cabinet kit free when you buy an FM-5 Transceiver kit. Where else can you get a complete transceiver for only $178

TRANSMIT CONVERTERS

For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 Watts output vhf, 1 Watt uhf.

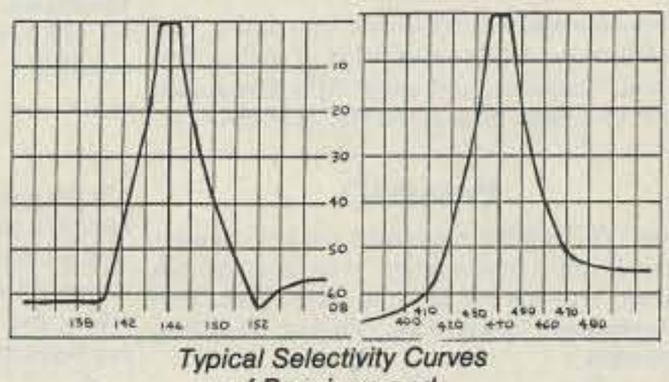
	Exciter Input Range	Antenna Output
For VHF,	28-30	144-146
Model XV2	28-29	145-146
Kit $79	28-30	50-52
Wired $149	27-27.4	144-144.4
(Specify band)	28-30	220-222*
	50-54	220-224
	144-146	50-52
	50-54	144-148
	144-146	28-30
For UHF,	28-30	432-434
Model XV4	28-30	435-437
Kit $99	50-54	432-436
Wired $169	61.25	439.25
	144-148	432-436*

*Add $20 for 2M input



VHF & UHF LINEAR AMPLIFIERS. Use with above. Power levels from 10 to 45 Watts. Several models, kits from $78.

LOOK AT THESE ATTRACTIVE CURVES!



Typical Selectivity Curves of Receivers and Helical Resonators.

IMPORTANT REASONS WHY YOU SHOULD BUY FROM THE VALUE LEADER:

1. *Largest selection of vhf and uhf kits in the world.*
2. *Exceptional quality and low prices due to large volume.*
3. *Fast delivery; most kits shipped same day.*
4. *Complete, professional instruction manuals.*
5. *Prompt factory service available and free phone consultation.*
6. *In business 21 years.*
7. *Sell more repeater modules than all other mfrs. and have for years. Can give quality features for much lower cost.*

- **Call or Write for FREE CATALOG**
- **(Send $1.00 or 4 IRC'c for overseas mailing)**
- **Order by phone or mail ● Add $3 S & H per order**
  (Electronic answering service evenings & weekends)
  Use VISA, MASTERCARD, Check, or UPS COD.

hamtronics, inc. ↙33

65-D MOUL RD. ● HILTON NY 14468
Phone: 716-392-9430
Hamtronics ® is a registered trademark

↙ See List of Advertisers on page 98

DEALER DIRECTORY

Culver City CA

Jun's Electronics, 3919 Sepulveda Blvd., Culver City CA 90230, 390-8003. Trades 463-1886 San Diego, 827-5732 (Reno NV).

Fontana CA

Complete lines ICOM, DenTron, Ten-Tec, Mirage, Cubic, Lunar, over 4000 electronic products for hobbyist, technician, experimenter. Also CB radio, landmobile. **Fontana Electronics, 8628 Sierra Ave., Fontana CA 92335, 822-7710.**

San Jose CA

Bay area's newest amateur radio store. New & used amateur radio sales & service. We feature Kenwood, ICOM, Azden, Yaesu, Ten-Tec, Santec & many more. **Shaver Radio, Inc., 1775A S. Winchester Blvd., Campbell CA 95008, 370-6665.**

New Castle DE

Factory Authorized Dealer! Yaesu, ICOM, Ten-Tec, KDK, Kenwood, AEA, Kantronics, Santec. Full line of accessories. No sales tax in Delaware. One mile off I-95. **Delaware Amateur Supply, 71 Meadow Road, New Castle DE 19720, 328-7728.**

Boise ID

Rocky Mountain area's newest ham dealer. Call RJM first for AEA, Azden, KDK, Ten-Tec, Butternut, Cushcraft, and more! **RJM Electronics, 4204 Overland, Boise ID 83705. 343-4018.**

Preston ID

Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Call me for all your ham needs. **Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.**

Littleton MA

The reliable ham store serving NE. Full line of ICOM & Kenwood. Yaesu HTs, Drake, Daiwa, B&W accessories. Curtis & Trac keyers. Larsen, Hustler, Telex/Hy-Gain products. Mirage amps., Astron P.S., Alpha Delta protectors, ARRL & Kantronics instruction aids. Whistler radar detectors. Full line of coax fittings. **TEL—COM Electronic Communications, 675 Great Rd. (Rt. 119), Littleton MA 01460, 486-3400/3040.**

Livonia MI

Complete photovoltaic systems. Amateur radio, repeater, satellite, and computer applications! Call Paul WD8AHO. **Encon Photovoltaics, 27600 Schoolcraft Road, Livonia MI 48150, 523-1850.**

Lincoln NE

G&C Communications is a full-line distributor of major-line amateur equipment and accessories, antennas, and everything. **4230 Progressive Ave., Lincoln NE 68504, 46-RADIO.**

Derry NH

Serving the ham community with new and used equipment. We stock and service most major lines: AEA, Astron, Azden, B&W, Cushcraft, Hy-Gain, Hustler, ICOM, Kenwood, KLM, Larsen, Mirage, Mosley; books, rotors, cable and connectors. Business hours 9–7 Monday through Thursday, and 9–5 Friday and Saturday. **Rivendell, 68 Warner Hill Road, Derry NH 03038; 434-5371.**

Albany, New York
UPSTATE NEW YORK

Kenwood, ICOM, Ten-Tec, Belden, Cushcraft, Larsen, Hustler, ARRL, Hy-Gain, B&W, MFJ, Mirage. New and used equipment. Serving the amateur community since 1942. **Adirondack Electronics, Inc., 1991 Central Avenue, Albany NY 12205, 456-0203** (one mile west of Northway exit 2W).

Columbus OH

The biggest and best ham store in the Midwest featuring Kenwood and other quality products with working displays. We sell only the best. Authorized Kenwood service. **Universal Amateur Radio, Inc., 1280 Aida Dr., Reynoldsburg (Columbus) OH 43068, 866-4267.**

Dallas TX

IBM PC/XT kits, supplies, expansion products; video restorer kits for pay TV, CATV, satellite hobbyists' electronic project kits/app-notes. More than 9000 parts in stock: semiconductors, ICs, discretes, video accessories, tools, audio, automotive, cabinets, computer peripherals. Please write for your free 60-page catalog: **Sabet Electronics, 13650 Floyd Rd., Ste. 104, Dallas TX 75243; 783-4950** (formerly I.E.).

DEALERS

Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the December '84 issue must be in our hands by October 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20						20					15
ARGENTINA	20	40A	20	40					10		20A	20A
AUSTRALIA	20	40A		40	40	20	20	20		20	15	15
CANAL ZONE	40A	40A	40	40	40		20	20A	10	15A	20A	20
ENGLAND	40	40	40	40				15	20A	20		
HAWAII	20	20				20	20			15	15	15
INDIA						20	20	20				
JAPAN	20					40	20				15	15
MEXICO	40A	40A	40	40	40		20	20A	10	15A	20A	20
PHILIPPINES							20					
PUERTO RICO	40A	40A	40	40	40	20	20A	15A	15A	20A	20	40A
SOUTH AFRICA	40	40A	20					15A	15A	20A	20A	20A
U.S.S.R.	20	20					20	15			20	20
WEST COAST	21A	20	40	40	40	40	40	20	15	15A	15A	15A

CENTRAL UNITED STATES TO:

ALASKA	20				40	40	20	20			15	15
ARGENTINA	20	40	40	40						15A	20A	20A
AUSTRALIA					40	40	20	20	20		15	15
CANAL ZONE	40	40	40	40	40	20	20	15	15A	15A	15A	15
ENGLAND	40	40	40	40				15	15	20A	20	20
HAWAII	20	20	20	40	40		20	20		10	10	15
INDIA	20	20					20	20				
JAPAN	20					40	20	20				15
MEXICO	40	40	40	40	40	20	20	20	20	15A	15A	15
PHILIPPINES	20A	20					20	20			15	15
PUERTO RICO	40	40	40	40	40	20	20	20	20	15A	15A	15
SOUTH AFRICA							10	15A	15	20A	20A	20
U.S.S.R.							20	20A	15	20	20	

WESTERN UNITED STATES TO:

ALASKA	20A	20A	20			40	40	40A	20	20	20	20A
ARGENTINA	20A	20	40A	40						15A	15A	15A
AUSTRALIA	20A	20A	20	20	40	40	40		20	20	15	15
CANAL ZONE	20	20	40A	40A	40			20	20A	15A	15A	15A
ENGLAND			40					20	15	20A	20	20
HAWAII	15	20A	20A	40A	40	40	40	20	20	20		15A
INDIA	20A	20A						20	20			
JAPAN	20A	20A	20			40	40	40A	20	20	20	20A
MEXICO	20	20	40A	40A	40			20	20A	15A	15A	15A
PHILIPPINES	15			20		40	40		20	20		
PUERTO RICO	20	20	40A	40A	40			20	20A	15A	15A	15A
SOUTH AFRICA	20							20	20	15	20	20
U.S.S.R.			40	40				20A	15A	10	20	20
EAST COAST	15A	20	40	40	40	40	40	20	15	15A	15A	15A

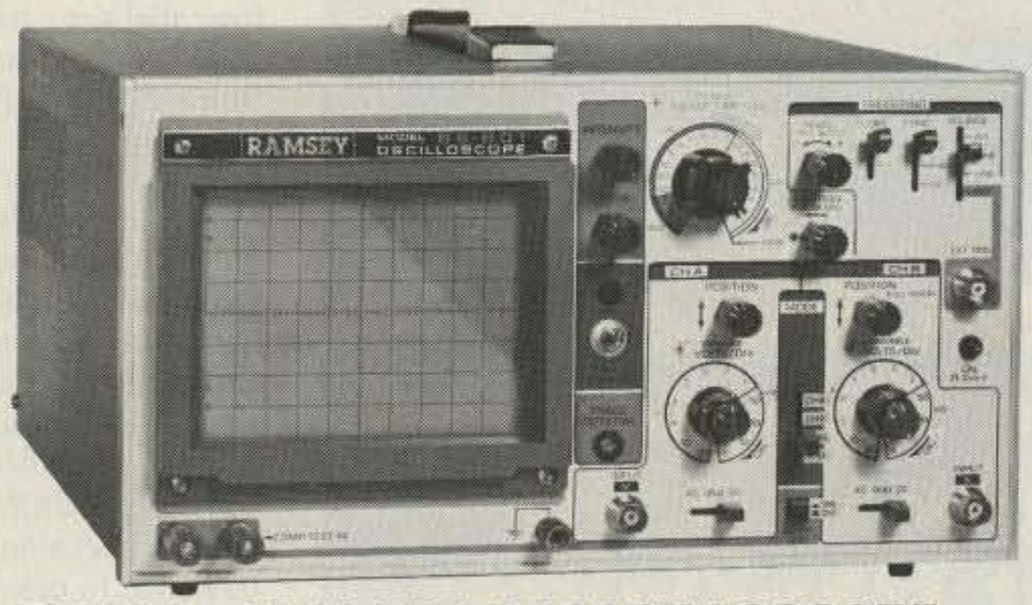
A = Next higher frequency band may also be useful.
B = Difficult circuit this period.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

OCTOBER

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

RAMSEY

THE FIRST NAME IN ELECTRONIC TEST GEAR



20 MHz DUAL TRACE OSCILLOSCOPE

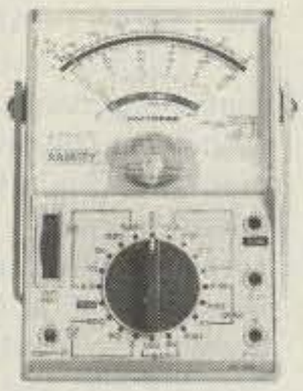
Unsurpassed quality at an unbeatable price, the Ramsey oscilloscope compares to others costing hundreds more. Features include a component testing circuit for resistor, capacitor, digital circuit and diode testing. • TV video sync filter • wide bandwidth & high sensitivity • internal graticule • front panel trace rotator • Z axis • high sensitivity x-y mode • regulated power supply • built-in calibrator • rock solid triggering

$399.95 high quality hook on probes included

45 MHz DUAL SWEEP OSCILLOSCOPE

The Ramsey 625 is a dual time base, delayed sweep unit that includes a built-in signal delay line to permit clear viewing during very short rise times of high frequency waveforms. Other features include; variable trigger holdoff • 20 calibrated sweep time ranges from 0.5 s/div to 0.2 µS/div. • fully adjustable sweep time • X5 sweep magnification • five trigger sources: CH1, CH2, LINE EXTernal and INTernal (V mode) • front panel x-y operation, Z axis input • sum difference of CH1, and CH2 waveforms displayed as single trace • sweep gate and sweep output • auto focus • single sweep

$799.95 high quality hook on probes included



RAMSEY D-1100 VOM MULTITESTER

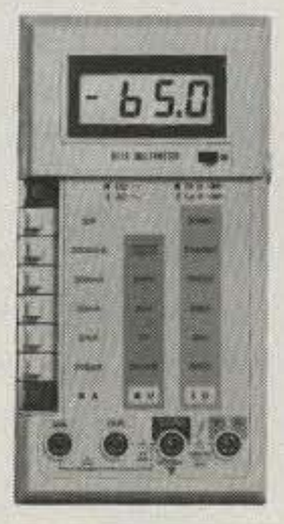
Compact and reliable, designed to service a wide variety of equipment. Features include • mirror back scale • double-jeweled precision moving coil • double overload protection • an ideal low cost unit for the beginner or as a spare back-up unit.

$19.95 test leads and battery included

NEW RAMSEY 1200 VOM MULTITESTER

Check transistors, diodes and LEDs with this professional quality meter. Other features include; decibel scale • 20K volt metering system • 3½" mirrored scale • polarity switch • 20 measuring ranges • safety probes • high impact plastic case

$24.95 test leads and battery included



RAMSEY D-3100 DIGITAL MULTIMETER

Reliable, accurate digital measurements at an amazingly low cost • in-line color coded push buttons, speeds range selection • abs plastic tilt stand • recessed input jacks • overload protection on all ranges • 3½ digit LCD display with auto zero, auto polarity & low BAT. indicator

$49.95 test leads and battery included

CT-70 7 DIGIT 525 MHz COUNTER

Lab quality at a breakthrough price. Features • 3 frequency ranges each with pre amp • dual selectable gate times • gate activity indicator • 50mV @ 150 MHz typical sensitivity • wide frequency range • 1 ppm accuracy

$119.95 wired includes AC adapter

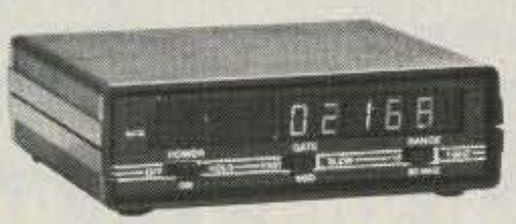
CT-70 kit $99.95
BP-4 nicad pack 8.95

CT-90 9 DIGIT 600 MHz COUNTER

The most versatile for less than $300. Features 3 selectable gate times • 9 digits • gate indicator • display hold • 25mV @ 150 MHz typical sensitivity • 10 MHz timebase for WWV calibration • 1 ppm accuracy

$149.95 wired includes AC adapter

CT-90 kit $129.95
OV-1 0.1 PPM oven timebase 59.95
BP-4 nicad pack 8.95



CT-125 9 DIGIT 1.2 GHz COUNTER

A 9 digit counter that will outperform units costing hundreds more. • gate indicator • 24mV @ 150 MHz typical sensitivity • 9 digit display • 1 ppm accuracy • display hold • dual inputs with preamps

$169.95 wired includes AC adapter

BP-4 nicad pack 8.95

CT-50 8 DIGIT 600 MHz COUNTER

A versatile lab bench counter with optional receive frequency adapter, which turns the CT-50 into a digital readout for most any receiver • 25 mV @ 150 MHz typical sensitivity • 8 digit display • 1 ppm accuracy

$169.95 wired

CT-50 kit $139.95
RA-1 receiver adapter kit 14.95

DM-700 DIGITAL MULTIMETER

Professional quality at a hobbyist price. Features include 26 different ranges and 5 functions • 3½ digit, ½ inch LED display • automatic decimal placement • automatic polarity

$119.95 wired includes AC adapter

DM-700 kit $99.95
MP-1 probe set 4.95

PS-2 AUDIO MULTIPLIER

The PS-2 is handy for high resolution audio resolution measurements, multiplies UP in frequency • great for PL tone measurements • multiplies by 10 or 100 • 0.01 Hz resolution & built-in signal preamp/conditioner

$49.95 wired

PS-2 kit $39.95

PR-2 COUNTER PREAMP

The PR-2 is ideal for measuring weak signals from 10 to 1,000 MHz • flat 25 db gain • BNC connectors • great for shifting RF • ideal receiver/TV preamp

$44.95 wired includes AC adapter

PR-2 kit $34.95

PS-1B 600 MHz PRESCALER

Extends the range of your present counter to 600 MHz • 2 stage preamp • divide by 10 circuitry • sensitivity: 25mV @ 150 MHz • BNC connectors • drives any counter

$59.95 wired includes AC adapter

PS-1B kit $49.95

ACCESSORIES FOR RAMSEY COUNTERS

Telescopic whip antenna—BNC plug	$ 8.95
High impedance probe, light loading	16.95
Low pass probe, audio use	16.95
Direct probe, general purpose use	13.95
Tilt bail, for CT-70, 90, 125	3.95

VISA MasterCard

PHONE ORDERS CALL
716-586-3950
TELEX 466735 RAMSEY CI

TERMS: • satisfaction guaranteed • examine for 10 days: if not pleased, return in original form for refund • add 6% for shipping and insurance to a maximum of $10.00 • overseas add 15% for surface mail • COD add $2.50 (COD in USA only) • orders under $15.00 add $1.50 • NY residents add 7% sales tax • 90 day parts warranty on all kits • 1 year parts & labor warranty on all wired units.

RAMSEY

RAMSEY ELECTRONICS, INC.
2575 Baird Rd.
Penfield, N.Y. 14626 ✓ 268

✓ See List of Advertisers on page 98

What To Look For In A Phone Patch

The best way to decide what patch is right for you is to first decide what a patch should do. A patch should:

- Give complete control to the mobile, allowing full break in operation.
- Not interfere with the normal operation of your base station. It should not require you to connect and disconnect cables (or flip switches!) every time you wish to use your radio as a normal base station.
- Not depend on volume or squelch settings of your radio. It should work the same regardless of what you do with these controls.
- You should be able to hear your base station speaker with the patch installed. Remember, you have a base station because there are mobiles. ONE OF THEM MIGHT NEED HELP.
- The patch should have standard features at no extra cost. These should include programmable toll restrict (dip switches), tone or rotary dialing, programmable patch and activity timers, and front panel indicators of channel and patch status.

ONLY SMART PATCH HAS ALL OF THE ABOVE.

With SMART PATCH You are in CONTROL

With CES 510SA Simplex Autopatch, there's no waiting for VOX circuits to drop. Simply key your transmitter to take control.

SMART PATCH is all you need to turn your base station into a personal autopatch. SMART PATCH uses the only operating system that gives the mobile complete control. Full break-in capability allows the mobile user to actually interrupt the telephone party. SMART PATCH does not interfere with the normal use of your base station. SMART PATCH works well with any FM transceiver and provides switch selectable tone or rotary dialing, toll restrict, programmable control codes, CW ID and much more.

To Take CONTROL with Smart Patch — Call 800-327-9956 Ext. 101 today.

Now Mobile Operators Can Enjoy An Affordable Personal Phone Patch. . .

- Without an expensive repeater.
- Using any FM tranceiver as a base station.
- The secret is a SIMPLEX autopatch, The *SMART PATCH.*

SMART PATCH Is Easy To Install

To install *SMART PATCH*, connect the multicolored computer style ribbon cable to mic audio, receiver discriminator, PTT, and power. A modular phone cord is provided for connection to your phone system. Sound simple? . . . IT IS!

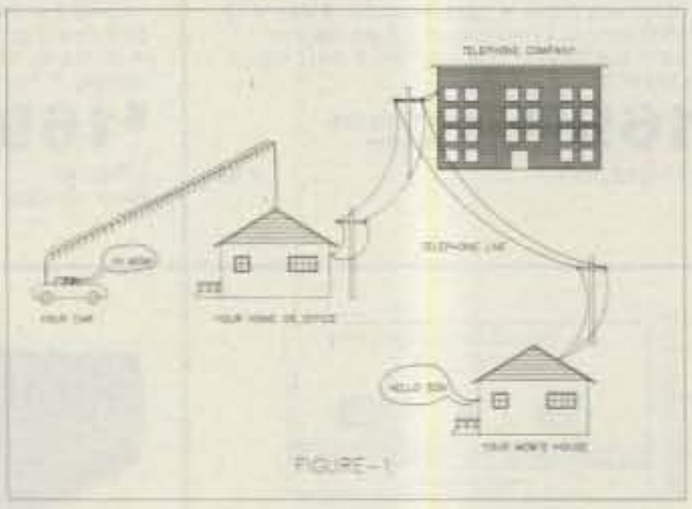


FIGURE-1

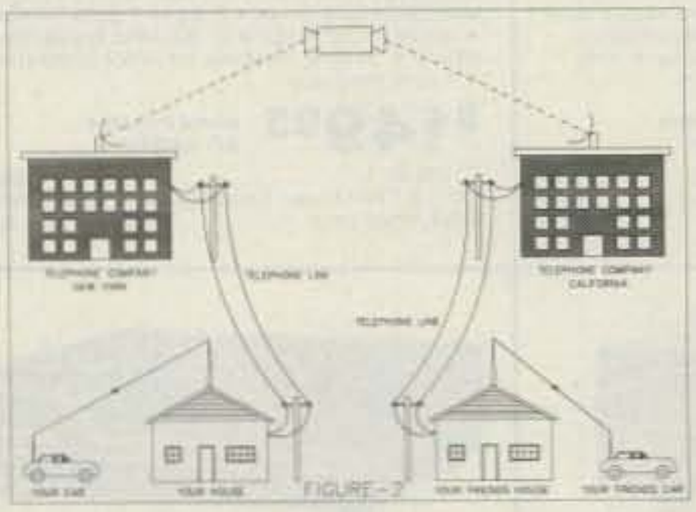


FIGURE-2

How To Use *SMART PATCH*

Placing a call is simpl Send your access coc from your mobile (exan ple: *73). This brings u the Patch and you w hear dial tone transmitte from your base statio Since *SMART PATCH* checking about once pe second to see if you wa to dial, all you have to d is key your transmitte then dial the phone nun ber. You will now hea the phone ring and som one answer. Since the e hanced control system *SMART PATCH* is co stantly checking to see you wish to talk, you nee to simply key your tran mitter and then talk That's right, you simpl key your transmitter t interrupt the phone lin The base station auto matically stops transmi ting after you key you mic. *SMART PATCH* doe not require any specia tone equipment to contr your base station. It sam ples very high frequenc noise present at you receivers discriminator t determine if a mobile i present. No words or sylla bles are ever lost.

SMART PATCH Is All You Need To Automatically Patch Your Base Station To Your Phone Line.

Use *SMART PATCH* for:

- Mobile (or remote base to phone line via Simple base. (see fig 1.)
- Mobile to Mobile via in terconnected base sta tions for extended range (see fig. 2.)
- Telephone line to mobil (or remote base).
- *SMART PATCH* use SIMPLEX BASE STA TION EQUIPMENT. Us your ordinary base sta tion. *SMART PATCH* does this without inte fering with the norma use of your radio.

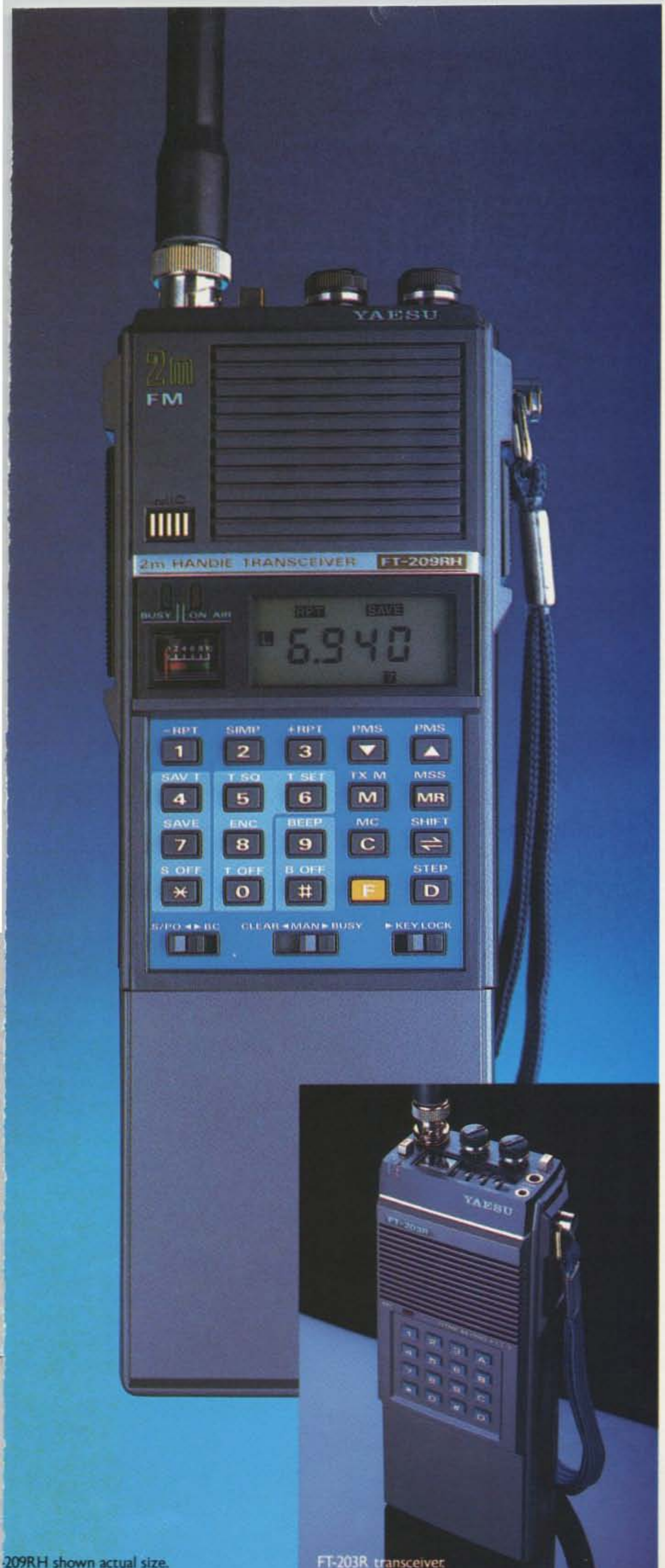
WARRANTY?

YES, 180 days of warran ty protection. You simpl can't go wrong.

An FCC type accepte coupler is available fo *SMART PATCH.*

CES® ✓462

Communications Electronics Specialties, Inc.
P.O. Box 2930, Winter Park, Florida 32790
Telephone: (305) 645-0474 **Or call toll-free (800)327-9956**



209RH shown actual size.

FT-203R transceiver

The Yaesu FT-209RH. 5 watts that your batteries can live with.

Have the power you need when you need it with Yaesu's new 5-watt, 2-meter handheld. Power to get out in situations where ordinary HTs just won't make it.

We designed our HT with a unique user-programmable Power Saver that puts the rig to "sleep" while you're monitoring and "wakes it up" when the squelch breaks. So you can listen for hours and still have plenty of power to hit those hard-to-reach repeaters when you need to.

With the FT-209RH there's no need to fiddle with knobs when you change from one memory channel to another. That's because you can independently store everything you need in each of the ten memories: receive frequency, standard or non-standard offset, even tone encode/decode with an optional module. And then recall any channel at the touch of a button.

It's easy to hear what's happening on your favorite repeaters or simplex frequencies. Just touch a button and scan all memory channels, or selected ones. Or all frequencies between any two adjacent memories. Use the priority feature to return automatically to your special frequency when it becomes active.

Bring up controlled-access machines with the optional plug-in subaudible tone encoder/decoder, independently programmed from the keyboard for each channel. Listen for tone-encoded signals on selected channels—without having to hear a bunch of chatter—by enabling the decode function.

The FT-209RH, which covers 10 MHz for CAP and MARS use, comes complete with a 500-mAh battery, charger and soft case.

For those who want a basic radio without the bells and whistles, consider the compact, lightweight FT-203R. This economical HT features 2.5 watts of power and an optional DTMF keypad. Most all the accessories for the 209 work with the 203, including an optional VOX headset that gives you hands-free operation that's perfect for public service events.

So when you visit your dealer, let him know you won't settle for anything but the best. A radio built by Yaesu.

YAESU

Yaesu Electronics Corporation
6851 Walthall Way, Paramount, CA 90723
(213) 633-4007.

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100.

KENWOOD

...pacesetter in amateur radio

TM-211A DCS... a new turn in 2 meters/70 cm.

TM-211A/411A

The TM-211A 2 meter and the TM-411A 70 cm mobiles combine ultra compact size with the added feature of a 7 position adjustable front panel, allowing you maximum flexibility in both home and automotive installations! These compact transceivers also feature Kenwood's innovative DCS (Digital Code Squelch) circuit, that allows you to program your transceiver to respond only to transmissions from stations whose radios transmit a pre-selected digital code. Both radios deliver 25 big watts of R.F. power on HI and 5 watts (approximately) on LO power. Dual digital VFO's, built-in, highly visible yellow LED display, five memories plus COMM Channel add to this impressive array of features. The TM-211A and TM-411A each boast high performance receive and transmit specifications and an external high quality speaker that provides unsurpassed sound quality. Mounting flexibility is also a feature. Yes, all these features, plus priority watch, memory and programmable band scan, microphone test function, audible "beeper" for operation confirmation, repeater offset switch and reverse switch. The TM-211A and TM-411A offer you the best in 2 meters and 70 cm operations!

Subject to FCC approval.

Optional accessories:

- CD-10 Call Sign Display
- PS-430 D.C. Power Supply
- KPS-7A Power Supply
- MC-55 Mobile Microphone with Time-Out Timer
- MA-4000 Dual Band Mobile Antenna with Duplexer
- SW-100A/B SWR/Power meters
- PG-3A Noise Filter

More information on these products is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

CD-10/DCS

The optional CD-10 helps maximize your use of Kenwood's revolutionary new signalling concept, DCS (Digital Code Squelch). DCS uses digital code information to open squelch on a receiver that has been programmed to accept the specific code being transmitted. Up to 100,000 different 5-digit codes are possible, allowing each station to have its own "private call" code or

to respond to a "group call" or "common call" code. Program your call sign (up to 6 digits) in the ASCII code and it is automatically transmitted when the transmit key is depressed. The CD-10 stores the calling station's call sign in its memory for future reference, and it is also displayed on the L.C.D. readout. The CD-10 can store call sign data of up to 20 stations, allowing you to quickly check for calls if you have been absent from your station, and review your contacts for logging purposes. The DCS/call sign data transmission system uses mark and space frequencies within the normal speech band width (compatible w/most repeaters).

TM-201A/401A

The extremely popular TM-201A 2 meter FM (25 watts, 142.000 to 149.000 MHz) and the TM-401A 70 cm FM (10 watts, 440-450 MHz) ultra compact mobile transceivers are also available.

Specifications and prices are subject to change without notice or obligation.