THE HANDBOOK FOR ALL YOUR COMMUNICATIONS NEEDS

1992 POPULAR COMMUNICATIONS

ISSN 1059-2164

$4.95
Canada $5.95
Communications Guide No. 1

COMMUNICATIONS GUIDE

Over 400 Products Listed

0 74820 08643 8 25

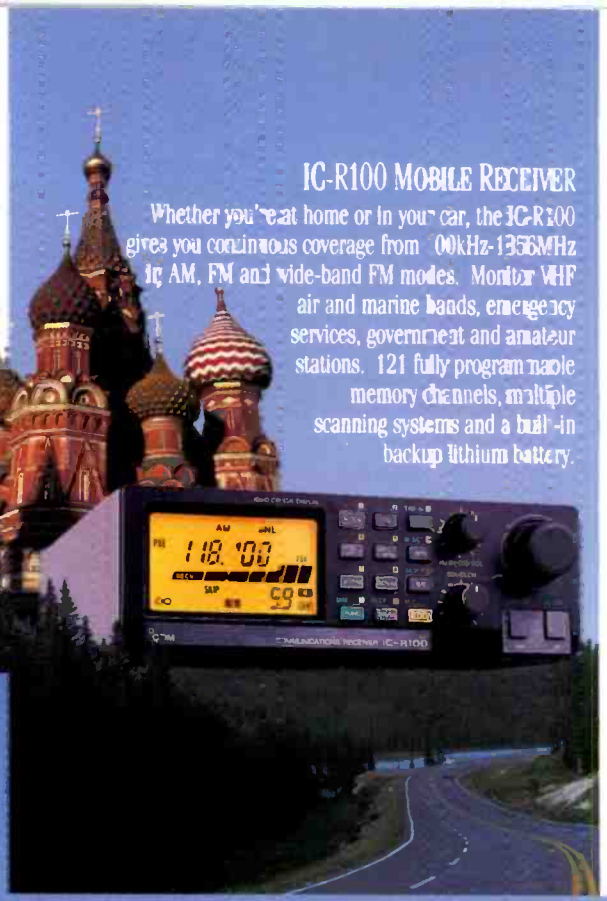
Plus—Shortwave Tuning Guide and Complete Information on Buying and Using Your Receiver, Scanner, CB or Amateur Transceiver!

TAKE THE WORLD ON THE ROAD

WORLDWIDE RECEIVERS FROM ICOM

IC-R100 MOBILE RECEIVER

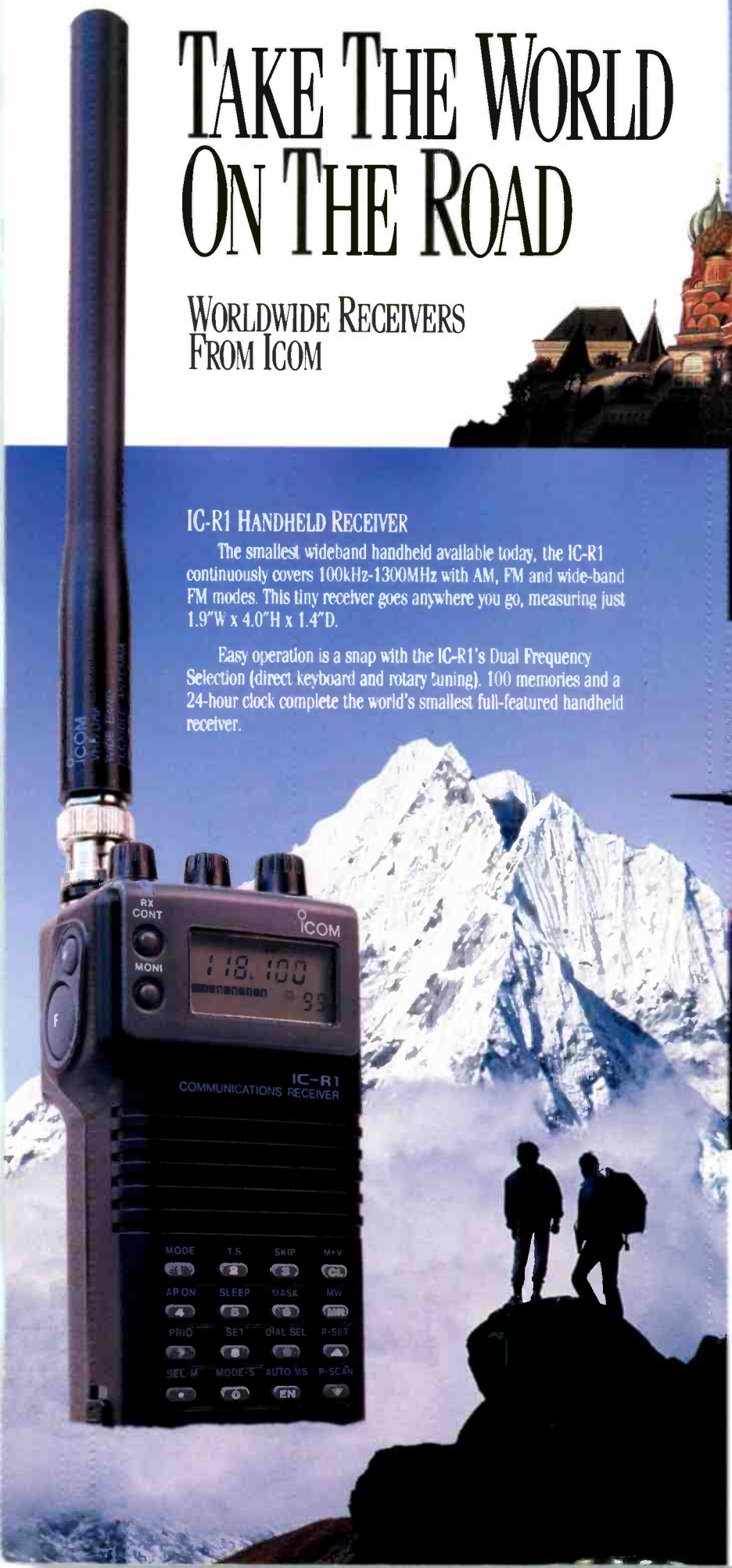
Whether you're at home or in your car, the IC-R100 gives you continuous coverage from 100kHz-1856MHz in AM, FM and wide-band FM modes. Monitor VHF air and marine bands, emergency services, government and amateur stations. 121 fully programmable memory channels, multiple scanning systems and a built-in backup lithium battery.



IC-R1 HANDHELD RECEIVER

The smallest wideband handheld available today, the IC-R1 continuously covers 100kHz-1300MHz with AM, FM and wide-band FM modes. This tiny receiver goes anywhere you go, measuring just 1.9"W x 4.0"H x 1.4"D.

Easy operation is a snap with the IC-R1's Dual Frequency Selection (direct keyboard and rotary tuning). 100 memories and a 24-hour clock complete the world's smallest full-featured handheld receiver.



IC-R72 BASE RECEIVER

The IC-R72 continuously receives 100kHz-30MHz in SSB, AM and CW modes with exceptionally high sensitivity. An optional UT-8 provides FM reception. The IC-R72 incorporates a noise blanker, five scanning systems, internal backup battery and built-in clock with Icom's DDS System. The IC-R72 boasts a 160dB wide dynamic range while an easy to access keyboard provides convenient programming versatility... superb for shortwave listeners!

See our complete line of quality receivers at your local authorized Icom dealer.

CORPORATE HEADQUARTERS:
ICOM America, Inc., 2380-116th Ave. N.E.
Bellevue, WA 98004
CUSTOMER SERVICE HOTLINE
(206) 454-7619
CUSTOMER SERVICE CENTERS
8102 Skypark South, Suite 52-B
Irvine, CA 92714
777 Phoenix Parkway, Suite 201
Atlanta, GA 30349
3071 - #5 Road, Unit 3
Richmond, B.C. V6X 2T4 Canada
2380-116th Ave. N.E., Bellevue, WA 98004

For full details call the Icom Brochure Hotline at 1-800-999-9877.

ICOM

NATION'S NUMBER ONE RADIO DEALER

Minutes From Washington D.C.

HAPPY HOLIDAYS from Electronic Equipment Bank

SONY ICFSW77

NEW

From the genius of Sony, the world's most advanced portable Receiver. Factory programmed, 100 of the most popular SWL stations which you can reprogram yourself.

- .15-30MHz AM/CW/SSB
- 76-108MHz FM (Stereo)
- Station Name Tuning
- 160 Memory Pre-set
- Synchronous Detection
- Wide-Narrow Filters
- Multi Function Scan
- Multi Function Clock/Alarm
- 120VAC Adapter Incl.
- 10.8x6.8x1.8 in. Wt. 52oz.

List $624.95 **EEB $call** + sh.

It's Time To Upgrade!

SONY ICF2010

Big Receiver performance in a portable, take with you package. Thousands of satisfied users make the ICF2010 Sony's Biggest Seller!

- .15-30MHz AM/CW/SSB
- 76-108MHz FM Band
- 116-136MHz Air Band
- Synchronous Detection
- 32 Program Memories
- Direct Keyboard Entry
- Multi Scan Functions
- Multi Clock Functions
- 4.5 VDC (3D) & (2) AA not incl.
- 120VAC Adapter Incl.
- 6.25x11.3x2.2 Wt 48 oz.

List $429.95 **EEB $call** + sh.

A True Classic!

SONY ICFSW7600

This is our number one selling mid-sized portable. Explorers and travelers will love the versatility of the ICF SW7600.

- .15-30MHz AM/CW/SSB
- 76-108MHz FM Band
- 10 Station Memory
- Full SW Coverage .1-30mHz
- Dual Conversion
- AN61 Antenna Incl.
- Clock, Timer, Alarm
- AM/SSB/FM/FM Stereo
- Direct Keyboard Entry
- Power (4) AA Not Incl. AC adptr. incl.
- 7 1/4 x 4 3/4 x 1 1/4 wt. 22 oz.

List $399.95 **EEB $call** + sh.

#1 Compact Portable!

SONY TCM38V

Turns your scanner into a logging receiver. Let the TCM38V run unattended. Play back later. You won't miss any action.

- Logging cassette recorder
- CH1 audio, ch 2, time date
- Records date, time & play back to LCD readout
- Ideal for scanner monitorin
- VOR voice/audio auto start
- Auto record level
- Built in microphone or Ext.
- Power (2) AA not incl.
- Opt. AC adapter PA3N 13 $9.95
- 3 1/2 x 5 1/4 x 1 1/4 wt. 10 oz.

List $129.95 **EEB $call** + sh.

NEW Innovative Recorder!

JRC NRD535D

NEW

The NRD515 then 525 now 535D. Each generation has introduced state-of-the-art features to satisfy the most discerning listner.

- 1-30MHz AM/CW/SSB/FM
- New Exalted Carrier
- New Selectable Sidaband (ECSS)
- Phase Lock Detection
- Variable Bandwidth Control (BWC)
- Tuning Steps 1Hz DDS (10Hz readout)
- 100dB Dynamic Range
- 200 station memory
- RTTY Demod Option
- 4 Filter Position 3 Supplied .1,2,6kHz
- 13x5x11 in. Wt. 20lbs.

List $1999 **EEB $call** + sh.

ICOM R71A

Setting World Standards! Versatile, Reliable, Rugged. Our Top Selling Desktop Receiver!

- .1-30MHz AM/CW/SSB Opt. FM
- Pass Band Tuning
- 100dB Dynamic Range
- Filters 6 & 2.4kHz Opt. CW 500Hz
- 120/240 VAC Opt. 12VDC
- 32 Programmable memories
- Dual VFO
- Multi Scan Functions
- IR. Remote Option
- Computer Control Option
- Many EEB Filters & other Options
- 11.3x4.3x10.9 in. Wt. 16.5 lbs.

List $999 **EEB $call** + sh.

DRAKE R8

NEW

Getting Rave Reviews From The Experts! EEB welcomes Drake back to the shortwave market. The R8 promises to be a big hit with the serious listeners.

- .1-30MHz AM/CW/SSB
- VHF Opt. 35-55/108-174MHz
- 100 Memory Channels
- Synchronous Detection
- 5 filters .5, 1.8, 2.3, 4, 6 kHz
- All Mode AM, CW, SSB, RTTY, FM
- Band Pass Tuning
- RS232 Serial Interface
- Dual Antenna Inputs
- 13.2x13x5.25 in. Wt. 13lbs.

EEB $call + sh.

FREE in U.S.A. NEW 1992 CATALOG

- All New expanded SWL
- New Amateur Section
- Enlarged Scanner Section
- New Specialty Section
- Expanded Book Section

This is our largest catalog ever! If you received our 1991 catalog your on our mailing list. Watch for your copy! If you never received an EEB catalog call-write or FAX (703-938-6911) today! Our Catalog is free in U.S. $1.00 in Canada/Mexico. All others are $3.00.

EEB

ELECTRONIC EQUIPMENT BANK
323 Mill Street N.E.
Vienna, VA. 22180

ORDERS: 800-368-3270
Local Tech: 703-938-3350
FAX: 703-938-6911

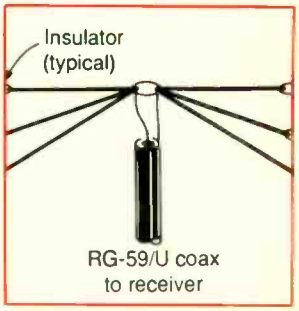
- Sorry, no COD's
- Free Catalog in U.S.
- Battery's not included
- Prices subject to change
- Prices do not include freight
- Returns subject to 20% restock fee

POPULAR COMMUNICATIONS

The 1992 Communications Guide

FEATURES

DIRECTORY LISTINGS



12

18

66

42

KENWOOD

Hear it All!

R-5000
R-2000
High performance receivers.

Scan the world bands with Kenwood's R-5000, R-2000 and RZ-1. Listen in on foreign music, news, and commentary. Monitor local police, fire, and other public safety services, as well as the Marine channels, and the many other services.

(The VHF converter options must be used in the R-5000 and R-2000.)

R-5000

The R-5000 is a high performance, top-of-the-line receiver, with 100 memory channels, and direct keyboard or main dial tuning—makes station selection super easy! Other useful features include programmable scanning, large, built-in speaker, 110 volt AC or 12 volt DC operation (with optional DCK-2 cable), VHF capability (108-174 MHz) with the VC-20 option, dual 24-hour clocks with timer, and even voice frequency readout with the VS-1 option.

R-2000

The R-2000 is an all band, all mode, receiver with 10 memory channels and many deluxe features such as programmable scanning, dual 24-hour clocks with timer, all-mode squelch and noise blankers, a large, front- mounted, speaker, 110 volt AC or 12 volt DC operation (with the DCK-1 cable kit), and 118-174 MHz VHF capability with VC-10 option.

Optional Accessories R-2000:

- **VC-10** VHF converter
- **DCK-1** DC cable kit for 12 volt DC use.

R-5000:

- **VC-20** VHF converter
- **VS-1** Voice module
- **DCK-2** for 12 volt DC operation
- **YK-88A-1** AM filter
- **YK-88SN** SSB filter
- **YK-88C** CW filter
- **MB-430** Mounting bracket.

Other Accessories:

- **SP-430** External speaker
- **SP-41** Compact mobile speaker
- **SP-50B** Mobile speaker
- **HS-5** Deluxe headphones
- **HS-6** Lightweight headphones

RZ-1
Wide-band scanning receiver

The RZ-1 wide-band, scanning receiver covers 500 kHz-905 MHz, in AM, and narrow or wideband FM. The automatic mode selection function makes listening easier. One hundred memory channels with message and band marker, direct keyboard or VFO frequency entry, and versatile scanning functions, such as memory channel and band scan, with four types of scan stop. The RZ-1 is a 12 volt DC operated, compact unit, with built-in speaker, front-mounted phones jack, squelch for narrow FM, illuminated keys, and a "beeper" to confirm keyboard operation.

Optional Accessory

- **PG-2N** Extra DC cable

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

KENWOOD

...pacesetter in Amateur Radio

The 1992 Communications Guide

Back in the '60s when I got my first scanner; a 10-channel crystal-controlled shoebox-size receiver, few people imagined shirt-pocket size handheld scanners with 1,000 programmable channels, digital frequency readout and rechargeable NiCds. Even fewer folks could envision computer-controlled communications receivers with enough bells and whistles to make Captain Kirk envious.

Times sure have changed! But with the multitude of receivers, CB radios and the like on the market, how do you decide which gear to purchase? What features do you really need and what accessories are available? This first edition of our semi-annual guide is your personal source book designed to introduce you to the fascinating world of communications and to help you make the right buying decision.

You'll read *interesting* communications articles by more than a dozen well-known authors. Subjects range in scope from learning about shortwave radio to how to set up a monitoring station. You'll learn where and when to tune, and even how to construct your first antenna.

The last couple of years have brought remarkable changes in our ever-shrinking world. The recent crumbling of the Berlin Wall and the Communist system, the Gulf War and civil unrest in many parts of the world underscore the fact that what is here today, might not be tomorrow.

Over the years, I've found that listening to the networks and reading the newspapers only gives us a small portion of the news. If you're interested in hearing all the world has to offer and visiting distant lands from the comfort of your home, or if you've always wanted to get your "ham" license, now's the time; and this is the book for you!

As you read the articles, compare the features and specifications of the equipment in the Product Listings, you'll get a good idea of the type of equipment that's right for you. Remember, the best all-around deals are obtained from our advertisers; they know the business (many are either amateur operators or hobbyists themselves), and they're always willing to help you buy your first receiver, or even upgrade your listening post.

The prices we've listed are suggested retail/list prices. They change from time to time for many reasons, so be sure to check the advertisements in our Guide and the monthly *Popular Communications* magazine.

Thanks for taking our *Communications Guide* home; you'll be amazed at the wealth of information and entertainment you've been missing! If you have any comments or suggestions about our Guide, please drop us a line.

HAROLD A. ORT
EDITOR

A publication of

CQ Communications, Inc.
76 North Broadway
Hicksville, NY 11801-2953 USA.

Offices: 76 North Broadway, Hicksville, NY 11801. Telephone: 516 681-2922. FAX 516 681-2926. The PopularCommunications Communications Guide (ISSN 1059-2164) is published annually by CQ Communications, Inc.

Printed in the United States of America.
Postmaster: Please send change of address to CQ Communications, Inc., 76 North Broadway, Hicksville, NY 11801.

CQ Communications, Inc. is publisher of CQ The Radio Amateurs Journal, Popular Communications, ComputerCraft, Electronic Servicing & Technology, CQ Radio Amateur (Spanish CQ), Communications Quarterly, CQ Amateur Radio Equipment Buyer's Guide, CQ Amateur Radio Antenna Buyer's Guide, and Popular Communications Communications Guide.

GILFER

Our 39th Year

First in Shortwave

JAPAN RADIO CO.

JRC NRD-535

The next generation in high performance receivers

All the features: gen. coverage, 0.1 to 30 MHz, AM, USB, LSB, CW, RTTY, FAX & narrow FM. **Tunes to 1 Hz**, direct digital synthesis. **Advanced ECSS operation** for phase-lock AM. Variable bandwidth; 200 memory ch.; triple superhet for superior sensitivity, selectivity, image rejection; dual width noise blanker; notch filter; 24 hr. clock/timer; digital S meter; optional RTTY demod. & more. **Most comprehensive computer interface.**

KENWOOD

Kenwood R-5000

"Best receiver ever offered by Kenwood" – R. Lichte.

Dual superhet/100 kHz – 30 MHz / all modes / dual digital VFOs / dual IF crystal filters / IF shift / tuneable Notch filter / dual mode Noise Blanker / 100 memories / programmable memory scan & band scan / dual 24 hr clocks w. timer / optional voice synthesizer, PC control-interface/speaker / UHF converter / DC cable.

WE ALSO STOCK THESE FINE RECEIVERS...

KENWOOD FRG-8800
ICOM R-71A
AOR SCANNERS

DRAKE

Drake R-8

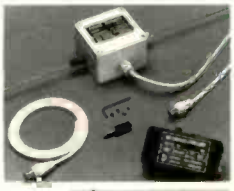
New world-class shortwave receiver. All the features and it's made in the USA. Coverage 0.1 to 30 MHz plus VHF 35-55 and 108-174 MHz (optional VHF converter); receives AM, USB, LSB, CW, RTTY, FM; PLL synthesis; 5 filter bandwidths; synchronous detector; 100 memory ch.; dual mode noise blanker; dual time zone clock; timer function; passband offset; selectable AGC; two VFOs; preamp and attenuator; RS232C interface with optional software remote control package; dual antenna inputs; built-in speaker (external speaker option); digital display; and more.

ANTENNAS

The Best in Active Antennas.

Gilfer special – **Dressler** Active Receiving Antennas. They're perfect for limited antenna space – perform like they were outdoor full size jobs, but they fit anywhere. Two models: **ara 60** is ideal for SWL, covering 200 kHz to 30 MHz optimum, up to 100 MHz reduced performance. 10 dB gain $189.95 (+$10), model **ara 1500** is perfect for VHF-UHF scanner receivers, covering 50 MHz – 1500 MHz. Up to 16 dB gain. $189.95 (+$10)

DATONG



Outdoor Active Antenna, listed as best in famous handbook, AD-370.

Indoor Active Antenna, same as above but flexible elements, AD-270.

WE ALSO STOCK...

Eavesdropper 3
Alpha Delta Sloper
DX-SWL, DX-SWL/
DYMEK DA-100-D
Trans-trap Arresters

Catalog $1 USA, $3 Overseas

PORTABLES

WE STOCK THE BEST...
GRUNDIG SAT-650, -500
SONY 2010, -SW77, -SW55, -SW1S, -PRO 80, ICF-7600
AOR AR-900, AR-950 & AR-1000

ACCESSORIES

Sony 2010 Cover, black waterproof fabric. $12.95.

Travel Case, padded black Dupont Codura, zipper top opening, shoulder strap, fits receivers up to 12"x8"x5" (Sony 2010, Grundig SAT-500). $32.95 (+$3)

SPECIAL SWL VALUE

Save $8.50 on books Plus you get a Free Certificate good for $5 off on any receiver purchase.

New 3rd Edition
The World is Yours
by Sam Alcorn Reg. $9.95 ppd.
"Best book of its kind"

Beginners and avid SWLers alike learn from this exciting review of shortwave. Reviewed with delight by Radio Israel, Radio Austria, Trans World Radio and others. Learn what is on each band; the best countries to hear and why; easiest-ever time chart; dictionary of technical terms.

Radio Receiver, Chance or Choice +More Radio Receivers...
both for $18.50, ppd USA

R. Lichte, world renowned professional radio engineer, tests all the famous receivers impartially (not affiliated with any manufacturer), using the same parameters and equipment, and writes the results factually so you can compare each brand and model. Over 90 reviews cover Yaesu, ICOM, JRC, Sony, Panasonic, Realistic, Sangean, Grundig, Phillips and more. Get the straight facts from Lichte.

All three books just $19.95, ppd USA

GILFER SHORTWAVE • 52 Park Ave., Park Ridge, NJ 07656

Order operators: 1-800-GILFER-1 (1-800-445-3371) • Sales information, technical, & NJ res. 201/391-7887

Tuning in the World

So you've always meant to buy a shortwave radio, but haven't gotten around to it yet? Well, here's what you missed in the last couple of years . . .

BY HARRY HELMS

Listeners to Germany's Deutsche Welle on October 3, 1990 were able to hear live coverage of the reunification ceremonies, and were there-via radio The instant East Germany (and its Radio Berlin International) vanished forever into history.

Kol Israel's home service broadcasts on 9388 kHz were interrupted on January 18, 1991 by warning tones indicating that a Scud missile had been launched from Iraq. SWLs in North America listened transfixed as an announcer in Hebrew and English told listeners how to put on gas masks and what to do in case of a chemical attack. A few minutes later, Kol Israel gave the "all clear" signal indicating the danger had passed-for the moment.

During the years under Nikolai Ceaucescu, Radio Bucharest reflected the rigid cult and personality of the leader, and devoted much of its programming to praising the dictator's "achievements." Upon his overthrow and execution in late 1989, the station abruptly swung the other way.

In the first 1990 edition of a program called "Listener's Letterbox," the announcers apologized for the previous censorship and distortions of the truth broadcast by Radio Bucharest. In the future, they promised, Radio Bucharest would broadcast the truth to the best of their ability and would respond to listener comments and criticisms.

And there's more. After the 1989 San Francisco earthquake, listeners to various ham radio emergency nets were able to get faster, more accurate assessments of the damage caused, than those simply tuned into television networks. Other SWLs eavesdrop on orbiting Soviet manned spacecraft, distress calls from ships on the high seas, communications of the Strategic Air Command, and even coded messages intended for espionage agents. A shortwave radio can let you hear all of this and much more. What is this fascinating world like?

How the Shortwave Spectrum is Divided

Just where shortwave begins and ends is a matter of interpretation. The technical folks will tell you that shortwave begins at about 3 MHz and continues to around 30 MHz. Most "shortwave" radios sold today cover approximately 150 kHz (territory that's known as *longwave*) to 30 MHz. Most SWLs consider shortwave to mean all frequencies above the upper end of the AM broadcast band (currently 1600 kHz, although it will soon expand up to 1700 kHz) to 30 MHz.

Shortwave radio is a lot different from the AM and FM broadcasting bands. In fact, your first exposure to shortwave can be scary. Instead of stations neatly spaced across the dial, you usually hear a cacophony of bleeps, buzzes, roars, some things that sound like quacking ducks on helium, some English, and a lot of languages that you'd swear could be part of a trivia quiz at a linguists' convention. But that confusion is misleading. The shortwave bands are actually well organized, with certain segments set aside for specific purposes.

Table 1 shows the major bands used for *international broadcasting*. These bands are established by international agreements. It's where you'll find such stations as the BBC, Radio Moscow, Radio Japan, Deutsche Welle, Radio Nederland, and other powerhouse signals. Here, most major nations (and a lot of others too) broadcast programs in English aimed at North American listeners. Most of these English language broadcasts are aired during North American evenings, while a few are broadcast for reception during the morning hours. In addition to English, you'll hear virtually every spoken language in the world at one time or another on the international broadcasting frequencies.

Table 1
The International Broadcasting Bands

5950 to 6200 kHz	49 meters
7100 to 7300 kHz	41 meters
9500 to 9900 kHz	31 meters
11650 to 12050 kHz	25 meters
13600 to 13800 kHz	22 meters
15100 to 15600 kHz	19 meters
17550 to 17900 kHz	16 meters
21450 to 21850 kHz	13 meters
25670 to 26100 kHz	11 meters

You'll notice in Table 1 that each frequency range in kHz is also referred to by its *wavelength*. The frequency of 9600 kHz is said to be in the 31-*meter* band. The use of wavelength to mean certain frequency ranges is a convenient shorthand and a holdover from the early days of radio.

Not everything you hear in the international broadcasting bands will be intended for listeners outside the country where the station is located. Many nations with large land areas or isolated populations will use the international broadcasting bands to retransmit their local services to listeners beyond the coverage of ordinary AM and FM transmitters. While you won't hear much English on such stations, you can hear exotic languages and music and get a real flavor of foreign culture from them. Some of my favorite "domestic" international broadcasters include Radio Tahiti, on 11825 and 15170 kHz evenings after around 0300 UTC; Radio Luxembourg on 6090 kHz around 0000 and on 15350 kHz at 0400; and CKZU in Vancouver, BC Canada on 6160

Now, You Can Eavesdrop On The World. Introducing the new Drake R8 Communications Receiver. It's world class, world band radio, made in the U.S.A. From Perth to the Persian Gulf, Moscow to Mozambique, local or global, you hear events *as they happen* with amazing clarity. Since 1943, Drake

has been setting the standards in electronic communications. . .and then raising them. Today, there's no better shortwave receiver than the Drake R8. **Out-Of-This-World Performance.** The new Drake R8 has more standard features than other shortwave radios. You get wide frequency range (100 KHz to 30,000 KHz), coverage of all world and local bands, and excellent dynamic range. But you also get important features you won't find on receivers costing hundreds of dollars more. A multi-voltage power supply. Pre-amp and attenuator. Five bandwidth filters and synchronous detector. Dual mode noise blanker and passband offset. Non-volatile 100 channel memory. All designed to give you the best reception with the least distortion. **Down-To-Earth Design.** The ergonomic design of the R8 gives you real ease of operation. You have convenient keypad entry, with large, legible controls. The face is bold. Uncluttered. And the liquid crystal display (LCD) is backlighted for easy reading. **Try The R8. . . At Our Risk.** If you're not impressed by Drake's quality, performance and ease of operation, return the R8 Receiver within 15 days and we'll refund your money in full, less our original shipping charge. For more information, or to order, call **TOLL-FREE, 1-800-9-DRAKE-8.** Telephone orders may be placed on a major credit card. $979.00 (Shipping and handling $10 in continental U.S. Ohio residents add 6½% tax.) Call **TOLL-FREE, 1-800-9-DRAKE-8** today. You can't lose.

DRAKE

In touch with the world.

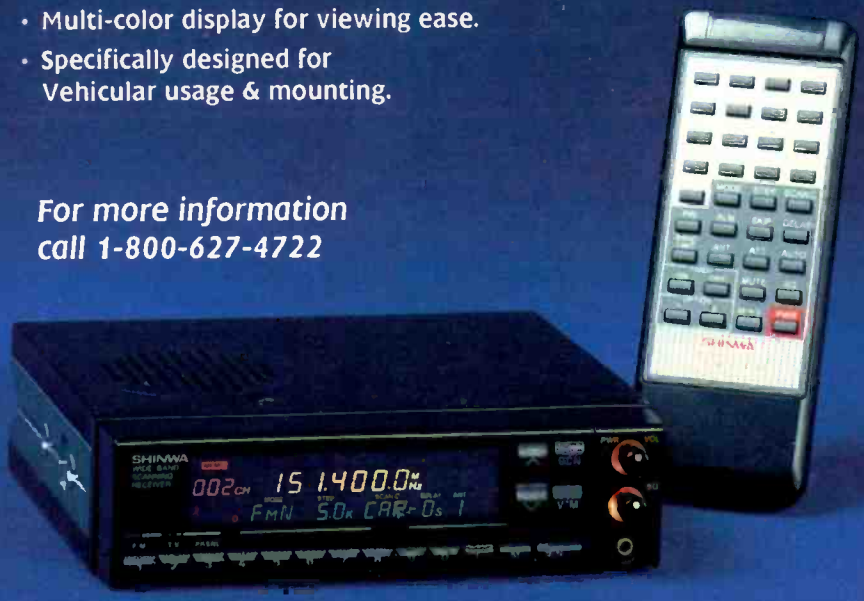
R.L. Drake Company • P.O. Box 3006 • Miamisburg, Ohio 45342 U.S.A.

ALL BAND RECEIVERS

FEATURES:

- Frequency range of 25 to 999.995 MHz
- Frequency & Mode selected via Front panel or Remote control.
- Wireless infrared remote control.
- 200 channel memory (20 channel x 10 groups).
- Scanning speed up to 35 channels per second.
- Programmable indicators & alerts include, Priority, Alarm & ON/OFF timer.
- Multi-color display for viewing ease.
- Specifically designed for Vehicular usage & mounting.

For more information call 1-800-627-4722



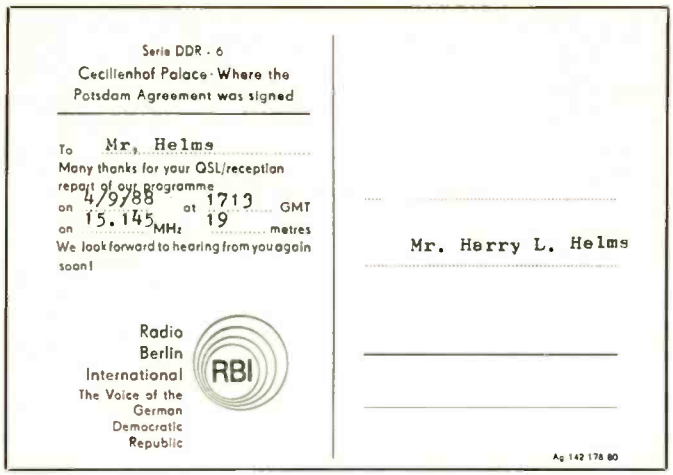
SHINWA Tsushiniki Co., Ltd
12-2 Hamadayama 4-Chrome
Suginamiku Tokoyo, Japan
TEL (03) 3313-1211
FAX (03) 3313-1218
TELEX: J27432 Sinwacom

SHINWA Communications of America Inc.
TEL 1-800-627-4722

SHINWA Communications of Canada Inc.
TEL 1-604-876-0006

SHINWA Communications of Latin America Inc.
TEL 919-846-7751

SHINWA Europe AB
TEL +46 (08) 643-7510



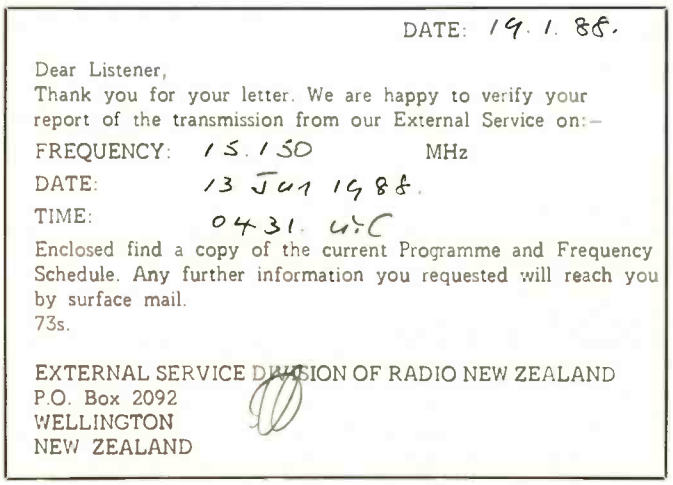
Serie DDR - 6
Cecilienhof Palace - Where the Potsdam Agreement was signed

To Mr, Helms
Many thanks for your QSL/reception report of our programme
on 4/9/88 at 1713 GMT
on 15.145 MHz 19 metres
We look forward to hearing from you again soon!

Radio Berlin International
The Voice of the German Democratic Republic

Mr. Harry L. Helms

Ag 142 178 80



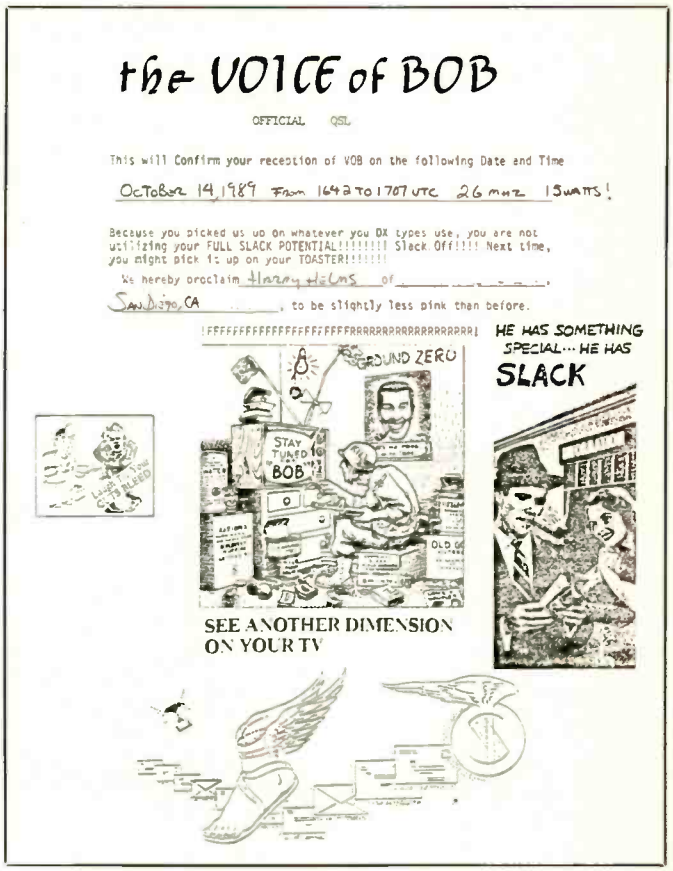
DATE: 19.1.88.

Dear Listener,
Thank you for your letter. We are happy to verify your report of the transmission from our External Service on:–

FREQUENCY: 15.150 MHz
DATE: 13 Jan 1988.
TIME: 0431. U.C

Enclosed find a copy of the current Programme and Frequency Schedule. Any further information you requested will reach you by surface mail.
73s.

EXTERNAL SERVICE DIVISION OF RADIO NEW ZEALAND
P.O. Box 2092
WELLINGTON
NEW ZEALAND



kHz which lets me eavesdrop on excellent Canadian Broadcasting Corp. programming during my local mornings. If you're east of the Mississippi, you're more likely to hear CKZN in St. Johns, Newfoundland on this frequency instead.

Most stations in the international broadcasting bands are spaced apart at 5 kHz intervals such as 6150, 6155, 6160 kHz, etc. You'll also notice some international broadcasting stations operate just above and below the bands listed in Table 1; this little bit of cheating is done to escape interference. Some broadcasters go even further and operate completely outside the established international broadcasting bands. One example is China's Peoples Broadcasting Station on 6840 kHz, which is often well heard around dawn. Iran has used 9022 kHz since the days of the Shah. Vietnam is sometimes heard on 10060 kHz and North Korea is likely to pop up almost anywhere in the shortwave spectrum.

The Tropical Bands

Table 2 shows three bands specifically allocated for use by broadcasting stations located between the tropics. In the tropical regions, static and other atmospheric noise is so high that AM band reception outside of the local service area of a station is usually unsatisfactory. Moreover, many nations in the tropics cover large, isolated areas. The three *tropical broadcasting bands* are ideally suited for reliable coverage within a radius of about 1000 miles from the transmitter, and the static is much less than on the AM broadcast band (however, the static on the tropical bands is higher than on the international broadcasting bands). Tropical broadcasting stations can be heard at distances far beyond their normal coverage area, and these stations are a real treat if you like exotic music and languages. These bands start swinging during the night hours. Shortly after your local sunset, you can hear the numerous stations throughout Central and South America throughout the tropical bands. As 0500 UTC approaches, many of those stations will sign off and soon afterwards stations in Africa can be heard signing on. After these stations fade out around 0700, stations in Asia and the Pacific from such countries as Indonesia, China, New Guinea, and the Solomon Islands start being heard. Finally, beginning at about 1000, many stations in Central and South America can be heard signing back on for another day of broadcasting.

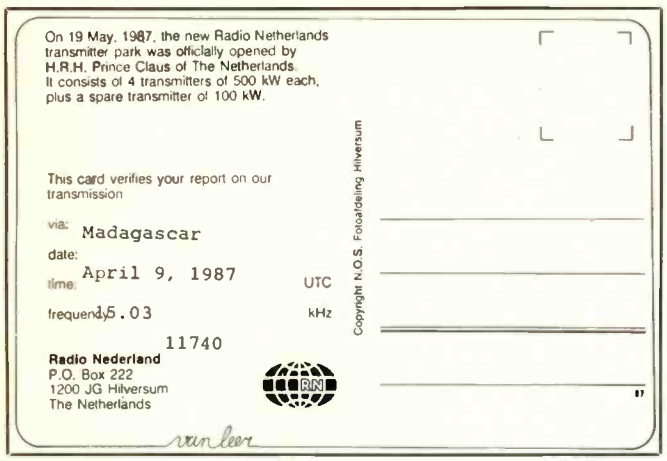
Table 2
Tropical Broadcasting Bands

2300 to 2498 kHz	120 meters
3200 to 3400 kHz	90 meters
4750 to 5060 kHz	60 meters

As with the international bands, there is some cheating in using the tropical bands. Some decidedly non-tropical places like the Soviet Union, Mongolia, and Pakistan can be heard on the frequencies in Table 2.

The Amateur Bands

Amateur (or, as they're more commonly know, "ham") radio operators have use of the frequency bands shown in Table 3. In the United States, these bands, are divided into separate ranges for CW (Morse code) and voice modes, such as SSB. For bands below 10 MHz,



On 19 May, 1987, the new Radio Netherlands transmitter park was officially opened by H.R.H. Prince Claus of The Netherlands. It consists of 4 transmitters of 500 kW each, plus a spare transmitter of 100 kW.

This card verifies your report on our transmission

via: Madagascar

date:

time: April 9, 1987 UTC

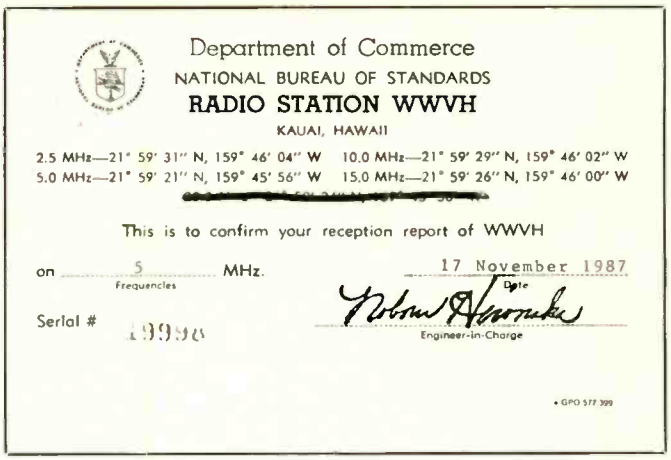
frequency: 15.03 kHz

11740

Radio Nederland
P.O. Box 222
1200 JG Hilversum
The Netherlands

van leer

Copyright N.O.S. Fotoafdeling Hilversum



Department of Commerce
NATIONAL BUREAU OF STANDARDS
RADIO STATION WWVH
KAUAI, HAWAII

2.5 MHz—21° 59' 31" N, 159° 46' 04" W 10.0 MHz—21° 59' 29" N, 159° 46' 02" W
5.0 MHz—21° 59' 21" N, 159° 45' 56" W 15.0 MHz—21° 59' 26" N, 159° 46' 00" W

This is to confirm your reception report of WWVH

on 5 Frequencies MHz. 17 November 1987 Date

Serial # 19986

Engineer-in-Charge

• GPO 577 399

LSB is used, while USB is used on the higher frequencies. The upper end of each ham band (such as 3750 to 4000 kHz) is used for voice communications, while the lower end is used for CW, RTTY, and packet radio. A glossary in the back of the *Communications Guide* explains these terms in detail.

The World of Utilities

The remainder of the shortwave spectrum not used for broadcasting or ham radio is used mainly by *utility* stations. As their name suggests, these are stations that do some sort of work. Utility stations include those used by military forces, transmissions between coast stations and ships, communications between ground stations and aircraft aloft, navigation beacons, and aeronautical weather stations. For an in-depth look at utility stations, be sure to check out the excellent article by Don Schimmel in our *Communications Guide*.

The shortwave bands also have several *standard time and frequency stations*, with perhaps the most familiar one being WWV on 2500, 5000, 10000, 15000, and 20000 kHz. These stations transmit highly accurate time signals and also provide an accurate frequency reference for calibration of receivers and laboratory instruments. WWV has a sister station, WWVH on the Hawaiian island of Kauai that operates on the same frequencies. However, it's often possible to hear WWVH under WWV. WWVH gives its time announcements just prior to WWV and uses a woman's voice, making it easy to identify. Another easily heard station is Canada's CHU, operating on 3330, 7335, and 14670 kHz. Time announcements are given each minute in English and French. Another station you can try for is Japan's JJY on 8000 kHz (best heard a couple of hours before your local dawn until shortly after sunrise, and Australia's VNG on 16000 kHz, usually best heard around your local sunset until a couple of hours thereafter.

Table 3
"Ham" (Amateur) Radio Bands

1800 to 2000 kHz	160 meters
3500 to 4000 kHz	80 meters
7000 to 7300 kHz	40 meters
10100 to 10150 kHz	30 meters
14000 to 14350 kHz	20 meters
18068 to 18168 kHz	17 meters
21000 to 21450 kHz	15 meters
24890 to 24990 kHz	12 meters
28000 to 29700 kHz	10 meters

Finally, shortwave is used by all manner of extralegal stations. Some are *clandestines*, which are politically-oriented stations operating under some sort of deceptive cover. The recent Gulf War featured several stations, such as the Voice of Free Iraq, which broadcast Iraq and opposed Saddam Hussein. The actual location of this station is now believed to have been Saudi Arabia. You can also hear *pirates*, which are illegal broadcasting stations operated as something of a hobby by would-be broadcasters. You can sometimes hear these stations on weekends and holiday nights around 7415 kHz. George Zeller's article in our Guide covers the world of pirate broadcasters in depth. There are also *numbers* stations, in which a synthesized voice (usually that of a woman) can be heard reading number groups of four or five digits in such languages as Spanish, English, German, and even Bulgarian. These are generally believed to be coded instructions to espionage agents using the "one-time pad" method of encryption. Finally, there are numerous illegal fishing vessel, smuggler, and hobbyist radio networks scattered throughout the shortwave bands. Most of these networks are people using illegally modified ham radio transceivers. Table 4 gives a list of some frequencies on which clandestine, pirate, and numbers stations can be heard.

As you can see, while certain bands have been set aside for specific purposes, there's enough variation in actual usage to make random "tuning around" an enjoyable experience. That's how many expert SWL/DXers discover new frequencies and stations!

Reception Patterns

Shortwave isn't like your local FM broadcasting band or the AM broadcasting band during the daytime. Instead, what you can hear on a given frequency varies with the time of day and season of the year.

The process by which a radio signal gets from one point to another, known as *propagation*, is a complex subject. Bill Orr has covered the subject in a short, easy-to-understand article of our Guide. Perhaps the most important guideline to remember concerns which bands are most useful at specific times of the day. Although there are plenty of exceptions, the following general rules are reasonably accurate:

- Frequencies below 9000 kHz are most useful for reception at night.
- Frequencies between 9000 and 14000 kHz are useful during the day and night, although their respective usefulness during night and day will vary throughout the year.
- Frequencies above 14000 kHz are most useful during the day.

Now, we have to qualify those guidelines a bit:

- Stations to the east of you often begin fading in on frequencies below 9000 kHz during late afternoons at your location. Stations to the west of you an often be heard a couple of hours after your local sunrise on frequencies below 9000 kHz.
- Stations above 14000 kHz located to the west of you can often be heard sever-

Table 4

Clandestine, Pirate, and Unknown

3480	Voice of National Salvation, from North Korea to South Korea, sign on 1000 UTC in Korean
5930	Four-digit number groups in Spanish read by a woman; at various time in the evening hours
6825	Five-digit number groups in Spanish read by a woman; at various times in the evening hours
7415	Active pirate radio station channel, often weekend nights and holidays
9942	La Voz del CID, anti-Castro programming in Spanish until 0415 UTC
9965	Radio Caiman, anti-Castro Spanish programming until 0315 UTC
10665	Four-digit number groups in Spanish read by a woman; at various times in the evening hours

al hours after your local sunset, particularly during the summer.

- Frequencies above 14000 kHz are better for long distance reception in the daytime during the winter than in the summer.
- Frequencies below 9000 kHz are better during the winter months than in the summer.
- Some of the best reception conditions on all bands happen around the spring and autumn equinoxes.

Major international broadcasters are well aware of how reception changes throughout the year and they adjust frequencies used for their broadcasts to North America to ensure the best reception possible. During the winter, for example, many European broadcasters will use the 49, 41, and 31 meter bands for their North American services. During the summer, many of these stations will move up to the 25 and 19 meter bands. This only applies to *international broadcasters*; domestic and tropical band shortwave stations tend to stay on the same frequencies throughout the year.

Shortwave reception is highly influenced by the level of solar activity. An active sun will release charged particles which enter the Earth's ionosphere, producing greater ionization and allowing higher frequency signals (those above 15 MHz or so) to propagate better. We're currently coming off a peak in solar activity, as indicated by a large number of sunspots. However, reception on higher frequencies should still be good for another couple of years. If solar activity becomes too high, as indicated by solar flares, a *geomagnetic storm* can be produced in the ionosphere, resulting in disrupted shortwave reception, including complete "blackouts" lasting a few hours!

International broadcasters change their frequencies on a quarterly basis. Advance notice of new frequencies are given by the stations themselves on the air and through program schedules sent to listeners on their mailing list. If you become a fan of a certain station (such as the BBC), it pays to write and ask to receive their program schedule regularly. Membership in a SWL club with a monthly bulletin is another good way to stay current with the latest schedules. Also, read the monthly *Listening Post* column in *Popular Communications* magazine for schedule changes and listener observations.

Reporting and QSLs

For many SWLs, just hearing a station isn't enough. Many people collect souvenir cards or letters, known as *QSLs or verifications*, sent by the station to confirm that the SWL did indeed hear the station. The mechanism for securing a QSL is the *reception report*.

Reception reports are letters containing enough details to prove to the station that you heard them. At the very minimum, a reception report should contain the date you heard the station, the exact frequency you heard it on, and the times you heard the station. For most international broadcasters, give the date and time in UTC; for domestic stations, use the station's local date and time. Sufficient program details to prove you heard the station should also be given.

In the case of international broadcasters, they like to get comments about their programs. Did you like what you heard? Actually, I've always wondered how seriously such comments are actually taken, since many international broadcasters seem to aim their programming more to please the funding authorities in their country than they do overseas listeners! However, if you do hear something you especially like, mention it-perhaps your pat on the back will reach those responsible.

Give the station a brief description of your receiving equipment and your general geographic location if you're not in or near a major city. Finally, politely ask (**never** demand) the station to send you a QSL card or letter if the details of your report are correct. For more information on QSLing read the article in the Communications Guide by Gerry Dexter.

The Next Steps

If you get seriously interested in tuning the international broadcasting bands, you'll need a current and accurate frequency reference. My favorite is *Passport to World Band Radio*, a by-frequency listing of world shortwave stations. Another good guide is the *World Radio Television Handbook*, another annual publication that has most of its information organized in a by-country format. These and other useful shortwave references are available from the POP'COMM Bookshop and most SWL and ham radio equipment dealers.

Shortwave is a dynamic medium, and you'll need some way of staying up to date on changes. One good way is *Popular Communications* magazine, which has monthly columns devoted to shortwave broadcasting, utility stations, and pirate radio, along with numerous feature articles. The top North American club devoted to shortwave listening is the North American Shortwave Association, 45 Wildflower Road, Levittown, PA 19057. They publish a monthly journal packed with DX news. Annual membership is currently $23. A sample copy of their bulletin is $2.

Don't feel too bad if you missed out on the exciting listening events mentioned at the beginning of this article. In the years ahead, there will be a lot more history and excitement to be heard! Why not join the millions who tune shortwave every day? ■

Quick and Easy Shortwave Antennas You Can Build

There's a lot to hear out there, but without a good antenna connected to your receiver, you'll miss the action. . .

BY WILLIAM ORR, W6SAI

I started SWLing (shortwave listening) when most of you readers were running around in three-corner pants. I loved it then and I love it now! There's an exciting world of long distance communications available to your ears. All you need to hear the excitement is a good shortwave receiver and a **good antenna**.

In this article I'll discuss inexpensive antennas you can build to help you avoid some of the pitfalls I encountered when I bought my first shortwave receiver. It was a dispiriting experience. It took nearly a week before I heard any signals. I didn't know anything about antennas and had to learn the hard way. At first, it wasn't much fun!

Of course, today's receivers are much better and more sensitive than my three tube blooper. Even so, the best receiver can be rendered mute if you connect it to a bad antenna.

Before I discuss specific antennas, let's examine shortwave radio for a moment. It's important to understand a few basic principles to fully grasp the concept of a good shortwave antenna. The term shortwave encompasses those radio waves extending from the top of the standard broadcast band to about 10 meters. Some folks express this range as running from 1.6 to 30 MHz (megahertz). Others express the range as running from 200 meters to 10 meters. Regardless, they are all talking about the same broad radio span that holds so many surprises.

Shortwave Radio— A Quick Overview

Scattered through this span of frequencies are narrow bands allocated by international agreement to long-range broadcasting, marine radio, point-to-point radio, radio amateurs, the military and other services. The reason they are here is that the shortwave range supports very long distance communication. Sometimes it reaches around the world! Many shortwave books provide detailed listings of stations in various services. *Popular Communications* magazine provides monthly lists and commentaries on shortwave stations of all categories. This information is a great help to a savvy SWL.

Long distance radio communication results from the lucky fact that energy radiated from the sun creates layers of ionized atmosphere about 100 to 300 miles above the earth (see sidebar article). Called the ionosphere, these layers reflect shortwave signals back to earth, just like a mirror reflects light. It is an imperfect mirror though; the reflective ability depends upon the amount of sunlight hitting the earth, the time of year, sunspots on the sun's surface, storms on the sun and other interesting things. Generally speaking, radio reception is best in the spring and fall months during the years when sunspot activity is highest. The years 1991-1993 are near the peak of solar activity, so today's shortwave listeners are in luck.

You'll find that early morning and early evening hours are best for long distance reception. Sometimes the shortwaves stay active all night. But why spoil your fun? You'll get the hang of things while you listen for long distance stations on your radio. It's sort of on-the-job training.

Now, let's talk about good antennas that are easy to get working, inexpensive to build and will pull in those long distance stations! Here we go.

The Simplest Receiving Antenna

Sometimes simple is best. You already know that good reception depends on a good antenna. One of the best designs is a **random-length wire**, from 30 to 100 feet long, erected in the clear (Fig. 1). It should be placed well clear of power lines (which are dangerous and also create radio noise). Try to get the horizontal portion at least 20 feet above the ground. It will work at a lower elevation, but height of the antenna is important. You can run a wire from the peak of your house roof to a nearby tree. You can also make an inexpensive antenna mast from five or 10-foot sections of TV mast, or u se a telescoping TV mast to support the far end of your wire.

Antenna insulators should be placed on each end of the horizontal wire. You can buy suitable glass or ceramic insulators, or you can make your own out of one-half inch diameter plastic rod cut to about three inches long. Just drill holes at each end to pass the antenna wire and the supporting rope. Pass the wire through the insulator hole and wrap it back upon itself. It isn't necessary to solder the wire at this point. Use 14 or larger enamel-coated wire for the horizontal portion of your antenna. The lead-in portion should be insulated to keep it from shorting to other parts of your residence, such as window frames, metal screens, etc. Stranded –18 wire (any color) will do.

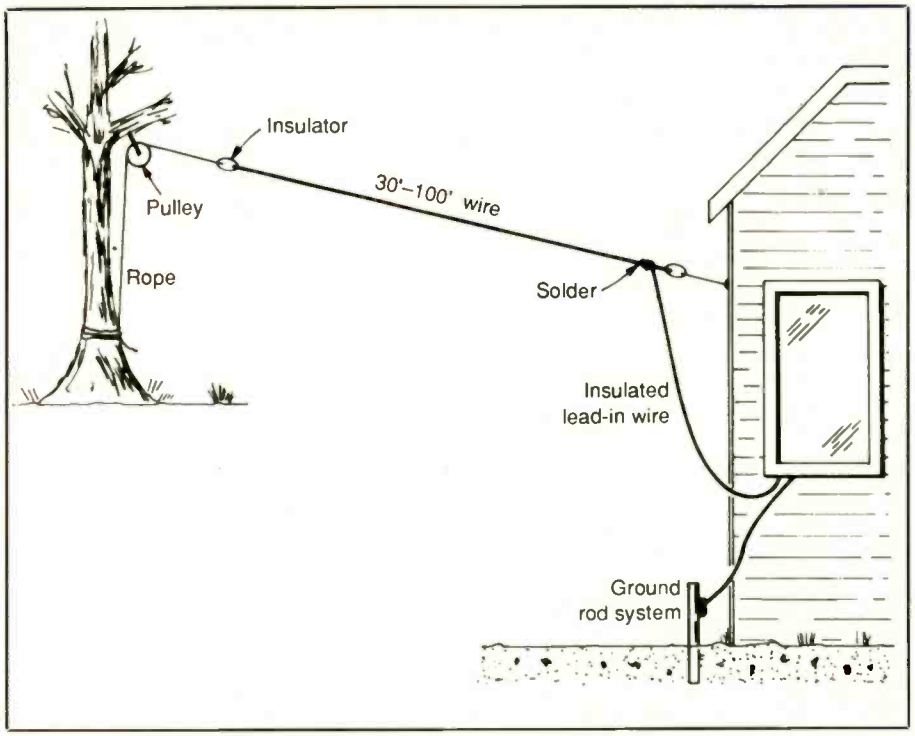


Fig. 1. Simple may be best. Horizontal wire, in the clear, at least 20 feet high serves as an all-purpose shortwave antenna. See text for details.

Solder the joint where the wires connect. You can coat the joint with a little asphalt roof paint, or wrap it with electrical tape. A weatherproof sealant is also available commercially that, when wrapped around soldered joints, effectively seals out moisture. Sealing the joint helps to keep rain or snow off the connection.

Orientation of the wire is not important. Just run it in a clear direction, away from as many man-made objects as possible. This is a basic shortwave antenna used by countless thousands of listeners. You'll be surprised at what you'll hear on the shortwaves with this easy-to-erect sky-wire!

Improving the Wire Antenna

The wire antenna requires a good ground return to work well. Most shortwave receivers use the ground of the residential electrical system as a *radio ground*. This connection is internal to the receiver.

The main fault with this type of ground is that some of the radio interference present on all power lines may be introduced into your receiver as annoying, buzzing background noise. A good external radio ground will help to reduce power line noise. If you are on the ground floor of your building, you're in luck. You can use the ground system shown in Fig. 2. It consists of multiple two-foot long ground rods driven into the earth, connected together and to the ground terminal of your receiver. The rods are cut from a six-foot long ground rod available at most electrical supply stores.

It is not necessary to use the full six-foot length, as the radio ground is effective only to a depth of a few inches. Military tests have shown it is better to have many short rods, connected in parallel, than it is to have one long rod.

Drill a hole in one end of each rod for a connection bolt and then drive the rods into the ground until the end protrudes only an inch or two. Place the rods about two feet apart. Pack the dirt firmly around the rods to make good contact between the rod and earth.

The Ground Connection

The next step is to connect the ground rods together. I use insulated, solid house wire as it is cheap. Make connections between the rods and also attach a wire to reach up into the house to your receiver. It's best if the lead from the rods to your receiver is not more than six or eight feet long.

This system won't work if your receiver is on the second floor, as the ground wire will be too long. However, a good radio ground can be made by running a short wire (less than eight feet long) from your receiver to a nearby copper cold water pipe. This works well whether or not you are on the ground floor.

What if you're not on the ground floor and there's no nearby cold water pipe to use for a ground? You can try a connection from your receiver ground post to a nearby radiator or air conditioning or heating duct. It might help in reducing extraneous background radio noise.

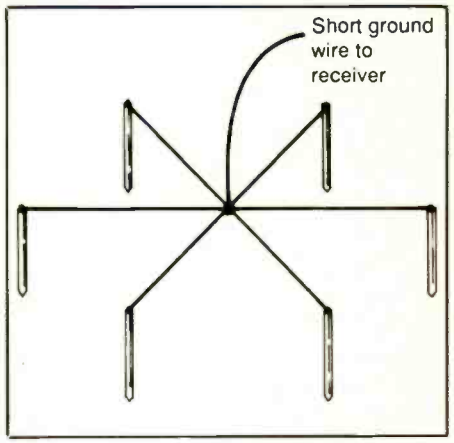


Fig. 2. Military-type multiple ground connection. Six rods (two feet long) are connected in parallel. No. 12 insulated house wire is used for connections. Drive rods into ground until connection point is at ground level.

The Random-wire Tuner

You can really boost the performance of a random-length receiving antenna by adding a tuner to it (photo A). The tuner "peaks" (tunes) the wire to your receiving frequency. The little electrical circuit inside the tuner is manually adjusted for maximum received signal. Sometimes weak signals will literally jump right out of the background noise when the tuner is adjusted properly.

The best of all combinations is to use the random-length antenna (I like a total length of about 100 feet) with a good earth ground and a random-wire tuner. This arrangement is hard to beat and works very well over the complete shortwave spectrum.

Random-length wire tuner boosts signals and rejects phantom signals and images. (MFJ 16010 or 956 are typical tuners.)

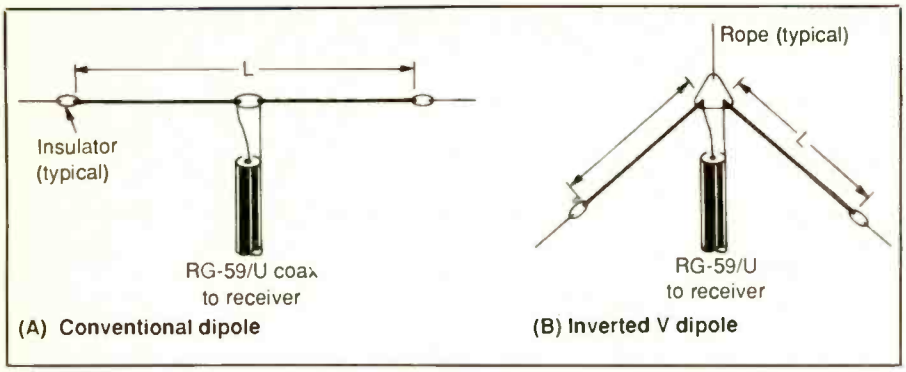


Fig. 3. Inner conductor of coax line is attached to one-half of dipole, the shield is attached to other half. Coax line may be any length. See text and Table 1 for details.

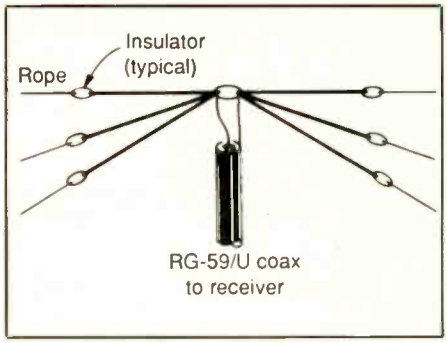


Fig. 4. Multiple, parallel-connected dipoles work on more than one shortwave band. Choose lengths from Table 1.

An Indoor Wire Antenna

Because of situations involving landlords or other problems, it's sometimes impossible to erect an outside wire antenna. If you're in a wood-frame building, take a length of small diameter 18 or 20) insulated white wire and place it around the ceiling of the room, run it down the hall, and into another room. Fasten it to the top of the wall with small pieces of transparent tape. It will work better if you're on the second floor, as your wire is higher above ground. Again, use a tuner on the wire to get maximum results. You'll be surprised at how well it works! Use a ground connection with it, if possible.

The Dipole and Inverted-V Antennas

The **dipole antenna** is a half-wavelength wire cut to a specific band of frequencies in the shortwave range you listen to most often. It's connected to your receiver with RG-58/U or RG-59/U coaxial cable (Fig. 3A).

Two or more dipoles can be combined into a system that will work on more than one shortwave band (Fig. 4).

The **inverted-V antenna** is a dipole mounted in a V position (Fig. 3B). It requires only one high support pole, the dipole ends are tied off at conveniently low points. It is easy to install and picks up signals readily in all directions. As in the case of the basic dipole, two or more inverted-Vs can be connected in parallel to provide multi-band reception. Be sure to space the wires a few feet apart.

Building a Dipole or Inverted-V Antenna

Construction of the dipole or inverted-V is simple. Overall wire length is cut according to Table 1, allowing a few extra inches of wire at each end to make connections. Glass or plastic egg-type insulators are used at the ends and a center insulator having a coax fitting can be used. This requires that the coax line have a plug that will match the coax receptacle on the insulator. You can buy a center insulator with a built-in coax receptacle, but if you want to avoid the hassle of putting the plug on the coax, you can make your own center insulator from a T-joint of PVC plumbing pipe (Fig. 5). This device requires no coax fitting or plug, as the coax is brought into the T-fitting and soldered directly to the halves of the antenna wire. The first step is to prepare the coax line for connection to the antenna wires. Remove about 1 1/2 inches of the outer jacket, using a sharp razor blade to slit the jacket. Unbraid the outer conductor using a sharp nail. It is then twisted into a pigtail. About an inch of the insulation is removed from the center conductor. The coax is passed into the center leg of the T-fitting, trimmed, and the ends are soldered to the antenna wires. The final step is to temporarily cap the ends of the T with paper tape, and fill the fitting with epoxy, making sure it flows smoothly around the coax.

As with the random wire antenna, the dipole (or inverted-V) should be erected as high in the air as possible. A center height of 40 feet is excellent. End heights are less important. My inverted-V for the 40 meter band is 35 feet high at the center, with the ends anchored to fences at the six-foot level. Since there is almost 10 feet of rope holding each end of the antenna, the end insulators are actually about 10 feet in the air.

Best pickup of the dipole is at right angles to the wire. I suggest you run your antenna in roughly a north-south direction. This way you'll effectively cover Europe and northern Africa to the east and Japan and the Orient to the west. You'll still hear stations from other directions. The inverted-V is relatively non-directional, so the direction of the antenna wire is unimportant.

Table 1
Dipole or Inverted-V Dimensions

Band	Length (L)
90 meter 3.2–3.4 MHz	142 ft.
60 meter 4.7–5.0 MHz	96 ft.
49 meter 5.9–6.5 MHz	77 ft.
41 meter 7.1–7.5 MHz	65 ft.
31 meter 9.2–9.7 MHz	50 ft.
25 meter 11.5–12 MHz	40 ft.
16 meter 17.6–18 MHz	26 ft. 6 in.
13 meter 21.45–21.8 MHz	21 ft. 6 in.
11 meter 25.4–26.2 MHz	18 ft.

Trap Dipole Antennas

The disadvantage of the dipole or inverted-V antenna is that they operate efficiently only over one shortwave band. It is said to be **resonant** on a narrow band of frequencies. You can hear signals of other bands, but they will be weaker. As I said, two dipoles for separate bands may be connected in parallel and run at right angles to each other for greater coverage, but there is another solution. Multiband **trap dipoles** are available from several manufacturers. These interesting antennas have small resonators (traps) connected along the antenna wire that provide optimum reception on more than one shortwave broadcast band. A different version is adjusted for best reception on the amateur bands. The trap dipole may be installed in the normal manner, or as an inverted-V.

A Vertical Antenna?

Listeners short on space might contemplate a vertical antenna. The simplest one is a single random-length wire, supported at the top end. It can be used in conjunction with an antenna tuner, if desired. The dipole may also be mounted in

MAXIMUM RANGE MAXIMIZED SENSITIVITY

We've Carefully balanced the amount of gain used in our input amplifiers - too much or too little results in poor performance. **OPTOELECTRONICS' HANDI-COUNTERS™** with maximized sensitivity give you the maximum range for antenna pick-up.

Made in the USA

MODEL 3000
Multi-function Counter
10Hz-3GHz, 10 Digit LCD with frequency, period, ratio, interval & signal level bargraph....**$375.**

Maximum Security Device.
Increase your frequency finding™ by 10 times the distance or more.
Tunable Preselector APS-104 $995.

Counter Sold separately

MODEL 8030
With all the features of the 3000 plus enhanced input signal conditioning and enhanced TCXO time base
$579.

OPTOELECTRONICS

$99.

Model 2300 - 1MHz-2.4GHz Available with NiCads and AC Charger Adapter. Complete Package only....$128.

$199.

Model 2210A
10Hz-2.4GHz Full range counter.Price includes Nicads & AC charger/adapter.

The Original Pocket-Sized LED Handi-Counter™

All of ***OPTOELECTRONICS'*** LED Handi-Counters™ will:

- Count frequencies above 2.4GHz.
- Have display saving Power Switch (avoids premature LED burn-out, leading cause of counter failure.)

Accept no substitutes - Look for the *OPTOELECTRONICS* name on the label!

Only *OPTOELECTRONICS* offers you *MAXIMIZED SENSITIVITY.*

Factory Direct Order Line **1-800-327-5912**

FL(305)771-2050 • FAX(305)771-2052

5821 NE 14th Ave. • Ft. Lauderdale, FL33334 • 5% Ship/Handling (Max. $10) U.S. & Canada. 15% outside continental U.S.A.
Visa and Master Card accepted.

a vertical position. The vertical antenna, however, has a serious drawback because it is susceptible to atmospheric (static) and man-made noise. It is particularly sensitive to automobile ignition noise and noise generated by thunderstorms. In many instances, when a vertical antenna is used, a high, random noise level will be heard in the receiver, masking some of the weaker signals you want to hear. However, a 'noisy' antenna is better than no antenna at all, and in some circumstances the vertical antenna is the only practical choice.

If you decide to use a vertical antenna, keep it away from power line "drops". Move it around a bit while you listen to the receiver. Try to find a position that produces minimum noise. In a noise-free location (is there one anywhere?) the vertical antenna works well, but your chances of noise pickup are substantially greater with a vertical than with a horizontal antenna.

Unobtrusive (Invisible) Antennas

Alas, in some cases, it is almost impossible to put up an outdoor antenna because of property restrictions, fussy neighbors and huffy landlords. There are several ways of skirting around these obstacles without raising suspicion. First of all, the antenna can be located indoors, as discussed earlier. Next, consider a very thin (26 or smaller) enamel wire run from your residence to a nearby tree. This wire is virtually invisible from the ground. (It is also invisible to birds, which can fly into the wire!) Make your insulators out of very short pieces of 1/4-inch diameter plastic rod.

It's a tricky job to erect an antenna you can't see. One solution is to place a small folded paper strip over the center of the wire during construction. Attach a thread to one end of the paper. Eyeing the paper will assist you in getting the wire into place. When all is well, gently pull on the thread and the paper will come off and float down to the ground.

Another idea is to run your antenna under the eaves of the house, or use the metal rain gutters for an antenna. A friend of mine lives in a high-rise apartment. He has no rain gutters and no nearby tree for a tie point. He still has two "invisible" antennas. One is a short wire connecting to the metal porch railing. The second is a thin wire that he drops down from the porch at night or the early morning hours. He has a fishing sinker on the end to prevent it from whipping in the wind. The thin wire produces better results, but he is lazy and uses the porch railing most of the time for general listening. He uses a small antenna tuner on either antenna.

Regardless of restrictions, if you're clever, you can find a good, ungrounded metal conductor you can use for an antenna.

There's no rule that says your antenna has to be in the horizontal or vertical plane, or that it must run in a straight line. A dipole or random wire can be erected on a slant, or can have several bends in it without reducing reception. You can bend or shape the antenna to fit the space at hand. Don't be afraid to experiment!

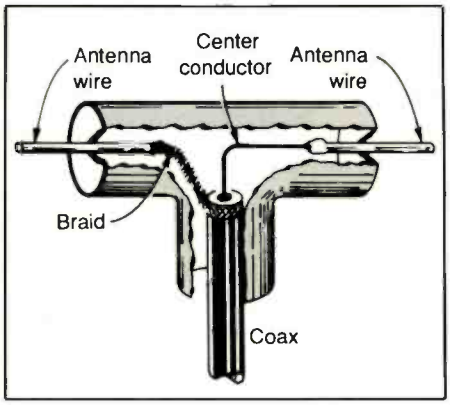
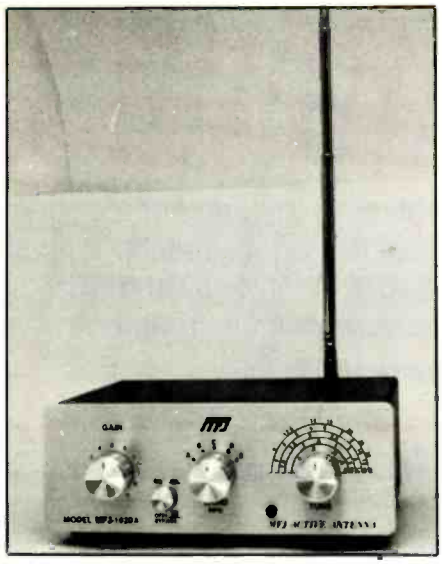


Fig. 5. Center insulator for dipole is made of PVC T-fitting. After connections are made, fitting is filled with epoxy to make waterproof joint.



Active antenna combines short whip antenna with sensitive, high-gain tuner. Reduces noise and phantom signals while boosting wanted signal. (MFJ model 1020A.)

The Active Antenna

An interesting alternative to the conventional wire antenna is the recently developed **active antenna**. This device consists of a box holding a short vertical whip antenna (about four feet long). In the box is a special amplifier-tuner (Photo B). The amplifier makes up for the reduced signal pickup of the short whip and the tuner peaks the circuit to the frequency you wish to receive. The box sits on the table next to your receiver. It is connected to the receiver with a short coax line. The battery to energize the amplifier is inside the box.

An outdoor version of the active antenna has a remote whip which can be mounted in a more advantageous posi-

The Sun and Shortwave Communication

by William Orr

Radio waves are a form of electromagnetic energy, similar to light, X-rays, and ultra-violet rays. All of these rays are emitted from the sun and enter the earth's atmosphere. It is a characteristic of these waves that they travel in a straight line from the source. Why, then, do short radio waves (about 2 to 30 MHz) span such great distances, curving around the earth? The clue was found in 1902 when scientists discovered that the earth's upper atmosphere contained an electrically conducting region created by solar radiation. In 1924 the angle of arrival of radio signals from a beyond-the-horizon transmitter was measured. It was such that the signals could have only arrived from overhead reflection from something in the atmosphere about 100 miles above the earth's surface. By 1925 the reflection region had been verified by a primitive "radar" system which bounced pulses off the overhead layer, reflecting them back to a nearby receiver. By measuring the time lag between transmitted and received pulses, the height of the reflecting layer, called the ionosphere, was determined.

In 1927, during an eclipse of the sun, it was found that solar radiation altered the reflective ability of the ionosphere. The rapid development of shortwave radio in the early 1930s led to continuing observations of the ionosphere and the effect it has on radio propagation.

The ionosphere is composed of several layers, like the skin of an onion. The lowest layer called the D-layer is about 30 to 50 miles high. It is mainly transparent to radio waves and disappears [illegible] it the E-layer, also occurring during daylight hours. It is more intense than the D-layer and occurs at heights between 50 and 70 miles. It supports little radio communication except under special circumstances.

The F-layers are the workhorses of high frequency (shortwave) communication. They exist from 80 to 200 miles high and readily reflect radio waves. The intensity of the F-layers (there are two of them) are subject to solar radiation, with hourly, seasonal and long-term cyclical changes.

tion—on top of your house or mobile home, for example. The four-foot whip is quite inconspicuous.

These clever devises are most useful for listeners on the move and who wish to carry a compact receiver with them without having to bother erecting a conventional antenna. The active antenna is also a help for those listeners who, for one reason or another, cannot erect a long, outdoor antenna.

Safety First. Watch for Power Lines and Lightning!

Take care when you erect your antenna. Do not pass it under or over power lines. If it breaks, it must not fall on a power line. Power lines are dangerous, so stay clear of them! In addition, they are a prolific source of radio noise. Be smart. Stay away from these deadly hazards.

Lightning is another often ignored danger. Don't invite lightning to strike your radio installation. If there is a storm in your area, the *safest* thing to do is to disconnect your antenna and toss the lead-in wire out the window! That's right—out the window. Don't give lightning a chance to enter your home via your antenna. Even a nearby lightning strike can induce voltage into your antenna that can damage components of your receiver if it is connected to the antenna.

Lightning arrestors are available that can protect your receiver against **static electricity buildup** during a lightning storm. A heavy wire between the arrestor and a ground rod is required. But remember that NOTHING can protect you or your equipment against a direct lightning strike! That's why it is prudent to completely disconnect the antenna lead-in from your residence during a storm. A surge protector on the AC power line is also recommended.

One of my early learning experiences concerned lightning. I had just stopped listening as a lightning storm was approaching. I turned off the receiver and removed my headphones. Suddenly there was a loud thunder crash and a brilliant lightning strike on a tree several hundred feet away from the house. The tree was split in two. When I stopped shaking, I noticed my antenna was gone. It had been vaporized! There was a big, black charred area around the window sill. The induced voltage from the lightning stroke had jumped from my antenna wire to the metal window frame. What about my receiver? The input circuit was charred and smoke was coming out of it. Luckily, a good friend who knew his onions was able to repair my receiver. But he couldn't repair my fear of lightning, which remains to this day.

Summary

There's no substitute for a good antenna. I suggest you start out with an end-fed wire and a tuner. After you find your way around the shortwave spectrum, erect a dipole for your favorite band. Where do you go from there? There are a number of good handbooks available that describe gain antennas (beams) you can build or buy. The sky's the limit. Good listening and plenty of DX to you!

Recommended Reading

You'll find a lot of nifty antenna ideas in various publications. Ones that I recommend are:

1. "Easy-Up Antennas," by Edward M. Knoll. Published by Howard W. Sams Co., Indianapolis, IN.
2. Simple, Low-Cost Wire Antennas for Radio Amateur," by William Orr.
3. "The Shortwave Propagation Handbook," by Jacobs and Cohen. These books are available from the CQ Bookstore. ■

Scanning The VHF-UHF Bands

Gone are the days of plug-in crystals; today's scanners have literally hundreds of channels that let you hear everything from your local sheriff to space shuttle communications. Here's how.

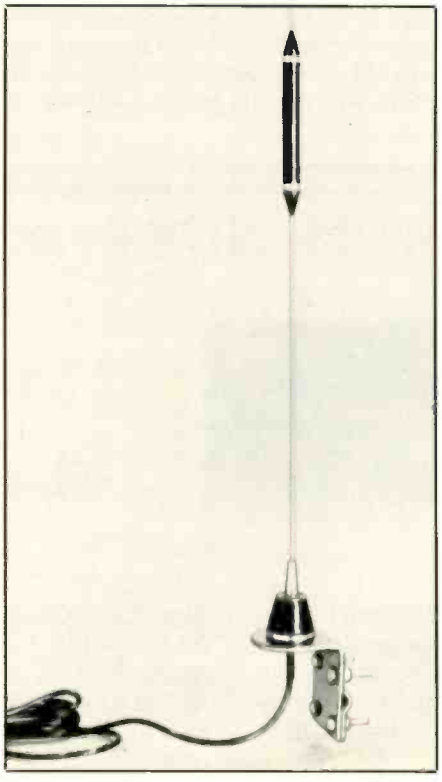
BY CHUCK GYSI, N2DUP

While listening to the VHF and UHF bands isn't a relatively new hobby, scanning is. Tunable receivers allowed listeners to tune in the VHF and UHF bands for years before scanners became available, however, that meant the listener was fixed on a single frequency after tuning in a desired station. The popularity of listening to VHF-UHF didn't catch on until scanners became programmable. Prior to programmable scanners, hobbyists were required to plug in specially purchased crystals for each frequency they wished to scan in their radios. For the serious monitor, that usually meant a box of the plug-in crystals for every conceivable important frequency.

Enter Programmable Scanners

Programmable scanners really made a marked increase in the ranks, especially when radios became capable of literally searching for new frequencies by electronically tuning up and down the band. In addition, with digital readout, the exact frequency made it possible to re-tune signals on a regular basis. No longer were VHF-UHF hobbyists locked in to a single frequency on a tunable set or to whatever crystals were installed in their scanner.

The first programmable scanners were quite primitive, compared to today's standards. When they started arriving on the scene in the early to mid-1970s, various manufacturers used different methods to synthesize the frequencies scanned. For instance, one manufacturer, Regency, used specially cut combs in its Whamo scanner to sort out each of the 10- channels. An add-on box was also available for that scanner to enable the operator to manually dial in desired frequencies. Another scanner maker, SBE, made the Optiscan radio that used cards punched for each of the 10 channels to be scanned. The card would be inserted into the front of the radio. By owning a set of cards, the operator could have various "programs" for traveling into different areas or different listening desires.



Scanner antennas come in a variety of mounts. This is a mirror mount/side mount mobile antenna.

Another early programmable scanner on the market was the Bearcat 101. The 16-channel scanner could be programmed for each channel by throwing the channel dip switches on the front of the radio up or down, in accordance with a book that showed programs for every frequency. It was a step in the right direction.

Bearcat and Regency then came out with digital readout scanners where frequencies could be manually entered through a keypad. The scanners could also search for new frequencies by the user setting upper and lower limits to be searched. The scanner would electronically tune up through the limits, stopping on each active frequency.

Many different types of scanners have come and gone since the first programmables came out. Some of those that are no longer available also had some favorite features no longer found on radios. For instance, the Bearcat 250 had a "count" feature that could tell you how many times a particular frequency was active. This was especially valuable to those who wanted to check a frequency, while they were at work during the day. Some features on the Regency Touch 16-K scanner allowed the user to scan the old conventional mobile telephone channels without locking up on the channels that were inactive and transmitting a tone. The scanner had a tone filter that al-

lowed it to scan through the mobile phone channels with the tone on them, stopping only on channels that had actual telephone conversations. The T16-K also had a weather alert feature that filtered out the tone alert transmitted by the National Weather Service Stations. This meant that you could use the scanner as a weather alert radio; the receiver would open up and you would hear weather broadcasts in the event of severe weather bulletins.

Over the past several years, the features on scanners haven't changed much. Some popular features on scanners today include:

• **Service search** - The radio has frequencies preprogrammed for specific radio services. By pushing a single button, the scanner will automatically search through all available frequencies for a specific user. For instance, you can press a button labeled "police" and the scanner will search through all police radio service frequencies for activity.

However, there are some drawbacks with service search. For example, in some locations, police departments might be using local government radio service frequencies and not police radio service frequencies. If that is the case, you won't find them with service search in the "police" mode. In addition, none of the service search functions will check frequencies higher than 470 MHz. If you live in one of the top 20 metropolitan areas, police departments in your metro area are using frequencies between 470 and 512 MHz. In addition, police agencies also use frequencies in the 800 MHz band, too, although all scanners can't tune in this band.

One last drawback with service search is in the actual preprogrammed frequencies themselves. Included are repeater input frequencies, often slowing down your search rate with unnecessary frequencies. For instance, in addition to searching police frequencies from 460.025 to 460.55 MHz, the scanner will also search from 465.025 to 465.55 MHz. This is unnecessary because there are so few police agencies that operate on the 465 MHz channels except to access repeaters on the 460 MHz band to retransmit mobile and handheld radios. If you were to hear a signal on the 465 MHz band, more than likely it is being retransmitted on the 460 MHz band by a repeater station at a high point in your area.

• **Weather search** - While this function is essentially a service search of the National Weather Service broadcast channels, it is a nice function to have on a scanner. This is sometimes the only service search on scanners. Almost all scanner users will listen to weather broadcasts (typically on 162.4, 162.475, and 162.55 MHz), at one time or another. Many users program the local weather channel into one channel and lock it out. When they want weather information, they just manually punch in that channel. When they're done listening, they hit scan to resume scanning operation. However, this means tying up one of your channels for weather broadcasts. With a weather button on your scanner, you have instant access to weather broadcasts without loading up a channel or two with weather frequencies. If severe weather strikes your region frequently, look for a scanner with this feature.

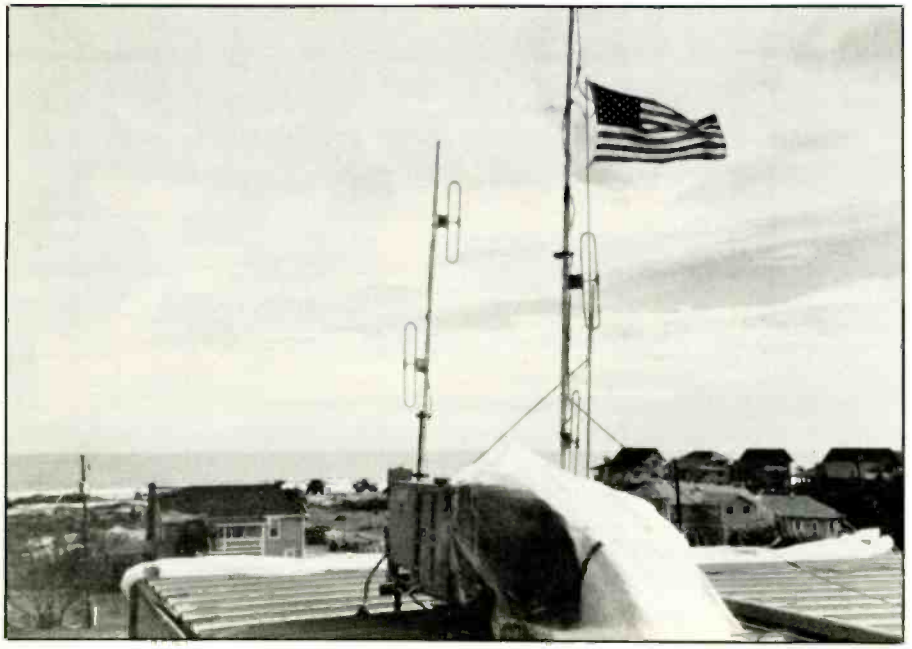
The VHF marine band from 156.275 to 157.425 has plenty of action at sea, in rivers, and on lakes.

• **Sound squelch** - This is a newer feature that is starting to become popular on scanners. Currently available on the Radio Shack Realistic Pro-2006 and AOR AR2800 scanners, this is a front-panel switch that, when activated, keeps the scanner from locking up on a channel that is hearing only a carrier. For instance, some two-way radio user might be experiencing equipment problems such as a stuck microphone jamming the channel. When a channel comes up during scan and there is no voice heard on the channel, the scanner simply resumes scanning. Think about all those times you jumped up from your seat to hit the scan button to resume scanning because of a dead carrier on the channel.

• **Banks** - Most scanners with more than 20 channels will group the channels into banks of 10 to 100 channels and typically have five to 10 banks. For instance, a 400-channel scanner might have 10 banks of 40 channels. Some scanner users like to break down their frequencies into banks. For example, some will group all their local police frequencies into one bank, all their local fire frequencies into another bank, etc. One scanner, the AOR AR1000 is a handheld that covers 1000 channels in 10 banks. Some people ask how anyone could possibly program that many frequencies into such a scanner. The best use for a scanner with that many channels and with bank capability is to use different banks for various areas that you might travel during the year. Imagine never having to program your scanner when you travel! By setting aside one or more banks for travel frequencies, you're set to roll anytime you hit the road or airport.

• **Attenuator switch** - This switch is often found on the back of some of the upper line of scanners. If you live or travel into an area where there are a lot of radio transmitters, such as paging, this is an extremely important function. It basically reduces the radio's sensitivity. Only the stronger signals will be received when this switch is activated. This also helps the user who buys a better scanner, but only wants to hear more local communications. If you live in an area with a lot of transmitters, especially paging operations, the attenuator switch eliminates some of the interference you might be experiencing from nearby transmitters coming in on frequencies they aren't supposed to.

• **RF amplifier** - Some of the Uniden Bearcat scanners now offer the option of being able to plug in an optional board inside the scanner that amplifies the signal within the scanner. If you live in a fringe area, this feature is definitely worth looking into. A switch on the bottom of the ra-



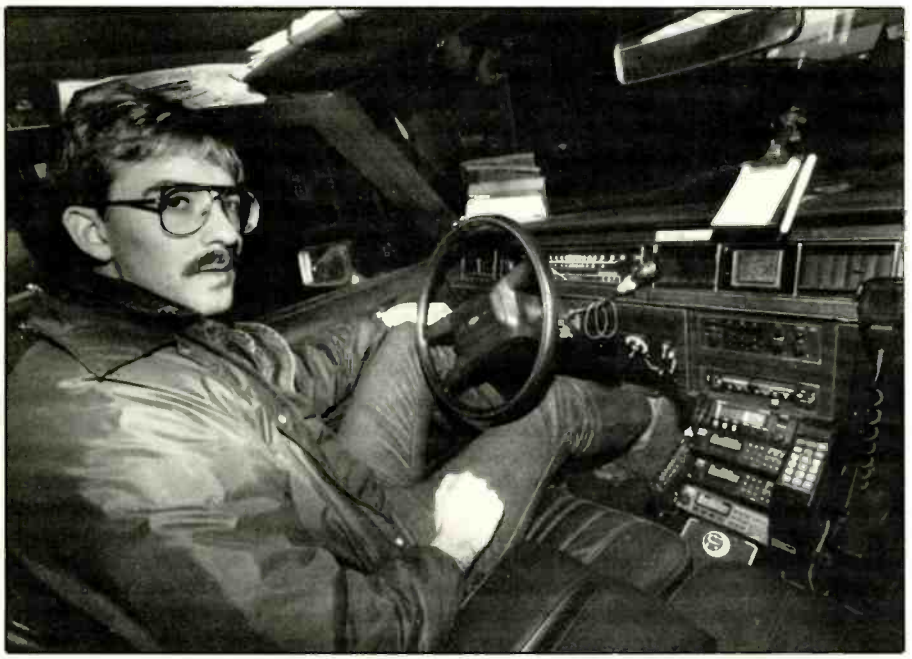
Disaster communications can be heard on scanners. This single base station antenna was left standing in a South Carolina town after Hurricane Hugo ripped through with 150 mph winds.

dio allows the amplifier to be turned on and off. This makes it especially valuable for the mobile user who might typically need the amplifier on when around the local community, but needs it off to avoid overload when driving through cities where a lot of nearby transmitters cause interference.

• **CTCSS** - This has been one of the few really innovative options for scanners over the past several years. Most two-way radio users have a component installed inside their radios that automatically transmits a sub-audible tone every time the microphone button is pushed. In addition, all the radios in a particular radio user's group will also have a component installed that automatically decodes this sub-audible tone when transmitted. These low-frequency tones, between 67 and 250 hertz, allow all the radios within a given group to remain silent until a radio with a similar CTCSS (continuous tone-coded squelch system) tone transmits.

CTCSS is also known by trade names such as Private Line (PL) and Quiet Channel. By using CTCSS tones, a radio user can only hear radios within his own group and not other users on the same frequency. For example, in almost all areas, there are UHF business band repeaters owned by radio shops and are used by various businesses in a community. However, each user on the repeater is using a separate CTCSS tone, so the radios in their own group remain silent until their own CTCSS tone is transmitted by other radios within the group. That way many users can use the same channel and not have to listen to all the other users, too.

Uniden Bearcat now makes four scanners that can decode these CTCSS tones much like two-way radios can. For example, if there are four police departments in your area that use 155.31 MHz for communications, and you want to hear only two of the four users, all you need to do is figure out their CTCSS tones and then actually screen out the unwanted users by listening to the frequency with only the desired CTCSS tones. This scanner feature is great in metropolitan areas with a lot of overlapping radio users. It can also help you identify transmitters you hear. For instance, one frequency might be reused by the same agency within your area, however, you might not know what tower is transmitting each time you hear something. If each tower uses a separate CTCSS tone, your scanner will automatically tell you which tower is transmitting as you notice what CTCSS tone pops up during scan.



Jon Hill, a photographer for the Boston Herald, has several scanners in his car to keep abreast of police and fire action. Almost all news photographers rely on scanners to know where the action is.

Where to Look

Once you get past listening to local police and fire activity on your scanner, you may want to venture into listening to other forms of communications. The best advice is to start with a good scanner directory for your area. There are so many directories available today; gathering data and making directories has turned into a true cottage industry. If you find that there are no available scanner directories for your area, chances are you could make a few bucks by collating all the information you can find, then presenting it in a nice, readable format. Most scanner dealers carry one kind of directory or another.

In addition to local scanner directories, there are also many specialized directories available for targeting specific interests. For example, there are spe-

cial directories on the market for railroad, aircraft, federal agencies, mobile phones and fire frequencies. For almost *any* type of scanner frequency directory, contact CRB Research, P.O. Box 56, Commack, NY 11725. These directories and books will probably give you more frequencies than you could ever imagine; let alone find enough time to listen to!

Once you decide to venture into the extended world of scanning, knowing where to look can help increase your enjoyment of the hobby. Most scanner directories will include a listing of where to tune in certain types of signals. Let's take a look at where the most popular listening targets can be found:

• **Public safety** - Usually where beginning scanner hobbyists start out. Try these ranges (all frequencies in MHz) for various radio users: 30.86 - 31.98, forestry conservation; 33.02 - 33.10, highway maintenance, special emergency; 33.42 - 33.98, fire; 37.02 - 37.42, police, local government; 37.90 - 37.98, highway maintenance, special emergency; 42.02 - 42.94, state police; 44.62 - 46.58, forestry conservation, fire, local government, police, highway maintenance, special emergency; 47.02 - 47.66, highway maintenance, special emergency; 150.995 - 151.475, forestry conservation, highway maintenance; 153.74 - 154.445, fire, local government; 154.65 - 156.24, local government, police, highway maintenance, special emergency; 158.73 - 159.465, forestry conservation, local government, police, highway maintenance; 420 - 430, while used by hams in most of the country, this band is also used for public safety and business users near the Canadian border to alleviate overcrowding on other bands; 453.012 - 453.987, forestry conservation, fire, local government, police, highway maintenance, special emergency; 460.012 - 460.637, fire, police, special emergency; 462.937 - 463.187, paramedics; 470-512, used in 6 MHz chunks in the nation's top 20 metro areas; 851 - 856, while business users predominate this band, you can also expect to find public safety users here; 856 - 861, trunked radio systems here can incorporate various public safety users within a city or governmental entity; 866 - 869, all public safety agencies are gradually getting permission to move to this band on a region-by-region basis.

• **Hams** - While many scanner users don't have the desire to tune in hams' chatter on a regular basis, during an emergency, the situations that rely upon amateur radio operators' participation, bring the following frequencies to life. Ham repeaters in your area are the place to tune for useful information. Check the following bands for hams in your area: 28 - 29.7, 50 - 54, 144 - 148, 222 - 225, 420 - 450, 902 - 928, and 1240 - 1300 MHz.

• **General Mobile Radio Service** - This set of frequencies can be used by individuals for any purpose and can also be used by public safety teams that provide communications services. Try tuning in 462.55 - 462.725 for GMRS repeaters and base stations. In addition, low-power operations are allowed on seven frequencies between the normal eight GMRS channels. Try 462.5625, 462.5875, 462.6125, 462.6375, 462.6625, 462.6875 and 462.712. Most public safety teams, such as REACT, keep watch on 462.675 on a nationwide basis (and use a nationwide CTCSS tone of 141.3 hertz).

• **Utilities** - Power utilities can be found in the following ranges: 37.46 - 37.86, 47.70 - 48.54, 153.41 - 153.725, 158.13 - 158.265, 173.25 - 173.35, and 451.025 - 451.675.

• **Petroleum products** - Check 25.02 - 25.32, 30.66 - 30.82, 31.32 - 31.76, 33.18 - 33.38, 48.56 - 49.50, 153.035 - 153.68, 158.145 - 158.445, 173.25 - 173.35, and 451.175 - 451.75.

• **Forest products** - If you live in a logging region, check out these frequencies: 29.71 - 29.79, 31.48 - 31.76, 43.02 - 43.52, 48.56 - 49.58, 153.05 - 153.68, 158.145 - 158.46, 173.25 - 173.35, 451.175 - 451.75, and 452.1 - 452.45.

• **Film industry** - Is a movie being filmed nearby? Check here: 152.87 - 153.02, and 173.225 - 173.375.

• **Newspapers** - Your local newspaper might be using the following frequencies to see that papers are delivered or to dispatch reporters and photographers to news scenes: 173.225 - 173.375, and 452.975 - 453.0.

• **Farms, road construction, mines, fuel delivery, concrete, etc.** - Check among these frequencies: 30.58 - 30.64, 31.28 - 31.96, 35.28 - 35.86, 43.02 - 43.52, 47.44 - 47.68, 49.52 - 49.58, 151.49 - 151.595, 152.87 - 153.395, 158.325 - 158.46, and 451.725 -452.175.

• **Businesses, schools and hospitals** can use the following range of frequencies: 27.43 - 27.53, 30.76 - 31.24, 33.14 - 33.16, 35.02 - 35.18, 35.70 - 35.98, 42.96 - 43.0, 151.625 - 151.955, 154.515 - 154.625, 457.525 - 457.6, 460.9 - 462.175, 462.75 - 462.925, 463.2 - 465, 851 - 866, and 935 - 940.

• **Manufacturers** - Factories can use the following: 72.02 - 72.6, 75.44 - 75.6, 153.05 - 153.395, 158.28 - 158.43, 451.175 - 451.675, and 462.2 - 462.525.

• **Telephone companies** - Check here for the phone folks: 35.16, 43.16, 151.985, 158.34, and 451.175 - 451.675.

• **Buses, trucking lines** - These frequencies are used for urban and inter-urban purposes: 30.66 - 31.14, 43.7 - 44.6, 159.495 - 160.2, and 452.325 - 452.875.

• **Railroads** - The rail lines can be heard here: 160.215 - 161.565, and 452.325 - 452.95.

The AOR AR1000XC scanner covers 500 kHz to 1300 MHz continuous. This includes broadcast and shortwave bands!

• **Taxicabs** - Find them here: 152.27 - 152.465 (base), 157.53 - 157.725 (cabs), 452.05 - 452.5 (base), 457.05 - 457.5 (cabs).

• **Tow trucks** - They talk on these frequencies: 150.815 - 150.965, 157.47 - 157.515, and 452.525 - 452.6 (base and mobile).

• **TV and radio stations** - Hear the news before it's on the air: 161.64 - 161.76, 450 - 451, and 455 - 456.

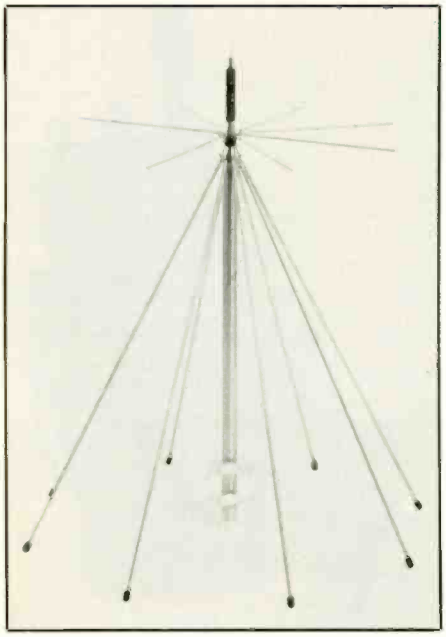
• **Federal government** - In the past, federal operations could be counted on to show up on specific frequencies. That isn't the case so much any more. In an effort to evade listeners, old Uncle Sam shows up just about anywhere on federal frequencies. While little use is made of 30 - 50 MHz frequencies today, try searching from 162 - 174, and 406 - 420 MHz.

• **Cordless phones** - The base units operate on 10 channels between 46.61 and 46.97, and the handset units operate on 10 channels from 49.67 to 49.99.

• **Baby monitors** - They use five channels between 49.83 and 49.89.

• **Cellular phones** - If cellular service is offered in your area, check 869 - 894.

• **Aero phones** - Hear regular folks making telephone calls from commercial aircraft on 6-kilohertz-spaced channels between 894 - 896 MHz. However, you'll need a receiver capable of operating in the AM mode on this band. You can also hear phone calls from private aircraft on 459.7 - 459.975 in the normal narrowband FM mode.



A discone antenna offers flat characteristics over the 25-1300 MHz range, but offers no gain. Notice the top vertical element, which offers VHF low band coverage. Not all discones have this feature.

One of the more interesting things to hear on the scanner bands is medical helicopters en-route to transport critically injured patients. Parkview Memorial Hospital's Samaritan Medical Aeromedical Service in Fort Wayne, IN uses 155.205 for dispatch purposes.

• **Conventional mobile phones** - For the old-fashioned mobile phones (pre-cellular days), check 152.03 - 152.24, 152.51 - 152.81, and 454.025 - 454.675.

• **Paging** - Most paging takes place on a shared basis on old mobile phone channels or on the new 931-MHz band.

• **Aircraft** - Check for navigational aids from 108 to 118 MHz and for routine aero communications from 118 - 137 MHz.

• **Military aircraft** - Hear military pilots and towers in the 225 - 400 MHz band. But, be sure to tune in the AM mode. However, if you search through in the FM mode, you might stumble across military satellites relaying important calls.

• **Citizens band** - Even if CB isn't your bag, you ought to monitor 27.065 (Channel 9) for emergency calls. Other CB channels can be heard in the range from 26.965 - 27.405.

• **VHF marine band** - If you live near any body of water, be sure to tune in the VHF marine band, specifically the emergency and calling Channel 16 (156.8). Other marine channels range from 156.275 - 157.425. Hear boaters placing phone calls from their boats in the 161.8 - 162.0 range.

• **Marine calls** - If you live near the inland waterway of the Mississippi River, be sure to tune in the 217 - 218 range for phone calls from vessels. These frequencies are like a cellular system for vessels traveling waterways. They are also used for fax and data purposes. Here regular narrowband FM is used.

Useful accessories

After you get involved in the hobby, you'll want to improve your scanning station and increase your chance of catching various signals. There are a lot of available add-on devices to enhance your listening.

If you want to receive signals from farther away than you're capable of right now, or want to increase your chances of hearing a mobile in the next county, consider adding an amplifier in line between your antenna and the scanner. The amplifier boosts the incoming signal, however, sometimes that also means increasing the level of noise on the signal, too.

If you like to search for frequencies on-site, such as at a shopping mall, you may want to consider what many scanner hobbyists already have: a frequency counter. When a nearby transmitter or handheld radio is keyed up, the frequency counter will give a digital readout of the transmitting frequency. Range, of course, depends on the counter's sensitivity.

Antennas

There are a variety of mobile, base and handheld antennas available for scanners. Each one serves a distinct purpose, so you should read all the specifications before buying an antenna. Be sure to check out the excellent article on scanner antennas by Bill Price in our Communications Guide.

The **discone** antenna has become the most popular base antenna because of its wide frequency coverage. While offering no gain, the antenna functions quite well over the 30-1300 MHz range. The discone is also a good antenna for hams because it can be used to transmit in the 50 - 54, 144 - 148, 222 - 225, 420 - 450, 902 - 928 and 1240 - 1300 MHz amateur bands. If listening to VHF low band (30 - 50 MHz) is included in your listening habits, be sure your discone has a top vertical element above the top horizontal radiating elements. Some discones don't have this top stick and therefore don't function as well on the VHF low band. It will cost a few more bucks for this version, but it will give you better coverage on 30 – 50 MHz.

If you mount your scanner in the car, you should purchase a mobile antenna as well. Various antennas have gain characteristics, so check the specs on any antenna before you buy. Sometimes the design of the antenna and how it will look on your vehicle will influence your decision more so than how it will perform. A gain mobile antenna will likely have a base or center-loaded coil to electronically increase the length of the antenna. Mobile antennas come in the following varieties: trunk mount, magnetic mount, cowl mount, roof mount (in other words, you drill a hole to mount it), rain gutter mount, mirror mount (for trucks), on-glass mount

for windshields or windows, and just about any other configuration you can think of.

Base antennas can be mounted on a mast, on the eave, on an exhaust pipe, strapped to the chimney (remember that soot and chemicals from the chimney can adversely affect the performance of any antenna), side-mounted on a tower, tripod mounted on the roof, etc. If gain is important to you, check the specs! Some scanner antennas will only cover through UHF, and aren't designed for 800 MHz and higher coverage. One tip: If a single band is more important to you than having an antenna that covers all bands, con-

SCANNER FREQUENCY CHART

Some frequencies are used just about anywhere in the United States. Here are a few frequencies you should find active in your area, no matter where you live.

(All frequencies in MHz)

27.065 - CB Channel 9, used for emergencies. Monitor in the AM mode.

27.185 - CB Channel 19, the calling channel (if you can stand all the chatter and nonsense).

29.6 - Nationwide simplex calling frequency for hams on the 10-meter band. Monitor in narrow FM mode. You'll hear hams from all around the hemisphere when conditions are right.

52.525 - Similar to the above frequency, but in the 6-meter ham band.

143.625 - Soviet MIR space station crew. Monitor in narrow FM mode and brush up on your Russian.

146.52 - The most popular ham simplex frequency, this is in the 2-meter ham band. Almost every ham has capability to operate on this frequency.

148.15 - Used by the Civil Air Patrol for both simplex operations and as a repeater output. This is a good frequency to keep in your scanner if a CAP unit operates nearby.

151.625 - Itinerant businesses use this channel while moving around the United States. If a show comes into your town, they'll likely be using this frequency for some purpose.

154.280 - Used in many areas of the nation for mutual aid by fire departments.

154.570 - Limited to two watts for business users. Some interesting folks can show up here, not to mention fast-food restaurant drive-through windows.

154.6 - Same as 154.57 above.

155.34 - Used in many areas of the country for ambulances to call hospitals while they are en-route with patient information.

155.37 - Used for point-to-point communications in many areas by police agencies. All-points bulletins are a common use of this frequency.

155.475 - The nationwide police emergency mutual aid frequency. Used today in almost all areas for police mutual aid communications.

156.8 - Marine Channel 16 for calling and emergencies. If something is going on in the water, you'll hear it here first.

157.1 - Coast Guard bulletins and information broadcasts to mariners.

162.4 - National Weather Service broadcasts 24 hours a day. Also on 162.475 and 162.55, as well as some additional adjacent frequencies.

165.375 - Secret Service "Charlie" channel. Used almost on a full nationwide basis for various day-to-day activities.

166.4625 - Treasury Department common frequency. Used by agencies such as Secret Service (X-ray channel), Customs and Bureau of Alcohol, Tobacco and Firearms (F-4).

167.05 - Federal Communications Commission uses this frequency as a repeater output and for simplex communications on a nationwide basis.

167.5625 - FBI, F-4 common frequency. Every FBI radio has access to this frequency, anywhere in the U.S.

223.5 - Hams use this simplex frequency.

415.7 - Hear phone calls being placed from Air Force One and other executive aircraft in the White House fleet.

446.0 - The UHF simplex frequency for hams.

462.675 - The nationally adopted emergency and motorist assistance frequency used by public service teams in the General Mobile Radio Service band.

464.5 - Another popular itinerant business channel, similar to 151.625.

464.55 - Same as 464.5.

866.0125, 866.5125, 867.0125, 867.5125, and 868.0125 - Public safety mutual aid channels in the new 800 MHz public safety band.

sider buying a ham antenna designed for the band you want to listen to. For instance, if almost all the scanner activity in your area is on VHF high band (148 - 174 MHz), consider buying an antenna designed for the 2-meter ham band. Ham antennas usually cost less than the commercial version for two-way radio users and work superbly. If you're running more than 50 feet of coax between your radio and the antenna, be sure to use a good quality low-loss coax. By using a cheap cable with a lot of loss, the best antenna in the world will function poorly, because the signal will be greatly diminished before it reaches your radio.

A Look at Clubs

The best bet for scanner enthusiasts who are interested in getting the most from the hobby is to join a local-based scanner club. There are many across the nation, with new ones forming all the time. Some have come and gone and some have tried to chew off more than they can handle, losing the attention of their members.

Most scanner clubs publish a monthly or bimonthly newsletter with frequency updates and lists, code lists, unit numbering schemes, listening tips, information exchange, etc. Many of the larger clubs meet on a regular basis, from monthly to annually. If you want to find out more information, check the classified ads in the back of *Popular Communications*, or even consider placing an ad yourself to see if any other scanner enthusiasts in your area are interested in starting a club, too. You'd be surprised at how many share your interest in the hobby. Here are a few of the larger regional clubs that might be of interest. Be sure to send a self-addressed, stamped envelope for a reply.

• Northeast Scanners (serves New Jersey, New York, Pennsylvania, Delaware, Maryland, District of Columbia, Maine, Connecticut, Massachusetts, New Hampshire, Rhode Island, Vermont and Virginia) Sample copies of *Northeast Scanning News* are available for $2 check made payable to Les Mattson. Contact: NESN, Les Mattson, 212-I West Broad Street, Paulsboro, NJ 08066-1653.

• Chicago Area Radio Monitoring Association (serves Chicagoland and nearby states such as Indiana and Wisconsin, as well as the entire state of Illinois). For subscriptions, send $5 cash only to: Kurt Stoudt, 2625 North Forest, Arlington Heights, IL 60004.

• Capitol Hill Monitors (serves Washington, D.C. and surrounding areas of Maryland, Virginia and southern Delaware and serves as a supplement to NESN, above). For information contact: Alan Henney, 6912 Prince Georges Avenue, Takoma Park, MD 20912 (for Washington area), or Arnold Miller, 407 Foxview Court, Reisterstown, MD 21136 (for Baltimore area only).

• All Ohio Scanner Club (serves Ohio, as well as surrounding states of Illinois, Indiana, Kentucky, Michigan, Pennsylvania, West Virginia and Ontario, Canada). For sample issue of the *American Scannergram*, send $2 to: Dave Marshall, Managing Editor, All Ohio Scanner Club, 50 Villa Road, Springfield, Ohio 45503-1036.

• Bay Area Scanner Enthusiasts (serves the greater San Francisco Bay area). For club information and information on the *Listening Post* newsletter, send $1 and a business-sized, self-addressed stamped envelope to: Herman Frisch, BASE, 1465 Portobelo Drive, San Jose, CA 95118.

• Toledo Area Radio Enthusiasts (serves the immediate Toledo, Ohio area for both scanner and SWL hobbyists). For information contact: Ernie Dellinger, 6629 Sue Lane, Maumee, Ohio 43537.

• Radio Monitors Newsletter of Maryland (serves scanner and shortwave listeners in Maryland). For information, write to: RMNM, Ron Bruckman, P.O. Box 394, Hampstead, MD 21074.

• Frequency Fan Club (publishes monthly publication for race buffs who like using their scanners at auto races). Annual dues are $30. For information, write to: *Race Scanning Monthly*, Frequency Fan Club, P.O. Box 991, Mulberry, FL 33860.

• Hawkeye Scanning Group of Iowa (serves the state of Iowa only) is a newly formed group. For information, send a self-addressed, stamped envelope to: SCAN-Iowa, P.O. Box 974-HS, Burlington, IA 52601-0974.

Interpreting The Specs

We've sorted through the terms and buzzwords to provide you, the prospective receiver buyer, with information you need before buying your communicatlons equipment. Naturally, the best test of a receiver is connecting it to your own antenna and using it in your own unique way, but the following information is critical in your buying decision. We don't intend this section to be your sole source of information when buying a receiver; but used in conjunction with the information elsewhere in our Guide and advertisements from manufacturers and dealers, it provides you with information to make your buyIng decision easier.

•**Frequency range**—Very simply, this tells what bands and frequencies within specific bands are covered in the receiver. Be sure to compare frequency ranges mentioned in the various articles in our Guide with the specs.

•**Sensitivity**—Always given in **microvolts**, the lower the figure, the better. For example, .6μv (microvolts) is better than 1 microvolt; .5 microvolts is better than .8 microvolts. A good definltion of sensitivity is a receiver's ability to take a very weak signal at its input (the antenna) and deliver an intelligible signal at the speaker.

The sensitivity rating Is *qualified* by stating how many microvolts are required to provide 12dB SINAD in scanners and UHF/VHF receivers, or how many microvolts are required to provide 10dB S/N in communicatlons receivers. Some specifications for scanners and UHF/VHF receivers will note how many μv are required for 20dB quieting, however this method is somewhat inferior to the SINAD rating developed by the Electronics Industries Association (EIA). SINAD comes from **S**ignal, **N**oise, **a**nd **D**istortion, 20dB quieting determines the input level required to provide a 10dB signal-to-noise ratio at the speaker. *In all cases, the lower the sensitivity in microvolts, the better.* Remember too, with better sensitivity comes **intermod**, a condition that allows unwanted signals to show up In places they don't belong, especially in larger metro areas of the country.

•**Selectivity**—This is a major criteria. Selectivity is the receiver's ability to hear one signal while eliminating adjacent signals. Here, measurement is expressed in decibels (dB). The *higher* the figure, the better. For instance, 60dB selectivity is better than 50dB selectivity. Simply look for a higher dB figure when comparing selectivity figures.

A receiver rated with selectivity at 7dB for ±7.5 kHz means signals beyond 7.5 kHz away from your center frequency will be rejected/reduced at least 7db below the carrier. A good receiver will have a selectivity swltch, enabling the user to reduce or eliminate unwanted adjacent frequency stations.

• **Audio output**—In order to have adequate volume from the radio's speaker, a measurement expressed in watts (W) is given. For some scanners, particularly handheld scanners that must use small speakers, the power is given in milliwatts (mW or one one-thousandth of a watt). In a base or mobile installation, look for audio output of 1W or more. The higher the figure, the better. In the case of handheld receivers, for example, 300 mW is better than 200 mW. (Don't forget that operating your equipment at higher volume runs your batteries down faster).

• **Power requirements**—While many receivers (particularly scanners) can be powered from a car 12 V battery for mobile installations, typically 110 Vac is used for base installations. If you're buying a communications receiver and plan on traveling out of the U.S., it's a good idea to ensure your receiver has a **voltage selector switch**. You simply flick a switch corresponding to the voltage in the country you're visiting.

To recharge NiCds in your scanner in countries that use 220 volts, you'll need a step-down transformer. Some scanners allow you to charge it's batteries in the car by using an optional cigarette lighter plug. It's a handy feature if you do a lot of travelling. With some scanners it's included, and with others, it's an inexpensive accessory.

• **Display**—Make sure you're able to read the display in the dark, or dimly lit room. Some liquid crystal displays (LCDs) and light emitting diodes (LEDs) vary in intensity. Can you read the display in bright sunlight?

• For communications receivers, is there a **notch filter**?—Useful if you'll be doing DXing with your receiver. It effectively can remove unwanted heterodynes (loud high-pitched noise from two signals in close proximity) from a desired signal.

• **A noise blanker switch**?—Avaivable on many receivers, it can effectively reduce or eliminate pulse type ignition noise.

• **RF attenuator switch**—This switch, labeled in dB can effectively reduce strong signals. Today, it's also available on some scanners.

• **Options**—Does your receiver permit such options as additional filters, a voice synthesizer, remote control, VHF converter, computer interface, external speaker or headphones? Always consider the possibility that you just might decide to upgrade your receiver or improve its performance. You might not need them today, but think before you buy, because tomorrow is just around the corner!

Can Laws Affect Your Scanner Use?

Here's Some Food For Thought on Monitoring Rights—and Wrongs!

BY TOM KNEITEL, K2AES

Most things you can think of doing that are enjoyable eventually end up buried under an assortment of regulations, statutes, ordinances, and laws that seek to cause people to seek their pleasures in a manner that best suits the preferences of others. This has come down through history. If you don't know what I mean, ask people who enjoy driving, smoking, hunting, sunbathing, fishing, boating, or flying.

Using a radio—it's one of life's few pleasures performed in the confines of one's own home or car by consenting adults that is affected by laws. Well, you know that if you want to communicate over a ham, CB or business radio, there are regulations; and you need an FCC license to be a ham operator or use a business radio. If you want to install a scanner in a vehicle in many areas of the nation, there are all sorts of state and local regulations demanding you have a special permit issued by law enforcement authorities.

Even just listening has long had a very simple federal law with a "Thou Shalt Not." This is a law that basically states a person may tune in on anything they want to hear, however, in the event they overhear a transmission addressed to someone other than themselves, they can't reveal or profit from its contents, nor can they tell anybody that the transmission took place. In one form or another, this has been around since the earliest days of wireless, and it still exists today as Section 705 of the Communications Act. For years, this law seemed to cover all of the bases quite adequately. The law didn't apply to ham or broadcasting station transmissions.

Cellular phones are sold with the customers being told that there's a federal law that ensures their privacy. Technically, that's true. But, in actual practice, many people listen to these calls, despite the generally unenforceable cellular privacy law.

More Privacy Wanted

Traditionally, it has been the practice within communications, when someone who is communicating by radio desires privacy, it is their responsibility to take steps to transmit their messages in a manner that ensures such security. This has been effectively accomplished by the use of codes, encryption, voice scramblers, directionally beamed signals, use of unrevealed frequencies, unusual transmission modes (such as packet, RTTY, frequency hopping, or satellites), and other techniques or combinations of methods.

With the exception of occasional military, diplomatic, espionage, federal and law enforcement communications, extraordinary attempts to accomplish privacy haven't been commonplace on the airwaves over the years.

For decades, people used 2 MHz band

THE JAPAN RADIO CO.

NRD-535

THE NEXT GENERATION IN HIGH-PERFORMANCE HF RECEIVERS

Once again JRC breaks new ground in shortwave receiver design. The new NRD-535 has all the features SWLs and amateurs have been waiting for. General coverage from 0.1 to 30 MHz in AM, USB, LSB, CW, RTTY, FAX and Narrow FM modes. Advanced ECSS operation for phase-lock AM reception. Variable bandwidth control (BWC). Tuning accuracy to 1 Hz possible with direct digital synthesis. 200 memory channels with scan and sweep operation. Triple Superheterodyne receiving system. Superb sensitivity, selectivity and image rejection. Dual-width noise blanker eliminates impulse noise. Squelch, RF Gain, Attenuator, AGC and Tone controls. Optional RTTY demodulator available. 24 hour clock/timer. Easy to read vacuum fluorescent display with digital S-meter. AC and DC operation. Plus the most comprehensive computer interface found on any radio to date. Call or write today for a full color brochure, price list and dealer information.

JRC Japan Radio Co., Ltd.

MAIN OFFICE: Akasaka Twin Tower (Main), Akasaka 2-chome, Minato-ku, Tokyo 107, JAPAN
Tel.: (03) 584-8836 Telex: 242-5420 JRCTOK J

IN U.S.A.: 430 Park Avenue (2nd Floor), New York, NY 10022
Tel.: (212) 355-1180 FAX: (212) 319-5227 Telex: 961114 JAPAN RADIO NYK

(and presently 161 MHz) marine radiotelephones to make ship-to-shore telephone calls. Since the late 1940's, when 36 MHz and 152 MHz car phone service began, millions of mobile telephone calls were placed. All of these calls have always been easy for anybody to overhear, although those using the marine and car telephones were never concerned about this factor.

In the early 1980's, a new car phone technology burst upon the scene. This was cellular, which uses frequencies in the 869 to 894 MHz range. Although the cellular concept differs in many ways from non-cellular type car phones (now called IMTS car phone service), in at least one respect they are the same. Present generation (analog) cellular phones transmit in the plain FM mode. It's the same as the taxi company and fire dispatchers, pizza delivery services, and hams in the 2 meter band. As such, any person having a receiver capable of scanning 869 to 894 MHz is able to listen to cellular calls, the same as they have been able to listen to marine and other car phone calls for decades.

As soon as the cellular industry realized this, they yelled "foul," and began complaining about the need for cellular phone users to be assured of a "reasonable expectation of privacy." They wanted to be able to market cellular phones in a way that they could convey to their customers the idea that the devices offered the same communications security as, for instance standard "hardwired" home telephones. They felt that if the prospective cellular customer felt that a sea of unseen ears were out there able to hear every call, then maybe they wouldn't sell as many of the phones, or be able to charge very much for the air time.

Voice scramblers were considered but would have added hundreds of dollars to the cost of each individual car phone. Someone then came up with an idea that will certainly go down in communications history as the strangest of them all. They decided to get a law passed that would make it *illegal* to listen to the cellular calls.

It was a novel approach in that it sought to take the burden of ensuring privacy away from those who wanted the privacy, shifting the responsibility of providing that privacy over to others. Observers noted that the airwaves were a public resource, and outlawing the monitoring of certain frequencies because of commercial interests was very low. Others said that if they wanted privacy, the cellular industry would have to incorporate voice scramblers.

There were those who said that such a law would be a violation of First Amendment rights. And, several people pointed out that there wouldn't really be any way to enforce such a law.

What do people talk about over their cellulars? Business deals, personal matters, political strategies and more. And they argue, complain, and scheme and lots more. It's attracted a growing audience of listeners, all of whom are breaking a federal ban on such eavesdropping!

So, when they tried to get this law passed in California, it was promptly laughed right out of the state's legislative halls. The next stop was Washington, DC. This time, the idea was repackaged and spoon fed to a few carefully selected Congressional windbags who would sponsor it as federal legislation.

Under its streamlined look, it was thinly disguised with a lot of nonsense wording that made it *appear* as if it were primarily intended to stop federal agency snooping on private citizens. Under the veneer was the same law, and being pushed by the cellular industry. But, who could be against federal snooping on helpless citizens?

Hearings were held. The FBI, which would have to enforce such a law, said they wouldn't enforce it, except in the most flagrant circumstances, such as blackmail.

The proposed law, somewhat diluted from what the cellular industry had really wanted, finally got shoved through and voted into law along with a lot of other legislation in the final hours of the 99th Congress, which had run two weeks late. The legislators were so anxious to close up shop and go home, they probably would have voted the Man in the Moon into law. They spent exactly 25 seconds discussing this law's intent and merits before rubber stamping it into law as the Electronic Communications Privacy Act of 1986 (Public Law 99-508).

The ECPA essentially says it's illegal to monitor voice paging systems, SCA subcarriers on FM broadcasters, scrambled or coded transmissions, remote broadcast or studio-transmitter broadcast links, private microwave systems, or Common Carriers. A Common Carrier is a communications service available to the general public for hire, such as a car phone.

Tone-only pagers, cordless phones, and systems relating to aircraft or maritime communications are exempted from the ECPA.

The law does *not* make it illegal to manufacture, import, sell, or own equipment capable of receiving the frequencies used by any of the off-limits stations, or modifying equipment to enable it to do so.

Although the ECPA establishes specific penalties for violations, it still remains what is generally thought of as junk legislation and a "toothless tiger." The ECPA generates more fear in respect to what other laws it might open the way for in the future than what the ECPA, itself, represents to the average hobbyist.

A Question of Violations

The ECPA may, in fact, have shot itself in the foot. It attracted a lot of attention to the cellular privacy issue. It made many people wonder what was going on there that required so much privacy, especially after the many years of people chatting openly on car phones.

When stories in the news media began

appearing saying that drug dealers all had cellulars, and that most politicians, show biz types, and other celebrities also had them—well, it made a lot of people think that maybe something was going on that was interesting enough to check out. And, it seems, that there was.

A rather enthusiastic group of listeners are out there who are really just interested in eavesdropping on cellular and other radio-based telephone calls. Call them nosy, call them voyeurs, call them what you will, and they don't seem to care. Let's face it, Americans are great snoops. We've been interested in the inner secrets of the lives of others ever since partyline telephones were used more than 90 years ago. And when the neighbors are having a good shouting match, we don't slam down our windows, we stand closer so we don't miss a single word.

This is also why we watch TV soaps, and voraciously read every last gaudy supermarket tabloid. What can I say, by nature, we like to know other peoples' business. Cellular phones offer it all in a never ending panorama of real-life drama—romance, comedy, complaints, big deals, family problems, cheating, arguments, tragedy and more. It's as easy to hear as a police or fire dispatcher, and to add spice, it's all illegal to monitor. What could be more inviting? It's a dream come true for many people, and it's as typically American as apple pie, baseball, '55 Chevys, and junk laws that can't be enforced!

There are those who spend hours upon hours every day tuned in to all of this. There is, for the most part, little chance that anybody will ever be willing or able to come into their homes in order to collect evidence of ECPA violations, then press that evidence in a federal trial.

Ethical?

Some have said that, still, it's tacky and unethical to listen in on the conversations and affairs of others like this. Those who listen point out that they agree that it would be true if they had dragged a chair over to the window of a neighbor's house in order to stand up and peer through their window to see and hear what's going on inside the privacy of the neighbor's home.

But this, they claim, is quite different. They are sitting in their own homes monitoring a scanner, which is a passive device. They aren't going out and seeking information on the lives of others. But other people have purchased radio transmitters that send out unscrambled signals on public airwaves. Those signals cross people's property lines and enter their homes without permission. If people wish to sit in their homes with a passive device and examine those uninvited signals, they should hardly be accused of doing anything either unethical or illegal.

In 1929, U.S. Secretary of State Henry Stimson complained about governmental espionage activities, observing, "Gentlemen do not read each other's mail." But, even the official ethics of our own government would indicate otherwise, for Uncle Sam himself, is the world's greatest, and most proficient eavesdropper on the telephone calls of others. Aside from those taps on hardwired phones of citizens under surveillance for various reasons, the government routinely monitors certain terrestrial microwave relay towers used for long distance telephone calls. This, to say nothing of a huge network of secret satellites, ground stations, aircraft, and ships used to listen in on private diplomatic, military, commercial, and personal telephone calls, FAX'es, telexes and other communications from around the world, including from friendly nations. We are also the world's busiest codebreakers! So much for the ethics of respecting the privacy of others' communications.

The Radio Paparazzi?

To be sure, the vast majority of private citizens who monitor cellular calls are doing it for their own personal amusement and/or amazement. Nevertheless, there are those tuned in who aren't satisfied with simply taking it all in for the sheer entertainment value.

There is a thriving bootleg tape underground of cellular calls made by well known persons. They are taped by those who keep an ear peeled for such calls, and have a sixth sense for when to find them. When one is stumbled upon, it is promptly recorded.

What becomes of these tapes? Some recordists file them away for their own personal review, like putting snapshots of celebrities in a scrapbook. Some make copies and swap them with other collectors. Who knows how many copies and dubs of a single juicy tape might eventually be made and sent out? Undoubtedly, by now there surely must have been instances of persons having been blackmailed by unscrupulous persons having access to such tapes.

At least some recorded cellular conversations have turned up sold or given to the news media, or used as political hot potatoes.

In July of 1990, recorded cellular conversations forced the resignation of Stuart (Bud) Smith as British Columbia's attorney general. A reporter received six or seven tapes containing conversations that raised a number of questions concerning some policies and strategies that were thought to be questionable.

In the fall of 1990, there was a big flap in Massachusetts when a reporter got a copy of a tape recorded cellular call between political candidate Jim Rappaport and his campaign manager talking about the opposing candidate.

Around the same time, in Atlanta, a married couple who worked in local political campaigns were found to have about 300 tape recorded cellular conversations of elected officials. The tapes, which had been spliced and edited, were said to contain very salty language, as well as intimate personal revelations, and apparently some questionable dealings. The FBI was investigating, although the couple's attorney said he was prepared to bring a challenge to the constitutionality of the ECPA if his clients were ever prosecuted.

In March of 1991, Massachusetts again activated with a vivid taped cellular conversation of Steve Grossman, Chairman of the Democratic State Committee. Someone sent a reporter a tape of Grossman talking to one of his aides about some payments to a consultant.

In the spring of 1991, headlines appeared claiming the existence of taped cellular conversations of Virginia's Governor Douglas Wilder concerning the personal life of Virginia Senator Charles Robb, with whom Wilder had been having a political feud.

Obviously, such instances (within the USA) are the types of violations of the ECPA that the FBI would be most likely to pursue if, indeed, the agency decided to test the law. If the identity of the person who made such a recording could be determined and proven, there might well be sufficient evidence for the government to pursue a case.

An attempt to knock down the ECPA by claiming that it is unconstitutional might work, but would be lengthy, complex, and very costly. My own personal view is that, while the ECPA is as stupid a law as it is frightening, I have very little sympathy for anybody who gets caught passing around cellular tapes to the news media, politicians, other recordists, or anybody.

Will the ECPA Stand?

Chances are that the ECPA is here to stay. We'll be lucky if something even worse doesn't come along next year. When governments begin restricting what citizens can hear (for whatever reason) then it's something to be concerned about.

How far is it from the ECPA to commercial interests getting the government to tell you which TV channels you can't watch—and which books you can't read?

Shortwave Tuning Guide

BY GERRY DEXTER

This shortwave tuning guide has been prepared to help you hear some of the major shortwave broadcasting stations on your shortwave receiver. There are several important things to note before using the listing.

Station Schedules

The operating schedules of most international broadcasters undergo what often seems almost constant adjustment, sometimes wholesale change. This is necessary to take advantage of the seasonal and year-to-year changes in shortwave propagation conditions which determine how well a signal is received in the intended listening area. Because of these changes, it is impossible to provide a complete and permanent listing of the frequencies each broadcaster is using or may use at any given moment. Some broadcasters use only a few frequencies which stay relatively stable, while others have dozens from which they can choose. The frequencies on this list include those currently in use and those which have a history of frequent use. It's important to note that many broadcasters will not have all of the listed frequencies in use at any one hour. Thus, you should check the listed frequencies to see which are active and providing the best reception.

Most Use English

The broadcasts listed here are all in **English** and many of them are intended for reception in North America. There are any number of stations on the air which use English at least some of the time, although many are not easily heard. Still, other shortwave broadcasters do not air any English at all. Some of the broadcasts listed here have altered air times on weekends or are not on the air on weekends.

Times are given in Co-ordinated Universal Time (UTC) and indicate the *starting* time of the English broadcast. Some

Shortwave Tuning Guide

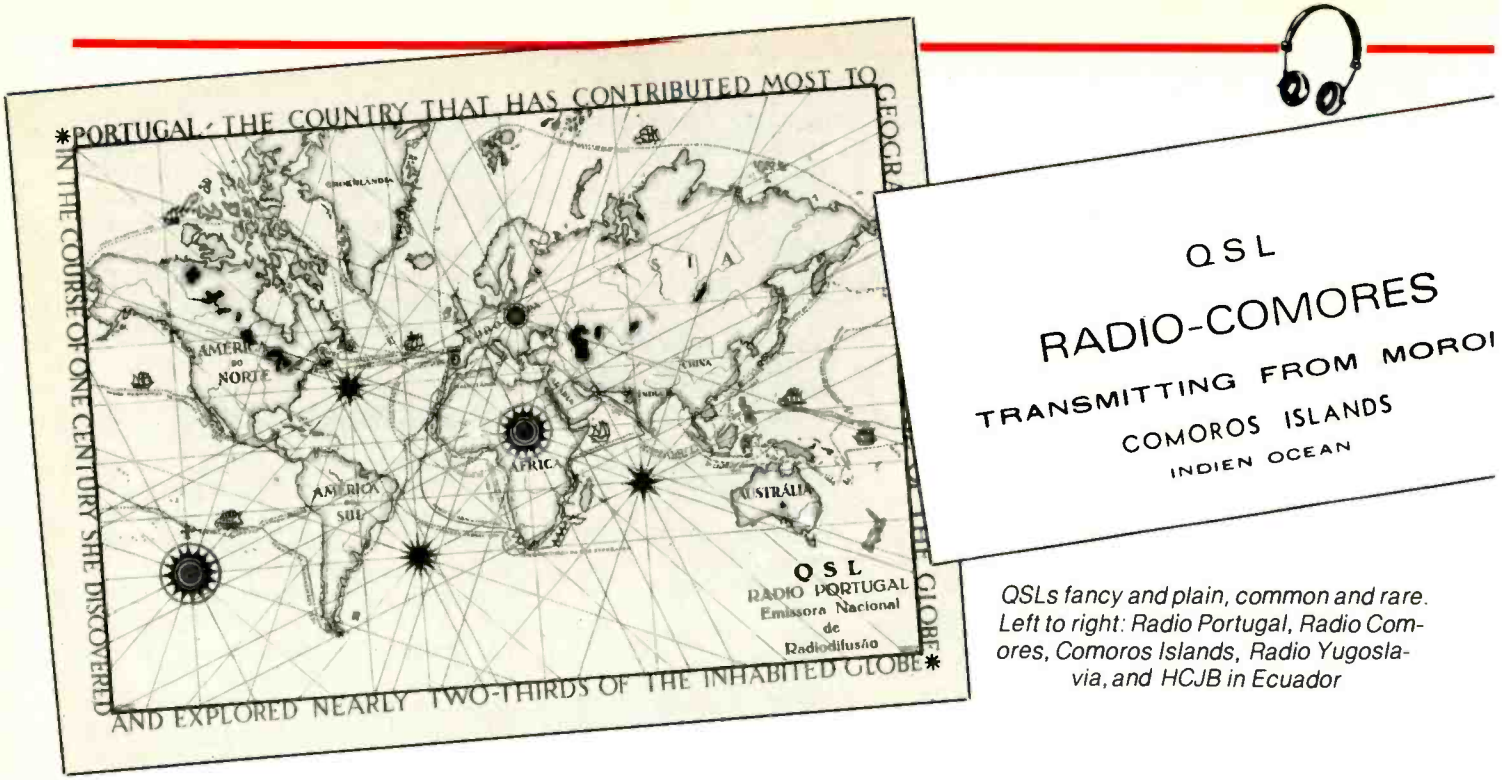
Country/Station	Rating/Time	Frequency
Albania, Radio Tirana	(C) 0230, 0330	9580, 9760, 11825
Australia, Radio Australia	(A) Early mornings	5995, 9580, 9770, 17630
Austria, Radio Austria Int'l	(A) 0130, 0530	6015, 9870, 9875, 13730
Belgium, Belgian Radio & TV	(C) 0030	13675, 13720
Brazil, Radiobras	(C) 1200	11745
Canada, Radio Canada Int'l	(A) 2100, 2330, 0530	9635, 9755, 11855, 11955, 17875
China, Radio Beijing	(B) 0000, 0300, 0400, 1200	9665, 9670, 9690, 9770, 11600, 11660, 11695, 11715, 15450, 17855
Costa Rica, Radio For Peace Int'l	(B) 24 hours	7375, 13630, 15030, 21565
Cuba, Radio Havana	(A) 1900, 0000	9505, 11760, 11820, 11950, 15140, 17705
Czechoslovakia, Radio Prague Int'l	(C) 0000, 0100, 0300, 0400	5930, 7345, 11685, 11990
Ecuador, HCJB	(A) 0030, 1600	9745, 15155, 17890, 21480
Egypt, Radio Cairo	(C) 0200	9475, 9675
England, BBC	(A) 24 hours	5975, 6175, 7325, 9410, 9515, 9590, 9640, 9915, 11750, 12095, 15070, 15220, 15260, 15400, 15575, 17640, 17705
Finland, Radio Finland Int'l	(B) 1100, 1330, 1400, 2300	15185, 15400, 21550
France, Radio France, Int'l	(A) 1230, 1400, 1600	9805, 11670, 15195, 17620, 17650, 21635
Germany, Voice of Germany	(A) 0100, 0300, 0500, 0600	5960, 6045, 6085, 6160, 9545, 9565, 9670, 11865, 13790, 15390
Greece, Voice of Greece	(C) 0130, 0340	7430, 9395, 9420, 11645
Hungary, Radio Budapest	(C) 0030, 0130	6110, 9520, 9585, 9835, 11910, 15160
India, All India Radio	(C) 1745, 2045	9910, 11620
Israel, Voice of Israel	(B) 0000, 0100, 0400	9435, 11605, 15640, 17575
Italy, Italian Radio & TV	(C) 0100	9575, 11800
Japan, Radio Japan	(A) 0100, 0300, 1100	5960, 6120, 15325
Netherlands, Radio Netherlands	(A) 0030, 0330, 0630	6020, 6165, 9590, 11895, 15390
Netherlands Antilles, TransWorld Radio	(A) 0300, 1100	9535, 11815, 11930, 15345
New Zealand, Radio New Zealand	(B) 2200-1210	9700, 17770
Nigeria, Voice of Nigeria	(C) 0500	7255
North Korea, Radio Pyongyang	(C) 0000, 1100	9977, 11335, 15115
Norway, Radio Norway	(B) 0200, 0500, 1200, 2000	11845, 15165, 15360, 21700
Portugal, Radio Portugal	(B) 0230	9555, 9600, 9705, 11840
South Africa, Radio RSA	(C) 0400	7270, 11920
South Korea, Radio Korea	(C) 1030, 1230	9575, 9750, 11715, 15575
Spain, Spanish National Radio	(B) 0000, 0500	9630, 11880
Sweden, Radio Sweden	(C) 0200, 0330, 1530	9695, 11705, 17875, 21500

Switzerland, Swiss Radio Int'l	(B) 0200, 0400, 1330, 1530	6135, 9650, 9885, 12035, 13635, 21630, 21695
Syria, Radio Damascus	(C) 2005, 2110	12085, 15095
Taiwan, Voice of Free China	(A) 2200, 0200, 0700	5950, 9680, 17750, 21720
Turkey, Voice of Turkey	(B) 2300, 0300	9445
United Arab Emirates	(C) 0330, 1600	15400, 15435
UAE Radio		21605
Voice of the UAE	(C) 2200	13605, 17855
United States Voice of America	(A) 24 hours	5995, 6035, 9575, 9590, 9775, 9815, 11580, 11920, 15205, 15410, 15580, 17800, 21625
Herald Broadcasting/Christian Science Monitor	(A) 24 hours	7395, 9455, 9465, 9850, 11705, 13670, 15300, 15610, 21640
WRNO	(B) 1500-0400	6185, 7355, 13720, 15420
WWCR	(A) 24 hours	7520, 15690
WHRI	(A) 24 hours	7355, 9495, 11790, 15105, 17830
KNLS	(C) 0800, 1500, 1800, 2000	9615, 11715, 11910, 11945
USSR, Radio Moscow	(A) 24 hours	6000, 9685, 9740, 9820, 11655, 11710, 11840, 11950, 12050, 12055, 15140, 15460, 15475, 17660, 17670, 17700, 17810, 17890
Radio Kiev, Ukraine	(C) 0000	11770, 11860, 15180, 17690, 17720
Radio Vilnius, Lithuania	(C) 2300	11770, 11860, 15180, 17690, 17720
Vatican City, Vatican Radio	(C) 0250, 0500	6245, 7250, 7305, 9615, 11620, 11740
Vietnam, Voice of Vietnam	(C) 1000, 1200	9840, 12020, 15010
Yugoslavia, Radio Yugoslavia	(B) 0000, 1200, 2100	11735, 15165, 17740

broadcasts run for just a half an hour (or even less), while others will run straight through for a period of several hours. The Voice of America, Radio Moscow and the BBC operate in English virtually around the clock. Some transmissions might be on the air an hour earlier or later as the seasons change and countries move to or from the observance of daylight savings time.

A Graded Reception Rating

A reception-quality rating has been provided for each station to give you an idea of what the first-time listener might expect. An "A" rating indicates a station which should supply good to excellent reception in North America most of the time. A "B" rating indicates that reception should be fair to good in North America much of the time, while a "C" indicates that reception might be only poor to fair much of the time. These grades, however, should only be considered a general guide. Listeners in the eastern areas of North America will find that reception of stations in Europe and Africa will be better than those in Asia and the Pacific. Listeners in the western part of the continent will find the reverse is generally the case.



QSLs fancy and plain, common and rare. Left to right: Radio Portugal, Radio Comores, Comoros Islands, Radio Yugoslavia, and HCJB in Ecuador

Verifying Reception . . .

The Art of QSLing the Stations You Hear

It's an abbreviation you won't find listed in the dictionary. Yet, for many listeners, getting "QSLs" from the stations they hear is almost as important as hearing the stations in the first place.

BY GERRY L. DEXTER

A **QSL** is a card or letter sent by a radio station to confirm reception of that station. Ideally, it's proof you heard what you claim you heard. Ham radio operators have exchanged QSL cards to confirm their contacts since radio began. If you think stamp collectors or baseball card collectors are serious about their hobby, you haven't met a really serious QSL collector!

QSLs come in all shapes, sizes and formats: fancy, multi-color cards, plain cards, form letters, and sometimes long, personal letters. Often the QSL isn't the only thing included. Listeners might receive station brochures, schedules, picture postcards, tourist brochures, pennants, and bumper stickers. One station has even sent t-shirts!

Many SWLs have spent many years (and many dollars!) building collections from hundreds of stations; many now off the air and some from countries that no longer exist. The last QSLs sent by Radio Berlin International are stamped "Last QSL", marking the last day of East Germany. There's nothing quite like the kick of finding a long-awaited reply in the mailbox!

How To QSL

So, how do you get QSLs? First, of course, you must actually hear the station. While that process is underway you need to be taking notes on what you're hearing. If the station is in English and has a pretty good signal, there's no problem getting program details down on paper. However, if the signal is weak and/or in a foreign language, then you have a much greater challenge. Experienced SWLs learn how to dig through the noise to pull out tidbits of information and how to pick out enough words (people and place names, if nothing else) to get enough details together to form the basis for a report. Thirty minutes of listening is ideal, though sometimes that's not possible. You should have enough program details to convince the station it was their broadcast you heard.

Besides program content, you need to supply several other pieces of information. Your name and address, of course, and the date and time in UTC (GMT) (convert this to the station's *local* time if you

are writing to a small station where they might not be familiar with UTC) are the first ingredients of a successful report. Be sure to include the frequency on which you heard the station. The station will want to know how good reception was, too, so it's important to note whether the signal was strong, fair, or just barely making it to your headphones. Was there interference from other stations (QRM)? If so, it's helpful if you can provide the frequency and name of the interfering station. How about fading (QSB)? Was there static (QRN)? Large stations like to have all this information condensed into what's known as the **SINPO** code. Numerical ratings from 1 to 5 (5 is the best) are given for Signal strength, Interference, Noise (static), Propagation (fading) and Overall quality. Others prefer a simpler, SIO code, which simply leaves the noise and propagation factors out. Small stations should just be provided with a verbal description, because they might not be familiar with these codes. Indicate too, the make or type of receiver and antenna you used.

Station program departments like to know what you thought of their efforts, so it's often a good idea to include some comments on this subject if you can.

Many SWLs also include a small gift; used commemorative stamps, picture postcards, photos of the "shack", tourist literature or stickers from a local radio station, and so on.

The Reception Report

All of this information is presented in what's known as a **reception report**, which might be a letter or a form you fill in, or a form with a cover letter. Writing in English will work with nearly all of the larger broadcasters, but smaller stations in Latin American and Indonesia usually don't have anyone who speaks English on the staff, so it's better to write to those stations in their own language. SWLs usually find someone who can translate a couple of basic letters and enough plug-in words to get by, or they use a multi-lingual report form provided by some SWL clubs. Many also use one of the foreign language reporting books on the market. If you're using a computer or wordprocessor, it's a good idea to keep your original letter on file, so the next time you want to send a foreign language report, you won't have to re-type the basic parts of the letters.

Sending Return Postage

In most cases, its a good idea to send along return postage in some form. International Reply Coupons (IRCs), available at your post office, have been used for this purpose, but are not ideal. A better way is to send **mint stamps** of the country to which you are writing with your reception report. There are dealers who specialize in supplying such stamps. One is William J. Plum, 12 Glenn Road, Flemington, NJ 08822. His number is 908-788-1020. Write or call him for information and a price list.

Many SWLs just tuck a $1 bill inside the envelope, though receiving foreign currency through the mail (or even having it in one's possession) is illegal in many countries. Many of the big international broadcasters don't require return postage at all. Addresses of stations can be found in the annual edition of the *World Radio TV Handbook* and the *World Broadcast Station Address Book*. Also, be sure to read the "Listening Post" column in *Popular Communications* for address changes and other important station information throughout the year. You should always send reports via airmail since surface mail takes so much longer-and the wait for a reply is usually quite long even under the best of conditions!

The Waiting Game

Ah, yes, let's talk about The Wait. The kicker is that there's no guarantee you'll get a reply. Most stations are somewhere between two extremes and reply as the spirit, bureaucracy and politics of the time move them. Going after QSLs wouldn't be as much fun if every station replied every time.

There are a number of steps you can take if it seems you aren't going to get a reply. The most basic and effective of these is the follow-up. That's a copy of your original report (make two or three copies when you do the original) sent out with a **polite** cover letter explaining that you haven't heard from the station. The follow-up process can continue every three or four months for as long as it takes, or as long as your determination holds up.

There are a lot of other moves you can make. Send a new report based on a new reception, or send several fresh reports two or three weeks apart. Make up your own QSL (called a "prepared form card") and send that. Then someone at the station just signs it and sends it back to you. Try addressing your report to a specific title or individual. The WRTVH gives names of owners or main department heads for many stations. Many SWL clubs have QSL columns and give the names of people (verie signers) currently signing QSL cards and letters. Another technique is

Continued on page 143

Sport of Kings!

Having Fun With Ham Radio

Getting into the hobby has never been easier! Here's your ticket to getting on the air.

BY FREDERICK O. MAIA, W5YI-VEC

What do EA@JC, JY1 and HS1A all have in common? They are the Amateur Radio station call signs of heads of state! Yes, the kings of Spain, Jordan and Thailand are all ham radio operators. Even our own ex-senator from Arizona, Barry Goldwater is K7UGA. The Amateur Radio hobby is filled with many celebrities . . . Chet Atkins is WA4CZD, Ronnie Milsap is WB4KCG . . . Marlon Brando is licensed at his retreat in French Polynesia as FO5GJ. Did you know that Arthur Godfrey was a ham?

They are joined by some two million "commoners" from all walks of life; plain folks like you and me, who participate in the world's greatest hobby. There are five-year old ham operators . . . and senior citizens in their nineties! One fourth of the world's amateur radio operators are in the United States!

By dictionary definition, an amateur is ". . . a person who engages in an activity for pleasure rather than for financial benefit . . . " That says it all!

In a sentence, ham radio is a hobby of electronic communications. But it is also much more. It is a training ground for our nation's engineers and a volunteer public communications service in times of emergency and natural disaster.

Anyone Can Become A Ham

There are few restrictions! You do have to be licensed by the government, however. This is because Amateur radio offers virtually unlimited communications capability. Hams may operate their own international short wave stations, two-way over-the-air television, crystal clear FM, two-way computer-to-computer stations (using radio instead of the phone modems), lash their radio stations to the phone lines and even contact other hams worldwide through orbiting satellites that the Amateur community owns!

Amateur radio has been around since the beginning of electrical communication. The first radio pioneers were, of course, amateurs. There were no professionals around when Guglielmo Marconi sent and received his first radio signals around the turn of the century. He inspired hundreds of other amateurs to experiment with radio. Formal licensing of Amateur Radio operators began in 1912. It is a fact that most communications breakthroughs have been made by ham operators, including the discovery that radio signals could be bounced off the sky only to return to earth loud and clear thousands of miles away.

Amateurs use several segments of the radio spectrum which is shared with all other radio services . . . such as broadcasting, business, and police radio. The licensing procedure exists for the same reason a private pilot must be licensed. There are certain things you need to know to avoid harm to others.

Up until a few years ago, you had to take a very detailed technical, rule and Morse code examination before a Federal Communications Commission engineer. But no more. Today, getting a ham ticket is certainly easier than qualifying for an automobile driver's license! Times have changed and more reliable and easier to operate equipment is now available. Few hams today actually build their transmitting equipment.

To be FCC licensed as a ham today you need only answer 41 out of 55 multiple choice questions. That's right! There are no other conditions. You simply study a large pool of questions and explanations covering nine different topics. (See **Table 3**) The test you take is now given in nearly every large city by other senior level ham operators. All questions and their answers are known and widely published.

Amateur radio exists in nearly every country in the world. They are found on essentially the same frequencies as a result of international treaties and government regulations. Ham radio operators in the United States are licensed and regulated by the Federal Communications Commission, the government agency charged with regulating all telecommunications. The International Telecommunication Union (ITU), a United Nations agency headquartered in Geneva, Switzerland, is the worldwide governing body over telecommunications.

The FCC Amateur Service regulations state that Amateur Radio is a hobby of self-education and emergency preparedness. It is to our country's benefit to have a reservoir of trained operators, technicians and electronics experts. Amateurs are the best good will ambassadors this country has!

There is a very big difference between Amateur and Citizens Band radio. For one thing, you don't need a license to be a CBer. Beginning hams may operate with up to 1,500 watt power levels on many bands in every mode imaginable. Citizens band radio is restricted to short distance business or personal communications on one band with four watts. CB was really created in the mid-1950's to provide radio communications for small business. Amateurs may communicate with anyone, anywhere. Transacting business, however, is expressly prohibited in the Amateur Radio Service. Amateur radio must remain a non-pecuniary hobby.

Amateurs of all countries have their own unique station call sign as an aid to radio rule enforcement. Foreign countries are identified by their call sign prefix; while "K", "W", "N", and certain prefixes beginning with "A" are internationally allocated to the United States. Call

Excuse me, but do you like having ears?

Think about it...you, sitting at home, listening to the pilot of that airplane that just flew overhead. I'm talking about radios-- not stereos, but radios-- able to hear everything from police and ambulances in your town all the way to broadcasts from Moscow, all from your own home! That's right, and it doesn't even require a license.

Grove Enterprises is here to help you on your way to the fascinating hobby of scanner and shortwave listening.

If you have ears and enjoy using them, let us entice you.

Write or call us today for your free catalog.

Grove Enterprises Inc.
140 Dog Branch Road
Brasstown, NC 28902
1-800-438-8155

Wait...There's More!

Monitoring Times...What more is there to say?

As the leading magazine for shortwave and scanner hobbyists, from it's upbeat news to it's up-to-date frequency lists, Monitoring Times is one listening tool you can't afford to be without. Join 30,000 other subscribers who are enjoying the benefits of unparalleled writing and reviews.

Don't delay any longer. Order your subscription today.

- International Broadcasting
- Utility Monitoring
- Frequency Lists
- Ham Radio
- Broadcasting Schedules
- Scanning
- News And Features
- Interviews With Experts
- Electronic Projects
- Equipment Reviews
- Listening Tips
- Shortwave And Longwave Listening

1 year for only $19.95 (US)

Have your Mastercard or Visa card ready and call:

1-800-438-8155

or write us at:
Monitoring Times
PO Box 98
Brasstown, NC 28902

MONITORING TIMES

For a sample copy of Monitoring Times, send $3.00 to the above address.

signs contain a numeral after the international prefix which indicates the geographical area in which they are licensed. (See **Table 5**) Hams can readily identify the origin of DX signals they hear by the call sign prefix.

Becoming A Ham Radio Operator

While many ham clubs have Amateur Radio license preparation classes, most newcomers to the ham radio hobby simply study the required material on their own. The best source of information about amateur radio will be from the local ham in your neighborhood. Hams are always eager to help beginners enter the hobby. Newcomers are the life blood of Amateur Radio.

Once you are familiar with the required material, a local volunteer examining (VE) team will be glad to administer the license tests to you. There are thousands of VE's in all parts of the country! One is bound to be near you! There are presently two different amateur examination programs; Novice entry-level and the VEC System, which examines all amateur classes above the Novice.

There are *five* different Amateur Radio license classes; two of which are considered entry level. Most newcomers today enter the hobby as a Technician Class operator which does not require knowledge of the international Morse code. You need only pass two short multiple choice tests to become a Technician. The code-free Technician Class has only been in existence since February 1991 and is now the most popular entry level by far! The other beginning class, the "Novice" level, requires Morse code proficiency at five words-per-minute and passing one 30 question multiple choice exam.

Amateur radio licensing is based on the incentive system. Hams qualify for higher class licenses which yield more frequencies and privileges when they gain more knowledge and operating skills which is demonstrated by passing a test. There are three amateur operator levels above the beginning Technician and Novice class. They are the General, Advanced and Amateur Extra Class tickets. All Amateur licenses carry a ten year term and may be renewed indefinitely without cost or re-examination. There is no examination fee to become a Novice. The fee to be tested at the Technician and higher class level is around $5.

Learning the Morse Code

International regulations still require that amateur operators know the Morse code when the radio operation takes place on the short wave bands below 30 MHz. This is because the various nations of the world took the position years ago that the code is still needed in emergency situations. This requirement is certain to be eliminated at some point, since the International Maritime Service is now eliminating the telegraphy requirement for professional radio officers aboard ocean-going vessels. It is illogical to require Morse code proficiency for amateurs when the professionals are abandoning it in favor of more reliable emergency communications methods.

Most countries allow their amateurs to operate on the VHF and higher frequencies (those above 30 MHz) without telegraphy knowledge. The United States joined the codeless ham class group last year and it has indeed proved very popular! The new Codeless Technician class allows access by beginners to 2-meters which is the most popular of all the ham bands. Strangely, Japan even permits its code-free beginners to operate at low power on the shortwave bands as well. Japan believes the international radio regulations exist to reduce interference to other services and that their no-code shortwave class does not cause interference to them.

There are many good Morse code teaching courses on cassette tapes and personal computer disks. Beginners can learn the code with just a few weeks of practice. The W5YI Group has a two cassette code course—or a computer course for IBM compatible PC's for only $9.95 plus $1.50 shipping. (Order toll free with a credit card by calling 1-800-669-9594.) Another way to learn the Morse code is by listening to code being transmitted over the amateur airwaves.

Amateur Radio Equipment

Nearly all of today's commercially available ham radio equipment is a combination transmitter and receiver called a

Table 1

§Part 97 Amateur Radio Service Regulations

Subpart A: **General Provisions** concerns those rules concerned with license and station location requirements.
- Purpose of the Amateur Radio Service
- Control operator and station license requirements
- New, renewed or modified license regulations
- Restrictions on operation aboard ships and aircraft

Subpart B: **Station Operation Standards** comprises those standards that apply to all types of amateur station operation including:
- Authorized, prohibited and restricted communications
- Third party and international communications
- Control operator duties and station licensee responsibilities

Subpart C: **Special Operations** contains the requirements that apply to all non-standard operations such as:
- Beacon, auxiliary and remote control stations
- Space, earth and telecommand stations

Subpart D: **Technical Standards** includes the technical parameters:
- Authorized bands, emissions, power levels
- Frequency sharing requirements
- Rules concerning RF power amplifier use

Subpart E: **Emergency Communications** contains the rules applicable to operations in distress and emergency situations:
- Operation during a disaster
- Safety of life and protection of property guidelines
- RACES, the Radio Amateur Civil Emergency Service

Subpart F: **Qualifying Examination Systems** contains the requirements for obtaining licenses:
- Qualifying for an amateur operator license
- Preparing, administering and coordinating amateur radio examinations.
- Novice and VE/VEC Examination Systems

In addition, there are two appendices detailing the places where the amateur service is regulated by the FCC and the various testing regions.

Table 2

Examination Elements that Must be Passed

Amateur Class	Code Element	Written Element
Novice	(A)	2
Technician	(No Code)	2, 3(A)
Tech Plus	1(A)	2, 3(A)
General	1(B)	2, 3(A), 3(B)
Advanced	1(B)	2, 3(A), 3(B), 4(A)
Extra Class	1(C)	2, 3(A), 3(B), 4(A), 4(B)

Test Element	Written Test Element Covers	Total Questions	Passing Mark
2	Novice Theory, regulations, procedures	30	22
3(A)	Technician Theory, regulations, procedures	25	19
3(B)	General Theory, regulations, procedures	25	19
4(A)	Advanced Theory, regulations, procedures	50	37
4(B)	Extra Class Theory, regulations, procedures	40	30

Written test questions must relate to the privileges accorded.

Morse Code Test Element Covers

1(A) 5 word-per-minute Morse Code Receiving Test
1(B) 13 word-per-minute Morse Code Receiving Test
1(A) 20 word-per-minute Morse Code Receiving Test

Code test must be sufficient to prove that the examinee has the ability to receive by ear texts in the international Morse code at the prescribed speed, using all the letters of the alphabet, numerals 0-9, period, comma, question mark, slant bar and operating prosigns *AR*, *BT* and *SK*.

transceiver. Very few Amateurs use separate receivers and transmitters any more. For high frequency work, you merely attach a coaxial transmission line and an antenna to your rig and you are all set to go. Modern gear is now completely self tuning. Just plug it in and transmit. This is certainly different from the gear of a decade ago that required many manual adjustments.

We are frequently asked what first equipment should a new ham purchase. Assuming that the beginner entered the hobby at the no-code Technician level, our answer is always a two-meter handheld "talkie", as we call such a transceiver. This allows newcomers to immediately communicate on the local FM repeater and get to know the amateurs in the area. A repeater is an automatic station that retransmits local signals at higher power from tall antennas thereby increasing their distance range.

The two meter band is also the favorite haunt of packet (computer-to-computer) hobbyists. Packet station owners use their personal computers and radio modems to communicate with one another keyboard-to-keyboard using the free ham radio airwaves. The modem, technically called a Terminal Node Controller—or TNC for short—allows the computer station to act as a repeater. Signals coming down the computer/radio highway are automatically retransmitted by your station if they are not addressed to you.

This feature has allowed computer hams to establish a very elaborate worldwide network. Amateurs everywhere are sending and receiving messages to other hams across the globe directly from their computers free of charge. There are even Amateur-owned satellite uplink gateways to facilitate delivery to foreign destinations. Packet radio is undoubtedly the fastest growing aspect of the hobby today. Even beginners may participate since most packet activity takes place in the VHF and higher frequency bands where the code-free Technician is allowed to transmit.

Many newcomers want to talk to foreign countries and "shoot skip." Although there are times when this can be accomplished on the six meter band which is authorized to the Technician, as a general rule this requires at least a Novice ticket (and five word-per-minute code proficiency.) For this we recommend a high frequency transceiver capable of ten meter operation. While a directional beam antenna is preferable, a simple wire dipole strung between two trees will do. Reasonably priced two-meter and ten-meter gear is available from local ham equipment outlets, even from your neighborhood Radio Shack store!

Amateurs can often find used equipment at ham flea markets. Converting military surplus radio equipment used to be an economical way of getting on the air, but surplus gear is getting increasingly harder to find. Some firms offer amateur radio equipment in easy-to-construct kit form, although this is also getting hard to find. The advantage of kits is that you gain valuable building experience and are better qualified to repair your equipment should it become faulty.

Another question we get asked is how expensive is ham equipment. As in buying a car, the sky is the limit . . . from almost nothing to thousands of dollars. Some innovative amateurs with home brewing ability have maintained worldwide communications with a total investment of less than $100. Depending on the frequency bands, commercially available equipment could cost you anywhere from $200 and $2,000 to get on the air. Radio Shack's excellent two and ten meter gear sells for about $250 each. As a general rule, the more sophisticated the communications mode, the higher the cost.

Table 3

Written Examination Topics

Topic Letter	Sub-Element Description
A	FCC Rules for the Amateur Radio Services
B	Amateur station operating procedures
C	Radio wave propagation characteristics of amateur service frequency bands
D	Amateur radio practices
E	Electrical principles as applied to amateur station equipment
F	Amateur station equipment circuit components
G	Practical circuits employed in amateur station equipment
H	Signals and emissions transmitted by amateur stations
I	Amateur station antennas and feed lines

Amateur Operating Privileges

Hams have their own jargon! It is quite

different from that of the Citizens Band. While CBers have adopted the language of the road, Amateurs pattern their communications after that of the professional radioman. We recommend that you spend as much time as possible just listening to the ham bands to absorb some of the correct operating procedures. Chatting on the two meter band is quite different from that of the lower DX ham bands. Some countries, such as the Soviet Union, require their amateurs to first listen extensively to the ham bands before getting on the air. It is a very good idea!

Every amateur; newcomer and experienced alike, must be thoroughly familiar with the FCC regulations governing the Amateur Radio Service. These are contained in §Part 97 of the Code of Federal Regulations which has the force of federal law. Failure to adhere to these rules can result in severe fines and even imprisonment! The §Part 97 Rule Book can be completely read in just a few hours and is available from The W5YI Group, P. O. Box #565101, Dallas, Texas 75356 for only $2.95 postpaid. §Part 97, completely rewritten by our government in 1989, details everything you can and can't do on the amateur airwaves. You are required to know everything that is in the rules before transmitting! It consists of six sections. (See **Table 1**)

Table 4

Questions in Each Pool and Number to be Selected by Sub-element

Topic Letter	Element 2 Novice Questions in Pool	to Select	Elem. 3(A) Technician Questions in Pool	to Select	Elem. 3(B) General Questions in Pool	to Select	Elem. 4(A) Advanced Questions in Pool	to Select	Elem. 4(B) Extra Class Questions in Pool	to Select
A	111	10	63	5	46	4	66	6	115	8
B	48	2	30	3	35	3	10	1	21	4
C	18	1	30	3	30	3	20	2	12	2
D	44	4	44	4	50	5	40	4	27	4
E	44	4	34	2	41	2	100	10	65	6
F	21	2	37	2	11	1	60	6	36	4
G	20	2	17	1	10	1	100	10	69	4
H	23	2	28	2	22	2	63	6	44	4
I	39	3	42	3	41	4	48	5	49	4
Total	**368**	**30**	**325**	**25**	**286**	**25**	**507**	**50**	**438**	**40**

Question pools are updated on a three year cycle. Question pools were revised last year due to the implementation of the new Codeless Technician license class by the Federal Communications Commission.

There are four station call sign groupings. Technician class amateurs are usually issued 1-by-3 format call signs from Group C. That is one prefix letter followed by a regional call sign area number and three suffix letters, for example: N1AAA. Novice beginners are issued 2-by-3 format station call signs (such as KA1AAA) from Group D. (See **Tables 5** and **6**). You can frequently tell an amateur's class of license by his call sign format. Amateur radio licenses are normally received about six to eight weeks after passing the requirements.

Amateur Radio Operator Testing

All ham operator examinations are now conducted by volunteer examiners who hold senior level Amateur Radio licenses. They are accredited to administer the examinations by VEC's—Volunteer Examiner Coordinators. VEC's are commissioned by the government to act as the liaison between the Amateur testing and license issuance function. The W5YI Group is a VEC and manages over 600 testing teams and 10,000 examiners throughout the world.

Volunteer amateur self-testing started to take shape in the early 1980's when the FCC began abolishing most of its commercial radiotelephone licensing program. The government eventually turned their commercial radio technician licensing program over to industry groups. In an effort to conserve FCC resources, a general trend towards "privatizing" many of their functions resulted, including amateur radio operator testing.

The FCC issues the operator license at the direction of the VEC testing system. Most examination sessions are now conducted evenings or during the weekend and are more readily accessible to applicants. You can usually locate a test session by asking any local amateur. Applicants apply to take an examination by completing FCC Form 610, Application for Amateur Radio Station and/or Operator license available from the FCC (P. O. Box #1020, Gettysburg, PA 17326.)

The Amateur Examinations

As I mentioned, there are two entry level license classes. The written exami- 3A requires getting 19 questions correct out of 25. Applicants who pass one, but not both elements, receive a "credit" certificate for the element passed. They have a year to pass the remaining examination for the Technician license consists of passing two (Element 2 and 3A) multiple choice tests. Element 2 contains 30 questions (22 right passes); Element

Table 5

Amateur Call Sign Areas

Number	Areas
1	Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut.
2	New York, New Jersey
3	Pennsylvania, Delaware, Maryland, District of Columbia
4	Virginia, North and South Carolina, Georgia, Florida, Alabama, Tennessee, Kentucky, Puerto Rico and the U.S. Virgin Islands.
5	Mississippi, Louisiana, Arkansas, Oklahoma, Texas, New Mexico
6	California, Hawaii
7	Oregon, Washington, Idaho, Montana, Wyoming, Arizona, Nevada, Utah, Alaska
8	Michigan, Ohio, West Virginia
9	Wisconsin, Illinois, Indiana
0	Colorado, Nebraska, North and South Dakota, Kansas, Minnesota, Iowa, Missouri

FOR YOUR EARS ONLY

1 **Top Secret Registry of U.S. Government Radio Frequencies (25 to 470 MHz), 7th Edition,** by Tom Kneitel. Big 240-page book lists 200,000 frequencies: FBI, ATF, FCC, Treasury, DEA, Customs Service, Secret Service, Border Patrol, Immigration, FAA, NASA, EPA, NORAD, State Dept., Federal Prisons, US Marshal, CIA, National Forests, National Parks, Army, Navy, USMC, USAF, USCG, lots more! Lists all UHF aero (225 to 400 MHz), Plenty of locations, ID's, aircraft rosters & other info. Many Canadian listings, too.....$ 19.95

2 **Official North American Radio Guide (USA/Canada): AM/FM/SW.** Popular 158-page book with 16,000 entries (by location) listing callsign, frequency, & program format. Special section lists stations broadcasting major sports. Another section lists broadcasters giving regular weather forecasts. Handy guide for home or car.....$ 7.95

3 **National Police Frequency Directory.** Covering all 50 states, this giant 651-page book weighs more than 3 lbs. Lists, by location, all state, county, & municipal licensees in the Police Radio Service. Indicates base/mobile frequencies, callsigns, licensee names. Where known, channel designator numbers within systems are listed. Includes 800 MHz systems. This is the biggest police frequency directory ever!.....$ 14.95

4 **National 800/900 Telephone Service Code Book.** Did you know that the 1st 3 digits in all "800" toll-free phone numbers are hidden codes that identify the specific long distance carrier handling the call? Same with "900" toll numbers. Also, there are hundreds of "CIC" 3-digit codes used to dial-up direct access to facilities of 600 long distance service suppliers. This includes private access codes assigned for the internal voice/data comms of states, federal agencies, military switchboards, emergency networks, banks & credit card companies, satellite & paging services, TV networks, & major corporations. This new book is your guide to all of these codes, more than 1,600, plus info on their use.....$ 9.95

5 **Tune In On Telephone Calls.** A 160-page book explaining the growing (& at times illegal) interest in using scanners and communications receivers to listen in on telephone calls--cellular, cordless, ship/shore, air/ground, IMTS car phones, high seas phones, & many others, also radio pagers. USA/Canada info. Lots of frequencies listed.....$ 12.95

Order these great books by mail now! Enclose $3.50 shipping for 1st book & $1 for each additional book. Sent UPS to 50 states; 1st Class Mail to Canada, AK, HI, PR, APO, FPO. Residents of NY State add 8% sales tax to cost of books & shipping. Big catalog included with all orders.

Since 1967, CRB has been the pioneer & leading publisher of communications books & related material. Our latest complete catalog is available upon request (USA/Canada only).

CRB Research Books, Inc.

P.O. Box 56-X, Commack, NY 11725

Table 6

Amateur Call Sign Formats

Group No.:	Format:	Example:	Issued to:
Group D	2-by-3	KA1AAA	Novice
Group C	1-by-3	N5AAA	Technician, Tech Plus and General Class
Group B	2-by-2	KB7AA	Advanced Class
Group A	1-by-2,	W5YI	Extra Class
	2-by-1,	WR9Z	Extra Class
	Certain 2-by-2	AA6FN	Extra Class

Note: A 2-by-3 format call sign has two prefix letters, a call sign area number plus three suffix letters.

nation before they must be retested on both exams.

All questions are drawn from a large pool and are selected by the examiners according to an FCC specified formula. The questions relate to the privileges, rules and procedures of the Technician Class. The W5YI Group has a textbook called the Ham Radio Handbook which covers the material and questions needed to pass the Codeless Technician license requirements. If you have an IBM computer, you may want to consider the Codeless Technician Software package. Information on these are available by calling our toll-free number; 1-800-669-9594.

The Novice class requires passing a five words per minute code test in addition to the Element 2 written examination. Youngsters usually find the code test easier than the Element 3(A) written examinations. Technicians who pass the 5 wpm telegraphy test are also permitted the high frequency privileges of the Novice class.

In all, there are five written and three code tests covering the five classes in the Amateur Radio Service. Table No. 2 explains the various operator classes and the examinations that must be passed to obtain the various Amateur operator licenses. All of the questions, multiple choices and answers that make up the various question pools are widely published verbatim. (See **Table 4**) All written examinations are drawn from questions on nine topics. Each topic is designated by a letter. (See **Table 3**) There are from 25 to 50 questions in each examination question set that are taken from a pool of hundreds of possibilities.

All code tests consist of an approximate five minute simulated on-the-air Morse code QSO-type transmission. The answer format to the code test is selected by the volunteer examining team. The answer format may be one minute solid copy, multiple choice, or answering seven out of ten questions asked about the text. The VE team probably will not require a telegraphy sending examination.

The FCC has recently adopted special rules for administering code tests to the severely disabled. The handicapped may now respond to a series of sentences, phrases, words or even single letters sent in the international Morse code at 5 words-per-minute. The VE simply stops the code test and asks the applicant to identify the characters transmitted. Doctor certified severely handicapped applicants are also eligible for a code test exemption of the higher speeds.

So there you have it—a complete overview of the U.S. Amateur Radio Service and its testing requirements. Are you interested in joining us? We would love to have you. See you on the ham bands.

POP'COMM's
BOOK BUYER'S GUIDE
(800) 457-7373 8AM-5PM EST
CALL TOLL FREE

AMERICAN EXPRESS VISA MasterCard

Shipping and handling: $4.00 to US and Canadian address via US mail. Shipping via UPS Brown $5.00 to US address only. No COD orders. UPS Red or Blue cost plus $5.00 handling. All other orders shipped via US mail F.O.B. Greenville, NH, USA plus a $5.00 handling charge. Prices subject to change.

No Code Amateur Ticket

NOW YOU'RE TALKING by ARRL
This is THE book you need to get you're No-Code Amateur Radio license. Loaded with information. Completely prepares you for the 55 question Technician Class Amateur Radio ticket (30 questions from the Novice pool and 25 questions from the Technician pool.) Simple easy-to-understand explanations of complex questions make studying a snap. Fully illustrated. Also includes complete Novice exam study course. Get the Morse Code Training tape and you'll be set to qualify for your Novice license too. Expand your privileges to include HF CW and SSB privileges. Tested and proven study concept. ©1991 First Edition.
❑ AA-NYT ..... Softbound $18.95
❑ AR-MCT (for the Novice Code) ..... Morse Code Tape $9.95

SHORTWAVE RECEIVERS Past and Present edited by Fred Osterman
ut together to help the beginning SWL decide which radio to buy. Also a great reference for the experienced listener to have on hand. Full of andy facts. Includes evaluation of the radio's capabilities. © 1989
❑ UE-SRPP ..... Softbound $8.95

FREQUENCY MASTER FILE Vol. 1 Federal Assignments by The Communications Research Council
ontains all the latest information on frequencies in use by the US Government. Over 200 pages of listings arranged by Government agency, ocation, callsign and other available information. ©1990 1st edition 215 pages
❑ ATSI-FA1 ..... Softbound $24.95

M STREET DIRECTORY 1991 Edition - Complete Industry Guide to AM and FM Broadcasters US and Canada
omprehensive listing of broadcasters. Full of helpful information for the BC SWL. Has location frequency, program formats plus much more. he book to have if you tune the broadcast bands. © 1991 640 pages
❑ MST-J ..... Softbound $29.95

WIRELESS COMMUNICATION IN THE US, by Thorn Mayes
his fascinating history is all about the inventors, engineers and promoters that brought radio into use. Spark and ARC transmitters used hipboard and on costal stations are described so you can almost hear and smell them. Old timers will be able to relive their past. Newcomers ill learn more about the roots of radio communication. Great story. © 1989
❑ WM-WCUS ..... Softbound $29.95

AND PART OF WHICH I WAS - Recollections Of A Research Engineer by George H Brown
George Brown was one of radio's pioneers. His career began in the Roaring 20's as a college researcher. From there, he went on to work in both adio and the development of TV technology. He is a co-author with Lewis and Epstein of one of the most definitive pieces every done on ground ystems. Full of recollections of meetings with some of the most famous people in the history of radio. © 1982 revised 342 pages.
❑ GHB ..... Hardbound $19.95

IONSOUND ver. 3.19 by Jacob Handwerker, W1FM
Wonder when and on what frequency you'll be able to find that last DX country you need for honor roll? IONSOUND is a state-of-the-art software ool designed to predict ionospheric propagation to any part of the world. Using the latest in propagation engineering models, this handy tool is a aluable addition to the active ham's software library. Can be customized for a number of different variables. Menu driven for ease of use. Manual in an ASCII printable file is included. Math co-processor recommended but not required. IBM PCs and compatibles.
❑ ION5 (5.25" disk MS-DOS Computers) $29.95
❑ ION3 (3.5" disk MS-DOS Computers) $31.95

SHORTWAVE DIRECTORY by Bob Grove
Revised and up-to-date with all the current in-use shortwave frequencies. Includes Military and Civilian government agencies, scientific nstallations, selected SW broadcasters plus much more. Cross referenced by agency and frequency for quick identification. Exhaustive glossary of commonly used terms, acronyms and abbreviations. 270 pages ©1991
❑ GE-SD ..... Softbound $21.95

CONFIDENTIAL FREQUENCY LIST by Gilfer
Classic reference guide for the SWL. Listings for all kinds of services from 4-28 MHz. Also includes hundreds of RTTY station not found in earlier editions. Ship-to-shore, INTERPOL, embassies, aeronautical, spy "numbers" stations and much more. ©1990 7th edition
❑ GL-CF ..... Softbound $19.95

LATEST INTELLIGENCE - An International directory of codes, by James Tunnell
Finally, there's a key to the terms, phrases, acronyms, and abbreviations used by the military, law enforcement and other government agencies. Over 35,000 terms are explained and defined in a simple, easy-to-understand manner. Great for scanner ops and SWL's. Fully up-to-date © 1991 305 pages
❑ T-3531 ..... Softbound $16.95

PASSPORT TO WORLDBAND RADIO 1992 Edition
Brand new, fully revised and expanded. Now includes a bigger and better SWL'S buyer's guide. Also includes all the latest broadcast schedules from countries around the world. Great reference text for Hams as well as the serious SWL and casual listener ©1991
❑ IBS-RDI92 ..... Softbound $16.95

UNDERGROUND FREQUENCY GUIDE, by Harry Helms
The shortwave bands are filled with mysterious and unusual stations. Some are believed to send messages to spies and secret agents. Others come from drug smugglers, rebels and related clandestine groups. The only way to keep track of what is going on is to have Helm's new book. Over 500 listings with frequencies, times and broadcast formats make this a valuable book for the SWL. © 1990 86 pages
❑ HH-UFG ..... Softbound $10.95

SPORTS AND ENTERTAINMENT FREQUENCIES, complied by Bob Grove
Handy little book to have. Listings include the NFL, Blue Angels, Hotels and Casinos as well as press, shopping malls, and fast food restaurants. Also includes NASCAR, CART and Indy pit crew and driver frequencies! © 1991 70 pages
❑ GE-SEF ..... Softbound $9.95

WIRELESS ANTENNA HISTORY
A vertical design primer by Walter Schulz, K3OQF Starts with a well written history of radio's beginnings. Nine chapters cover radio from the first pioneers through the beginnings of radio astronomy. The vertical primer is a complete section on how to design, build and optimize a vertical antenna. Full of explanations and handy hints not found elsewhere. ©1988. 1st edition, 140 pages.
❑ GL-OQF ..... Softbound $16.95

CQ Books

KEYS, KEYS, KEYS, by Dave Ingram, K4TWJ
Sending Morse code by hand has become a lost art in this day of keyers and computerized code machines. Loaded with pictures, this new book shows just about every key that was ever used – from simple "cootie keys" and miniature spy keys to gold plated presentation models. Also gives you insights on how to collect, restore and use your classic keys. Great for the collector, old timer or newcomer. ©1991.
❑ CQ-KEY ..... Softbound $9.95

PROPAGATION HANDBOOK
Principles, Theory, Prediction
by Ted Cohen, N4XX and George Jacobs, W3ASK
Includes a complete explanation of ionospheric propagation principles; what are the D, E and all those F layers and what do they mean, as well as two sections on the Sun and how it effects radio wave propagation. 2nd Edition. 150 pages. ©1991.
❑ CQ-PH ..... Softbound $9.95

THE AMATEUR RADIO VERTICAL HANDBOOK
by Cpt. Paul H. Lee, USN (Ret.), N6PL
Based upon the author's years of work with a number of different vertical antenna designs, you'll get plenty of theory and design information along with a number of practical construction ideas. Included are designs for simple 1/4 and 5/8 wave antennas, as well as broadband and multi-element directional antennas. ©1984, 2nd edition.
❑ CQ-VAH ..... Softbound $9.95

PACKET USER'S NOTEBOOK
by Buck Rogers, K4ABT
Written with the beginner in mind, the Packet Notebook is full of handy tips, hints and suggestions on how to get the most out of your packet system. Includes a brief history, a how to get started section, standards, flow control and information on radio to TNC to computer interconnections for just about every radio. ©1989. 1st edition. 132 pages.
❑ CQ-PKT ..... Softbound $9.95

1992 EQUIPMENT BUYER'S GUIDE
Fully up-to-date. Complete listing of equipment available from the various equipment and accessory manufacturers. Includes radios and accessories plus helpful hints and tips and a complete listing of addresses and telephone numbers. ©1991
❑ CQ-EQP92 ..... Softbound $4.95

1991 ANTENNA BUYER'S GUIDE
Looking for the latest in antennas? It's all here in theCQ Antenna Buyer's Guide. Crammed full of articles, product information and a who's who section listing all of the manufacturers and importers. Get your's now and start planning for antenna projects. ©1991
❑ CQ-ANT91 ..... Softbound $4.95

PRACTICAL ANTENNA HANDBOOK
by Joe Carr, K4IPV
A comprehensive blend of theory and practical antenna applications make this book by noted author Carr, a valuable book to have on hand. Features detailed analysis and construction information for all kinds of antennas, an explanation of the secrets of radio propagation, theory and use of transmission lines, a comprehensive overview of the radio spectrum as well as 22 BASIC programs for designing antennas. Learn from an expert – get this book today. ©1990 1st edition 448 pages.
❑ T-3270 ..... Softbound $21.95

THE WORLD IS YOURS 3rd Edition by Sam Alcorn
This is one of the best beginner's books on SWL'ing we carry! No techno-jargon or incomprehensible babble to confuse the newcomer. Begins with a complete overview of what is available in the international broadcasting world. Lists the twenty most popular stations and gives you a full explanation of their programming. Simplified band bay band listening guide and local time to UCT found anywhere. ©1991 Third Edition 80 pages
❑ GL-WIY ..... Softbound $9.95

CQ Bookstore Main St Greenville, NH 03048 Div of CQ Communications Inc PCBG92
(603) 878-1441 • FAX (603) 878-1951

How to Set Up a Listening Post

Getting the most out of your listening involves more than simply plugging in your receiver; with adequate planning and preparation, you'll enjoy many hours behind the dials.

BY KEN WINTERS, N5AUX

Shortwave listening can be one of the most interesting hobbies you will every discover. Or, it can be a very frustrating one. The key to success in world band enjoyment is simple, however, and with just a little preparation and basic understanding of some of the fundamentals involved, you won't be disappointed.

You only need three things to enjoy shortwave listening. First, of course, is a shortwave receiver. The second is a good antenna. And the third is time.

Since we're dealing with world-wide communications, time is on your side for a change. You can pick and choose the times you wish to listen, based on your personal schedule. No matter what time of day or night you decide to tune the bands, there will be hundreds of signals on the air for you to hear.

As for the radio, there are so many brands and models to choose from that perhaps the most difficult task facing newcomers is how to pick the right radio. On the other hand, the particular model of radio is, surprisingly, the least important of the three things mentioned above.

The most important item in shortwave listening is the antenna. Now, don't get discouraged-that doesn't mean you need a huge radio tower with an enormous array of metal and wires strung out over acres and acres. In fact, you can set up a very effective antenna in any neighborhood, or even in an apartment, and, without your neighbors knowing it exists. The nice thing about antennas for receiving versus antennas for transmitting, is that they can be almost any size or shape and can be "hidden" much more easily. Of course, most portable shortwave receivers have a built-in antenna, that often provides good results. But for weak signals and under less than ideal conditions, you will want an external or outside antenna. An excellent article in our *Communications Guide* by Bill Orr explains in detail many things about shortwave antennas and even suggests ways to build your own antennas. Just keep in mind that once you get past the initial stages of tuning the big, powerful broadcast stations, there still remains a vast number of smaller stations that require a little more effort to catch.

Part of what makes shortwave listening so exciting is the unknown. True, you will often know what you're looking for, and, most of the time, you will probably find it. But the radio spectrum between 3 and 30 MHz is full of surprises. If you do only a small amount of "fishing", you can tune in on some very interesting and exciting signals almost any time you try.

The first thing you'll need for SWLing is the receiver. World band radios as they're called today, come in a variety of different models ranging from simple to super. They come in all sizes too, from pocket-sized gadgets you can carry anywhere, to monsters you can hardly lift. As you might expect, performance varies from fair to superb!

For the moment, let's consider some of the other aspects of setting up a shortwave monitoring post, and come back to the radio later. The amount of time you plan to spend listening has a lot to do with the type of radio you'll want. Other things, like operation and antennas should be considered, as well as expense. I've always found it's best to buy a quality receiver; not only do you get what you pay for, it'll have sufficient trade-in value if you decide to change receivers somewhere down the road.

No matter what you do plan, however, be prepared to expand both your original plan as well as your horizons once you've been hooked by the DX bug. There is such a variety of interesting services and stations on the shortwave bands, that no matter what your initial interest, you'll soon discover ever more exotic signals once you start tuning around the HF spectrum.

The ideal location for your listening post will be a desk or table where you can set up your radio and spread out some books, maps and notepads. It's a good idea, if you can, to locate your listening post near a window. This way, routing coax and wires can be done without having to run the cable around the room. A good reading lamp and comfortable chair are essential. You'll spend a lot of time there as you listen to your favorite foreign station beaming in music, or special programs that capture your attention and fire your imagination.

Regardless of the type of radio you use, you'll want to take lots of notes. Most shortwave stations broadcast on regular schedules on fixed frequencies. However, some of the most interesting ones don't always show up on time and on frequency.

Keeping notes on what, when, where and reception conditions will help you find the stations you want to hear, and, can be valuable if you wish to send reception reports to the stations heard. Many stations acknowledge such reports with

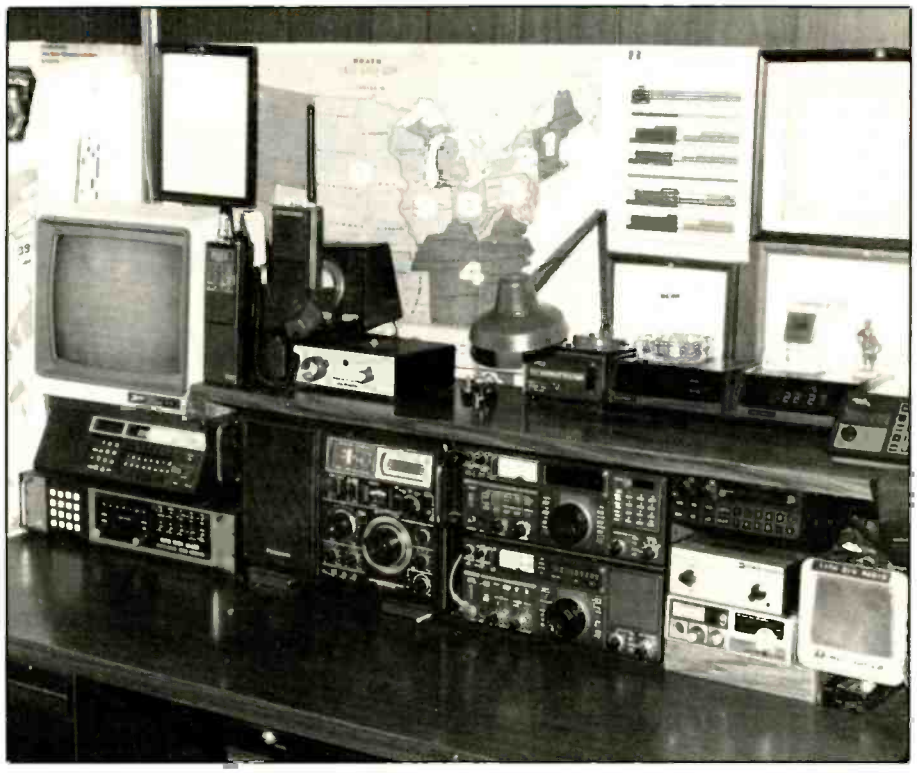
confirmations, called QSL cards. Many shortwave listeners have their walls covered with these cards and letters. Each card represents an adventure and is almost like a postcard from a friend who's traveling the world and bringing you insights into the languages, customs, and cultures they encounter. A globe or world map adds perspective to shortwave listening. You can place pins on the map to mark locations heard, and each new pin is like a point on a scoreboard. It's fun and exciting when friends visit and ask about the strange "postcards" proudly displayed, or the pins in your world map. You can relive and share the adventure with them as you point to distant lands and describe the language, culture, and music of the people who live there. Each card and every pinpoint mark is a place "visited", if not in person, in spirit and in essence. And everyone likes to travel. Through shortwave radio you can travel at the speed of light while using almost no energy at all!

In addition to being a comfortable place to relax, your listening post should be private enough to eliminate distractions. Sometimes it takes shear concentration to pull in a really weak or rare signal. You won't want the television drowning out the faint sounds from your speaker. On the other hand, you won't want to encroach on others' peace of mind with all those strange noises emanating from "that contraption."

A good pair of headphones can be one of the most valuable investments you'll ever make. First, they afford a higher quality of audio than you'll ever get from a radio speaker, regardless of its quality. Also you'll be able to listen late into the night without disturbing others. A good quality headset that's light-weight, but that covers the ears completely is best for blocking out ambient noise and keeping "that noise" confined to your ears. The same headphones or earphones that work with your stereo will work well with your shortwave radio.

When you're ready to select a radio, remember that radios are a lot like other things manufactured by several different companies; they come in a multitude of different models. Everyone has different tastes. You'll just have to decide on a suitable receiver to fit your needs by visiting your local ham radio dealer or by carefully checking the product descriptions and ads in our *Communications Guide*.

I will make a couple of recommendations, however. Look for good quality and reliability. Name brands help, but you'll find some high-quality, best buys with unfamiliar names, so you really need to do a lot of research. I suggest you choose a radio with a digital frequency display.



While these radios are a little more expensive than the ones with analog dials, the difference is well worth it. You can pay as little as $50 or as much as $1,000 or even more for your first shortwave receiver, but between $200 an $500 will buy you a radio you'll be pleased with, that will last a lifetime. Any radio that costs more than $300 will have all the really important features you'll want in a receiver.

Ask for help. If there's a ham radio operator in your neighborhood, drop by and tell him or her you're interested in shortwave listening. You'll be in for a treat. You can usually tell an amateur radio operator by the different types and variety of antennas on their tower, or by the callsign license plate on their car. Most hams are glad to help anyone interested in the radio hobby an many will be happy to invite you in an show you their station. Most radio amateurs started out as shortwave listeners themselves. They can provide a goldmine of valuable information and tips on getting started.

One of the best ways to learn about shortwave receivers is through magazines like *Popular Communications*. Not only are the advertisements full of useful information, but there are reviews and articles on the what, when, where an how of setting up a station to get the most out of your listening hobby. Remember the desk or table? Now you need a bookshelf too!

After you've made your choice and brought home your new receiver, now the fun begins. Plug it in, turn it on and tune it up. The first foreign station you hear may literally be music to your ears. Or, it might be total chaos. Turn off the radio in either case. That's right, turn it off. Now, find the users guide that flew out of the box when you grabbed the radio. Read it. So many folks never bother to read the instruction manual because it seems to easy to "figure out" the device in question. These folks miss half the fun and many of the features they paid for in the first place. Invariably, people will use a radio for months or even years without knowing some of its functions even exist. Maybe it's a "hidden" switch under the cover, or maybe the fact that one of the knobs not only turns left and right, but pushes in and pulls out too!

I've known people who sold perfectly good radios and other gadgets for half the price they paid because they were unhappy with some "quirk" that turned out to be operator error. This is important; read the instructions from cover to cover. I recently purchased a new handitalkie myself, and without the user's guide it's impossible to use all its features.

Don't forget to fill out and mail in the warranty registration card. You'll be covered in case the radio fails, and you'll also be added to a dozen more mailing lists too, unless you scribble "don't ...." on the card. On the other hand, you may want to be on some of these mailing lists, since they'll send you literature on shortwave guides and lots of extra gadgets you may or may not be able to do without. It's all part of the fun of shortwave listening. ■

Radioteletype (RTTY) on Your Receiver

You don't need a very elaborate listening post to copy and print signals from around the world. . .

BY ROBERT MARGOLIS

Monitoring radioteletype (RTTY) messages is a most fascinating and pleasurable way of listening to utility stations over shortwave radio. Many years of fun is yours, provided you're willing to devote time, patience and determination in mastering this communications medium.

Many types of foreign and domestic utility stations use RTTY (pronounced either with each letter separately, R-T-T-Y, or with two syllables, "rit-tee"), including the military, diplomatic stations, press services, ships, maritime stations, weather and government stations.

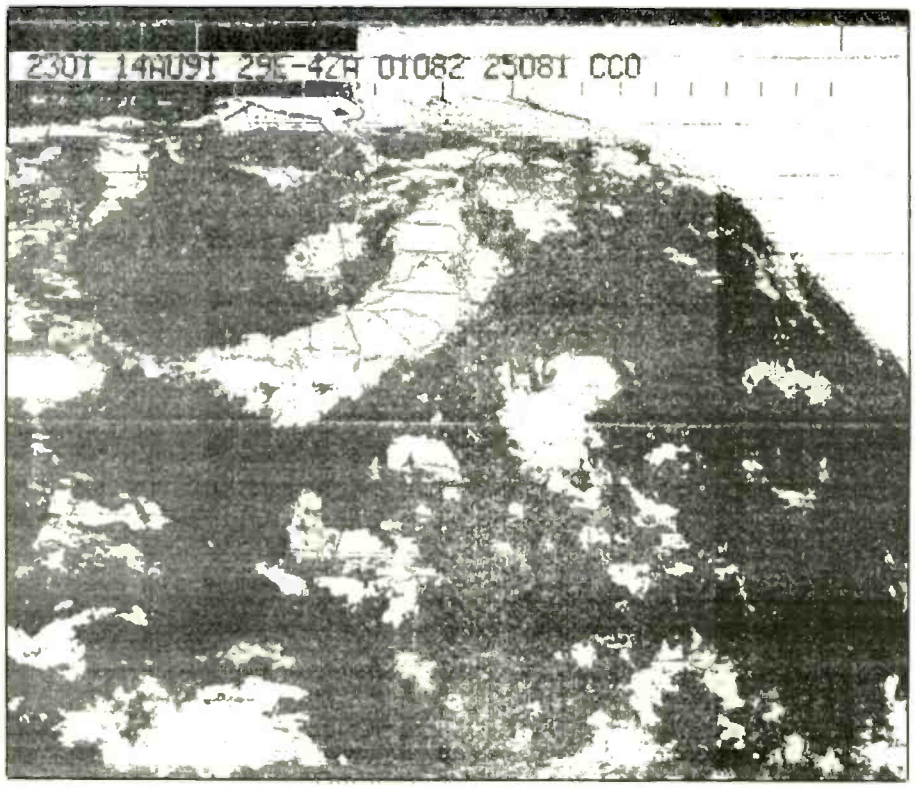
What you'll need besides a good shortwave receiver and antenna, is an RTTY decoder, and a video monitor. Some hobbyists use personal computers, decoding software and a RTTY interface as part of their tools. Optional equipment might include a printer for hard copy printouts of RTTY messages, and an oscilloscope as an aid to tuning a RTTY signal.

Your receiver must be stable; staying on the frequency you've tuned without drifting. If there is drift, then your RTTY text will become garbled. The radio must also have upper and lower sideband modes, or better yet, a RTTY switch position.

The antenna doesn't have to be elaborate; the one I use is just a 100-foot longwire strung between two trees, hovering only a few feet above the rooftop. It cost just a few dollars, but has enabled me to pick up stations in Antarctica. If you're an apartment dweller, you might consider hanging a length of wire out your window or stringing it along the ceiling.

Once your equipment is connected and operating, it's time to begin your first RTTY monitoring session. It really isn't difficult to tune in a RTTY station. The problem you'll be faced with is finding stations that produce copy that isn't encrypted. Most RTTY stations you hear will be sending encryption. Many others will be sending unencrypted text in a mode your decoder might not be able to decode. Don't let that stop you from trying to tune in RTTY stations. If you can't get plaintext copy from a station within a few minutes, go on to another station, and try your luck there. It's best for the RTTY beginner to go after stations that are listed in frequency guides or in the RTTY column of *Popular Communications* magazine. Your first attempts should be made on those stations that use *normal baudot RTTY*. As you become proficient at pulling in a number of those stations, you can then try for stations that use SITOR-A (also called ARQ and AMTOR) and SITOR-B (FEC) modes. After that, you should be confident enough to chase after the more exotic modes, such as ARQ-M2 (TDM), ARQ-E and ARQ-E3, and FEC-A. But, for right now, stick to the easier modes for tuning.

While you're learning how to "read the tremolo being played on a piccolo. These



Radiofacsimile weather chart was sent by NPM, US Navy, Pearl Harbor, HI, on 6453 kHz, at 0515 UTC, 120 RPM/576IOC.

mail," you should keep a logbook detailing what you've heard during a listening session. Give as much detail as possible, including the frequency, time, decoder settings, station, callsign, location, and what you were able to intercept. Some of this information can be obtained from various sources, including guidebooks, magazines and listener's clubs. Even if all you can get is encryption, jot it down. This will help you avoid trying to tune in to that station at a later time.

To help you get started in tuning RTTY signals, let's try to tune in the Tass and Prensa Latina news station coming from Havana, Cuba on 14928 kHz. I chose this station because its signal is often quite strong, even with bad propagation, and it can be heard almost anytime. It broadcasts with a 425 Hz shift, at 50 baud, with reverse (R) polarity. This description is sometimes written as 425/50R.

Press the buttons on your decoder so it's set to 425/50R. Check to see that your receiver is set to the "RTTY" switch position. If your receiver doesn't have a "RTTY" switch, but does have USB and LSB switch positions, stick with us for a moment and we'll discuss your situation shortly. Start tuning the radio to 14928 kHz. As you move up the dial, you'll begin to hear two different tones simultaneously at about 14926.4. As you get closer to 14928, the tones become higher in pitch. The sequence of tones you will hear resembles something like an ill-tuned, rising musical scale. If you're coming upon the frequency from the opposite direction, the "musical scale" will be descending. Either way, keep turning the dial until the "mark" and "space" lights on your decoder are flickering rapidly back and forth, or the tuning indicator shows the signal to be at its maximum strength. By now you should be getting readable copy on your video screen. If not, change the decoder setting to 425/50N.

You can also tune the station on USB, but you'll have to tune to a frequency about 2.5 kHz **lower**, i.e., 14925.5 kHz, to get readable copy. This time, however, as you approach 14925.5 from a lower frequency, the "musical scale" will be dropping in pitch, rather than rising. You should be on or quite near 14925.5 when the "mark" and "space" decoder lights flash back and forth. Tuning the station on LSB is similar to using the "RTTY" switch position, except that the frequency you'll be tuning to will be about 2.5 kHz **higher**, or 14930.5 kHz. The "musical scale" will rise in pitch as you move higher in frequency.

Now let's try two more RTTY modes, SITOR-A (ARQ) and SITOR-B (FEC). SITOR-A has a "chirp-chirp" type sound and SITOR-B sounds like a rapid trill or

```
zczckna002 3 inf 0512 tass ba221 e220 en e220001
+treaty-friendship
+ ++
     .georgia, azerbaijan conclude treaty.
     12/7 tass 153

~     tbilisi july  12 tass - an official treaty of friendship and
goodneighbourliness was concluded today by georgia and
azerbaijan, the ficst treaty in the history of theee republics,
('-(8,%94. ,3+' -93,:6 430orts.
     signing the treaty, presidents zviad gamsakhurdia and ayaz
mutalibov expressed the hope that with this poliocq57h wof8%7=vnaura
rvlations betwezn the peoples of t+he region, based on
international law and common human values, will set inn~~vaqkhl~ush
tmwigob~ettreaty efvi aves the recognition~ tte sides of the
repkopiis' sovdreignty and ter or~t integrity and the
principle~f noninterference in georgia's and azerbaijan's
internal affairs.
     in ddition, the republics pledge themselves to decide all
disputed questions in a peaceful way, without the interference of
a third party. they announce the exch
ge of the diplohtin
oissions ambhlrenogf~~ ot+her pr~e~ti~
'~~a jq z~commsrkijl and
~i~eei relations, the news agency reports.
     item ends




 n


     +
msk 15.14 13-07-1991
nnnn
```

Tass News in English, from Havana, Cuba, on 14901 kHz, at 1211 UTC, 50 baud.

```
ZCZC
/O/:PL-084
POL/
COLOMBIA-NARCOTRAFICO
EXTRADITABLES ANUNCIAN SU DISOLUCION Y CESE DE ACCIONES
BOGOTA, 3 JUL (PL) LOS EXTRADITABLES, GRUPO DE DIRECCION DEL
CARTEL DE LA DROGA DE_____P_L ANUNCIARON HOY SU DIS__U_W__P COMO
ORGANIZACION ARMADA Y EL CESE DE ACCIONES CONTRA SUS ENEMIGOS POR
CAUSA DE LA EXTRADICION5
   LA DECLARACION ESTA CONTENIDA EN U__
_T_____ZDO ENVIADO A LOS
MEDIOS DE PRENSA DE MEDELLIN, SEGUNDE CIUDAD EN IMPORTANCIA DE
COLOMBIA DISTANTE UNOS 250 KILOMETROS AL NOROCCIDENTE DE ESTA
___S___B.
    DICEN QUE ESTAS DECISIONES LAS TOMARON DESPUES DE CONOCER LA
POSICION DE LA ASAMBLEA CONSTITUYENTE, PRESUMIBLEMENTE EN
REFERENCIA A QUE ESTA PROHIBIO LA EXTRADICION DE COLOMBIANOS.
   LOS EXTRADITABLES TOMARON ESE NOMBRE PRECISAMENTE DEL RIESGO
EN QUE ESTABAN DE SER TRANSFERIDOS PARA SER JUZGADOS POR LA
JUSTICIA EN ESTADOS UNIDOS POR SUS VINCULACIONES CON EL
NARCOTRAFICO Y OTROS CRIMENES RELACIONADOS CON ESTE.
   EL ANUNCIO DE HOY SE SUMA A LA ENTREGA A LA JUSTICIA, DESDE EL
 PASADO 19 DE JUNIO, DEL JEFE DEL CARTEL DE MEDELLIN Y DE LOS
EXTRADITABLES, PABLO ESCOBAR, Y DE VARIOS DE SUS PRINCIPA____H
LAGARTENIENTES, ACOGIENDOSE A DECREO_ QUE GARANTIZABAN __
___________C_____LDE_ P_______LREL____
DE PENAS P_R__QUIENES DIERAN
ESE PASO.
   EN SU COMUNICADO ESTE GRUPO NARCOTERRORISTA AFIRMA QUE EL
CARTEL DE ______P L_____ORGANIZACION DE TRAFICO DE DROGAS
EXISTENTE EN COLOMBIA Y QUE SEGUN VERSIONES HA DESPLAZADO AL
DE MEDELLIN EN L_ PRIMACIA DEL NEH_CIO, ES __D O_BDADO POR VARIOS
ALTOS OFICIALES DE LA POLICIA.
FR/AS/JGT MI__
__NJUL-1991 15:20 UTC NNNN
NNNN 77
```

Prensa Latina, Havana, Cuba, with news in Spanish on 14928 kHz, at 1515 UTC, 50 baud.

```
    ABRE SABADO EM MOSCOU O IX CONGRESSO REPUBLICANO DA
ASSOCIACAO DE CECADORES E PESCA+DORES. UMA DAS SUAS TAREFAS E
DISCUTIR COMO MELHOR ORGANIZAR ESTE TIPO DE REPOUSO. O +SELSKAAA
JIZN+ EM ARTIGO ESPECIAL CHADA A ATENCAO PARA A DIFICIL SITUACAO
CRIADA PRESENTEMENTE NA +ROSOKHOTRIBOLOVSOIUZ+.
    OS JORNAIS PUBLICAM VARIOS MATERIAIS CONSAGRADOS AO 150-O
ANIVERSARIO DA MORTE DO GRANDE POETA RUSSO, MIKHAIL LERMONTOV.
    A IMPRENSA INFORMA QUE, A CONVITE DO PRESIDENTE DA URSSBN VO
PRESIDENTE DOS EUA, GEORGE BUSH, VISITARA' OFICIALMENTE A UNIAO
SOVIETICA DE 29 DE JULHO A_1 DE AGOETO DE 1+991. PARA 31 DE JULHO
E' MARCADA A ASSINATURA DO TRATADO DE REDUCAO E LIMITACAO DE
ARMAMENTOS ESTRATEGICOS OFENSIVOS. DURANTE A VISITA, OS
DIRIGENTES MAXIMOS DA URSS E DOS EUA MANTERAO CONVERSACOES SOBRE
UM VASTO C_NJUNTO DE QUESTOES INTERNACIONAIS E BILATERAIS.
    VITALI GAN, CORRESPONDENTE DO +PRAVDA+ EM WASHINGTON, EXPOE A
ENTREVISTA DO PRESIDENTE DOS EUA, GEORGE BUSH, QUE ESTE DEU A UM
GRUPO DE JORNALISTAS SOVIETICOS NA VESPERA DA SUA VIAGEM A
MOSCOU. +PENSO QUE A VISITA SERA' LOSITIVA. CREIO Q+UE EM
RESULTADO AS NOSSAS RETACOES SE REFORCARAO. ISTO E' MUITO
IMPORTANTE P+ARA OS ESTADOS UNIDOS E, GOSTARIA DE PENSAR, TAMBEM
IMPORTANTE PA
A A UNIAO SOVIETICA+, DISSE, ESPECIALMENTE, O
PRE_IDENTE DOS EUA.
    NA UNIAO SOVIETICA SAIU AA LUME A NOVA EDICAO DA +REVISTA
MAIS POPULAR DO MUNDO+ +READER'S_DIGEST+ EM RUSSO.  OJE O
+PRAVDA+ PUBLICA UMA ENTREVISTA COM O REDATOR-CHEFE DA REVISTA
KENNETH TO_LINSON, QUE VEIO A MOSCOU PARA PARTICIPAR NESTE EVENTO
NOTAVEL PARA A REVISTA. +A DIVERSIDADE DE TEM+AS E O TEXTO
ACESSIVEL PERMITIRAM-NOS CONQUISTAR A POPULARIDADE MUNDIAL -
DISSE O REDATOR-CHEFE. - CREMOS QUE A EDICAO RUSSA TERA' O MESMO
SUCESSO+.
    O ANALISTA POLITICO VSEVOLOD OVTCHINNIKOV, EM COMENTARIO +A
SUPERACAO DA ALIENACAO+, PUBLICADO NO +PRAVDA+, ANALISA O FETO DE
A ASEAN COMECAR A CONVIDAR AAS SUAS REUNIOES ANUAIS A URSS E A
CHINA. +SE AS REUNIOES ANUAIS DA ASEAN SE TORNAREM COM EFEITO
EALMENTE ABERTOS PARA TODOS OS PAISES ASIATICOS E DO PACIFICO
INTERESSADOS, ISTO PERMITIRA' DISCUT+IR FRUTIFERAMENTE OS
PROBLEMAS DE COOPERACAO REGIONAL E DE SEGURANCA REGIONAL+.
    O CORRESPONDENTE DO +TRUD+ EM PARIS CONTA COMO A FAMOSA ATRIZ
BRIGITTE BARDOT LUTA PELA VIDA DE ANIMAIS.
=     8.
-
    TS/
MSK 17.24 27-07-1991
NNNN
ZCZC
RYRYRYRYRYRYRYRYRYRYRZRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRY
RYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRY
MSK 17.25 27-07-1991
NNNN
```

Tass News in Portuguese from Moscow, USSR, on 18540 kHz, at 1411 UTC, 50 baud.

modes are mostly used by the maritime coastal stations, so check the maritime frequencies for them.

At the time this chapter was being written, the maritime radio bands were undergoing a drastic change. Frequencies worldwide were being shuffled all around. Where I once knew many coastal stations to be, there was now silence. They had packed their bags and gone elsewhere. So, while I can't give you any specifics at this time about the new frequencies of each maritime coastal station, I can tell you the general area where they're now located.

Look for the coastal stations between 4210.5 and 4219 kHz, 6314.5 and 6330.5, 8417 and 8436, 12579.5 and 12656.5, 16807 and 16902.5, 19681 and 19703, 22376.5 and 22443.5, and 26101 and 26120.5 kHz. If you want to listen in on the ships, which send at 50 baud or in SITOR-A mode, tune between 4172.5 and 4181.5, 6263 and 6275.5, 6281 and 6284.5, 8377 and 8396, 12477 and 12549.5, 12555 and 12559.5, 16683.5 and 16733.5, 16739 and 16784.5, 18870.5 and 18892.5, 22284.5 and 22351.5, and 25173 and 25192.5 kHz.

Twirl the dial within one of these frequency ranges until you hear the characteristic chirping sound of SITOR-A or the piccolo-sounding trill of SITOR-B. SITOR-B isn't heard as often as SITOR-A, but, if you hang around the coastal stations frequencies for a while, you'll eventually hear it. As a matter of fact, I just found a SITOR-B station while writing this paragraph. It was the U.S. Coast Guard station in Boston, transmitting on 12579 kHz at 0217 UTC. Tuning in the SITOR modes is similar to the way we tune normal baudot stations, i.e., by listening for two tones, high and low, and the musical scale-like sounds as you approach the transmitting frequency.

```
ZCZCAA
071225 - CHEMICAL INDUSTRY OF SOUTH HAMGYONG PROVINCE.
   PYONGYANG JULY 12 (KCNA) -- THE CHEMICAL INDUSTRY IS A
LEADING DOMAIN OF THE INDUSTRIES OF SOUTH HAMGYONG PROVINCE.
   THE PROVINCE ACCOUNTS FOR MORE THAN A HALF OF THE
CHEMICAL INDUSTRIAL OUTPUT VALUE OF THE NATION.
   THE HAMHUNG AREA IS THE CENTRE OF THE CHEMICAL INDUSTRY
OF THE PROVINCE PRODUCING VINALON, CHEMICAL FERTILIZERS,
CARBIDE, AGRICULTURAL CHEMICALS, SYNTHETIC RESIN, SYNTHETIC
RUBBER, DYES, AND BASIC CHEMICAL GOODS.
   THE FEBRUARY 8 VINALON COMPLEX, THE HUNGNAM FERTILIZER
COMPLEX, THE HUNGNAM PHARMACEUTIC FACTORY AND MINOR CHEMICAL
FACTORIES ARE LOCATED IN THIS AREA.
   THESE FACTORIES PRODUCE MORE THAN 1,000 KINDS OF CHEMICAL
GOODS IN LARGE QUANTITIES.
   THE CHEMICAL INDUSTRY OF THE PROVINCE HAS MADE A RADICAL
DEVELOPMENT SINCE THE VINALON INDUSTRY RELYING ON LIMESTONE
AND ANTHRACITE ABUNDANT IN THE COUNTRY WAS BUILT IN THE
1960S.
   THE VINALON FACTORY WHICH WAS COMMISSIONED IN 1961 HAS
VBEEN RECONSTRUCTED AND EXP_NDED CONSTANTLY AND IS PRODUCING
MORE THAN 180 KINDS OF CHEMICAL GOODS INCLUDING 50,000 TONS OF
VINALON, 50,000 TONS OF VINYL CHROLIDE, CAUSTIC SODA, SODIUM
CARBONATE, AND DYES_
   BEFORE THE LIBERATION OF THE COUNTRY (AUGUST 1945), NO
OTHER FERTILIZER THAN AMMONIUM SULPHATE WAS PRODUCED. BUT
NOW VARIOUS CHEMICAL FERTILIZERS SUCH AS UREA FERTILIZER,
AMMONIUM NITRATE, SUPERPHOSPHATE OF LIME AND MICRONUTRIENT
FERTILIZER ARE BEING TURNED OUT.
   IN THE MIDDLE OF THE 1960S, THE INDUSTRY OF AMMONIA
SYNTHESIS BY GASIFIED ANTHRACITE WAS FOUNDED, OPENING A NEW
PHASE OF THE FERTILIZER INDUSTRY.
   OVER THE LAST THREE DECADES, THE PRODUCTION OF
FERTILIZERS GREW 2.5 TIMES AT THE HUNGNAM FERTILIZER
COMPLEX.
   THE HAMHUNG AREA IS PRODUCING IN LARGE QUANTITIES
SULFURIC ACID, HYDROCHLORIC ACID, NITRIC ACID, ACETIC ACID,
PAINT, LACQUER, ETC.
   MANY MINOR CHEMICAL FACTORIES HAVE BEEN BUILT ALONG WITH
LARGE-SCALE ONES SO AS TO PRODUCE NOT ONLY BASIC CHEMICAL
GOODS BUT ALSO VARIOUS
AW CHEMICAL MATERIAL_AND SUBSIDIARY
MEDICINES WHICH ARE NOT MUCH IN DEMAND.
   MUNDREDS OF KINDS OF CHEMICAL GOODS ARE PRODUCED AT
CHEMICAL SHOPS AND BRANCH SHOPS AT CITY, COUNTY AND CENTRAL
FACTORIES AND ENTERPRISES IN THE PROVINCE. -0-
NNNN
```

KCNA, Pyongyang, North Korea, English news broadcast on 12175 kHz, at 2152 UTC, 50 baud.

Another tuning method, and one which you'll use more often, is to tune to the frequency and push each button, stepping through each baud setting, 45.5, 50, 75, and 100; and stepping through each shift, 170 Hz, 425 Hz, and 850 Hz, until you can clearly read the copy. Don't forget to push the "normal" and "reverse" buttons if clear copy can't be seen.

Once you get used to tuning in RTTY signals using my shortcut dial-twirling method, I recommend you read Radioteletype Monitoring: The Complete Guide, by Dallas W. Williams, available from Tiare Publications, P.O. Box 493, Lake Geneva, WI 53147. It's $9.95, plus $1 shipping. This book goes into more detail about tuning in the various RTTY signals. You'll also read about other types of RTTY transmissions, test tapes, encryption, the equipment used to send RTTY, some of the stations you'll meet on the air, and much more.

Just as text is sent over the airwaves in the form of an RTTY transmission, pictures can also be sent. The method of sending pictures over shortwave radio is called *radiofacsimile*. A FAX decoder, which looks something like an RTTY decoder, is used to turn the sound of the FAX signal, often described as having a "scratchy" sound similar to a phonograph needle stuck in the last groove of a phonograph record, into either a press photo or a weather map. The mode is harder to decode than RTTY, but, if you ever want to try your hand at monitoring radiofax stations, the manuals that come with the decoding equipment will be able to tell you what to do.

If you're new to the shortwave listening hobby, and particularly the utility aspect of SWLing, give RTTY monitoring a try. If you'd like to see what other monitors are receiving, be sure to read the "RTTY" column in *Popular Communications*. ■

What You Need to Know Before Buying a Receiver

Whether you're looking for a portable shortwave receiver or a scanner with dozens of bells and whistles, there are a few things you should know.

BY HAROLD ORT

Today's receivers come in all shapes and sizes, from small pocket-size portables, to large desk-top communications receivers. They also come in varying degrees of sensitivity, selectivity, and overall performance.

Sure, you can plunk down literally thousands of dollars for a commercial grade receiver, or you can be selective in your choice, by knowing the features you consider important. Whether you're a first-time buyer or trading up to a more elaborate receiver, there are a few things you need to know.

It's now possible to buy scanners with 1,000 channels! Not many years ago scanner users were dreaming of such capability. Like scanners, communications receivers have wide-frequency coverage, and many include channel memory, (presets) computer interface, digital frequency readout and jacks for tape recorders and external speakers.

Like buying a car or a home appliance, you should be prepared when you enter the showroom or open the catalog; know what you want and how much you're prepared to pay.Remember, you could probably buy a receiver from a local department store, but being able to ask questions and count on service is another matter. You'll find you can rely on manufacturer's and dealer's reputations when buying from companies that advertise in this Guide and *Popular Communications*.

A Look at Shortwave Receivers

Frankly, you don't have to spend an arm and a leg to hear large international shortwave broadcasters; they use such tremendous power, you simply can't miss them. But, as soon as you discover the excitement of hearing far away stations in the Pacific, South America or utility transmissions or you want to separate two stations that are operating in close proximity, you'll need to spend more than $200. The saying, "buy best, it's cheapest," is also true when purchasing communications equipment, of course based on your budget.

A Portable or Full-Coverage Communications Receiver?

Don't get me wrong, it's perfectly alright to want a small portable receiver; I own one, and so do lots of SWLs. We use them for traveling and as "back-up" receivers. If my full-size model dies, at least I'm still in business. Portables offer lots of features you'd expect to find on portables. For example many have a "sleep" feature that lulls you to sleep with music from your favorite shortwave, AM or FM station, plus it saves your batteries.

Other features include stereo FM and even some have the ability to tune SSB signals. For those folks interested in listening to utility transmissions (discussed in an article elsewhere in the Guide), a BFO switch is needed on the receiver. This allows tuning of SSB signals. So if you want to listen to most amateur operators and other SSB transmissions, this is a feature you'll need. If you're only chasing international broadcasters, it's a feature you can do without. But it's a lot easier to get a well-equipped receiver now than later.

Some portables also allow you to store several of your favorite stations in the memory for instant recall. Some have lighted dials, some don't. That's one feature I wish my radio had last year when I used it in the Saudi desert. If you'll be using your portable in the dark, a lighted dial is as important as "AA" batteries!

Most of today's portables have digital frequency readout. The older analog variety of tuning (remember the thin red tuning needle?) still exists on a few portables, but in some cases even these radios digitally display the tuned frequency in a small window. There's no more guessing what frequency you've tuned.

Remember to check out the specs, especially if you're buying a portable, because for some strange reason, not all portables cover the same frequency bands. Some manufacturers eliminate what they probably feel are "less important" segments, in favor of others. Always shop around, knowing beforehand what frequency segments are important to you before you buy.

When shopping for receivers, you will quickly find that most manufacturers and dealers are decent, honest, caring folks, who are sensitive to your needs. I suppose the reason is they want your return business. Maybe another reason is that the communications business is a group of very closely knit people; in other words, word gets around like wildfire. Most businesses will be happy to answer your questions about receivers. Just remember not to call their "800" number (unless their ads specifically say to) for product information. That's usually for placing orders and inquiring about the status of an order. Use their regular phone number, or write, asking for their catalog. Remember, tying up the "order line" could delay someone placing an order . . . next time that someone might be you!

Shop around! Some companies offer

free shipping, while others charge a small fee. Check the values, compare prices, features and then trust your instincts. They're usually correct! What is their policy on returns? Suppose you just aren't pleased with the "feel" of the radio and want to return it, no questions asked. A good company will accept your return in a reasonable amount of time (usually after you contact them) as long as the receiver isn't damaged, altered, and includes all original equipment (power cords, antennas, cases, etc.) and packing. That's not much to ask from an honest *consumer*. Remember, **courtesy is a two way street**.

Going All the Way—Buying a Full- Size Model

While a decision to purchase a portable receiver is an important one, plunking down several hundred (or thousand!) bucks on a full-feature receiver can be a stressful experience, ranking right up there with changing jobs and putting a dent in the family wheels. But it doesn't have to be.

Once you've decided to buy a receiver it's time to level with yourself again; that is ***before*** you place the order. Just what are your listening interests? Are you mainly interested in listening to the international shortwave broadcasters? If you are, you certainly don't need the most expensive communications receiver on the market. If you think you might get excited hearing a regional station broadcasting island music to the local population, you'll need a receiver capable of pulling the distant station out of the mud. To do serious **DXing**, plan on spending several hundred dollars. What it boils down to is the simple fact that you'll *need* the **selectivity and sensitivity**, filters and features found on the more expensive receivers. Believe me, you'll be glad you spent the money!

You wouldn't expect eight-cylinder performance from four cylinders, so don't expect to pull out a 500 watt broadcaster squeezed between the VOA and BBC, unless your machine is billed for such performance.

Can you have loads of fun and hear exotic stations without spending big bucks? Most definitely! It all depends on what **you** call exotic, unusual or difficult to hear. If you're interested in listening to any of the major international stations (VOA, BBC, China, Italy, Australia, Ecuador, to name a few) with any regularity, you're in luck; a receiver costing in the range of $200 to $700 will work for you.

With every imaginable combination of features available on most receivers, you'll be able to hear all of these and many, many more. Will that account for endless hours of listening enjoyment and DXing? It certainly will. In addition, you'll also be able to tune in SSB signals that will let you hear hams, aircraft on international routes, and numerous other signals. With a receiver that has memory presets, you'll be able to instantly access your favorite frequency and mode.

Looking at the Specs

Naturally an important consideration when buying a receiver is its size, appearance and construction. But beyond these obvious basics are more important operational considerations. As mentioned earlier, will the receiver be able to dig out the weaker signals, buried by powerhouse signals? Will the radio's audio be powerful enough to be heard in your shack? To help you compare receiver specifications and give you an idea of what to look for when buying your first receiver, we've put together a Receiver Selection Guide in the center of this Guide. Use it to learn the buzzwords of the communications world that will make you an informed consumer!

A Good Antenna is a Must!

You won't hear anything without a **good antenna**. Countless books and articles have been written about antennas, but the best ones I've read lately are in this Guide, written by Bill Orr and Bill Price. Here's the rule: poor or no antenna, poor or no reception. Period. So, now that you've decided to spend your money on a receiver, why not either buy or construct an antenna that lets your receiver do what it's designed to do? You'll be glad you did. But first, read their articles!

A Look at Scanners

Today's scanners put you at the cutting edge of modern microprocessor technology. Simply decide what frequencies you want to hear, program them into your radio, connect the telescoping whip and you'll hear the action, right? Well, almost, but not quite.

How many channels do you need? Will you be traveling around the country? If so, it pays to get a scanner with several hundred channel capacity; this way you can program your favorite frequencies in specific **banks**, either by service or geographical area, or however you choose. If you're simply after the local action, there are plenty of scanners for you too! Is the scanner you like prone to strong signal overload, especially in metropolitan areas where powerful countless dozens of signals abound? Again, be sure to check our "Receiver Selection Guide" in this book to help you

decide on which model to buy that best suits your monitoring needs.

At Home or On the Road?

Are you going to be using your scanner at home, work or on the road, or a combination of all three? If you do a lot of traveling, and you're on the road more than you're at home, consider installing a scanner in your vehicle, or buy a handheld radio.

Handheld scanners are either powered by "AA" batteries or self-contained NiCd batteries. I prefer the NiCd batteries, simply because they're convenient. Radios eat batteries. It's a fact of life. In the pre-NiCd days, folks were buying alkaline batteries like New Yorkers buy subway tokens, but today, thanks to the NiCd batteries and convenient wall chargers (or drop-in chargers) scanner and amateur handheld radios can be charged in a few hours or overnight. You'll normally get a few hours use from each charge, depending upon the length of charge, and type of battery.

Lots of listeners like handheld scanners for their versatility. It makes sense. You can take them anywhere. But be sure to check with your local authorities before using or installing a handheld or mobile scanner in your vehicle; it could be *illegal* in your area.

Many people use handhelds at public events, such as air shows, boating or sports events. There's plenty to hear and with a handheld you won't miss any of the action.

The listening range of your handheld is limited. With the provided rubber duck antenna, *regardless* of its size, reception is never as good as it is with a roof-mounted antenna, so don't expect to hear everything you do from your base, where you use an outside antenna.

Some companies offer telescoping whip antennas for use on handheld scanners. They're better than the flexible rubber duck, but be careful not to snag the long antenna on an overhead obstruction. If you do, you could damage the connector on the top of your scanner.

No doubt about it, a handheld scanner is a great monitoring tool, but only you know if a handheld is right for you. Is there a priority channel? Can you select the priority channel, or is it typically channel number one? Does the scanner cover all the bands you want to hear? Not all scanners do, so again, it's best to check first.

If all of your listening is below 800 MHz, then you probably don't need a full-coverage radio with the 800 MHz band. It pays to check first if there are any 800 MHz users in your area (or in areas where you'll be traveling). Some scanners have a portion of the new band, but have eliminated the "cellular" phone frequencies. No problem. In some instances, you'll be able to make simple modifications that will allow you to receive the cellular frequencies. (But then again, who would want to listen to cellular calls, since it's illegal!)

While I'm talking about handheld scanners, I'd like to relate a personal experience I had in the Big Apple. A few years ago I got a small handheld scanner. The radio had the frequency bands I wanted (including cellular) and some other features, such as lighted dial and a few other neat things. I sometimes take long lunch hours, and have a habit of taking my radio with me. I put the radio in my suit jacket pocket and cranked up the volume about half way. No doubt about it, New York is a loud place. Apparently too loud for my new scanner, so I cranked up the volume up more. Unfortunately there was no more.

Hardly anything could be heard above the noise of traffic and crowds. That wasn't the case with my next handheld! The lesson here is: check all the specs you can get your hands on before you buy, *always* keeping your listening habits in mind! In my example, I should have ensured the **audio output** would have been sufficient for my needs.

You might also want to read the various product reviews in *Popular Communications*. It's also important to check out the monthly columns for listener comments about specific receivers. There you'll hear about solutions to problems you might also be experiencing.

The bottom line is that it pays to be an informed consumer, whether you're looking for coax for your antenna or a top-of-the-line receiver. Armed with the Receiver Selection Guide you're on your way to great listening! ■

About Our Authors

Gerry L. Dexter has been active in shortwave for 40 years. He is the Shortwave Broadcast editor for *Popular Communications* magazine. His main areas of communications interest include Latins, clandestines and QSLing. He owns and operates Tiare Publications, which produces a long list of radio communications and monitoring books. He is the author of several books including *Secrets of Successful QSLing*, and *So You Bought A Shortwave Radio*. Gerry lives in Lake Geneva, Wisconsin with his wife and son.

Chuck Gysi has been a contributing editor on Scanning VHF/UHF for *Popular Communications* magazine for 8 years. He's also active with various scanner clubs, having served as a column editor and managing editor of the RCMA Newsletter for several years and is currently an associate (state) editor for the RCMA Journal. He also serves as a column editor for *Northeast Scanning News*. He has edited three editions of a scanner guide for the Philadelphia area and has been interviewed by the *Wall Street Journal* and *Business Week* on the topic of scanners. Gysi has been a licensed ham for 10 years (N2DUP), and is active on the HF, VHF, and UHF bands. Being the news editor of a daily newspaper in the Midwest, he uses scanners at work as well as at home. He is affiliated with emergency management services and is a former emergency medical technician. He has an extensive DC-to-daylight monitoring station at his home on the Mississippi River and owns Scan Communications Co., a radio business.

Harry Helms has been a SWL for over 25 years and is a columnist for *Popular Communications*. He has written over 20 books and 200 magazine articles, and is currently a managing partner of HighText Publications, Inc., a technical publications company. Harry has previously been a technical writer and book editor for McGraw-Hill, Prentice-Hall, Tandy Corporation, and Texas Instruments. He is also a ham radio operator (AA6FW) and holds the DXCC, WPX, WAC, and *CQ Magazine* SSB DX awards.

Tom Kneitel, K2AES, has been writing and editing in the hobby electronics field since 1956 and has had his well-known byline on hundreds of features and columns in many periodicals over the years including the original 1960 *Popular Electronics*, *TV Guide*, *Science and Mechanics*, and *Elementary Electronics*, to name a few. Currently he is the editor of *Popular Communications* magazine. Tom is also the author of a major portion of the Communications section of the *Encyclopedia Americana*, in addition to being the author of many books on subjects such as antennas, electronic construction projects, single sideband, military surplus electronics, as well as a very successful series of scanner frequency and electronics surveillance books. Also, in his writing credits, are a lengthy string of classified and unclassified electronics training films written for the United States Army Signal Corps. Between 1962 and 1982, he was the Editorial Director of *S/9 Hobby Radio Magazine*–the magazine generally acknowledged as having been the focal point of the personal communications boom that started in the mid 1970s. His hobbies cover scanners, amateur radio, shortwave monitoring, and boating.

Fred Maia, W5YI, is one of the world's best known hams. He got his start in communications as a military radio operator at age 17. Nearly 40 years later he is still at it. Fred now devotes his energy to spreading the word about the many outstanding aspects of the ham radio hobby. He also heads up a very large ham operator education and examining facility headquartered near Dallas. Tens of thousands of ham radio beginners have been trained and tested by his W5YI-VEC operation. Fred also led the successful two-year campaign to get the FCC to drop Morse code as a requirement for entry level ham radio operation. As of 1991, you no longer have to pass a code test to become a ham operator.

Robert Margolis has been the RTTY column editor for *Popular Communications* magazine since 1985. He started listening to shortwave radio broadcast stations in his youth. In 1983, while searching for a good quality SW radio, he went to a store that sold amateur radio equipment, saw an RTTY terminal on display, and was bitten immediately by the RTTY bug. Since then he has logged hundreds of different utility RTTY stations.

William I. Orr, W6SAI, was licensed as a radio amateur in 1934. He received his degree in Electrical Engineering from Columbia University and the University of California. During World War II he specialized in electronics and antenna systems at a large aircraft company in California. In 1948 he designed and built one of the first all-metal Yagi beam antennas for radio amateur communications in the 20 meter band. Orr is the author or co-author of numerous books, over 150 technical articles, and editor of the authoritative *Radio Handbook*. He has designed high-gain beam antennas for military and commercial service and his handbooks have won worldwide popularity. An executive of a large California electronics company, Orr continues to write technical articles in his spare time and is active in his home laboratory working on new antenna systems.

Harold Ort has been active in monitoring shortwave and VHF/UHF communications since the 1960's. In 1971 (on April Fool's Day) he enlisted in the U.S. Army. He served as a public affairs and media relations specialist during a 20-year career where he was the editor of several newspapers, a radio broadcaster and the author of many articles for internal publications. His career culminated with Operation Desert Storm where he wrote numerous articles and conducted media escorts. His by-line has appeared in *Popular Communications*, *USA Today*, *Electronics and Technology Today*, and several newspapers around the U.S.

William Grieb Price, N3AVY, is a former Coast Guard radio operator. He has been a licensed amateur radio operator for about 20 years and has worked in the communications industry for almost as long. He is an active SWL and scanner enthusiast and is 41.86 years older than a 2.14 year-old.

Don Schimmel has a broad background in communications spanning some 45 years and includes 30 years of combined military and government service. After a four year hitch as a U.S. Navy radioman, he attended the Milwaukee School of Engineering. From 1951 to 1977 he was employed by the U.S. government and served in a variety of communications-related positions. During his federal career he spent 10 years in Central/South America and in addition went on numerous official trips to Africa, the Far and Middle East and to Latin America. His initial shortwave interest began with SW broadcast, but soon he became more interested in monitoring utility transmissions. Now retired, Don is able to devote more time to monitoring and writing utility columns for the Numbers Fact-Sheet and for *Popular Communications* magazine. He is also a frequent contributor to the ADXR Club newsletter.

Ken Winters, N5AUX, is the editor and publisher of the renowned *D/FW Frequency List*, now in its eighth edition printing. Ken's interest in amateur radio and shortwave listening began when he was a teenager and has always been an important part of his life. Ken says he's been very fortunate to have lived through the vacuum tube-transistor transition and witnessed the evolution of the electronics industry from the first desktop computer to the current strain of 486-laptops

Continued on page 143

CB Radio: The Long Road Back

By BILL SANDERS, SSB-295

CB radio on 27 MHz hit the airwaves in 1959 and things have never been quite the same since then. Not that it got off to a running start, but it was born in controversy. The original 23 channel CB band was created by the Federal Communications Commission (FCC) from what had been known as the 11-meter ham band. The FCC claimed that hams hardly used this small band, and that it was right next to the hams' 10-meter band, anyway.

Ham operators complained bitterly and attempted to get the FCC to let these frequencies remain allocated to the Amateur service. The FCC was unimpressed, having in mind that the CB service they wanted to begin would provide short-range, low-power (5 watt input), personal and business communications at cheap prices and with minimal licensing requirements.

The FCC's general vision was that a family or small business would set up a base station and a few mobile units. They could then have local communications so if someone was tied up in traffic, or needed to stop to pick up something before returning, the radio would be a wonderful convenience. Help could be summoned by vehicles experiencing road emergencies, and people could use the radios for calling ahead for reservations at restaurants and hotels. Well, that was the dream, anyway.

Here's the CB shack of Eddy, SSB Network member SSB-77D, of New Brunswick, Canada.

The Reality

CB was *some* of these things, it's true. But the FCC hadn't taken into account several factors when they set up this band, especially on 27 MHz, and in 1959.

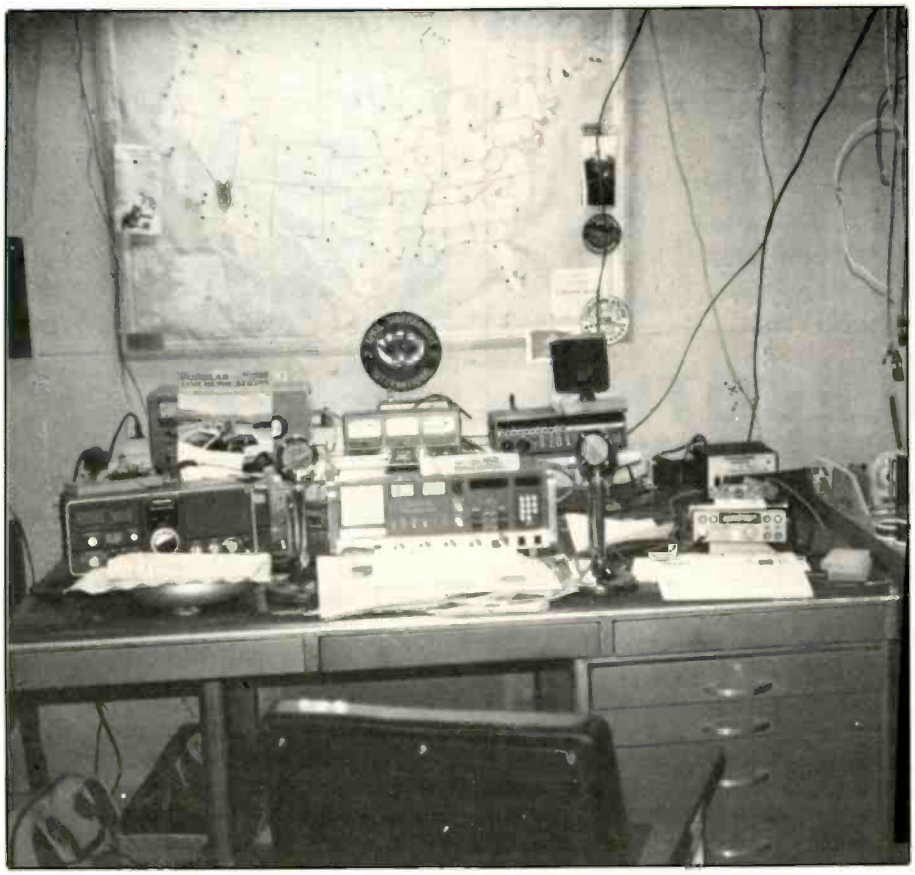
To begin with, 27 MHz is a portion of the frequency range that can bring in worldwide DX when ionospheric conditions are just right—which happens very often. And 5 watts will do the trick just fine. Moreover, 1959 and 1960 happened to be very good years for DX, and it was very easy to hear—and communicate with—distant CB'ers using the little 5-watt transceivers, which is exactly what most CB'ers thought was a pretty good idea, despite many FCC rules and regulations carefully drawn up and worded to specifically exclude DX'ing, ambiguous messages, and hobby-type communications between stations of different licensees.

Hams were shaking their heads and saying, "We told you so." The FCC was furious at the lack of respect being shown for the CB rules, even though it was still a relatively small service. The FCC sent out many frantic bulletins and clarifications reminding CB'ers that CB radio was not intended to be a hobby radio service, and if people wanted to chit-chat and work skip, they should study for a ham license. CB'ers couldn't have cared less, and the FCC began cranking out thousands of dollars worth of fines for rule violations.

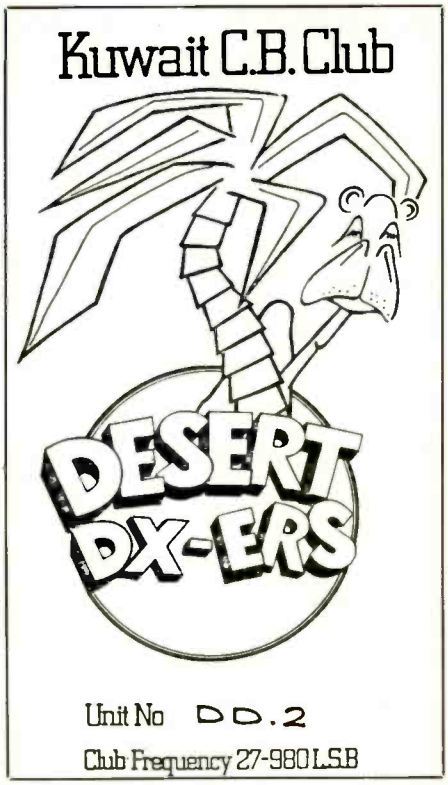
By the mid-1960's, lots of people had heard of the illicit joys to be found on these channels, and the band was attracting many new fans. Lots of operators began to realize about then that by substituting a "handle" (nickname) for the officially assigned FCC callsign, it significantly reduced the chances of getting caught and fined by the FCC's monitors.

Of course, many operators had also started attempting to get the edge on working DX by installing illegal signal boosters called linear amplifiers. The amplifiers could easily bring their station power up to 50, 100, 500 watts, or more. This also brought many complaints of TV interference from hapless viewers who registered their annoyance with the FCC.

As CB continued to grow, it remained primarily a service populated by persons interested in hobby communications. Then, in the mid-1970's there was the alleged gasoline shortage. That brought into the news media extensive coverage of CB radio and how it was supposedly being used by long-haul truckers for their own private "convoy" communications, especially in regard to avoiding police ("smokey") on the interstate highways.



Chuck Hurley, of Hamburg, NY, calls this beautiful station his very own.



This CB QSL from Kuwait was sent out before the Iraqi invasion.

Much of this was fiction and hype, but it glamorized the colorful truckers, and they loved every minute of media coverage. Suddenly everybody wanted a CB radio in their car so they could talk, walk, and be like the driver of an "18-wheeler."

That's when CB lingo developed, and CB songs were written, and movies and TV shows about CB came out, along with toys, trinkets, hats and beach towels. CB was a star!

From there, new manufacturers came into existence seemingly overnight, packing the marketplace with a myriad of transceivers and antennas. Millions and millions of people had taken to the CB channels, which were bulging at the seams and virtually useless in many metropolitan areas. Clubs were in operation, there were several dozen monthly magazines for CB'ers, and the FCC had even tossed in the towel on its hobby use prohibition, although it still forbade DX (skip) contacts.

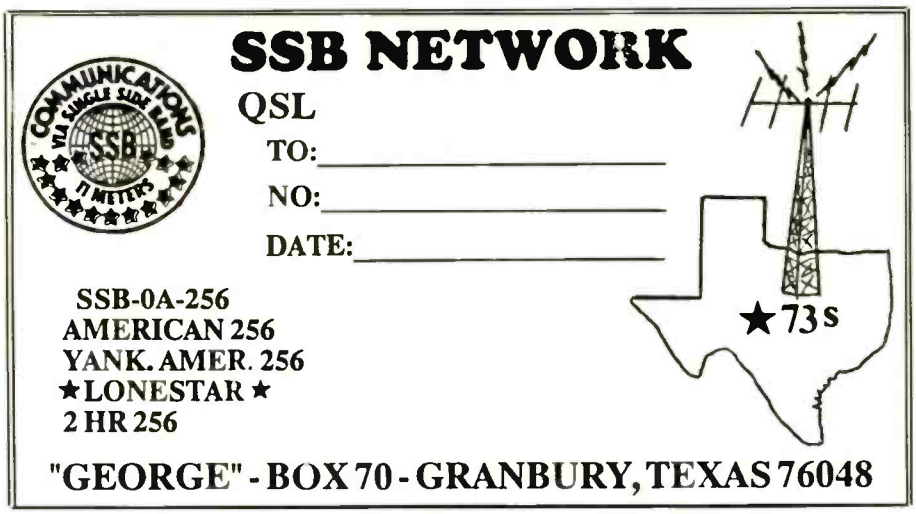
It Takes Two

CB, by then, had firmly split into two separate and distinct factions; the AM mode operators, and those that used single sideband (SSB) mode. Even today, this remains true.

The AM operators are the basic operators who identify with "handles," use CB lingo (words like "negatory," "goodbuddy," "breaker," and similar), and employ the "10 codes." As their name implies, these operators use AM-mode equipment.

SSB operators, disdain the use of "handles," CB lingo, and 10 codes. They identify their stations by numbers such as SSB-295, which is my own ID as issued by the SSB Network, the world's oldest (founded in 1964) and largest (100,000 + members) Sidebander's group. SSB operators use "Q" signals in their communications. And, as you may have guessed, they use SSB-mode for their communications.

There are far fewer SSB operators than AM operators. This is partially because the transceivers (which are usually combination AM/SSB sets) are considerably more expensive than AM-only transceivers. AM and SSB operations are



A CB QSL from George, SSB Network member SSB-0A256, of Texas.

A rare QSL from a brief DXpedition into Lesotho by some South African CB'ers.

Midland's "Road Max" is a heavy duty mobile AM-mode CB rig designed for the trucker market, but offering excellent service to any operators requiring a durable installation.

not compatible on the same channels; an AM operator tuning in an SSB operator would hear only something that sounds vaguely like a duck quacking instead of a voice that can be understood. An SSB operator tuned to an AM operator would hear only a whistling sound. For this reason, the two types of operations are usually (by voluntary agreement between the operators) kept separated. Most often, AM operations take place from channels 1 to 35; SSB operations most often take place from channels 36 to 40, in lower sideband (LSB) mode. There are, naturally, local variations and exceptions to this which should all be respected.

However, the differences between AM'ing and SSB'ing are far more than I've explained so far. Without going into a technical dissertation, SSB equipment can communicate at least twice the distance (or more) than can be achieved with AM equipment, while still remaining FCC-legal.

Also, SSB operators are into long round-table discussions consisting of numerous operators adding their thoughts. This, as opposed to AM, which is all too often the place for short signal checks, time checks, and making dates, and generally horsing around by loads of youngsters. In fact, youngsters are as welcome on SSB frequencies as CB handles, 10-

codes, and calling someone a "good-buddy."

CB Moving Right Along

In the late 1970's, CB became so crowded that the FCC decided that there would have to be more channels added to the band. I suppose they meant well, but somehow they must have done something wrong.

In 1976 alone, there were some 11-13 million CB sets sold. Then, in December of 1977, the FCC opened the CB band from 23 channels to 40 channels. As part of this expansion, the agency banned the sale of the older 23-channel CB sets. Sales took an immediate header, and within months, CB manufacturers began dropping left and right.

By the early 1980's, CB was, for the most part, history. The fad was over, even though the FCC had gone to all of the trouble to eliminate the need for CB'ers to acquire individual station licenses. There were a few manufacturers left, and only the most dedicated AM and SSB operators remained active on the channels.

CB has been recovering slowly since its fad era ended. These days, there are about 3 million CB transceivers being sold per year. The most popular brands presently include Realistic (Radio Shack), Cobra, Uniden, and Midland.

CB transceivers come in mobile units, base stations, in AM-only, and also combination AM/SSB configurations. There are also portable AM-only transceivers, including some intended primarily for vehicle emergency use. The vehicle emergency units don't require installation; they usually have a magnetic mount antenna and are powered through a cigarette lighter plug. For travelling on the interstates, CB channel 19 is where you keep tuned for traffic reports and road conditions, plus general chit-chat and wisecracks from your fellow drivers.

Another good frequency to remember while driving is channel 9. This is designated as the CB emergency channel. It's where you call for help, or road directions and instructions. In many areas of the USA and Canada it's monitored by volunteers from REACT International, Inc., P.O. Box 998, Wichita, KS 67201. If you send REACT a self addressed, stamped (U.S. 29-cent stamp only) return envelope, and request information on how to use your CB in an emergency, they'll send you some useful literature.

Hobby use still rules the other CB channels, AM and SSB. Even though it's still not allowed in the USA and Canada, when the band opens for skip, many operators nevertheless like to chat with other CB'ers across the nation and around the world.

For the FCC's part, the agency has seemingly given up on attempting to stop CB DX'ing. The FCC's current enforcement efforts on 27 MHz appear to be centered around those who make, import, sell and use illegal equipment that either run too much power, or that operate on unauthorized frequencies beyond the edges of the authorized band.

If you're interested in Sidebanding, send a self-addressed, stamped (U.S. 29-cent stamp only) long envelope to the SSB Network, P.O. Box 908-X, Smithtown, NY 11787. They'll send you info on Sidebanding and getting an ID number for use on those frequencies.

If you're interested only in AM-mode, make up a CB handle. The wilder and wackier, the better. Then, enjoy!

There are many practical uses for a CB set, but the greatest thing is all of the terrific folks you can meet on CB, both AM and SSB. They're waiting to meet you—they're waiting to welcome you and befriend you, help you get the most from your CB'ing. Join us! ■

Realistic's TRC-475, from Radio Shack, is an emergency rig intended to be carried in your car and put into service only in time of need. It also receives the 162 MHz NOAA weather broadcasts.

DXing the AM Broadcast Band

Listening for that elusive broadcasting station from Europe, the Caribbean and even Africa is possible—if you're patient and have a good receiver. . .

BY HARRY HELMS

When I was a youngster, I noticed something funny happened to the AM broadcast band at night. Soon after sundown, the band suddenly filled with stations from hundreds and even thousands of miles away. For a young boy deep in the Carolina woods, it was an exhilarating experience to hear stations from New York, Chicago, Boston, Dallas, Minneapolis, and other distant cities on the simple five-tube radio beside my bed. I found out that if you wrote a letter to these stations saying that you heard them, they would usually send back a card verifying your reception of their distant signals. Without realizing what I was getting into, I had taken the first steps along what would become a lifelong obsession with DXing. As I learned more about AM band DXing and improved my equipment, I was eventually able to hear broadcast band stations from places as distant as Turkey and Hawaii from a location only a few miles from the bedroom where I first got hooked.

Over a quarter-century has passed since I first discovered AM broadcast band (BCB) DXing, and a lot has changed over the years.

What has remained constant has been the challenge and fun of trying to dig a distant signal out of the static between 540 and 1600 kHz. The AM BCB is still a terrific place to try out your DXing wings before moving on to shortwave or other frequency ranges. Let's take a look at what's involved and how it works.

Clear Channels and Split Channels

You probably already know that AM stations in Canada, the United States and Mexico are spaced every 10 kHz apart beginning at 540 kHz. But not all frequencies are the same. In the United States and Canada, there are three different types of AM channels: **clear**, **regional**, **and local** (or "graveyard").

The term "clear channel" doesn't mean what it used to. Several years ago, it literally meant a frequency where there was only one or two stations operating at night anywhere in North America. The result was that certain stations, such as WLS, 890 kHz, in Chicago or WSM, 650 kHz, in Nashville, TN, could be heard coast-to-coast under average receiving conditions. Almost all clear channel stations used 50,000 watts (50 KW), the maximum power allocated to stations in the United States and Canada. During the late 1970s, the FCC began to allow additional stations to operate at night with reduced power on the clear channels; many stations which were formerly daytime-only operations on clear channels were also allowed to begin operation at night. Many of these newcomers to clear channels use directional antennas at night to avoid interference with other stations on the same channel. The result is that few clear channel stations today have the sort of wide coverage they once had. But some stations can still be widely heard-WBZ, 1030 kHz, in Boston still makes it to my southern California location regularly-and the clear channels still offer productive DXing. Some of the more interesting clear channel frequencies include 640, 650, 660, 670, 680, 690, 700, 750, 760, 770, 800, 820, 830, 840, 850, 880, 890, 1000, 1010, 1020, 1030, 1040, 1100, 1110, 1120, 1160, 1200, 1210, 1220, 1550, , and 1560 kHz.

Regional stations are intended to cover a much more limited area than clear channels. Typically, these use directional antennas at night and have transmitter powers of about 5 KW or so. During the day, these stations often run higher power-10 KW or so-and either use a non-directional antenna or an antenna with a broader pattern than their night antenna. Crowding is much greater than on clear channels; there are more potential DX targets, but you'll have to fight through more interference to hear them.

The "pits" of AM broadcasting, both for DXers and ordinary listeners, are the local channels. These frequencies-1230, 1240, 1300, 1340, 1400, 1450, and 1490 kHz-have well over a hundred stations per channel, each operating at night with 1000 watts and a nondirectional antenna. Most of these stations have no reliable coverage beyond about 25 miles of their transmitter site. If you listen to local channels where you have no nearby station operating, you'll soon see why these are called the "graveyard" frequencies! In such cases, these channels are a complete jumble, with one station "floating" atop the channel for a few seconds before fading away and being replaced by another.

In the last 15 years, the number of BCB stations in the United States has almost doubled. Currently, there are over 5000 AM stations in operation. In addition, a much greater percentage of stations now operate all night, although often with reduced power and directional antennas. This tremendous increase in the number of stations has resulted in far more interference for DXers and average listeners. Indeed, surveys have shown that BCB stations have lost about 75 percent of their audiences over the past decade, and a key reason cited has been the de-

graded signals, especially at night, caused by the large number of stations.

Not all of the world adheres to the neat 10 kHz spacing between channels found in Canada, the United States and Mexico. In fact, most of the world uses channels spaced every 9 kHz. These channels can be heard in North America "between" the 10 kHz channels, and are thus knows as **split channels** by BCB DXers. In Europe and Africa, the broadcast band starts at 531 kHz and then increases in 9 kHz intervals-540, 549, 558, 567, 576, etc.-up to 1602 kHz. Even in North and South America, some stations can be found between the 10 kHz stations. Sometimes this is done deliberately, as is the case with such well-heard Caribbean stations as Dominica on 595 kHz, St. Kitts on 825 kHz, Antigua on 1165 kHz, and the Cayman Islands on 1555 kHz. These stations can be heard throughout North America when conditions are good. In other cases, stations in Central and South America appear inadvertently on split channels when they drift off their assigned 10 kHz channels due to transmitter problems.

When to Listen

You can chase BCB DX anytime from about a half hour before your local sunset to about a half hour after your local sunrise. However, some times of the day and year are more productive than others.

The best time for BCB DX tends to be in October and March of each year, roughly three weeks after the autumn equinox and the three weeks before the spring equinox. I don't know of a scientific reason why this should be so, but historically, the most spectacular and consistent long range BCB DX has taken place during these times. One possible cause might be that the level of ionospheric ionization in the northern and southern hemispheres is about equal at these times. During each early autumn and "prespring," listeners along the east coast of North America have their best chances of hearing European and African stations while listeners in the west often report Asian and Pacific DX. Moreover, signals from clear channel stations are usually at their strongest and most steady during this time.

After these two peaks, the remainder of the winter months are usually best. The longer nighttime hours and reduced levels of ionization in the ionosphere mean lower signal absorption at BCB frequencies. Summer is generally not very productive for BCB DX. In addition to the increased signal absorption in the ionosphere, there are much higher levels of static due to thunderstorms. However, some nights in summer do yield good BCB DX and the different times for sunrise and sunset mean some stations are *only* possible in the summer.

Another important factor in BCB DX is the number of sunspots. A high number of sunspots indicates high solar activity, and that's good for shortwave DXers. However, this increased solar activity only increases absorption of BCB signals in the ionosphere. In other words, BCB DX gets worse as shortwave DX gets better. After a peak over the last two years, the number of sunspots and solar activity is heading downward and BCB DX conditions are improving. Peak conditions will be sometime in the future, however, possibly in 1995 and 1996.

Certain times of the day are better for BCB DX than others. For example, if you tune the AM band around 9 p.m. your local time for several consecutive days, you'll soon discover that certain stations are regulars on the various frequencies. If you continue to listen throughout the year, you'll discover that what you hear at 9 p.m. stays pretty constant. To hear different stations and DX, you need to tune the two magic times for domestic BCB DX: *sunrise/sunset* and the *experimental period*.

Sunrise and sunset are transitions between day and night, and conditions then are a combination of day and night conditions. For example, at sunset, conditions might be almost as favorable for DX as they will be later in the evening. However, many stations might still be operating on their daytime power and antenna system at that time, as "sunset or sunrise" for the purposes of the station determining their transmitter power or antenna means the sunrise or sunset *at the station location*. Thus, for a few minutes you often have stations covering a much greater area than they do later in the evening. When DXing at sunset, I've listened to three different stations take turns at "controlling" a channel within a 15 minute period. The station I can hear first will switch antennas or reduce power after a few minutes, allowing a second station to dominate the frequency. After a few more minutes, the second station will also reduce power or change antennas, and a third station will then be on top! The same process can also happen at sunrise. Since sunrise and sunset times change throughout the year, you'll find the stations you can hear on a given channel by "sunrise skip" or "sunset skip" will also change. Serious BCB DXers try to listen whenever they can at sunrise or sunset.

The experimental period is anytime between a station's local midnight and sunrise. In this time, the FCC permits stations to conduct equipment tests, including using their daytime antennas and transmitter power. During such tests, many stations use audio tones and frequent identifications ("This is KLZ on the air for testing purposes") which aid in spotting them. The most common night for these tests is Monday morning (that is, midnight Sunday to sunrise Monday), followed by Sunday and Saturday mornings.

Another bonus of Monday, Sunday, and Saturday mornings is that several stations have *silent periods* at such times. These silent periods may be regularly scheduled or as needed, but involve a station leaving the air completely. During silent periods, stations perform maintenance on equipment (such as antenna towers) which cannot be done while the station is on the air. When a clear channel station has a silent period, the result is that you can hear other stations that are otherwise impossible to hear.

International BCB DX

There is a surprising number of countries that can be heard on the BCB with the right equipment, a little effort, and some luck. The big requirement for international DX is sharp receiver selectivity so you can dig out the split channels between the 10 kHz domestic channels.

As I mentioned earlier, DXers along the east coast have the best chance of hearing European and African BCB stations, although in good conditions, trans-Atlantic reception is possible into the midwest and even the west coast. One peak period for European and African reception is from 2200 to 0000 UTC. At this time, European and African stations can be heard signing off at the end of their broadcasting day. Another peak period starts about 0500 UTC and runs until sunrise in Europe and Africa. At this time, the process is reversed and you can hear stations signing on.

Reception from Asia, the Pacific, and Australia is a late night and early morning affair. Stations from those areas don't begin to fade in until around 1000 UTC or so, and reception is possible until your local sunrise. However, you'll find receptions of these stations very difficult, unless you're along the west coast.

If you're used to the loud, steady signals from across the ocean on shortwave, foreign DX on the BCB might be a shock. Signals propagate far less effectively at BCB frequencies than they do on shortwave, and as a result are much weaker. In addition, transoceanic BCB signals are subject to long, deep fades. It's not unusual to experience only one or two minutes of audio out of each five minute period. Patience and persistence is a must!

Reception from the Caribbean, Central and South America is possible through-

out the evening and night hours. Some stations from these areas sign off at their local midnight, while others operate all night. Reception of stations to the south is often enhanced by geomagnetic storms which produce visible auroras and disrupt shortwave communications. The effects of such ionospheric storms are most pronounced in northern latitudes and become much less noticeable as one approaches the equator. Such storms can severely weaken reception of stations located in North America, allowing stations from the south to be heard in the reduced interference.

Your chances of hearing foreign BCB DX are affected greatly by your location. Listeners within 25 miles or so of the coast will always have a major advantage over listeners located further inland when it comes to hearing stations from the other side of the ocean. For example, listeners in Norfolk, Virginia will always experience better reception of trans-Atlantic stations than a DXer with similar equipment located in Richmond, Virginia. Someone in San Diego will be able to hear more stations from the Pacific and Australia than if they lived in San Bernadino, California. This is because foreign BCB signals rapidly weaken when they are refracted back up to the ionosphere by the ground. Seawater is highly conductive and weakens signals much less, and as a result, signals are best along the coast before ground refraction has a chance to weaken them.

Equipment for BCB DX Reception

Virtually any receiver covering the AM broadcast band will let you hear some DX, but you'll need a specialized receiver and antenna to let you have a fighting chance to hear truly rare BCB DX.

Sensitivity is not as important in a BCB receiver as you might think. This is because the atmospheric noise levels are much higher at BCB frequencies than on shortwave. As a practical matter, sensitivity of better than two microvolts or so is not needed. The atmospheric noise level is usually that strong, and so a more sensitive receiver means you only hear the noise better!

The biggest criterion for a receiver is **selectivity**, especially if you're chasing foreign DX. A receiver equipped with narrow bandwidth filters-such as those in the 2.5 to 3 kHz range normally used for SSB reception-will be a big help in digging out the DX between 10 kHz channels. Receivers with crystal or mechanical filters are preferred by BCB DXers, since those devices give the narrow bandwidth and good adjacent channel rejection necessary to hear split channel DX.

Another important factor in receivers is their ability to handle strong signals without overloading. While BCB DX signals are not overpowering, signals from your local AM stations often are, and the ratio between the strongest and weakest signals is greater on the BCB than on the shortwave frequencies. If the ratio is larger than the receiver can handle, the receiver may *overload*, producing phantom signals on various frequencies and making it impossible to DX on frequencies adjacent to a powerful signal. The ability to handle strong signals is indicated by a receiver's *dynamic range* measurement. A receiver suitable for BCB DX work will need a dynamic range in excess of 100 dB.

Many experienced BCB DXers prefer older vacuum tube receivers from 25 years or more ago. These receivers have a couple of characteristics that make them ideal for BCB work. One is that the dynamic range of vacuum tubes tends to be greater than transistors, and as a result, older vacuum tube receivers are almost immune to the effects of overloading. A second reason is that vacuum tube receivers were often designed for optimum AM mode reception instead of SSB or RTTY. The selectivity and audio sections of these receivers are ideal for the conditions found on the broadcast band. In my case, my favorite BCB DX receiver is a Hammarlund HQ150 made in 1955-I was three years old at the time!

While you can hear some BCB DX on a longwire, almost all serious DXers use some form of a *loop antenna*. A loop is a small, rotatable indoor antenna with a figure-8 reception pattern. This allows interference from stations located at right angles to the station you want to receive to be reduced by rotating the loop. Loop antennas also tend to pick up less electrical noise than other types of antennas. A transistorized amplifier is often used with a loop antenna to increase the signal level delivered to the receiver. Some loop antennas are available already assembled or in kit form. Plans for building different configurations of loops are frequently covered in monthly issues of *POP'COMM* and are also available from both of the major BCB DX clubs.

Joining The Club

BCB Dxing is a specialized activity, and two clubs have been formed to share tips and information. The oldest such club (having been around since 1933!) is the National Radio Club (NRC). The other, the International Radio Club of America (IRCA), was founded in 1964. Both clubs publish a weekly bulletin during the fall, winter and early spring BCB DX season with monthly publication the rest of the

Table 1

A Sample of BCB DX Stations You Can Hear!

Station	Frequency (kHz)
St. Kitts, West Indies	555
Ireland	567
New Zealand	567
Pakistan	585
Dominica, West Indies	595
BBC	693
St. Vincent, W.I.	705
Japan	747
Romania	756
Bonaire, Nethelands Ant.	800
St. Kitts, W.I.	825
Japan	828
France	945
Philippines	1134
Sweden	1179
Germany	1197
France	1278
Norway	1314
Luxembourg	1440
Monaco	1467
Bahamas	1540
Korea	1566

year. Each bulletin from these clubs includes reports on domestic and foreign DX being heard, member comments and observations, along with feature and technical articles. The primary difference between the clubs is that NRC membership tends to be concentrated on the east coast, while most IRCA members are on the west coast, although both clubs have members throughout North America and the world. Both clubs also publish reference guides and technical manuals for BCB DXers, including plans for loop antennas and receiver modifications. For membership information and sample bulletins for each club, send $2 to NRC Publications Center, P.O. Box 164, Mannsville, NY 13661-0164 and IRCA, 113 Magnolia 43, Riverside, CA 92505.

Reporting and QSLs

Yes, BCB stations do reply to reception reports and send out QSLs, although not as readily as their shortwave brethren. The usual rules for reception reporting apply, except that you should avoid any radio lingo such as "QRM" and the SINPO reporting code. You should give the time in the local time of the station, not UTC. The best material to include to prove your reception is local commercial announcements (known as "spots" in the radio business) and names of local announcers. If you hear a test during the experimental period, just the fact that you knew the station was on the air in the first place is good proof of reception! Send your report to the attention of the chief engineer or station manager, and always enclose return postage. Addresses for AM stations can be found in the *NRC AM Station Log*, published annually by the National Radio Club. An excellent source of articles and listener tips and loggings, is the Broadcast DXing column in *Popular Communications*.

Coming Up — A Brand New Band!

Looming over the horizon is a once-in-a-lifetime DX opportunity! In July of 1990, the FCC formally expanded the BCB from 1600 to 1700 kHz. While no stations have yet been authorized for this band, they will be coming on the air in the years ahead. In the first few months of operation, the level of interference in this range will be extremely low and it will therefore be possible for many stations in this new band to be heard coast-to-coast with little trouble. In addition, there will be tests of station equipment and facilities prior to commencement of regular broadcasting. Now's the time to hone your BCB DX skills in preparation for these DX opportunities! Don't forget to stay current by reading the Broadcast DXing column every month in *POP'COMM*.

But It Came With An Antenna . . .

Forget about the little telescoping whip antenna that came with your scanner. You'll hear so much more with an outside antenna, you'll wonder how you ever got along without one.

BY WILLIAM GRIEB PRICE, N3AVY

While I was waiting for my voice to change I got an old army shortwave receiver at the town dump. I connected a speaker and the power supply, turned it on and heard "white noise," (the loud *shhhhhhhhhh*) no matter where I tuned. I figured it didn't work, but before I carried it all the way back to the dump I straightened out a big paper clip and stuck one end into the antenna jack. I immediately received a station broadcasting in Chinese. I was shocked—but not so much as when I leaned against the radio's open power supply and the washing machine, bringing us to point 1, the government warning: WARNING! EVERYTHING IS DANGEROUS. BE CAREFUL.

Every antenna you buy will come with warnings. Read them. You could poke an eye out—or worse. When I recovered from the jolt, I realized that when I touched the paper clip with my hand, the signal got louder. No one was around, so I touched the paper clip with my elbow—the same thing happened, only I looked sillier. No matter how long a piece of wire I used, the reception was always better when I *touched* it—hence my first major antenna misconception: "*I* am the best antenna there is."

The next day in school, a science teacher explained that some signals are so powerful that you can receive them on a lousy radio with a paper clip for an antenna, and that there were antennas far superior to my body, even though I hadn't discovered them. This brings me to point 2: FIND SOMEONE TO HELP WITH TOUGH QUESTIONS.

Scanner, SWL, and amateur radio dealers, manufacturers, and radio amateurs (hams) can and will answer those tough questions you can't answer on your own with books and magazines. A ham might try to make a ham out of you, but that's painless, particularly with the new no-code license.

But My Scanner Works Fine With the Antenna That Came With It.

Yes. It's fine for portable use, and it's better than a paper clip, but not by much. The operative phrase here is, "you don't know what you're missing." You bought a scanner to hear *signals*. The best way to get those signals into your scanner is with a good antenna.

Tuned Antennas vs. LPW

Again, I turn to my youth for more misconceptions for you to chuckle over. Since my short wave radio performed best when it had an LPW (long piece of wire) attached to it, I scoffed when my father was "taken in" by a television antenna salesman. When I compared his fancy aluminum marvel to my long piece of wire (by substituting my wire for his antenna when he wasn't home), I was surprised. There really *was* something to antenna design. His worked better than mine.

Now I know that a particular size and shape sometimes makes an antenna outperform "lots of wire," particularly at higher frequencies. I didn't believe that all those elements did anything, though. In my stubborn mind I was sure that only *one* of them actually received the signal, and that the rest were just decoration to trick people like my father, who didn't share my expertise in antennas. Today, in the Sunday paper, you'll see set-top "satellite dish" antennas which really *are* mostly ornamental, but you won't find them in the scanner market—an advantage of having product reviews in magazines dedicated to the hobby.

You can often improve your scanner's performance merely by attaching a long piece of wire to the existing antenna, or to the antenna connector, and in doing so, you will become an antenna experimenter. This condition will probably not go away, so learn to live with it. This experiment demonstrates that the antenna that came with your scanner, in almost all cases, is inferior to a long piece of wire.

Does it Matter if the Wire is Insulated?

No—but you're always better off with insulated wire when you're experimenting, in case it touches something it shouldn't. Only the end you connect to the scanner has to be stripped to expose bare wire. It's probably time for another government warning: WARNING: WIRE IS DANGEROUS. YOU COULD TRIP OVER IT OR WRAP IT AROUND YOUR NECK AND CHOKE. YOU SHOULD ALSO AVOID PUTTING IT NEAR ELECTRICAL THINGS.

Someday, everything will come with a warning label, particularly things as dangerous as wire. For now, though, you'll just have to rough it like the pioneers did and think up your own warnings as you go.

The long piece of wire will most likely

improve your reception, but it is not the be-all and end-all of antennas. Actually there is no be-all and end-all (but if there were, it wouldn't be a long piece of wire). Just like there is no one car or computer or lifestyle that is right for everyone, even in what you'd think is the very similar group of scanner listeners, there's a broad divergence of needs.

Does it Matter Where You Live?

Yes. You might live in a bungalow in Los Angeles, a townhouse in Aspen, a high-rise in Manhattan, or a mobile home in Phoenix. Even if the resident of each of these homes had the same scanner and listened to the same kind of stations, no single antenna would be right for all of them. But even before we divide the antennas by frequency, we've got to address directivity and gain.

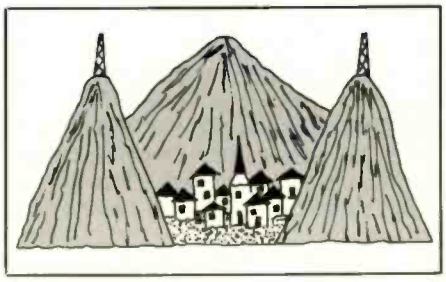
No Free Lunches

Directivity and gain are two antenna qualities which are closely related. An antenna designer can't change the gain of an antenna without affecting its directivity, and vice versa. The two are generally proportional to each other. The more gain an antenna has, the less area it covers (the more directional it is). Think of a trigger-controlled garden hose nozzle: pull a little and get a fine mist going over a large area (low gain—broad pattern). Pull the nozzle more for a lot of water going to a very specific area (high gain—narrow pattern). Squirting water represents *transmitting*, not receiving, but there is one universal truth about antennas: ALL ANTENNAS ARE RECIPROCAL.

It means that antennas work the same with respect to transmitting as they do to receiving. Picture a videotape of someone spraying the garden hose I mentioned. Now picture that video running backwards, with the water being sucked back into the hose. That's precisely how *receiving* compares to *transmitting* through the same antenna. The only noticeable difference is that receiving antennas can be lightweight, thin, and inconspicuous because they don't have to handle a lot of power being pumped into them by a transmitter.

A Trip to Aspen

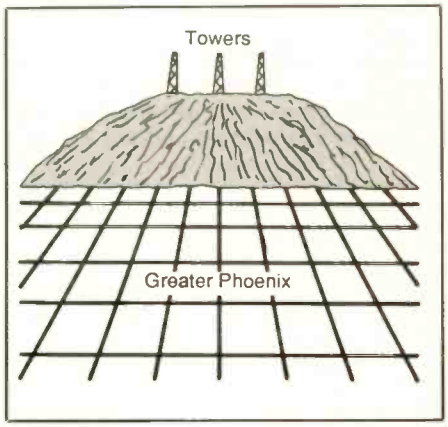
So which do you need? A broad spray or a powerful stream? If you lived in the



townhouse in Aspen, a directional antenna (powerful stream) pointed at a hard-to-see "shack" on Lower Red Mountain (just above Starwood) would probably bring some fascinating information. A while back, TV translators were located there, along with some two-way repeaters. But since Aspen is down in the center of a narrow valley, with transmitters in town *and* up on the mountains surrounding it, so you'd be close enough to the shack that a low gain omnidirectional antenna (like the broad spray from our hose) would get you those line-of-sight signals from the mountain and still receive the *direct* transmissions of the taxis as they battle for fares in town. The low gain omni (the broad spray of the garden hose) covers 360 degrees—all points of the compass—and still allows you to receive signals from down near the ground and up on the mountains over your head because it *also* covers (almost) 360 *vertical* degrees—like all the minutes on the face of a clock. This quality is called broad vertical beamwidth in an omnidirectional antenna. You get it in a low gain omnidirectional antenna—the kind that would suit you best if you lived in Aspen.

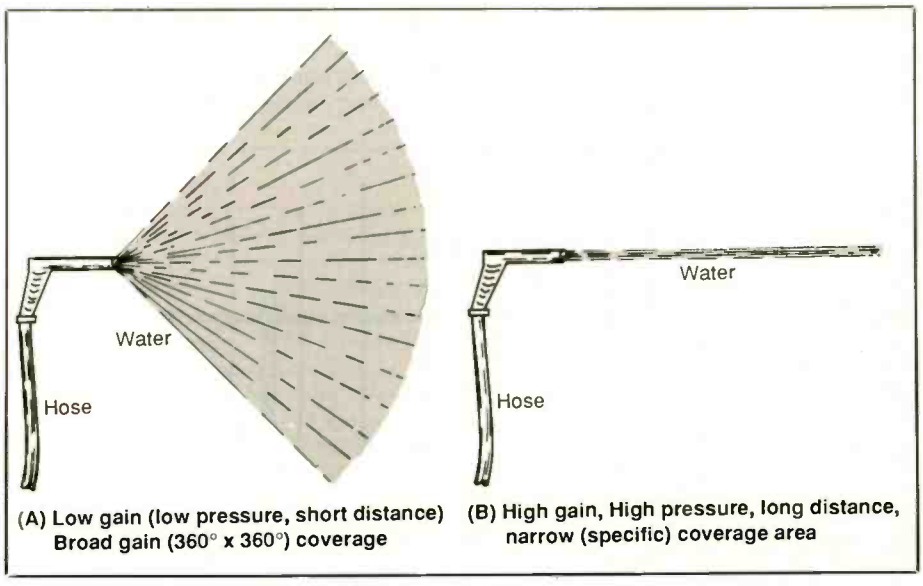
Now Off to Phoenix

Phoenix is generally flat. Flat and wide. Most significant transmitters and repeaters are on South Mountain, but South Mountain is farther away from most of greater Phoenix than Lower Red Mountain is from Aspen. You'd need an omnidirectional antenna in Phoenix, too, but here you don't need one that reaches up or down very much—just one that reaches straight out in a circle, sort of a disc-shaped pattern. You'd need more gain, too, because your disc would have to cover a wider circle than the spherical pattern you needed to cover Aspen, because in addition to Phoenix, there's Mesa, Tempe, Scottsdale, and more. So here you'd need higher gain than you do in Aspen, but it still has to cover 360 degrees. So where can we take away some coverage to increase our gain?



Instead of having your garden hose spray a 360 degree horizontal circle (all of the compass points) *and* a 360 degree *vertical* circle (all the minutes on the face of a clock), the circle we need in Phoenix will be pretty flat.

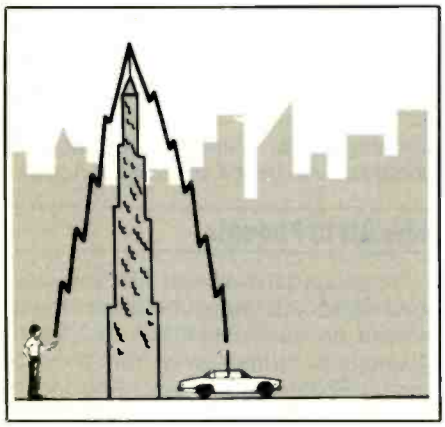
Our antenna designers will oblige us by taking all of the pressure used to spray water above and below the three-o'clock-nine-o'clock line and use it to spray a narrow horizontal disc of coverage farther than it reached in Aspen. Narrow vertical



(A) Low gain (low pressure, short distance) Broad gain (360° x 360°) coverage

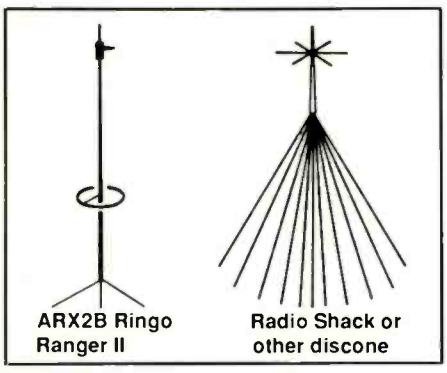
(B) High gain, High pressure, long distance, narrow (specific) coverage area

beamwidth gives higher gain in an omnidirectional antenna. A high gain omnidirectional antenna would serve you best if you lived in Phoenix. After looking down onto Los Angeles from Mount Wilson, I'd say the same applies for the sprawling City of the Angels, too.



What about Manhattan? Pretty flat—maybe a high-gain omni here too? Nope. The ground is flat, but the skyline looks like an electrocardiogram when you see it from New Jersey or Brooklyn. Lots of transmitters and repeaters on roofs—the Empire State Building, the World Trade Center and others—sometimes only ten feet away horizontally and over a thousand feet straight up. You'd need a *broad vertical beamwidth* for Manhattan, so a *low gain omni* is the one for NYC. But if you're a few miles away from Manhattan, say Brooklyn or Staten Island, then the high gain omni makes more sense.

Omnidirectional scanner antennas generally come in two designs: *vertical* and *discone*. There are variations, and there are other kinds, but the two major types are the vertical and the discone.

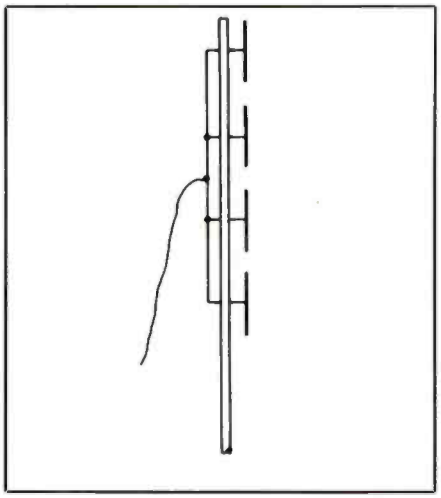


Vertical antennas are just that—vertical pieces of metal (sometimes housed in fiberglass) tuned so that they are the right length (usually some fraction of a wavelength at the design frequency) and with either tuning rings, horizontal radial rods, or ground plane rods. Discones usually look like the wire framework of a small teepee with a bunch of flat rods across the top. Discones have an advantage of being able to cover a broad range of frequencies, but at reduced performance when compared to frequency-specifiic antennas (remember: no free lunches).

By now you've probably got a pretty good picture of whether to choose a high gain or low gain omnidirectional antenna, but what if you don't want an *omni*directional antenna at all? What if you only want, say, a half-circle of coverage, because you're on Lakeshore Drive in Chicago and you could care less about what's happening on the lake?

There isn't exactly a *half*-circle antenna available, but there are *cardioid* (heart-shaped) patterns available, which are about as close to half-circle as you're going to get. Physically, they look a bit more complex than omnis, but they're not much harder to put up. They're *dipole arrays* and you can use them in their two or four pole *broad*-vertical beamwidth (low gain) configuration or stack a few of them (up to sixteen dipoles) for a *narrow* vertical beamwidth (high gain) configuration. Dipole arrays can be mounted to provide several useful semidirectional patterns, or in an omnidirectional mode, making them one of the most versatile antenna designs available. Most dipole array manufacturers provide information on how to achieve various patterns by mounting the arrays in different configurations.

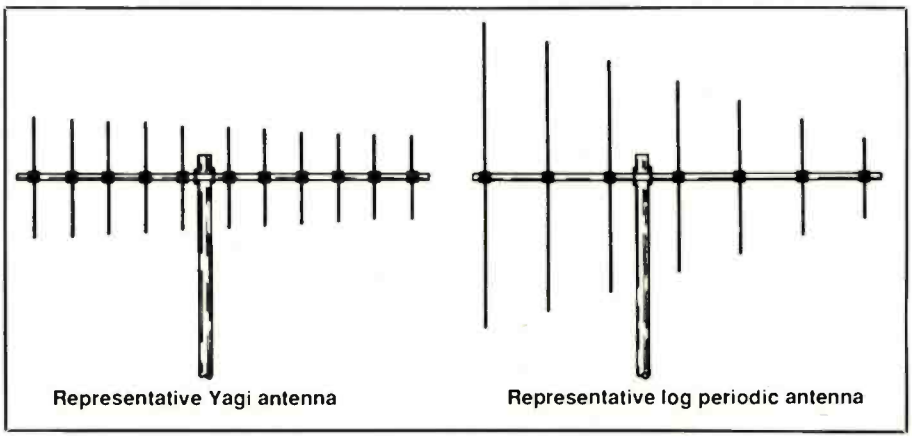
The other category scanner owners might be interested in is the *directional* antenna. Normally, this will be a *Yagi*, (rhymes with *foggy*) which looks like the skeleton of a fish, or a *log periodic* antenna, which also looks like a fish-skeleton, but the fish is more triangular and usually has more bones. Both of these styles provide directive patterns ranging from about 90 degrees down to about 25 degrees, and are usually used only by scanner owners whose entire area of interest could be seen by looking in only one direction (though some might use an omni for general monitoring, then switch to a directional antenna to receive some weak, distant signal). Directional antennas can be permanently aimed in a fixed direction or turned with a remotely-controlled rotor. When directional antennas are selected, there are more yagis to choose from than log-periodic, although log-periodic antennas usually have the advantage of greater bandwidth (they cover a wider range of frequencies) than yagis. They are usually more costly as well.



What Frequencies Will it Receive?

You may wonder what antenna will receive all frequencies, since your scanner (usually) only has one input jack for an antenna. You may want to buy the kind your friend (who lives on top of a mountain) has, because it picks up every frequency from every direction. What you'd really like to buy is his location.

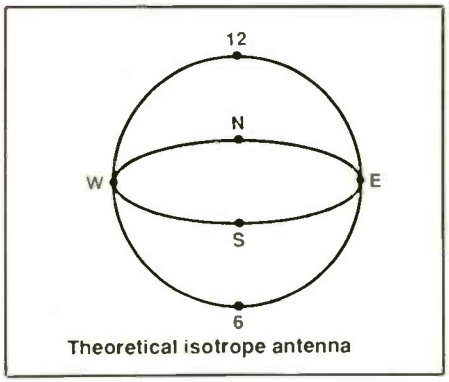
My paper clip (or my LPW) will receive all frequencies, but it won't do it very well. A high band VHF antenna, designed for 135-174MHz will receive low band VHF (30-50MHz) and UHF (450-512MHz), but not as well as a low band or UHF antenna. Some will receive a lot of frequencies and do a pretty acceptable job at it, but those



that are hot performers are usually always limited to one or two bands. It's like a sign I saw at a garage that said, "We specialize in all makes and models." It just ain't so. You can have great performance, and you can cover lots of frequencies you just can't do it on the same antenna.

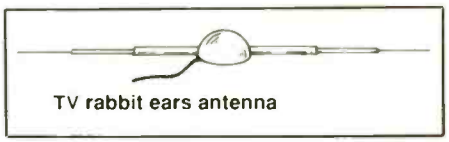
Gain and the Informed Consumer

If you haven't already heard this term, it's better you hear it from me than out on some street corner. *Gain* is a measurement of how much better one antenna receives than a reference antenna (usually either a *dipole* or an *isotrope*). First we'll see a word that's capitalized in the middle (deciBels), then we'll get the jargon out of the way quickly so we can get on with antennas.



Theoretical isotrope antenna

A *dipole* is a standard antenna built for a specific frequency, using the formula mentioned previously. It is two wires (or rods) extending opposite each other from a central feed point, like rabbit-ears. A


TV rabbit ears antenna

dipole has 2.14dBi gain. 2.14 deciBels (tenths of a Bel) over an *isotrope* (that's where the small "i" comes from. The "B" in the middle is capitalized because it comes from a man's name. Alexander Graham someone. The other reference type antenna is an *isotrope*. It is a point—a theoretical antenna which can not really exist (for one reason because there's no place to connect your coax) which radiates equally in all directions and therefore has no gain. A dipole does not perform equally well in all directions, and therefore has gain in some directions. Some people dislike references to gain above an isotrope because they say there's no such thing. There's no such thing as zero either, but I find it easier to say I'm 44 years old than to say I'm 41.86 years older than a 2.14-year-old. You decide. You just add 2.14 to your dBd number to get dBi, or subtract 2.14 from your dBi number to get dBd.

"Fine. Now What's a dB?"

It's a unit of measure. There are formulas to explain deciBels, but they're not necessary here, and they make great further reading for those who want to know. For now, they're marks on a yardstick to measure (among other things) antenna performance. Gain.

If you took our isotrope (the antenna that transmits or receives equally well in all directions) and had our antenna designers change it so that it only radiated in half a sphere, it would then have twice the *gain* (twice the transmitting and receiving ability) in that half of the sphere than the original isotrope did. It would have 3dB gain (precisely, you'd say 3dB*i*) gain in the half-sphere that it covered.

Why 3dB? Why Not Two? It's Twice as Much, Right?

Yes, and deciBels are generated logarithmically, and rather than make this into a boring math course, here's a little chart that will turn dB into multipliers for you.

Our high gain omnidirectional antenna (the one we used in Phoenix) might have 7dBi at the point where it receives best, and no gain (or even negative gain—meaning it receives more poorly than an isotrope) in some of the directions it's not intended to cover.

Gain figures usually list the most gain an antenna has in its best direction, and at its best frequency (just like cars list peak horsepower at their most efficient RPM). Multiband antennas should specify gain for each band. Antennas sold at mass-merchandise outlets often avoid any mention of gain, yet they are very specific when they list the range of frequency which they "cover." I'd be suspicious of an antenna whose vital statistics are a secret.

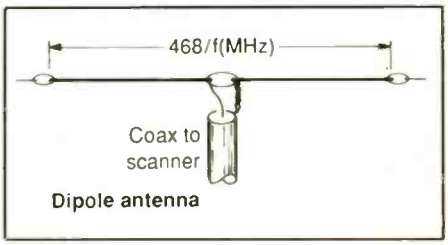
Polarization

With almost no exceptions, all the signals you'll hear on a scanner will be transmitted using vertical polarization. That means that vertical omnidirectional antennas are best suited for receiving them, and yagis (which could be mounted either vertically or horizontally) will be mounted with the elements (the bones of the fish) pointing up and down. The selection of vertical over horizontal is no accident, either. All vehicle antennas are vertically polarized, and all hand-held transceivers are intended to be held vertically as well.

The Dipole

It's possible (remember my dad's TV antenna) for a small antenna to work better than a much bigger LPW (long piece of wire) if that smaller antenna is tuned to the frequency of the desired signal. You won't find a dipole for sale (no—I stand corrected—a TV rabbit-ears antenna is a dipole, and they're for sale) but you might just want to understand them anyway.

Generally, dipoles are half-wavelength antennas. Wavelength depends on the



Dipole antenna

frequency of the signal you're listening to, and can be determined mathematically: TOTAL length in feet = 468 divided by (frequency) in MHz.

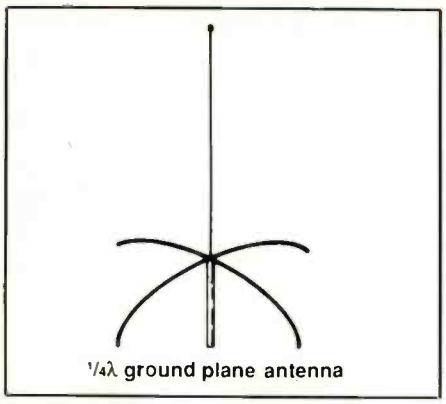
You can make a dipole out of wire (or get a set of rabbit-ears) and experiment with it. It should be mounted vertically, not horizontally as is usually done for television reception. The "V" shape you see on top of many televisions is not the correct way to mount a dipole. Installed and tuned (measured) properly, a dipole will be more effective than the little antenna that came with your scanner. Not by much, though, but it's a good experiment.

Rubber Ducks

The flexible *rubber duck* antenna was made for people who beat up their telescoping metal antennas on portable transceivers. They will work equally well on portable scanners, which is to say they are equivalent to a paper clip, but they're soft, won't break as readily as a pencil lead, and are less likely to poke your eye out. They are also more high-tech looking. If you are using a portable scanner in a portable mode (e.g., you are carrying it around with you) a rubber duck is your best bet. The minute you sit still, use something bigger.

The Quarter-Wave/Ground Plane Antenna

Here is an antenna you can buy *or* build. Buying them is considerably easier than building, and you'll probably spend more time looking for tools and materials



¼λ ground plane antenna

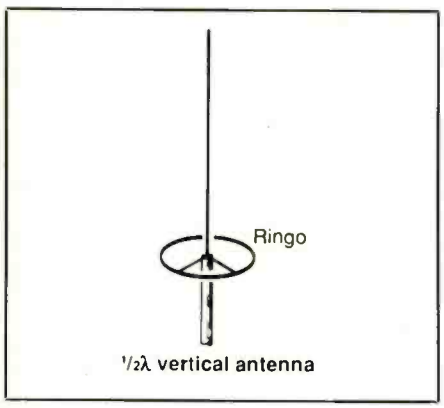
to build one than you would to earn the money to buy one, but building one can be fun, not too hard, and you'll be immensely proud of your accomplishment. It is beyond the scope of this article (I've always wanted to say that) to tell how to build an antenna, however there are good books available on the subject at SWL dealers, ham radio equipment dealers, from the ARRL, and from the publishers of this fine guide.

The quarter-wave/ground-plane antenna is a low-gain omnidirectional antenna, as we discussed in the Aspen scenario.

Some of them would be easily painted black and decorated (disguised) to look like a weathervane (using only *plastic* adornments, never metal) although you may find yourself with only three points on your compass,as some manufacturers find only three short radials necessary.

Half-Wave Verticals

Like seeing pigeons, you can't drive through a city and look up without seeing these antennas. Often a simple vertical

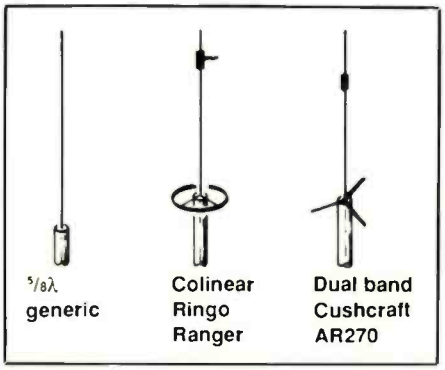


½λ vertical antenna

element with a tuning ring around the base, they are probably one of the most simple omnidirectional antennas made. They range from about 4 feet to about 20 feet tall and are available for almost any frequency range. Unlike pigeons, they are unobtrusive and a welcome addition to most any roof.

5/8 Wave, Loaded Verticals, Colinears and Dual-Band Antennas

These are other vertical antennas which are available for most of the bands you'll use with a scanner—sometimes two bands on one antenna. Some are quite costly, because they're made to



handle the RF energy from a transmitter, and some are relatively inexpensive in spite of their dual-band capability. The two bands most popular in a dual band configuration are usually the VHF-high (135-174MHz) and UHF (430-470MHz).

Receiving is More Forgiving Than Transmitting

Aha! We've caught him in a lie! He distinctly said that all antennas behaved exactly the same with respect to transmitting and receiving.

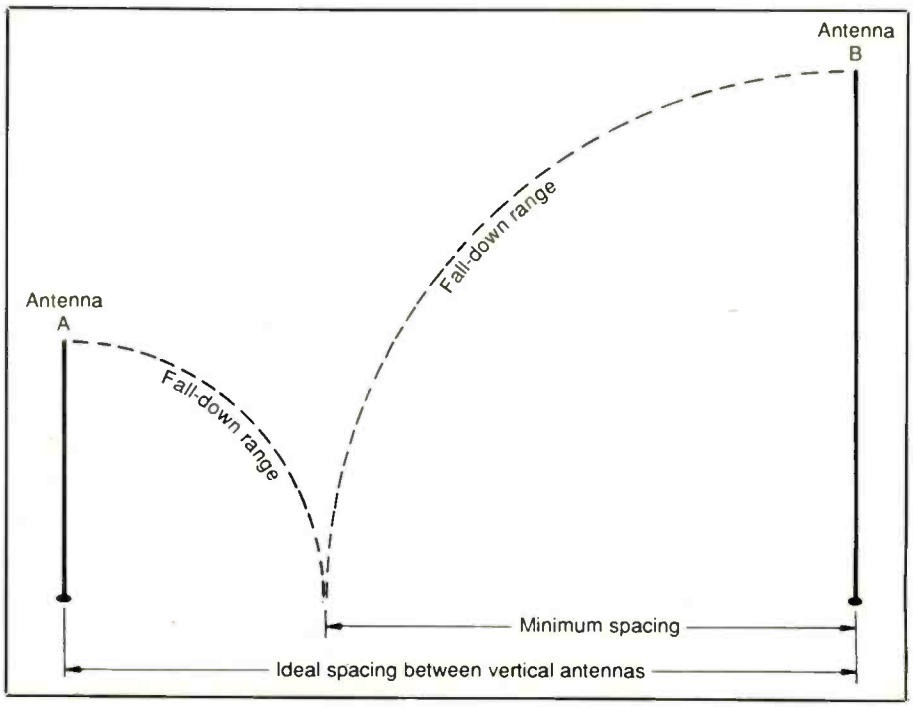
Well, yes, I did say that, and it's true. Receivers *seem* to be more forgiving to an antennas shortcomings than transmitters seem to be, because today's solid state transmitters will actually shut down when the antenna is not tuned "just so" for them. Receivers, on the other hand, won't even shut down if you try to receive *without* an antenna.

You can't transmit with an antenna that's not tuned to the frequency of your transmitter, but you can *receive* with a paper clip, an LPW or even your elbow.

Mobile Antennas

Mobile antennas are all omnidirectional. Some are designed for a specific frequency, others for two bands and some claim to perform on all bands. If you have the time to compare a single band antenna against an "all-band" antenna, you'll see the difference, but maybe you want medium performance on many bands rather than super performance on just one or two bands. That's why they make chocolate and vanilla.

Quite possibly, there's a law that requires me to say that some states, municipalities and other freedom-encroaching entities forbid the mobile use of scanners and radios capable of receiving police and other municipal transmissions, therefore you should consult your local law enforcement officials before installing mobile receivers. Carried far enough, this logic will someday breed laws which will prevent us from listening to anything except broadcast AM and FM and require us all to stay in our homes, as no crimes could be committed if everyone just stayed home listening to Neil Diamond.



Where to Put it

When you're locating your antenna, height is your friend. Who are you going to get to see over a crowd—a basketball star or a jockey? The signals that scanners pick up mostly propagate (travel) in generally the same way that light does—in a straight line. If you're on a boat and you want to see land, climb the mast. In certain situations, you wouldn't believe what raising an antenna five feet can do. First, though, a brief word from Dr. Safety: WARNING: HEIGHT IS DANGEROUS, PARTICULARLY WHEN IT IS ABOVE GROUND. BE CAREFUL. PLAN AHEAD. REMEMBER, POWER LINES ARE DEADLY. READ AND FOLLOW ALL WARNINGS PROVIDED BY ANTENNA MANUFACTURERS. YOU ARE NOT AN EXCEPTION.

Ok—enough of that. Back to mounting your antenna. Don't mount one vertical antenna where it could fall and touch another vertical antenna. This is not for safety reasons, it is for performance reasons. One antenna will often have an adverse effect on another antenna when it is within its own height of the other one. In general, all antennas should be far away from all other antennas. Like so many other topics covered here, there are reasons, formulas etc. for this rule, and once you know the rules you can break them, but they can be complex.

What Kind of Line (Coax) Should I Use?

Good line. Almost always 50 ohm line (that's a specification you mention when you buy your line. Your radio manual usually specifies the impedance of the antenna and line it wants you to use. It's usually 50 ohm. The basic choices are RG58/U and RG8/U (two generic types of coaxial cable). There's also RG213, and it's quite good, but beyond that it begins to get fancy and unnecessarily sophisticated. Don't scrimp on cable. Buy good stuff. Ask a ham/SWL equipment dealer or two-way radio shop for their recommendations. There are also some great mail-order sources, but *call* them or *write* to them and tell them what you want to do. Don't guess. They'll help you, just like the walk-in dealers. All of them really want you to be happy with your purchase.

Lightning Protection

Remember the knife fight in *Butch Cassidy and the Sundance Kid*? Remember when Butch wanted to discuss the *rules*, and the big guy said, "There ain't no *rules* in a knife fight?" Well, that's about how it is with lightning. It *will* strike twice in the same spot, and it will ignore most wives' (and husbands') tales.

Follow the manufacturer's recommendation for grounding the antenna, NEVER USE ALUMINUM GROUND WIRE—IT WILL VAPORIZE IF THERE'S A DIRECT STRIKE—and follow national, state and local electrical codes when installing and grounding your antenna.

Buy a lightning arrestor for each antenna. Air gap units work well for tube type scanners, which none of you have, so forget them. Buy a gas-discharge type lightning arrestor (its faster-acting circuitry will help to protect your solid state equipment), install it outside the house per manufacturer's instructions, and DON'T SCRIMP ON A GROUND ROD! EIGHT FEET LONG. SOLID COPPER—PLEASE.

Further Reading

If I suggest an antenna book, some people might run out and buy it because I said it was great, and frankly, I'm not that smart. I will suggest you look into books available at ham radio and SWL dealers (where you can open them and *see* if they're right for you) and from certain magazine publishers (whose initials are CQ and the ARRL—see addresses below) who offer a fine selection of communication books.

CQ Book Shop
Main Street
Greenville, NH 03048
(603) 878-1441

ARRL
225 Main Street
Newington, CT 06111
(203) 666-1541

And Furthermore . . .

I have come to the conclusion that most dealers are honest, some are even human beings and they all want your return business. Tell them what you want. Remember about motivation: they don't want an unhappy customer walking in with a problem—they'd rather steer you toward something you'll be happy with—something their experience tells them you'll like. Whether it's in person, on the phone or in a letter—make a friend at a dealer. Now go get a good antenna—hear what you've been missing. ■

Tuning In To Pirate Radio

Sure, they're illegal, but "more than 100 outlaw broadcasters appear on shortwave every year." Here's how to hear them. . .

BY GEORGE ZELLER

Reverend Billy Bob Huxley reveals the secret of how listeners can cash in on their faith. Punk rock music blasts away from a "leaky bathtub somewhere off the North American coast." A sportscaster breaks the news about a forthcoming bout between Mike Tyson and Don Knotts. A well-lubricated announcer promotes beer drinking while broadcasting.

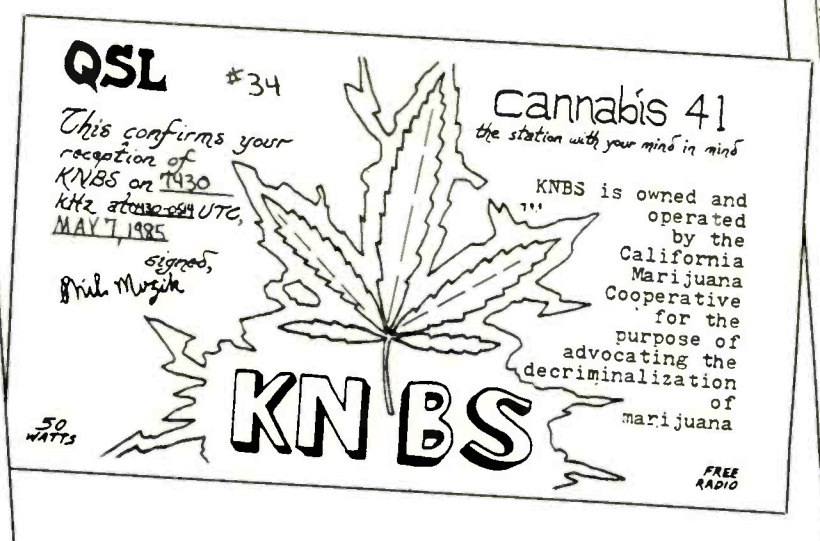
Sound interesting? All of these programming gems have been recently heard on the shortwave bands. They're pirate radio stations. Both the United States Federal Communications Commission and the Canadian Department of Communications prohibit unlicensed shortwave broadcasting. Nevertheless, more than 100 outlaw broadcasters appear on shortwave every year. Chasing these pirates around the bands is just plain fun; not for the FCC, but for us listeners, of course. The stations often provide some of the most entertaining fare on the high frequency bands.

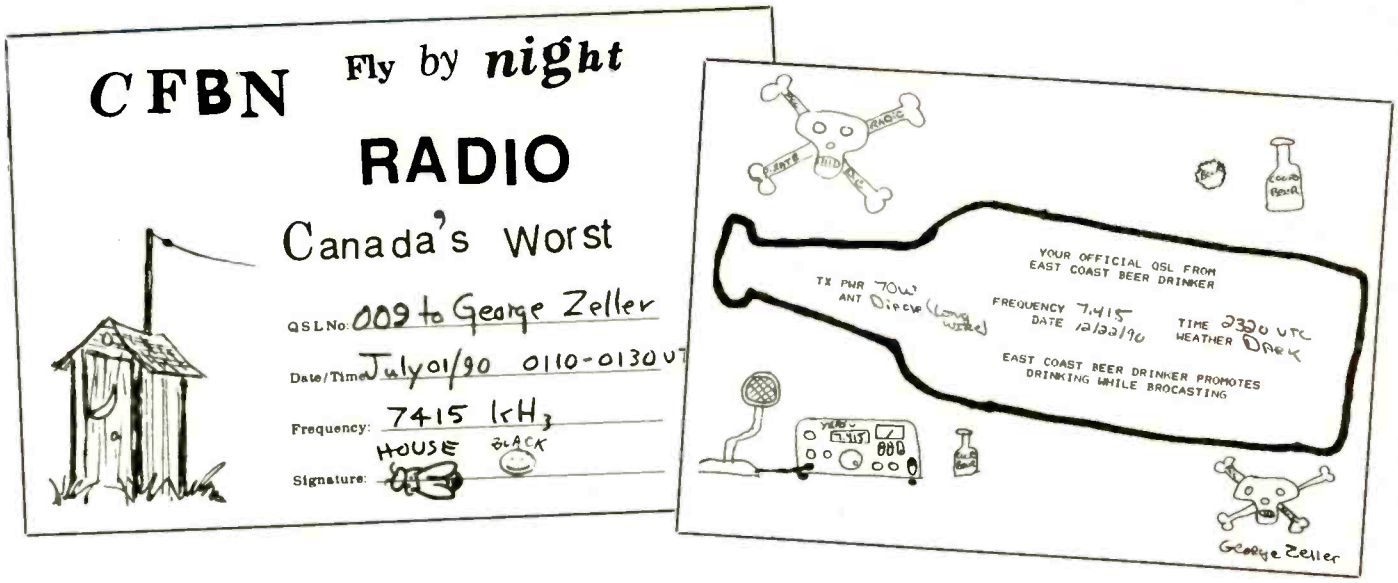
Three Types of Outlaws

The vast majority of programming on shortwave comes from international broadcasting stations or local/regional broadcasters, all of which are licensed by the governments (or operated by them) of the world. But, plenty of unlicensed stations also operate in a shadowy grey area without official sanction. The outlaw stations can be grouped into three types: clandestines, bootleg stations, and pirates.

Clandestine broadcasters serve as the media voice of revolutionary groups that are attempting to destabilize or overthrow governments in regions that are experiencing political turmoil. These stations come and go as the worldwide political situation changes, but some unlicensed clandestines have maintained regular daily operations for years. For instance, two longtime anti-Castro stations transmit at the top edge of the 31 meter band, and are easily heard every evening on inexpensive portable receivers. Radio Caiman on 9965 KHz and La Voz del CID on 9941.7 kHz annoy the Cuban government constantly.

Bootleg unlicensed broadcasts come



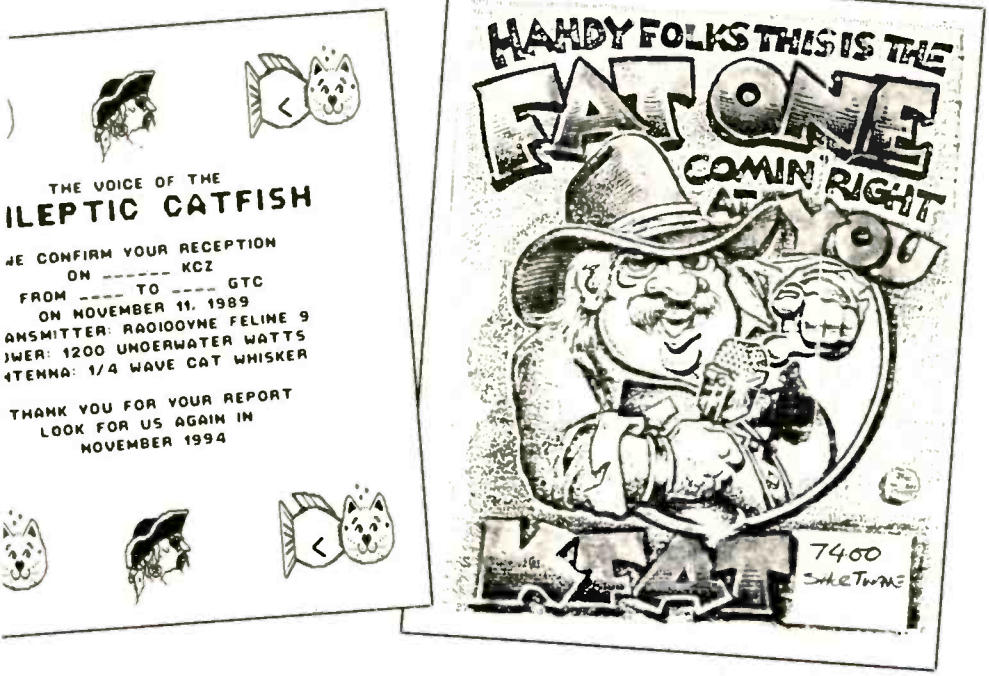


in a variety of strange forms. Some consist of endless strings of coded number groups, generally presumed to be operations by government intelligence agencies. Others are illegal voice communication networks maintained by smugglers, transport companies, or unauthorized hobbyist transmissions. Bootleg stations regularly appear in unusual places throughout the shortwave bands. Frequencies such as 5046, 6840, and 7445 kHz have featured strange bootleg transmissions for decades.

Pirate broadcasters are probably the most interesting and entertaining outlaw transmissions on shortwave. A few European pirates like Radio Caroline have been sponsored by well-financed corporate organizations that ignore international broadcasting regulations. But, the overwhelming majority of pirates are run by individual radio hobbyists. A very loosely knit "Free Radio" movement of North American pirates transmits in defiance of governmental licensing restrictions. Legitimate North American broadcasting stations can cost many thousands of dollars. Pirates circumvent this situation by firing up transmitters that often cost only a couple hundred bucks.

Some local pirate stations use frequencies in the BCB or FM broadcasting bands, but most North American pirates are found on shortwave. Most pop up in the 41 meter "Pirate Band," unofficially defined between 7355 and 7520 kHz. In recent years the area around 7415 kHz has been a very popular pirate frequency. If you want to hear a pirate, 7415 is the place to tune your receiver!

Another fertile frequency range to check for pirates is the low end of the 19 meter international broadcasting band, between 15010 and 15100 kHz. Occasional pirate activity can also be found around 1620, 6240, 6850, or 8000 kHz. The 6200 - 6350 KHz band is popular among European stations, although these tend to be difficult DX catches on this side of the Atlantic. Even so, some Europirates can be heard around 0400-0800 UTC, especially during the winter months.



What You'll Hear

In North America, pirate station programming is quite diverse. You never know what you might hear. Several stations transmit insipid "Kids Playing Radio" rock tunes, but many others produce highly creative and entertaining shows. Musical tastes include rock, country, reggae, new age, folk, classical, ethnic, and many other types. Some of these musical formats are not regularly heard from North American licensed broadcasters.

The real lure of pirate stations is their non-musical programming. Pirates regularly transmit some of the most fascinating and entertaining shows that are heard on shortwave radio today. Comedy material, often original productions by individual pirates, is a common format. Others feature drama, sports, political commentary, religion, nostalgia, and fantasy themes. The content of pirate broadcasts is limited only by the imagination and creativity of pirate station operators.

Even the names of pirate stations are often eye-catching. The official USA

government station, the Voice of America, faces pirate competition from stations calling themselves the Voice of Laryngitis, the Voice of Pancho Villa, and the Voice of the Epileptic Catfish. Call letter puns are common, such as KFAT (a country music station), KNBS (a pro-marijuana station) and WORK (a labor-management satire station). East Coast Beer Drinker promotes (what else?) beer consumption. A few profane stations must be censored from this family publication.

Since pirate transmissions are prohibited by law, all North American pirates broadcast on an unscheduled and erratic basis in an attempt to avoid apprehension by the FCC and the DOC. "Free Radio" stations can appear virtually anytime on an unpredictable basis. However, pirates have definite operating tendencies that can be used by listeners to increase their odds of hearing a station.

When They're On The Air

The majority of pirates operate on weekends. Friday, Saturday and Sunday are good times to look for their transmissions. Pirate broadcasting activity always increases substantially around major holidays, including some not-so-major times, such as April Fool's Day, and Friday the 13th. Most broadcasts are heard during local evenings, usually between 2200 and 0600 UTC.

Pirate DXing requires lots of patience. Even if you tune to 7415 at 0100 UTC on New Year's Eve, you might not hear a station immediately. But, careful and patient bandscanning around the "hot" frequencies during the times I've mentioned eventually results in a number of pirate loggings by any DXer. The fun then begins!

You might hear comedy from station manager Genghis Huxley of the Voice of Laryngitis, sponsored for years by Friendly Freddie's Budget Burials, "where death is cheap". The Voice of Tomorrow could show up on the bands with its harsh racist and pro-fascist analysis of western civilization. Pirate Rambo may appear over CSIC, with his "Psycho Chicken" interval signal. WBST, with its slogan, "WBST brings out the beast in me," is often noted on Halloween. Perhaps you might hear WYMN, the only all-female pirate with a "Testosterone Free Radio Format."

Some of the pirate stations are even more bizarre. The Voice of Bob, the official station of the Church of the Subgenius in Dallas, Texas, heals DXers who put their hands on the radio to acquire "slack." 9X2V, the Voice of 1932, claims to broadcast live from a hotel ballroom during the Great Depression. "The Spectator" specializes in haunting Gregorian Chants. You usually can't hear off-the-wall material like this from licensed broadcasters, but weird pirate shows are quite common.

Surprisingly, most pirates encourage correspondence from listeners. A majority of these outlaws of the airwaves will QSL accurate reception reports. The stations never announce true locations for obvious reasons, but they can be contacted through mail forwarding services. Although pirate broadcasting violates the law, it is perfectly legal for listeners to communicate with pirates through the mail.

Reception reports to pirates should be sent through a maildrop address that is announced during the transmission. For instance, two currently active maildrops are P.O. Box 492, Wellsville, NY 14895 and P.O. Box 109, Blue Ridge Summit, PA 17214. You must enclose three mint first class postage stamps inside the envelope to cover costs of forwarding your report to the station, and returning the QSL to you. Many pirates issue very attractive QSLs, some of which are illustrated here. Quite a few of these QSLs are collector's items, and all are certainly conversation pieces.

Pirate transmitters range from low power rigs to impressive 5 kw homebrew powerhouses. As a result, some pirate signals are difficult DX catches that must be fished out of the mud. Others blast in with signals that rival those from the BBC or WWCR. Whether you are a casual shortwave program listener or a hardcore DXer, there are plenty of interesting targets in the pirate bands. Every receiver in this Buyer's Guide is capable of picking up a pirate!

It's easy to get hooked on pirate chasing. Fortunately, several sources of detailed current pirate station information exists. *Popular Communications* magazines's monthly "Pirates Den" column tracks recent pirate activity. The annual *Pirate Radio Directory* reviews all North American pirates heard during the past year. It's available for $8.95 plus $2 shipping from Tiare Publications, P.O. Box 493, Lake Geneva, WI 53147. The Association of Clandestine Radio Enthusiasts, a hobby club, specializes in unlicensed pirate, clandestine, and bootleg transmissions. Samples of their monthly bulletin, *The ACE*, are available for $2 from P.O. Box 11201, Shawnee Mission, KS 66207.

Why not tune around 7415 KHz next weekend? You just might hear R.F. Burns of Radio Clandestine with his sidekicks Drewel the Cabin Boy and Wanda Lust. Or, maybe you'll hear a brand new pirate no one has logged before. Good luck! ■

Does Your Radio Go Where You Go?

Many communcations hobbyists just can't leave home without it; the handheld scanner or portable shortwave comes along. Here are a few things to remember before you close the luggage.

BY HAROLD A. ORT

Like many folks who went to Saudi Arabia last year, I'll never forget my experience there. But the ordeal was made more tolerable because of my small portable shortwave receiver. Alright, I admit it, I take my radios wherever I go.

When I heard that there was no AFN radio where we were going, I knew we were going to be there for the long haul; as they say in the military, "for the duration." To me the "long haul," in the desert meant more than a weekend. Spending more than a weekend away from my radios would be like an eternity, especially without any kind of news or static in my ears.

Every minute counted as I called Carolyn back in the U.S., asking her to order a small digital portable. Frankly I had always wanted a small portable, so I figured this was my chance. In the back of my mind, I was really hoping "Sadman" Hussein would back off and I'd simply have a new radio!

I soon realized that no one else had brought a radio, especially a shortwave radio capable of tuning in HOME and English broadcasts. Most of my friends brought portable tape-players that tuned the AM/FM bands, but where we were, all they could hear was chanting and static. Meanwhile I was hearing the news as it happened. From Sadman's feeble attempts to drag Israel into the conflict, to worldwide interpretation of the crisis, I had a window on the world, a window the Army hierarchy soon realized was their only link to the "real world." I couldn't help thinking that there we were in the middle of a hostile fire zone and I was doing more SWLing than I had in months!

It Could Be Worse

We were always told to be prepared for anything. Half the weight of my duffle bag was dozens of those "AA" batteries. But they didn't last long, in fact it wasn't long before our friendly supply sergeant became a source of power, as he had access to the "AA" batteries. There was no K-Mart or Radio Shack. I didn't ask questions. Just get the batteries—tomorrow might be too late.

Be prepared for anything, they always told me. I had the radio, plenty of batteries and my last issue of *Popular Communications*. (Remember I said that I don't go anywhere without my radios?) I even had my handheld scanner shipped to the desert!

But don't forget, you can never be completely prepared. There I was, with more "AA" batteries than Santa Claus, but what about an outside antenna? What about wire and alligator clips and a small tape recorder to capture all the action? What about those plastic air-tight food bags to seal my gear from the sand? Where on earth do you get wire and alligator clips when you're scrounging for cots and tent stoves?

Make a List

I've said all of this to remind all of us radio listeners that before you set out on a journey, even if it's a weekend jaunt, and you insist on taking the radio along, make a list and check it twice.

Are you going to be near a department store, or are you going to the middle of nowhere on a camping trip with your radios? Will there be access to electric power to charge the NiCds? If there is, will you remember to pack the wall charger? If there isn't, will you remember to bring a couple of extra sets of fresh batteries? Will you be in a sandy or damp area? What about a hank of wire and a couple of clips to string an antenna and some string to string the antenna?

Now, I don't advocate taking your hobby to such an extreme that you take your gear everywhere, but, let's face it, there are times when even the rest of the family gets a kick out of hearing the action on the bands, whether it's the local cops or the BBC news. You just never know when you might need your radios, so if you plan on taking any of your expensive communications gear along for the ride, be sure to observe a few common sense rules:

- Always take fresh batteries.
- Bring along the instruction manual. It only takes a little space, but might come in handy.
- Invest in a metal photo-gear case, especially if you've got a couple of *small* radios. The money you spend on a case is well worth it. Murphy's Law says that the most expensive radio you own will be rendered useless on its first contact with the ground. Murphy's Law also states that when that huge bottle of mouthwash leaks in your luggage, it will find the most direct path to your radios. So, a separate case is extremely important!
- Remember to bring an issue or two of *Popular Communications*, or at least a list

Continued on page 143

Popular frequencies to tune in U.S. Navy aircraft include 277.8, 340.2, and 360.2 MHz, AM mode. (U.S. Navy photo.)

Add Spice to Your Scanning

Don't Settle for Anything Less Than White Knuckles and a Pounding Heart.

BY MARTIN STETT, KCT1TC

"Report of disorderly teenagers and loud music at Evans Street and Yale Circle."

"This is the Lompoc County Fire Service with the weekly roll call of volunteer fire companies and rescue services."

"Eddie, the guys at the Texaco station said you delivered them two pies with mushroom topping and they ordered sausage."

Has this kind of communications traffic made you think that maybe the money you spent on your scanner would have been put to better use buying that new set of tires? Have you entered every area police, fire, taxi, pizza delivery, and business radio service channel you know of and yet you're still bored most of the time—and your super whiz-bang 400-channel megaHertz muncher still has 350 empty memory slots to fill?

You've definitely got a bad case of the Scanner Blahs. Lucky for you, the doctor is in.

Step One

The first step in a cure is understanding that many scanner owners don't take into account that they should broaden their scope of interest to cover other bands that are sometimes overlooked.

Put the scanner into search/scan mode and sort through some additional bands to see what new active frequencies you can discover. For instance, the VHF maritime band (156.275 to 157.425 MHz). What about the aeronautical communications band (118.0 to 137.0 MHz, AM mode)? And don't forget the railroad band (160.215 to 161.585 MHz).

Cordless telephones operate between 46.61 and 46.97 MHz, and usually provide many interesting moments for scanner owners within range of such devices.

Program your scanner with 151.625, 154.57, and 154.60 MHz. These are the three VHF frequencies available in many different brands of low-power handheld transceivers widely sold to businesses,

hunters, sports teams, and just about everybody else who wants inexpensive short-range communications. You can hear some wild and truly unforgettable things on these channels. No shortage of salty language here.

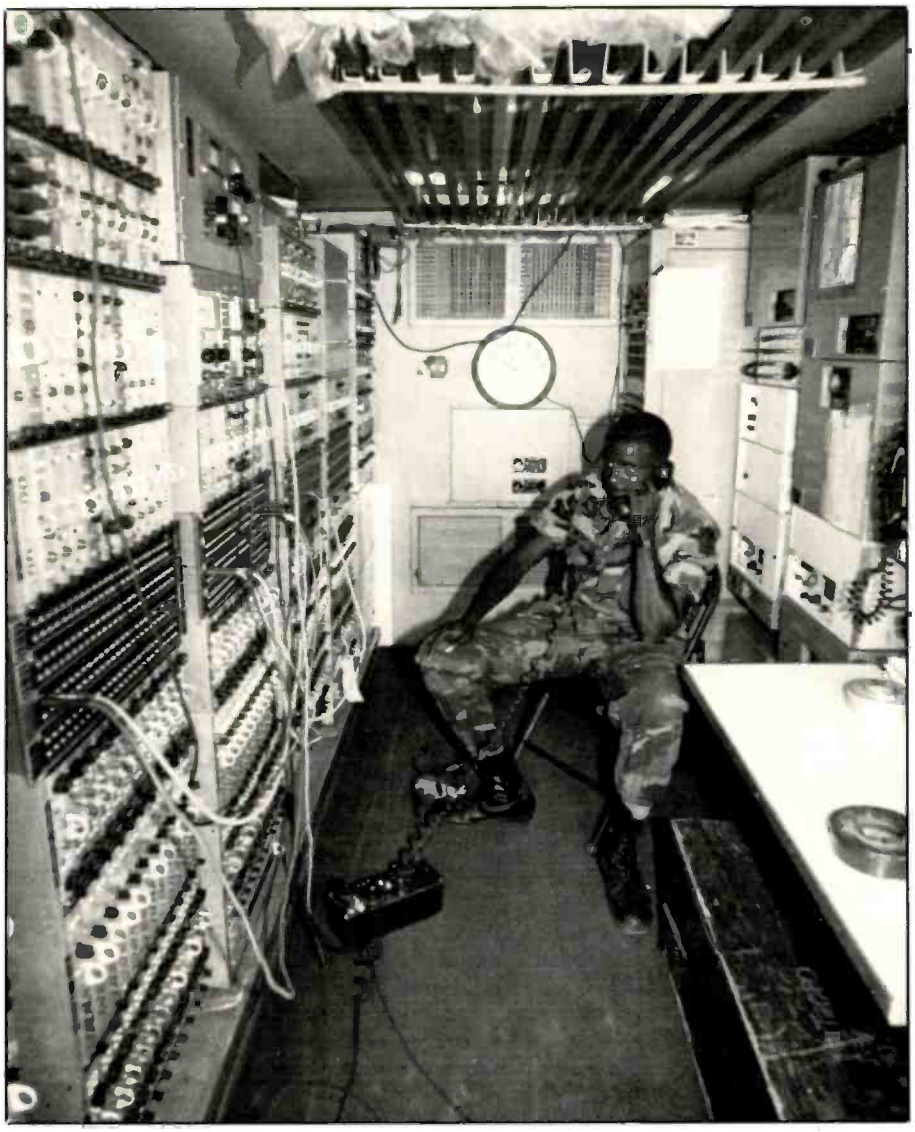
Many scanner owners take particular delight in monitoring the communications from drive-through windows at fast-food restaurants. Apparently the comments of the employees regarding the customers can be both crude and extremely funny, and they're all sent out over the headset transceivers they wear, which operate for short ranges on scanner frequencies.

While there are many local variations to fast-food frequencies, even within the same national chains, some frequencies do seem more commonly used than others. Many McDonalds are reported on 151.895, 154.60, 170.245, and 171.105 MHz. Many Burger Kings have been reported on 465.887 and 467.787. At Taco Bell, try 465.887 MHz, and also try the taco salad.

The Next Step

Now that you've added some salt, the next step is to add a dash of pepper to spice up your scanning. The heavy duty listening comes in the area of monitoring federal agencies. Yes, the FCC, Secret Service, Border Patrol, Immigration, FBI, U.S. Marshal Service, Customs Service, DEA, military services and everything else in the realm of federal operations.

You didn't forget about these stations, did you? Or is it that you didn't realize your scanner picks up their communications frequencies?



The U.S. Army makes heavy use of frequencies between 30 and 50 MHz, and often uses wideband FM (WFM) mode. Try searching the 30 to 50 MHz federal bands listed in the text. (U.S. Army photo.)

The standard reference guide to monitoring these stations is The *"Top Secret" Registry of U.S. Government Radio Frequencies, 7th Edition*, by Tom Kneitel (published by CRB Research Books, Inc. P.O. Box 56-GG, Commack, NY 11725, a free catalog is available upon request). This is a big 240 page directory of about 200,000 listings covering virtually every imaginable agency and military facility.

You can look for federal communications by putting your scanner into search/can mode and running through the following bands: 32.0 to 33.0, 34.0 to 35.0, 36.0 to 37.0, 38.0 to 39.0, 40.0 to 42.0 and 49.66 to 50.0 MHz, 137 to 144 MHz, 148.0 to 150.8 MHz, 162.02 to 174.0 MHz, 225 to 400 MHz, and 406.0 to 420.0 MHz. Note that communications in the 137.0 to 139.0 MHz band and the military aero band, 225.0 to 400 MHz are usually in the AM mode, as opposed to the FM usually encountered on VHF and UHF.

When skip conditions are good, many listeners report lots of nationwide activity on U.S. Fish and Wildlife Service frequencies 34.25, 34.41, 34.81, 34.83, and 34.85 MHz.

The U.S. Customs Service can often be heard on 165.2375 MHz, and you can frequently tune in on communications of the Treasury's Bureau of Alcohol, Tobacco and Firearms on 165.375 and 418.225 MHz. Among the many channels used by the Secret Service, you might try 165.787, 165.212, and 166.212 MHz. Air Force One, and other VIP military aircraft can sometimes be monitored passing air/ground phone calls on 415.70 MHz.

Interesting North American Aerospace Defense Command (NORAD) communications can be heard on 364.2 MHz, while if you put 311.0 MHz into your scanner, you'll be tuned in on an important frequency used by the USAF's Strategic Air Command.

In many areas of the USA, you can hear FCC repeaters operating on 167.05 MHz. These stations are located at the field offices and are used by the engineers to keep in touch with one another.

Postal Service inspectors and security have been reported on 413.60, 414.75, 415.05, 416.225, and 418.30 MHz.

If you want excitement, put 282.8 MHz into your scanner. That's the U.S. Coast Guard's search and rescue frequency. Another good USCG frequency is 381.8 MHz, where there is helo activity. If you hear a search operation in progress, also try listening on 148.15 MHz, which is a busy Civil Air Patrol channel.

These are just a small sampling of the huge number of federal frequencies that can be monitored to spice up any monitoring effort. Just wanted to show you that there's really a lot more out there to tune in than you might have assumed! ■

Monitoring Utility Communications—It's Where the Action Is!

Coast Guard rescues on the high seas, aircraft on trans-Atlantic flights and NASA space shuttle support communications are only part of the excitement of monitoring utility communications. . .

BY DON SCHIMMEL

When we mention **utility** communications, the new listener might think we're talking about the electric power company or public water or sewer service. However, that isn't the case in SWL circles. What we're referring to are the communications pertaining to everything except amateur (ham) and broadcast signals. This is the generally accepted definition for HF (high frequency) utility monitoring.

What then are the various types of activities falling within this broad category? A brief list would contain the U.S. Air Force, Army, Navy, maritime, Coast Guard, military, civil air, foreign ministries, embassies, spy numbers, navigational beacons, Drug Enforcement Agency and Federal Emergency Management Administration, to name a few. This list is certainly not intended to be considered all inclusive, but does give you an idea of the variety of loggings possible in the utility portions of the shortwave frequency spectrum.

If we're going to listen to the utilities, what do we need? Beyond a good receiver that has sideband tuning capabilities and suitable antenna, there are several accessories that will help you, including the many utility books currently on the market. In addition, your listening post should include a good world atlas or globe. You'll also find an almanac to be an invaluable aid.

There are many good receivers on the market for listening to voice and Morse code signals. Your selection of a particular unit should be based on what you want to pay and how many bells and whistles you desire. For a more detailed discussion, check the short article in our *Communications Guide* for information on selecting a receiver.

Hobbyists are not the only ones involved in monitoring communications! Here is a view of the antennas on the roof of the Soviet Embassy in Athens, Greece. Photo courtesy of Prof. Desmond Ball, Australia.

Antennas can vary from a simple random length of wire to a rotary beam. I've had very good reception from off-center dipoles with one leg 45 feet and the other 22 1/2 feet. Such an antenna seems to perform quite well across the HF bands.

Reception is further enhanced with an antenna tuner.

Real-Life Drama You Can Hear

Let's take an example of utility coverage and track it as events unfolded. This summary was prepared based on a detailed logging recently received from *POP'COMM* contributor Eugene Woody of New York.

One night at about 0530 UTC, I got a phone call from a friend and fellow SWLer in New York City, David Torres, advising that I should listen to 5277 kHz. He said it sounded like a U.S. Customs aircraft was in a tail chase. I was at my listening post when he called, so I spun my dial over.

All communications were relayed through Atlas due to band conditions. An aircraft of the Customs Service (I believe) with callsign Voyager was in a tail chase of a DC-3 which was heading toward Mexico from Venezuela at 23,500 feet. Voyager reported he couldn't get close enough to read the suspect aircraft's registration without spooking him. Atlas passed the message to Dragon. Voyager decided to stay eight miles behind the DC-3. At about 0710, aircrafts Aztec and Tiger were dispatched to assist when it seemed the suspect was headed toward Baja Mexico.

The suspect aircraft descended to 3,000 feet at about 0930; apparently heading for a landing at Los Mochis airport, Mexico. Fifteen minutes later, Voyager said the suspect was not heading for Los Mochis, but banked a turn towards a small airstrip south of Los Mochis. The DC-3 landed on this strip, illuminated only by automobile headlights.

Voyager overflew the strip and reported he could see a lot of activity and vehicles on the ground. Dragon was kept posted throughout by Atlas.

At 0950, the Voyager said they only had 30 minutes of on-scene fuel left and they would be outnumbered by apparently hostile ground forces if they attempted to land. They further reported that they saw three large trucks loading from the plane and numerous smaller vehicles. Atlas informed them to continue orbiting the scene, report what they saw, and that Aztec would have a five-minute ETA to relieve them. Tiger was enroute.

Aztec was ten minutes overdue at 1005, but Voyager couldn't wait. They broke off their observation and headed for Culiacan, Mexico to refuel. They reported the three trucks were departing northward, and that other vehicles had vanished. The suspect plane was still on the runway.

Aztec finally got on scene and was orbiting overhead. Voyager was back on the scene at the airstrip at 1155 for recon. They made communication with a unit evidently on the ground. Six minutes later, Voyager reported to Atlas, Dragon, and others that there were four DOA's on the ground. The suspect aircraft was gone. The four dead were reported to be enemy, not friendly forces.

At 1214, Park Place advises that the suspect aircraft is on the ground at Mazatlan, Mexico. Atlas relays to Voyager and tells them to remain on scene and act as airborne radio platform/command center.

Dawn is breaking. Voyager reports that he can see vehicles parked on the strip, but he can't land. Voyager is now waiting for Tiger's arrival. At 1238, Tiger is on the scene, preparing to land. At 1248 Tiger relays through Voyager that there is gunfire on the ground. Tiger lands at 1253 after ascertaining that gunfire was the Mexican National Police and the scene was secured.

The signals faded after that and I lost them. I also lost sleep that night, but it was worth it!

Now, having tasted a sample, let's check out some frequencies to see what they have to offer. Note the different types of activity represented in the list in Table 1. These only scratch the surface of many utility transmissions to be found on the airwaves.

TABLE 1

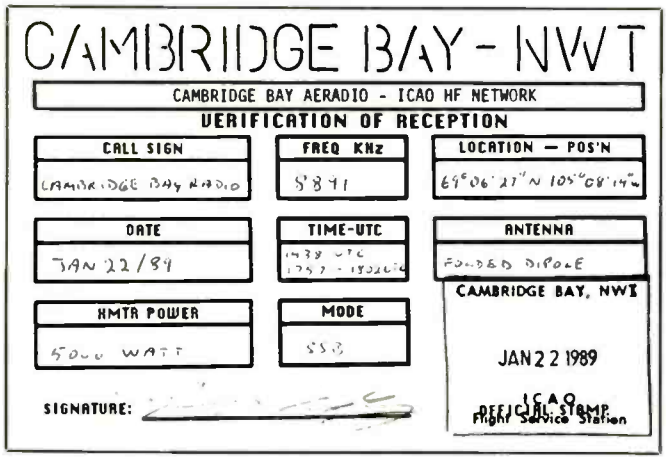
Monitoring Utility Communications
(All frequencies in kHz)

2716	USN	10780	NASA
3067	SAC	10944.8	Canadian forces
3130	USN tactical	11108	Israeli intelligence
3378	aeronautical	11208	Joint U.S. government (SHARES)
4066.1	USN		
4087.8	Mississippi River barges	12690	USCG
4125	maritime distress/safety	13354	NOAA-Hurricane hunters
4415	National Guard	13626	FAA
5190	space launch support units	13898	Cuban diplomatic
5197	MAC	13927	USAF MARS
5264	spy numbers	14362	Polish press
5547	aeronautical	14383.5	USN MARS
5703	TAC	14405	USAF MARS
6200	USCG	14441.5	USN MARS
6518.8	inland waterways	14510.5	USA MARS
6676	SE Asia volmet	14676.5	Argentine Provincial Police
6760	Italian AF	14686	U.S. Customs Service
6761	SAC	14792	NOAA
6792	spy numbers	15875	USN Loran stations
6927	USAF VIP travel	16420	maritime distress/safety
7527	DEA	16463.1	British Navy
7535	USN	16591.5	French Navy
7651	VOA feeder	17155	Soviet Navy
7997	USAF	18207	MAC
8241.5	USCG	18210	aeronautical
8281	maritime distress/safety	18323	USAF-VIP travel
8288	Italian Navy	18511	VOA feeder
8294.3	towboats on Ohio river	19440	Radio Moscow feeder
8697	Canadian forces	20000	WWV
8719	USN	20050	USAF-VIP travel
8766	USCG	20185.5	USA MARS
8989	USAF	20623.5	USN MARS
9041	spy numbers	20904	North Korean diplomatic
9082	Soviet Navy	20957	Ghana diplomatic
10000	WWV/WWVH	20993.5	USA MARS
10242	U.S. Customs Service	21811	spy numbers
10493	FEMA emergency net	23562	Netherlands diplomatic
10637	U.S. State Dept.	24862	Chilean Telcom

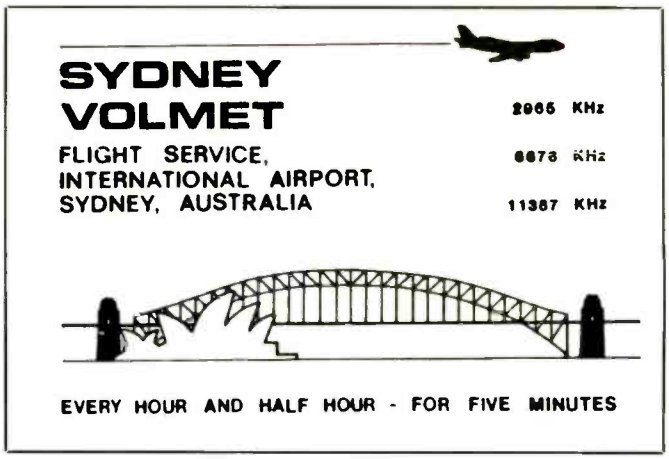
Getting a Handle On It All

Being able to identify what you are listening to adds to the enjoyment of utility SWLing. This points to the necessity of starting a bookshelf of reference material. There are countless titles available. As your funds permit, you should add those references you believe will be helpful to you. See Table 2 for some suggested ones.

Another valuable aid is a dictionary of foreign languages. One which is available in many bookstores is called *Seven Language Dictionary* published by Avenel Books of New York. This volume gives the English definitions of words in the French, Italian, German, Russian, Hebrew, Portuguese and Spanish languages. Thus, with just this one book, you can



PFC made up by Steve McDonald, BC, Canada.



Here is an example of a QSL from a Utility station. The particulars regarding the reception were on the reverse side of the card. Sent in by Dave Sabo, CA.

find many of the foreign words commonly heard while monitoring.

Do you want to know if there is a fellow SWLer nearby? You can order a copy of the *DXer's Directory* by Fred Osterman. This booklet contains the names and addresses of participating listeners. Who knows, you might find there is someone close to your monitoring station who shares your SWL interests. The book also includes an extensive listing of radio clubs in North America as well as some of the clubs in other parts of the world. Many of the clubs provide utility coverage in their newsletters. To order a copy, write to Universal Radio Research, 1280 Aida Drive, Reynoldsburg, Ohio 43068.

Club affiliation is an excellent way to really enjoy your listening hobby. Another source of a list of clubs in North America (those belonging to the Association of North American Radio Clubs) plus information describing the ANARC can be obtained for $1 from the ANARC, 79 Kipps Street, Greenfield Park, Quebec J4V 3B1 Canada.

Throughout the year several SWL conventions are held around the country. Two that I've attended are the SWL Winterfest in Kulpsville, Pennsylvania which is usually held in March; and the newly instituted Grove convention held in Knoxville, Tennessee in October. These affairs feature sessions covering the different phases of the hobby, led by knowledgeable individuals, most having many years of experience in shortwave listening fields. Club publications and *Popular Communications* magazine carry advance notices about these conventions.

I heartily recommend you listen to the ANARC SWL Amateur Radio Net which meets every Sunday morning at 1500 UTC on 7240 KHz, lower sideband. You don't have to be a ham operator to participate, because several net members act as "gateways." They will announce their phone numbers for contributors to call them and pass along loggings which are then given on the net for all to hear. Bob Brown, KW3F, and Dave Kirby N8JQX act as net controls. Net operation gets underway with a check-in of participating hams, followed by loggings which include shortwave broadcast and utility loggings. Upon completion of the loggings and discussion, the net might go into an open session.

A popular aspect of listening to communications is collecting verifications of reception. The acknowledgement cards, known as QSL cards (or letters) are sent by stations in response to a reception report provided by the listener. Sometimes listeners will send the station a PFC (prepared form card) that lists all pertinent information, so all the station does is sign the card and returns it to the listener. Elsewhere in our *Communications Guide*, you'll find an interesting article by Gerry Dexter that covers the art of QSLing.

There's plenty of unusual transmissions to hear out there—from Air Force One to foreign embassies. All you need is a good receiver and antenna, and, of course, a bit of patience too. Good listening! ■

Table 2

A list of some reference/identification publications

Aeronautical Communications Handbook, *Evans*
Beacon Guide and Updater, *Stryker*
Canadian Military Radio Frequency Guide, ING
Coast Guard Radio, *Pogue*
Confidential Frequency List, *Ferrell*
Guide To Embassy & Espionage Communications, *Kneitel*
Guide To Utility Stations, *Klingenfuss*
List of Limited Coastal Stations, Association of DX Reporters
Shortwave Directory, Grove
Shortwave Listening Guidebook, *Helms*
Shortwave Radio Listening With The Experts, *Dexter*
Speedx Reference Guide to the Utilities
The Pirate Radio Directory, *Zeller*
The Soviet Maritime Radioteletype Dictionary, *Osterman*
The Underground Frequency Guide, *Helms*
The Warship Directory, *Pogue*
USSR Merchant Ship List, *Berri*
Utility QSL Address Guides, Vols. 1 & 2, *Symington & Henault*
World Press Services, *Harrington*

Glossary

AC: Alternating current.

AF: Audio frequency.

AFC: Automatic frequency control.

AFSK: Automatic frequency shift keying.

AGC: Automatic gain control.

AM: Amplitude (envelope) modulation.

AMSAT: International association dedicated to promoting amateur space communications.

AMTOR: Amateur Teleprinting Over Radio; an error-correcting variation of RTTY.

ARQ: Automatic repeat request used in AMTOR.

ARRL: American Radio Relay League; U.S. national membership organization for ham radio operators.

ASCII: American Standard Code for Information Interchange. The ASCII 7-bit code represents 128 characters, including 32 control characters.

ATV: Amateur television; term usually applied to fast-scan TV, which is the standard home-entertainment format.

AVC: Automatic volume control.

Balun: Balanced-to-unbalanced matching transformer.

Bandpass filter: A filter that allows only a select band of frequencies to pass.

Bandwidth: Frequency space occupied by a signal.

Baud: The unit of digital-signal speed, equal to the number of events per second. Baud is not necessarily the number of bits per second.

BBS: Bulletin Board System.

BCI: Broadcast radio interference.

Beam antenna: An antenna that is directional.

BFO: Beat-frequency oscillator.

Binary: A two state numbering system represented by the 0 (zero) and 1 (one). A binary digit is called a bit. Digital data is represented by a one or zero bit.

Bit: Notation for a binary digit, the smallest unit of digital information. The bit can represent a choice of a one or zero (mark or space) in digital communications.

Broadcast communications: Communications intended to be received by the general public with no restrictions.

Buffer: A storage area or device (normally created by software in RAM) where data overflow is contained until RAM or disk space can be made available for storage., The buffer is mainly used to hold data while it is being transferred from one device to another.

CATVI: Cable television interference.

CB: Citizens Band radio.

CBMS: Computer-based message system.

cmd: An on-screen packet TNC prompt. This prompt informs the user that the TNC is in the command mode.

Coaxial cable: Commonly referred to as "coax." A feedline with one conductor completely surrounding the other.

CPU: Central processing unit; microprocessor.

CRT: Cathode-ray tube; used in TV receivers, computer monitors and oscilloscope displays.

CTCSS: Continuous tone-coded squelch system; sometimes called a sub-audible tone.

CW: Continuous wave; vernacular for Morse code.

D layer: Layer of the ionosphere that has little effect on shortwave radio propagation. Lowest layer of ionosphere.

dB: Decibel (1/10 of a Bel); unit for the ratio of two power measurements.

DB-25P and DB-25S: The connectors which support all 20 of the RS-232C signals. Recommended by the EIA.

DB-9P and DB-9S: Electronics Industries Association's recommended connector for use with RS-422A standard.

dBd: Decibels above or below a dipole antenna.

dBi: Decibels above or below an isotropic antenna.

DC: Direct current.

Digipeater: A store-and-forward digital repeater which will receive and transmit a data packet on the same frequency. All amateur packet stations are capable of digital repeating in a simplex environment.

Dipole: Antenna often used as a standard for calculating gain.

Downlink: Channel used for satellite-to-earth communications.

DTMF: Dual-tone multifrequency; telephone-type keypad signaling system that used 2-of-7 or 2-of-8 tones; often referred to by Bell's trademark Touchtone™.

Dummy load: A device that connects to a transceiver that allows a user to test a radio without actually transmitting a signal.

DX: Distant and/or rare station.

DXCC: Award offered by ARRL for working and confirming 100 or more different countries.

DXer: A person who actively specializes in tuning distant stations.

ECPA: Electronic Communications Privacy Act of 1986; Public law 99-508 that forbids listening to certain communications, including cellular phone communications.

EEPROM: Electrically-erasable programmable read-only memory.

EME: Earth-moon-earth; using the moon as a passive reflector to establish a signal path; moonbounce.

EMF: Electromotive force; voltage.

EMI: Electromagnetic interference.

EPROM: Erasable programmable read-only memory.

F layer: There are two F layers in the ionosphere; the F1 and F2. The F layer is responsible for reflecting radio waves to earth. Amount of reflectivity depends upon several factors including time of day, year, and amount of sunspot activity.

FAX: Facsimile; transmitting or receiving a visual image via wire or radio.

FET: Field-effect transistor.

FM: Frequency modulation.

FSK: Frequency-shift keying.

GaAs: Gallium arsenide; crystalline compound used in fabricating certain high-speed semiconductors.

Gateway: A bridge that provides a means to digipeat from one frequency into another or from one baud rate to another.

GMRS: General Mobile Radio Service; organized public safety teams using frequencies in the 462.55-462.725 MHz spectrum.

GMT: See UTC.

Ground: Common zero-voltage reference point; e.g. chassis ground or earth ground.

Harmonics: Signals from a transmitter occurring at multiples of the basic frequency.

Hertz (Hz): Basic unit of frequency measurement equal to 1 complete cycle in one second.

HF: High-frequency (3-30 MHz); hams often include 1.8 MHz in this category although, technically, it is a medium-frequency band.

IARU: International Amateur Radio Union; worldwide ham radio organization whose members consist of the official radio society from each country having one.

IC: Integrated circuit.

ID: Identification, as in station ID.

IF: Intermediate frequency; resultant frequency from heterodyning carrier frequency with oscillator; mixing all incoming signals to one intermediate frequency enhances amplifying, filtering and processing signals. It is frequently desirable to have more than one IF.

Ionosphere: Layers of charged particles above the earth's atmosphere that are responsible for reflecting radio waves back to earth.

Isotropic: Imaginary "single point" antenna used to calculate gain.

ITU: International Telecommunications Union; worldwide organization affiliated with UN that deals with telecommunications matters.

Jamming: Deliberate transmission of radio signals with the intent of rendering another signal ineffective.

JFET: Junction field-effect transistor.

KHz: Kilohertz (1000 Hz).

KW: Kilowatt (1000 W).

LCD: Liquid crystal display.

LED: Light-emitting diode.

LORAN: Long Range Aid to Navigation.

LSB: Lower sideband.

Ma: Milliampere (1/1000 A).

MF: Medium frequency (300-3000 KHz).

MHz: Megahertz (1,000,000 Hz or 1000 kHz).

Modem: Modulator/demodulator.

MUF: Maximum usable frequency; highest frequency at which the ionosphere supports propagation at any given time; usually best DX openings occur just below the MUF.

mV: Millivolt (1/1000 V).

mW: Milliwatt (1/1000 W).

NiCd: Nickel cadmium; usually refers to rechargeable battery packs.

NOAA: National Oceanic and Atmospheric Administration.

NODE: A remotely controlled TNC/digipeater.

NOVRAM: Non-volatile Random Access Memory is a memory chip that contains its own power source and holds memory, even if the power is removed from surrounding circuitry. External commands provide a means to change the memory contents.

NTS: ARRL's National Traffic System; network of stations devoted to relaying message traffic.

Ohm: A unit of resistance.

P-P: Peak-to-peak; as in peak-to-peak voltage.

PBBS: Packet Bulletin Board System.

PEP: Peak envelope power.

PFC: Prepared Form Card is a QSL card prepared by a radio enthusiast and sent to a radio station.

PLL: Phase-lock loop; used as one section of a digital frequency oscillator.

Potentiometer: Continuously variable resistor often used for adjusting levels, as in a volume control. Referred to as a "pot."

PROM: Programmable read-only memory; integrated circuit.

PTT: Push-to-talk; usually a switch on the microphone that activates the station transmitter.

QPSK: Quadrature Phase-Shift keying.

QSL: A verification of a listener's reception report. A card sent from one radio operator to another to confirm contact.

QRP: Low power operation, usually 5 W or less.

RACES: Radio Amateur Civil Emergency Service; quasi-official civil preparedness organization.

RAM: Random Access Memory; computer circuit memory made up of one or more RAM ICs that can be written to and read from.

Repeater: Automatic relay station.

RFI: Radio Frequency interference.

ROM: Read-only memory; usually an IC.

RS-232C: A set of signals accepted as a standard by the Electronics Industries Association (EIA) designed to make the interfacing of computers and networks easier.

RS-422A, RS-423A, and RS-449: The recent or newest standards which were developed to overcome the deficiencies of RS-232C.

RTTY: Radioteletype.

Selectivity: Ability of a receiver to reject signals adjacent to the tuned signal.

Sensitivity: A receivers ability to receive weak signals.

SINPO: A numerical rating system (from 1-5; 5 being ultimate) used by radio listeners when reporting signal quality to broadcasters. Signal, interference, noise, propagation and overall quality.

SSB: Single sideband; efficient form of voice transmission with one sideband and carrier frequency removed before transmission.

SSTV: Slow-scan television.

SWL: Shortwave listener.

SWR: Standing wave ratio; figure of merit indicating degree of match for antenna and feedline at some particular frequency.

TNC: Terminal Node Controller is the combined modem and assembler/disassembler. The interface device between the computer terminal and RF transceiver. The TNC assembles and disassembles packets and provides error detection.

TTL: Transistor-Transistor Logic.

TVI: Television interference.

UHF: Ultra-High frequency (300 MHz-3 GHz).

Uplink: Channel used for earth-to-satellite communications.

USB: Upper sideband.

UTC: Universal Coordinated Timer; formerly Greenwich Mean Time; world time.

Utility stations: Stations other than broadcast, or amateur stations; these stations are not intended to be heard by the public. They include aircraft communications, radiotelephone, marine, embassy and military communications.

V: Volt (unit of electrical force).

VCO: Voltage-controller oscillator.

VDT: Video-display terminal.

VE: Volunteer examiner.

VEC: Volunteer examiner coordinator.

VFO: Variable frequency oscillator.

VHF: Very-high frequency (30-300 MHz).

VLF: Very-low frequency (3-30 kHz).

VOM: Volt-ohm-milliammeter.

VOX: Voice-operated switch.

VSWR: Voltage standing wave ratio.

VTVM: Vacuum-tube voltmeter.

VXO: Variable crystal oscillator.

W: Watt (unit of electrical power).

WAC: Worked All Continents award from IARU administered by ARRL.

WARC: World Administrative Radio Conference; international ITU meeting that apportions radio spectrum and determines usage.

WAS: Worked All states award from ARRL for confirmed contact with each of 50 states.

WAZ: Worked All Zones award from CQ magazine for confirmed contact with each of 40 zones.

WEFAX: Weather facsimile, reconstructed satellite pictures and photographs. The WEFAX-receive mode is now an added feature of the all-mode digital controllers.

WPM: Words per minute, usually refers to Morse code speed.

X.25: An internationally-recognized-standard digital-communications-interface protocol.

XCVR: Transceiver.

XFMR: Transformer.

XTAL: Crystal.

XVTR: Transverter; enables a transceiver to operate on a frequency band other than the one it was designed for.

Yagi antenna: A directional beam antenna used by ham radio operators.

Base Communications Receivers

In this section, listed alphabetically, are currently available communications receivers. Additionally, a separate section encompassing portable receivers is included. Where possible, photos of equipment is provided. Prices are suggested retail/list prices and vary considerably from actual "street" prices. Shop around for the best deals.

ICOM

R71A

Communications receiver covering 100 kHz to 30 Mhz in AM, SSB, CW, RTTY and FM modes. Features include 32 memory channels, remote control operation (with optional control unit), scan functions, direct frequency entry or manual tuning, adjustable IF notch filter, adjustable noise blanker, built-in preamplifier and attenuator and optional filters.

Specifications: Sensitivity 100 kHz–4.99 MHz SSB, CW & RTTY less than 0.32 μV for 10dB S/N; AM less than 1.0 μV for 10dB S/N, 5–15.99 MHz SSB, CW, & RTTY less than 1.0 μV for 10dB S/N; AM less than 3.2 μV for 10dB S/N, 16–30 MHz SSB, CW, & RTTY less than 0.16 μV for 10dB S/N; AM less than 0.5 μV for 10dB S/N, FM (with optional converter) less than 0.32 μV for 12dB SINAD. Selectivity (preamp on) SSB, CW & RTTY more than 2.3 kHz—6dB, less than 4.2 kHz—60dB; AM more than 6 kHz—6dB and less than 15 kHz—6dB; FM more than 15 kHz—6dB and less than 25 kHz—60dB; Audio output more than 3W. Power 117 VAC. Dimensions (HWD) approx. 4⅛" × 11⅛" × 11". Weight 16½ lbs **$999**

R72

Communications receiver covering 30 kHz to 30 MHz in AM, SSB, CW and (with optional converter) FM in 99 memory channels. Features include 100dB dynamic range, 24-hour clock with timer, keyboard entry, preamplifier and attenuator, dial lock, level-selectable noise blanker, scan functions, including auto memory write scan. Options also include voice synthesizer, pc control, high stabili-

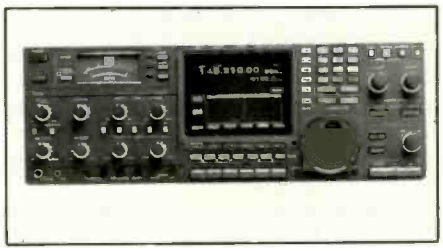
ty crystal units, receiver protector unit and FM receive unit.

Specifications: Sensitivity .1–1.8 MHz AM 12.6 μV, 1.8–30 MHz SSB, CW 0.16 – v, 28–30 MHz 2 μV and 0.5 μV FM. (SSB, CW for 10dB S/N, FM for 12dB SINAD). Selectivity SSB, AM narrow & CW more than 2.3 kHz—6dB and less than 4 kHz—60dB; AM more than 6 KHz—50 dB and less than 20 kHz—50dB; FM more than 15 kHz—6dB and less than 30 kHz—50dB. Audio output more than 2W. Power 117, 220 or 240 VAC & 13.8 VDC. Dimensions (HWD) approx. 3¾" × 9½" × 9". Weight 10½ lbs **$972**

R9000

Communications receiver covering 100 kHz to 199.8 MHz in AM, SSB, CW, RTTY and FM. Features include spectrum scope for visual signal confirmation, memory list allowing user to see contents of 10 memory channels at once, terminal monitor, 1000 memory channels, dual clocks, timer, AFC, notch filter, direct keyboard entry, 7 separate scan functions, Voice Scan Control, dial lock, rack mounting handles, RF attenuator and optional computer control converter.

Specifications: Sensitivity (maximum values given) .1–.499 MHz SSB, CW, &



RTTY 0.5 μV; AM 3.2 μV; .500–1.799 MHz SSB, CW, & RTTY 1.0 μV; AM 6.3 μV; 1.8–29.99 MHz SSB, CW, & RTTY 0.16 μV; AM 1.0 μV; 30–999.99 MHz SSB, CW, & RTTY 0.32 μV; AM 1.4 μV; FM 0.5 μV, WFM 1.4 μV; 1000–1239 MHz SSB, CW, & RTTY 0.63 μV; AM 4.0 μV; FM 1.0 μV; WFM 4.0 μV; 1240–1299.99 MHz SSB, CW, & RTTY 0.32 μV; AM 2.0 μV; FM 0.5 μV; WFM 2.0 μV; 1300-1599.99 MHz SSB, CW, & RTTY SSB, CW, & RTTY 0.63 μV; AM 4.0 μV; FM 1.0 μV; WFM 4.0 μV; 1600-199.8 MHz SSB, CW, & RTTY 1.0 μV; AM 5.6 μV; FM 1.4 μV, WFM 5.6 μV. Selectivity SSB, CW & RTTY more than 2.4 kHz—6dB; AM more than 6 kHz—6dB; FM more than 15 kHz—6dB, WFM more than 150 kHz—6dB; Audio output, more than 2.5W. Power 100–120 VAC. Dimensions (HWD) approx. 6× 17" × 14⅓". Weight approx. 44 lbs **$5459**

Japan Radio Co., Ltd.

NRD525

Communications receiver covering 90 kHz to 34 MHz in AM, SSB, CW, FAX, RTTY and FM modes. Features include 200 channel memory, scan reception, sweep reception, keypad entry or manual tuning, clock/timer, pc interface, dial lock, attenuator, noise blanker control, notch function and optional VHF-UHF converter and optional filters.

Specifications: Sensitivity 90 kHz–1.6 MHz SSB, CW, & RTTY 5.0 μV; AM 15 μV, 1.6–34 MHz SSB, CW & RTTY 0.5 μV; AM 2 μV; FM 0.7 μV, 34–60 MHz SSB, CW, & RTTY 1.0 μV; AM 3 μV; FM 1.5 μV, 114–174 MHz SSB, CW, RTTY 1.0 μV; AM 3 μV; FM 1.5 μV, 425–445 MHz SSB, CW & RTTY 1.0 μV; AM 3 μV; FM 1.5 μV. Selectivity (at inter) 6dB 2 kHz or more, and 60dB 6 kHz or less; Audio output, 0.5W or more, Power 100/120/220/240 VAC or 12–16 VDC (13.8 VDC standard). Dimensions (HWD) approx. 5⅛" × 13⅛" × 11⅛". Weight approx. 18½ lbs **$1275**

NRD535D

Communications receiver covering 100 kHz to 30 MHz in AM, FM, SSB, CW, FAX, RTTY modes. Features include 200 channel memory, memory channel search, scan reception, sweep reception, clock/timer, keyboard entry, dial lock, recording output, IF filters, RF attenuator, 6 kHz ceramic and 2 kHz mechanical and 1 kHZ crystal filter, notch

function, pc interface, ECSS (exalted carrier selectable sideband), bandwith control (BWC), and optional highly stable crystal oscillator kit, and optional RTTY (internal) demodulator, and 4 optional filters to further improve selectivity.

Specifications: Sensitivity 100 kHz–.5 MHz SSB, CW, & RTTY 5 μV; AM 15.8 μV, .5–1.6 MHz SSB, CW, & RTTY 2 μV; AM 6.3 μV, 1.6–30 MHz SSB, CW & RTTY 0.32

Base Communications Receivers (cont.)

μV; AM 2 μV; FM 0.5 μV (S/N: 10dB; Bandwidth: Inter; Modulation 400 Hz, 30%, AM mode (12dB SINAD FM). Selectivity (Inter) 2 kHz or more—6dB and 6 kHz or less—60dB; Audio output, 1W or more, Power100/120/220/240 VAC or 12-16 VDC (13.8 VDC standard). Dimensions (HWD) 5⅛" × 13⅛" × 11½". Weight approx. 19½ lbs **$1995**

Kenwood U.S.A.

R2000

Communications receiver covering 150 Khz to 30 MHz in AM, FM, SSB, and CW modes. (optional converter unit allows coverage of 118-174 MHz). Fea-

tures include 10 memory channels, lithium battery memory back-up, memory scan, programmable band scan, dual clocks and timer, 3 IF filters, built-in noise blanker, RF attenuator, and audible beep confirms memory entries and up/down band selections.

Specifications: Sensitivity SSB/CW less than 2 μV; AM 150 kHz-2 MHz less than 20 μV (less than 4 μV 2-30 MHz); and less than 10 μV 118-174 MHz; FM 2-30 MHz less than 1 μV, and 118-174 MHz less than 2 μV. Selectivity AM (W) 6 kHz—6dB; 18 kHz—50dB; (N) 2.7 kHz— 6dB; 5 kHz—50 dB; SSB/CW 2.7 kHz— 6dB & 5 kHz—50dB; Audio output 1.5W, Power 100/120/220/240 VAC or (with optional DCK-1) 13.8 VDC. Dimensions (HWD) approx. 4½" × 14⅘" × 8⅓". Weight approx. 12 lbs **$800**

R5000

Communications receiver covering 100 kHz to 30 MHz in AM, FM, SSB, CW, & FSK modes. (optional converter unit allows coverage of 108-174 MHz). Features include 100 memory channels, rechargeable memory back-up battery (lithium) high stability frequency control, built-in digital VFOs, dual high and low impedance antenna terminal, dual IF crystal filter, tunable notch filter, noise blanker, memory scroll, keyboard entry, dual 24-hour quartz clock/timer, RF attenuator, lock switch, switchable AGC switch; and optional voice synthesizer unit, filters, pc control, DC power cable kit with cigarette lighter plug and mobile mount.

Specifications: Sensitivity SSB, CW & FSK less than 2.5 μV (100-150 kHz), (150-500 kHz 1 μV), (.5-1.8 MHz 4 μV), (1.8-30 MHz 0.25 μV), (108-123 MHz 0.5 μV), (123-174 MHz 0.25 μV); AM: less than 25 μV 100-150 kHz, 10 μV 150-500 kHz, 32 μV .5-1.8 MHz, 2 μV 1.8-30 MHz, 4 μV 108-123 MHz, 2 μV 123-174 MHz; FM: less than 0.5 μV 1.8-30 kHz, 1 μV 108-123 MHz, 0.5 μV 123-174 MHz. Selectivity SSB, CW, FSK 2.4 kHz—6dB, 4.4 kHz—60dB; AM 6 kHz—6dB & 20 kHz—50dB; FM 12 kHz—6dB & 25 kHz—50dB. Audio output, 1.5W, Power 120 VAC or (with optional DCK-2) 13.8 VDC. Dimensions (HWD) approx. 4" × 10⅗" × 10⅗". Weight approx. 12 lbs **$1050**

RZ-1

Communications receiver covering 500 kHz to 905 MHz in AM, FM, NFM and WFM modes designed for mobile operation. Features include 100 memories, 10-band program capability, keyboard entry, auto-mode and auto-step operations, memory scan, lockout function,

large LCD display, auto-selectable dual antenna terminal. Also includes lithium battery memory back-up, beep to confirm keypad operation. Optional accessories include mobile speakers.

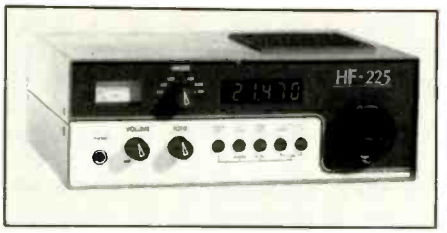
Specifications: Sensitivity AM less than 5 μV (MW band 10 μV), FM (N) 12dB SINAD less than 6 μV (500 kHz-60 MHz), 3 μV 60-905 MHz, FM (W) 12dB SINAD less than 1 μV (83 MHz). Selectivity AM 7 kHz—6dB and 18 kHz—50dB; FM (N) 10 kHz—6dB and 30 kHz—50dB, FM (W) 250 kHz—6dB and 600 kHz—30dB. Audio output 2W. Power 13.8 VDC. Dimensions (HWD) approx. 2" × 7" × 6⅕". Weight approx. 3 lbs **$600**

Lowe Electronics, Ltd.

HF-225

Communications receiver covering 30 kHz to 30 MHz in AM, SSB and CW in 30 memory channels. With optional board covers FM and synchronous AM. Features include LCD digital display that shows frequency or current filter in use, noise blanker, four memory functions. Options include FM board, internal rechargeable battery, carrying case, remote data entry keypad (connected by wire).

Specifications: Sensitivity 60 kHz-2 MHz, AM 1.2 μV, FM 1.0 μV, SSB 0.6 μV; 2 MHz-30 MHz AM less than 0.9 μV, FM same, and SSB less than 0.5 μV. Selectivity 2.2 kHz IF filter, 2.3 kHz—6db, 3.4—



60dB; IF filter 4 kHz, 5.9 kHz—6dB, 9.8—60dB and 10.7 kHz—80dB; IF filter 7 kHz, 8.8—6dB, 12.9 kHz—60dB, 14.6 kz—80dB; IF filter 10 kHz, 10.5 kHz—6dB, 21.5 kHz—60dB. Audio output 1.6W, Power external 12 VDC adapter. Dimensions (HWD) approx. 4⅓" × 10" × 8". Weight approx. 4 lbs . . . . . **$771** (price varies, but was correct as of publication date—plus $60 for shipping to U.S.)

HF-235

Communications receiver covering 30 kHz to 30 MHz in AM, SSB, CW and FM modes in 30 channel memories. Features include direct frequency entry, LCD digital display, variable voltage selector, RF attenuator, lithium battery backup, selectable filters and remote control option with optional RS232 data link.

Specifications: Sensitivity 60 kHz-2 MHz, AM less than 1.5 μV, FM less than

1.2 μV, & SSB less than 0.7 μV; 2 MHz-30 MHz, AM less than 1.0 μV, FM less than 0.9 μV, and SSB less than 0.5 μV. Selectivity IF filter 2.2 kHz 2.3 kHz—6dB, 3.4 kHz—60dB; IF filter 4 kHz, 5.9 kHz—6dB, 9.8 kHz—60dB; IF filter 7 kHz 8.8 kHz—6dB, 12.9 kHz—60dB; IF filter 10 kHz 10.5 kHz—6dB, 21.5 kHz—60dB. Audio power 2.5W, Power selectable 110/220/240 VDC. Dimensions (HWD)

Base Communications Receivers (cont.)

approx. 3½" × 19⅓" × 12¾". Weight approx. 12 lbs. **$1600**
(price varies, but was correct as of publication date—plus $60 for shipping to U.S.)

R.L. Drake Company

R8

Communications receiver covering 100 kHz to 30 MHz in AM, SSB, CW, RTTY and NFM modes in 100 channel memories. Features include LCD digital display, showing frequency, operating/mode status information, memory backup requires no battery, built-in selectable power supply, timer, built-in RS232 interface, noise blanker, preamplifier, attenuator, and selectable filters. Options include VHF converter to receive 35–55 and 108–174 MHz, matching external speaker and software remote control package for RS232C serial interface.

Specifications: Sensitivity 100 kHz–1.5 MHz, SSB, CW less than 1 μV; 1.5–30 MHz less than 0.5 μV; 5.0–30 MHz (with preamp) less than 0.25 μV; AM, 100 kHz–1.5 MHz, AM less than 3.0 μV, 1.5–30 MHz less than 1.5 μV, 5–30 MHz (with preamp) less than 0.8 μV; FM (12dB SINAD) 1.5–30 MHz, less than 0.5 μV. Selectivity 6 kHz—6dB less than 12 kHz—60dB; 4 kHz—6dB less than 8 kHz—60dB; 2.3 kHz—6dB, less than 4.5 kHz—60dB; 1.8 kHz—6dB less than 3.6 kHz—60dB; 500 Hz—6dB less than 1.5 kHz—60dB and 12 kHz—6dB less than 25 kHz—60dB. Audio output 2.5W, Power 100/120/200/ 240 VAC or 11–16 VDC. Dimensions (HWD) 5¼" × 13⅜" × 13". Weight 13 lbs. **$979**

Yaesu U.S.A.

FRG-8800

Communications receiver covering 150 kHz to 30 MHz in AM, SSB, CW, NFM and WFM in 12 channel memories. Features include CAT system computer control, dual 24-hour clock/timer, selectable AGC rates, noise blanking widths and tuning rates. Also includes attenuator control and dial lock. With optional FRV-8800 VHF converter, 118-174 MHz is available to user.

Specifications: Sensitivity 150 kHz–1.6 MHz, AM 30 μV, SSB & CW 3 μV; 1.6–30 MHz AM 4 μV, SSB & CW 0.4 μV, FM 1 μV; 118–174 MHz (with optional converter) AM 10 μV, SSB/CW 1 μV, and FM 2 μV. Selectivity AM 6 kHz—6dB, 15 kHz—50dB; AM-narrow 2.7 kHz—6dB, 8 kHz—50dB; SSB/CW 2.7 kHz—6dB, 8 kHz—50dB; NFM 12.5 kHz—6dB, 30 kHz—40dB. Audio output 1.4W. Power 100/120/220/240 VAC and 4.5 VDC for memory backup. Dimensions (HWD) approx. 4¾" × 13⅓" × 9". Weight approx. 13½ lbs.
FRG-8800 . . . . . **$784**

Portable Communications Receivers

The following listing of portable communications receivers includes more than three dozen receivers, from small analog-tuning receivers to more elaborate models. Be sure to read the articles elsewhere in the Guide before making your selection. Remember, prices are suggested retail/list prices and vary considerably from the actual "street" prices. Shop around for the best deals.

Grundig

Satellit 500

Portable communications receiver with continuous coverage from 1.6–30 MHz, includes AM 510–1620 kHz, FM 87.5–108 MHz, LW 148–353 kHz, and SW bands with SSB capability. Features and specifications include digital key pad frequency entry or manual tuning, LCD frequency display, built-in NiCd charger, automatic station search and scan functions, automatic gain control, dual clocks, last-station memory, signal strength indicator, bass/treble controls and headphone jack. Operates on 4 D batteries or external 10-16 VDC power. Dimensions (HWD) approx. 7″ × 12″ × 2½″. Weight 4 lbs.

Satellit 500 . . . . . **$700**

Satellit 650

Portable communications receiver with nearly same frequency coverage as Satellit 500, except LW coverage is 148–420 kHz. Features BFO for SSB reception, 60 station programmable memory (SW 32, AM 8, FM 16, and LW 4 stations), keypad frequency entry or manual tuning, LCD frequency display, separate bass/treble controls, auxiliary cassette input/output, automatic gain control, 3 programmable on/off times, 24-hour clock/calendar, signal strength indicator, headphone jack, and battery charge indicator. Operates on 6 D size batteries and 2 AA batteries or switchable AC power (110–127/220–240 VDC), rechargeable NiCd battery, or 10–16 VDC. Dimensions (HWD) 9½″ × 19¾″ × 8″. Weight 18¾ lbs.

Satellit 650 . . . . . **$1100**

Cosmopolit

Portable communications receiver covering AM, FM and SW bands. Features include the following specifications and frequency coverage: AM, FM standard bands, including SW in: 5.95–6.20, 7.10–7.40, 9.50–9.90, 11.65–12.05, 13.60–13.80, 15.10–15.60, and 17.55–17.90. Includes AFC on FM, cassette with recording and battery indicator. One touch recording with auto off in the record and play modes. Features also include tape counter, built-in microphone, clock with voice synthesizer that announces current or wake-up time, tuning and stereo indicators, connection for external microphone, mini-headphones, batteries, guide and pouch. Operates on 3 AA batteries or optional AC adapter. Dimensions (HWD) 3¼″ × 8″ × 1½″. Weight 1¼ lbs.

Cosmopolit **$250**

Yacht Boy 220

Portable communications receiver covering AM, FM, and SW bands. Features include the following specifications and frequency coverage: 3.9–21.85 MHz in addition to standard AM and FM bands. Other features include LED tuning indicator, analog tuning and stereo headphone connector. Operates on 3 AA batteries. Dimensions (HWD) 3¾″ × 6″ × 1½″. Weight ¼ lb **$130**

Yacht Boy 230

Portable communications receiver covering AM, FM, LW and SW bands. Features include SW coverage: 2.3–26.1 MHz and world map and time zone scanning, covering 42 world cities, dual function alarm clock w/snooze/sleep/alarm functions. Also includes headphone connector. Dimensions (HWD) 4½″ × 7¼″ × 1½″. Weight 1 lb **$200**

Travel Kit TK-220

Kit includes Yacht Boy 220 receiver with the following additional items: Braun travel alarm clock, Swiss army knife, Mini Mag Lite flashlight, Astrum pen/pencil set w/desktop stand, and Casio credit card-sized calculator **$250**

Travel Kit TK-230

Kit includes Yacht Boy 230 receiver with following additional items: Astrum pen/pencil set w/desktop stand, Swiss army knife, Mini-Mag Lite flashlight, stereo headphones, and a Grundig shortwave directory **$280**

TK-Cosmo

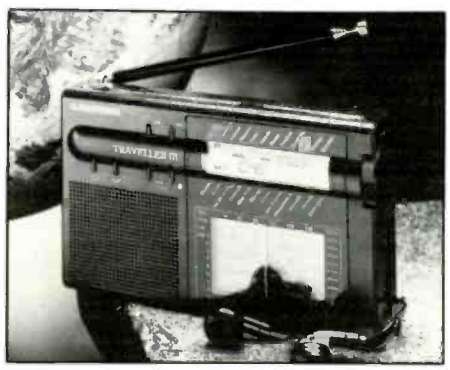
Kit includes Cosmopolit receiver with following items: Mont Blanc pen, Mini-Mag Lite flashlight, Swiss army knife, stereo headphones, and a Grundig shortwave directory **$400**

Traveller II

Portable communications receiver covering AM, FM and SW bands. SW coverage is 5.8–15.6 MHz. Includes built-in world time clock, with alarm, earphones, tuning indicator and carrying case. Operates on 3 AA batteries and includes jack for external AC power. Dimensions (HWD) 3¼″ × 5½″ × 1″. Weight ⅞ lb **$100**

Traveller III

Portable communications receiver with same basic features as Traveller II, except SW coverage is 3.90–21.85 MHz. Includes light button, LCD display shows time, date, daylight savings correction, world time zones and calendar simultaneously. Includes 12/24-hour clock, wake-up alarm/radio and sleep timer, and travel pouch. Operates on 3 AA batteries or optional AC adapter. Dimensions (HWD) 3½″ × 5⅝″ × 1¼″. Weight ⅝ lb **$170**



Magnavox

D1875

Portable communications receiver covering AM, FM, SW and LW bands. Features include the following coverage: 87.5–108 MHz, 150–225 kHz, 525–1606 kHz, 5.95–6.25, 7–7.35, 9.45–9.9, 11.6–12.15, 13.4–14.05, 14.95–15.65, 17.5–

Portable Communications Receivers (cont.)

18.2, 21.2-21.95 and 25.4-26.3 MHz. Features slide controls, rotary tuning control, headphone jack, wrist strap, carry pouch, and telescopic antenna.

Specifications: Audio output .6W, Operates on 4 AA batteries. Dimensions (HWD) 4¾" × 7¾" × 1½". Weight approx. 1 lb **$100**

AE3205

Portable communications receiver covering MW, FM, SW and LW bands. Features include the following coverage: 87.5-108 MHz, 148.5-283.5 kHz, 520--1605 kHz, 5.95-6.2, 7.1-7.3, 9.5-9.9, 11.65-12.05, 15.1-15.6 and 17.45-18 MHz. Features rotary tuning control, earphone jack, wrist strap, and telescopic antenna.

Specifications: Audio output .6W. Operates on 3 AA batteries. Dimensions (HWD) approx. 4" × 6½" × 1½". Weight approx. 1 lb **$50**

AE3405GY

Portable communications receiver covering AM, FM, SW and LW bands. Features include the following coverage:

87.5-108 MHz, 148.5-283.5, and 526.5-1606.5 kHz, 5.95-6.2, 7.1-7.3, 9.5-9.9, 11.6-12.05, 13.6-13.8, 15.1-15.6, 16.55-17.9, 21.45-21.85, and 25.6-26.1 MHz. Features lock button, LED FM stereo indicator, high/low tone switch, dynamic bass boost, shortwave guide and carry pouch.

Specifications: Audio output 130mW. Operates on 2 AA batteries. Dimensions (HWD) approx. 3" × 4¾" × 8" **$90**

AE3805

Portable communications receiver covering AM, FM, and SW bands. Features include the following coverage: 87.5-108 MHz, 531-1602 kHz, 3.2-7.3 and 9.5-21.75 MHz. Features 20 station

memory, auto search tuning on all bands, digital quartz-PLL tuning, LCD display, preset station alarm, sleep timer, 2½" speaker, station tuning guide, carry pouch, and telescopic antenna.

Specifications: Audio output .6W. Operates on 4 AA batteries. Dimensions (HWD) 4¼" × 6½" × 1½". Weight approx. 1 lb **$120**

Panasonic Company

RF-B45

Portable communications receiver covering FM, MW, SW and LW bands. Features and specifications include SSB with fine tuning, up-conversion double superheterodyne system, 6-way multi-tuning system: 18-station preset memory tuning, frequency direct access tuning, meter band direct access, up/down manual tuning, auto tuning and memory search with signal strength selectivity;

built-in quartz clock/timer with sleep/standby function, LCD multi-information readout, 10-key direct time setting, operation hold switch, high/low tone selector, DX/local sensitivity selector, selectable frequency step, power switch light, deluxe carrying case, antenna wire and earphone. Jacks for external antenna, earphone and DC power. Operates on 4 AA batteries (not included). Dimensions (HWD) 4 1/16" × 8 1/16" × 1 7/16". Weight 1⅜ lbs **$200**

RF-B65

Portable communications receiver covering FM, MW, SW, and LW bands. Features and specifications include SW 1.615-29.99 MHz, 520-610 kHz, 87.5-108 MHz and 155-519 kHz, SSB with fine tuning, up conversion double superheterodyne system, 1 kHz step fine tuning for LW, MW/SW, 6-way tuning system with 36-station preset memory tuning, frequency direct access tuning, meter band direct access, up/down manual tuning, auto-scan tuning and electronic rotary tuning. Also includes built-in quartz clock/timer in two separate time zones, sleep/standby function, LCD multi-information readout, 10-key direct time set-

ting, operation hold switch, high/low tone selector, DX/local sensitivity selector, frequency step selector, deluxe carrying case, antenna wire and earphone. Jacks for external antenna, earphone and DC power. Operates on 4 AA batteries (not included) and clock memory operates on 2 AA batteries, (not included). Dimensions (HWD) 4⅝" × 7 13/16" × 1 5/16". Weight 1⅜ lbs.
RF-B65 . . . . . **$280**

Radio Shack

DX-350

Portable communications receiver covering AM, FM, LW, and SW bands. Features and specifications include the following frequency coverage: AM 535-1705 kHz, FM 88-108 MHz, LW 150-281 kHz, SW 5.85-6.20, 7.05-7.45, 9.45-9.90, 11.6-12.0, 13.55-13.85, 15.10-15.60, 17.45-18.0, 21.45-21.95, and 25.67-26.15 MHz. Analog tuning. Audio output 200mW. Operates on 4 AA batteries (not included) or 6V adapter. Includes head-

phone jack (3.5mm). Dimensions (HWD) 4″ × 7″ × 1½″. Weight 14 oz without batteries **$60**

DX-390

Portable communications receiver covering AM, FM, SW and LW bands. Features include the following coverage: 87.5–108 MHz, 105–519 kHz, 520–1710 kHz, and 1.711–29.99 MHz. (SW is divided into 13 bands: 120M 2.3–2.495 MHz, 90M 3.2–3.4 MHz, 75M 3.9–4.0 MHz, 60M 4.75–5.060 MHz, 49M 5.95–6.2 MHz, 41M 7.1–7.3 MHz, 31M 9.5–9.9 MHz, 25M 11.65–12.05 MHz, 21M 13.6–

13.8 MHz, 19M 15.1–15.6 MHz, 16M 17.55–17.9 MHz, 13M 21.45–21.85 MHz and 11M 25.67–26.1 MHz). Features SSB/CW coverage. Total of 18 memory channels (SW) and 9 each on AM, FM, and LW. Functions include dial lock, adjustable BFO for SSB reception, LCD showing frequency, modes, dual times. Has scan tuning, clock-radio wake/sleep functions, AM bandwidth and RF gain controls. Also includes battery power indicator, folding stand, and memo pad allowing user to record helpful information.

Specifications: Audio output 700mW, Operates on 4 D batteries (back-up on 3 AA batteries, also uses optional AC or DC adapters. Dimensions (HWD) 7 9/16″ × 11⅝″ × 2 11/16″. Weight 4½ lbs (with batteries) **$240**

DX-440

Portable communications receiver covering AM, FM, LW and SW bands. Features include the following coverage: 87.5–108 MHz, 150–29999 kHz (SW is divided into 12 shortwave bands: 120M 2.3–2.5 MHz, 90M 3.2–3.4 MHz, 75M 3.9–4.0 MHz, 60M 4.750–5.060 MHz, 49M 5.8–6.2 MHz, 41M 7.1–7.5 MHz, 31M 9.5–9.9 MHz, 25M 11.65–12.05 MHz, 19M 15.1–15.6 MHz, 16M 17.55–17.9 MHz, 13M 21.45–21.85 MHz, 11M 25.6–26.1 MHz). Total of 9 channel memory, LCD showing frequency, direct access keypad, dual-function mode switch allows user to display frequency or time on LCD panel, tone controls, scanning control, stereo headphone jack and multiple power source operation.

Specifications: Audio output 1.2W. Operates on 6 D batteries, 2 AA batteries for back-up and clock or AC/DC adapter. Dimensions (HWD) approx. 6⅓″ × 11½″ × 2⅓″. Weight 3¾ lbs **$200**

DX-370

Portable communications receiver covering AM, FM, and SW bands. Features and specifications include the following frequency coverage: AM 535–1705 kHz, FM 88–108 MHz, and SW 3.2–7.3 and 9.5–21.75 MHz. Includes LCD frequency display, clock w/sleep/alarm function (radio or buzzer), stereo headphone jack, lock switch and up to 5 storable frequencies for each band (total of 20). Audio output 500mW. Operates on 4 AA batteries (not included) or AC or DC adapter (not included). Dimensions (HWD) 4⅛″ × 6½″ × 1¼″. Weight approx. 1⅛ lbs (with batteries) **$120**

Sangean America, Inc.

SG-621

Portable communications receiver covering AM, FM, and SW bands. Features and specifications include SW coverage 5.9–6.20, 7.1–7.4, 9.5–9.9, 11.65–12.05, 13.6–13.9, 15.1–15.6, 17.55–17.9, and 21.45–21.85 MHz. AM: 530–1710

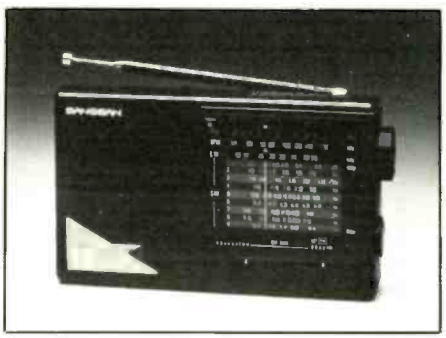
kHz, FM: 87.5–108 MHz. Features LCD display indicating time, stereo and AM/FM tuning symbols, band in use, SW band in meters, sleep function, timer, timer alarm for radio/buzzer, snooze and battery indicator. LCD also has back light. Analog dial. Includes headphones, pouch and handbook. Audio output 120mW. Operates on 3 AA batteries (not included) or 4.5 VDC external power. Dimensions (HWD) 3½″ × 6¾″ × 1¼″. Weight 11½ oz. SG-621 . . . . . **$120**

SG-631

Portable communications receiver covering AM, FM and SW bands. Features and specifications include the following frequency coverage: AM 530–1710 kHz, FM 87.5–108 MHz, and SW 5.9–6.2, 7.1–7.4, 9.5–9.9, 11.65–12.05, 13.60–13.90, 15.10–15.60, 17.50–17.95 and 21.45–21.95 MHz. Display shows time, day, country (for 260 cities). Include 8 city memory presets, LED tuning indicator, analog tuning, FM stereo indicator, alarm/snooze function, automatic daylight savings time compensator, low battery indicator, 10-second light, stereo/mono switch and suede pouch, stereo headphones and handbook. Audio output 200mW. Operates on 4 AA batteries (not included) or 6 VDC external power. Dimensions (HWD) 4″ × 7½″ × 1½″. Weight approx. ¾ lb **$140**

SG-700L

Portable communications receiver covering AM, FM, LW, and SW bands. Features and specifications include the following frequency coverage: AM 520–



1720 kHz, FM 78.5–108 MHz, LW 150–281 kHz, SW 5.85–6.20, 7.05–7.45, 9.45–9.90, 11.6–12.0, 13.55–13.85, 15.10–15.60, 17.45–18.0, 21.45–21.95, and 25.67–26.15 MHz. Includes earphone jack, analog tuning, and LED tuning indicator. Audio output 500mW. Operates on 4 AA batteries (not included). Dimensions 4″ × 7″ × 1½″ **$70**

SG-789

Portable communications receiver covering AM, FM and SW bands. Features and specifications include the following frequency coverage: AM 522–1620 kHz, FM 87.5–108 MHz, SW 2.30–5.20, 5.80–6.20, 7.05–7.50, 9.45–9.90, 11.55–12.05, 15.05–15.55, 17.45–18.05, 21.45–21.95 MHz. Includes analog tuning, stereo headphones, pouch and handbook. Audio output 150mW. Operates on 3 AA batteries (not included) or 4.5 VDC external power. Dimensions (HWD) 3⅜″ × 6⅜″ × 1⅛″. Weight ¾ lb **$70**

SG-796

Portable communications receiver covering AM, FM, and SW bands. Fea-

tures and specifications include the following frequency coverage: AM 522–1620 kHz, FM 87.5–108 MHz, SW 2.30–5.20, 5.85–6.20, 7.10–7.50, 9.45–9.90, 11.60–12.05, 15.10–15.60, and 17.45–18.08 MHz. Includes analog tuning, pouch and handbook. Audio output 120mW. Operates on 2 AA batteries (not included) or 3 VDC external power. Dimensions (HWD) 3″ × 6⅝″ × 1″. Weight approx. ½ lb **$60**

ATS-800

Portable communications receiver covering AM, FM, and SW bands. Features and specifications include the following frequency coverage: AM 530–1630 kHz, FM 87.5–108 MHz, SW 3.2–7.3, and 9.5–21.75 MHz. Features include LCD frequency display that also shows clock/sleep timer functions. Includes up/down tuning buttons, sleep function and wake to music or alarm function, 20-preset station memory and battery low indicator. Audio output 285mW. Operates on 4 AA batteries (not included) or 6 VDC external power. Dimensions (HWD) 4¼″ × 6¾″ × 1½″. Weight 1 lb **$140**

ATS-803A

Portable communications receiver covering AM, FM, LW and SW bands and SSB function with adjustable BFO. Features and specifications include the following frequency coverage: AM 520–1620 kHz, FM 87.5–108 MHz, LW 150–281 kHz, SW 2.3–2.5, 3.2–3.4, 3.9–4.0, 4.75–5.06, 5.80–6.20, 7.10–7.50, 9.50–9.90, 11.65–12.05, 15.10–15.60, 17.55–17.90, 21.45–21.85, and 25.60–26.10 MHz. Includes stereo headphones, auto-scan, manual tuning, sleep timer, adjustable snooze timer, 9 memory presets, LCD frequency display, external antenna adapter, shoulder strap, AC converter, and handbook. Audio output 900mW. Operates on 6 D size batteries and back-up operates on 2 AA batteries (not included) or 9 VDC external power. Dimensions (HWD) 6⁵⁄₁₆″ × 11½″ × 2⅜″. Weight 3¾ lbs. ATS-803A **$250**

ATS-808

Portable communications receiver covering AM, FM, LW, and SW bands. Features and specifications include the following frequency coverage: AM 520–1629 kHz, FM 87.5–108 MHz, LW 150–519 kHz, and SW continuous from 150 kHz to 29.999 MHz. Includes LCD frequency display, five tuning methods including auto-scan and 45 memory presets. Also includes stereo headphones, pouch, antenna adapter and handbook. Audio output 340mW. Operates on 4 AA batteries, back-up operates on 2 AA batteries (not included) or 6 VDC external power. Dimensions (HWD) 4½″ × 7¾″ × 1½″. Weight approx. 1⅓ lbs **$260**

ATS-818

Portable communications receiver covering AM, FM and SW from 150 kHz to 29.99 MHz. Includes 45 memory presets, BFO for SSB reception, LCD frequency display, radio/buzzer clock alarm, AM wide/narrow filter, dual time display (local/UTC), sleep timer, RF gain control, signal strength and battery indicator, tone control and safety lock. Tuning methods include direct keypad entry, auto scan, memory recall or rotary dial. Also includes AC adapter, external antenna jack and handbook. Audio output 800mW. Operates on 4 D size batteries and 3 AA batteries for back-up. Includes AC adapter. Dimensions (HWD) and weight approx. same as ATS-803A **$289**

ATS-818CS

Portable communications receiver with same basics as ATS-818, except includes built-in cassette recorder with auto-stop function and programmable recorder function, play/record LED indicator. ATS-818CS **$329**

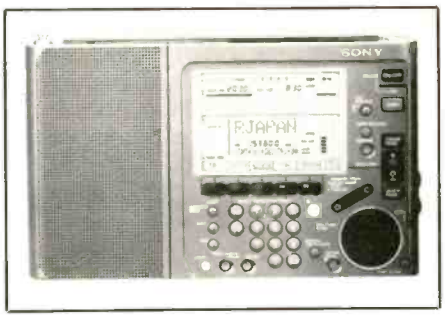
Sony

ICF-7601

Portable communications receiver covering AM, FM, LW, and SW bands. Features and specifications include the following frequency coverage: AM 530–1705 kHz, FM 76–108 MHz, LW 150–285 kHz, SW 2.3–21.9 MHz. Also includes LED tuning indicator, analog tuning, high/low tone switch, earphone, carrying case, and guide. Operates on 4 AA batteries (not included) or optional AC adapter, car battery cord or battery pack. Dimensions (HWD) 4⅞″ × 7⅝″ × 1⁹⁄₁₆″. Weight approx. 1½ lbs **$130**

ICF-SW77

Portable communications receiver covering FM, MW, LW, and SW bands. Features and specifications include FM coverage 76.5–108 MHz, and MW/LW/SW coverage from .15–30 MHz. SSB feature allows tuning of utility transmissions, direct keyboard entry or manual tuning, auto-scan tuning, pre-set station tuning memory of up to 20 tuning pages with storage of 5 station names on each page. Each station can have up to 10 frequencies in memory (up to limit of 160 memories). Other features include quick page which is fast tuning of favorite stations, hold, 2 page for total of 10 stations, factory-programmed country and frequency presets, UTC world time clock system, world time scale (visual map reference of correct time around globe), telescoping SW/FM and ferrite bar LW/MW antennas. Audio output 500mW. Power requirement 100-240 VAC (with supplied adapter) 4 C batteries (not included), 6 VDC, 13.8 VDC, car adapter cord DCC-E160L (optional). Dimensions (HWD) 6½″ × 10⅔″ × 1⅔″. Weight 3 lbs **$625**



Portable Communications Receivers (cont.)

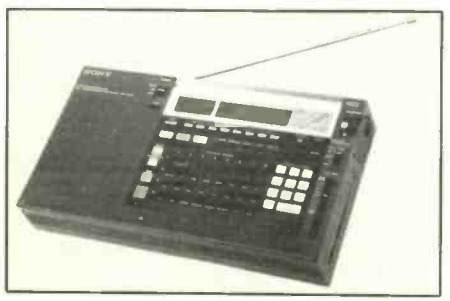
ICF-SW1S

Portable communications receiver covering AM, FM, LW and SW bands. Features include the following coverage: 88–108 MHz, 160–1611 kHz, 1.615–29.995 MHz. Total of 10 memory channels, 10-key Direct Access tuning, LCD frequency display, PLL frequency synthesis, built-in clock with alarm/sleep functions, stereo headphones, tone control, active antenna with controller, manual and auto scan tuning, and carry case.

Specifications: Sensitivity FM 12dB, SW 3.9 MHz 10dB, 11.8 MHz 9dB, 26.1 MHz 9 dB, LW 55dB. Audio output 250mW. Operates on 2 AA batteries (not included) or 120 VAC with supplied adapter or DC with optional car/battery cord. Dimensions (HWD) approx. 4¾″ × 2⅞″ × 1″. Weight approx. 8 oz (with batteries).
ICF-SW1S **$350**

ICF-2010

Portable communications receiver covering AM, FM, SW, LW, and FM air bands. Features include the following coverage: 76–108 MHz, 150–29.99 kHz



and 116–136 MHz. Total of 32 station memory presets. Other features include PLL tuning, Direct Access tuning, built-in clock with standby/alarm/sleep functions (also switchable 12 or 24 hour format), switchable IF bandwidth, automatic scan tuning and memory scan tuning and earphone.

Specifications: Sensitivity FM 11dB, mW 28–31dB, and SW 5dB. Selectivity (at −50dB) +9.0 kHz (wide) +5.0 kHz (narrow). Audio output 380mW. Operates on 3 D batteries (not included), 120 VAC with included adapter and DC with optional car battery cord. Also requires 2 AA batteries for built-in clock. Dimensions (HWD) 6¼″ × 11⅜″ × 2 1/16″. Weight 3¾ lbs.
ICF-2010 . . . . . **$430**

ICF-SW20

Portable communications receiver covering AM, FM, MW and SW bands. Features include the following coverage: 530–1605 kHz, 87.6–108 MHz, 5.85–6.35, 6.95–7.45, 9.4–9.9, 11.6–12.1, 15.0–15.5, 17.55–18.05, 21.4–21.9 MHz. Features include bandspread tuning, 3″ speaker, earphone and carry case.

Specifications: Analog tuning, Audio output 250mW. Operates on 2 AA batteries (not included) or optional AC or DC adapter. Dimensions (HWD) 2¾″ × 4⅜″ × 1″. Weight approx. 9¼ oz **$100**

ICF-SW7600

Portable communications receiver covering AM, FM, LW and SW bands. Features include the following coverage: 87.6–108 MHz, 530–1610 kHz, 150–528 kHz and 1.615–29.995 MHz. Features include SSB capability, 10-key direct access tuning, manual and automatic scan tuning, key lock, 3″ speaker, high/low tone switch, LCD frequency display, stereo headphones, and built-in clock/timer with sleep and standby functions.

Specifications: Sensitivity FM 9dB (S/N: 30dB), MW 33–44dB (S/N: 6dB) and SW 0–2dB (S/N 6dB (external antenna) and 6–12dB with telescopic antenna). Audio output, unavailable. Operates on 4 AA batteries (not included) or 120 VAC with supplied adapter. Dimensions (HWD) 4 11/16″ × 7 9/32″ × 1¼″. Weight approx. 1½ lbs **$250**

ICF-7700

Portable communications receiver covering AM, FM, LW and SW bands.

Features include the following coverage: 76–108 MHz, 530–1700 kHz, and SW bands in the following segments: 3.050–3.565, 3.700–4.215, 4.650–5.165, 5.800–6.315, 6.950–7.465, 9.375–10.010, 11.525–12.160, 13.375–14.010, 14.975–15.610, 17.475–18.110, 21.325–21.960, and 25.475–26.100 MHz. Includes 15 station memory presets, built-in clock with alarm/sleep function, tone control, LCD frequency display, rotary tuning control, PLL quartz frequency synthesis and earphone, carrying case, and wire antenna.

Specifications: Sensitivity FM 9dB, SW 5dB and MW 30–35dB; Selectivity: ±6.3 kHz −50dB. Audio output, unavailable. Operates on 4 AA batteries (not included) or AC and DC with optional converters. Dimensions (HWD) 4⅝″ × 7⅝″ × 1¼″. Weight approx. 1⅓ lbs **$200**

ICF-PR080

Portable communications receiver covering AM, FM, TV (low) LW, and SW bands. With supplied converter, covers 108.15–216 MHz. Features include the following coverage: 150 kHz–108 MHz continuous coverage. Includes 10-key direct access tuning, 40 station memory with 5 different scan capabilities, auto and manual squelch, LCD frequency display, search, delay, and priority functions. Also includes PLL quartz frequency synthesis, AM wide/narrow tuning, AM fine tuning, 10-second display light, and tone control. Includes antenna, shoulder belt, carrying case, handbook, and frequency converter.

Specifications: Sensitivity: FM 10dB, mW 40–45dB, SW 5dB. Selectivity (at 50dB) 6.0 kHz (wide) and 3.8 kHz (narrow). Audio output 400mW, Operates on 4 AA batteries (not included), or optional rechargeable battery, AC adapter, DC adapter or battery pack. Dimensions (HWD) 7 5/32″ × 3 17/32″ × 1 31/32″, Weight 1 lb 6½ oz **$450**

CRF-V21

Portable communications receiver covering AM, FM, SW, LW, VLF, and weather satellite band. Features include the following coverage: 9 kHz–29.999 MHz, and 137.62–141.12 MHz. Includes built-in high resolution printer for weather charts and photos, (requires optional AN-P1200 antenna), SSB and NFM capability, LCD display, dual-power operation, memory function stores up to 350 stations, scan capability, spectrum analyzer function, adjustable FSK permits modulation of received frequencies to improve reception of photographic data, AC adapter, 6V rechargeable battery, battery charger and 2 AA batteries. Also includes telescopic antenna unit, antenna cable, cable reel, plug & plug adapter, dust cover, printer paper, tape, and handbook.

Specifications: Sensitivity: 9 kHz–49.99 kHz 30μV, 50 kHz–1.999 kHz 10μV and 2–29.999 MHz 1μV, and 76–108.099 MHz 3μV. Selectivity: AM wide −6dB/−50dB, ±3.0 kHz and ±7.0 kHz; AM narrow ±1.35 kHz and ±3.0 kHz; SSB ±1.35 kHz and ±3.0 kHz; FAX/RTTY ±1.75 kHz and ±3.6 kHz; NFM ±7.0 kHz and ±12.5 kHz. FAX/RTTY/Satellite FAX broadcast section: Drum speed 60, 90, 120, 240 rpm; index of cooperation H (576) L (288). RTTY: transmission speed: BAUDOT 60, 66, 75, 100 wpm; ASCII 110, 200, 300, 600 bps. Satellite FAX: drum speed 120, 240 rpm. Index of cooperation H (576) L (288). Audio output 1.7W. Operates on 6 VDC supplied rechargeable battery, AC operation with supplied adapter. Optional accessories: AN-P1200 antenna, printer paper, NP-22H rechargeable battery. Dimensions (HWD) 11¼" × 16¼" × 6¾". Weight 21 lbs (including battery and print paper) **$6,500**

Base/Mobile Scanners

In this section, listed alphabetically, are currently available base/mobile scanners. A separate section features handheld models. Remember, the prices given are the suggested retail/list prices; they vary considerably from actual "street" prices. Shop around for the best deals.

AOR Ltd.

AR950

Programmable scanner covers 27-54, 108-174, 406-512, and 830-950 MHz in 100 channels; unrestricted 800 MHz coverage; 5 scan banks, 5 search banks; earphone jack; delay, hold features; chanel 1 priority, includes two antennas, AC & DC power cord w/mobile mounting hardware.

Specifications: Sensitivity 0.4μV Low, High, 0.8μV Air, 0.5μV UHF, and 1.0μV 800; Audio output 1W; Antenna, BNC; Scan speed 15 ch/sec.; IF 21.4 MHz, 455 kHz; Increments 10, 12.5, 25 and 30; Power 120 VAC, 12.8 VDC, 200mA. Dimensions (HWD) 2¼" × 5⅝" × 6½". Weight approx 1 lb **$259**

AR2500

Programmable scanner covers continuous from 1 MHz to 1500 MHz in 2016

channels. AM, FM, WFM, and BFO for SSB, CW; 64 scan banks, 16 search banks; Built in RS232 port (for use with optional control package - $295); includes antenna, mounting bracket.

Specifications: Sensitivity .35μV NFM, 1.0μV WFM, 1.0 AM/SSB/CW; Selectivity ± 7.5 kHz at 6dB (NFM), ± 20 kHz at 70dB (NFM), and ± 50 kHz at 6dB (WFM); Audio output 1.2 W at 4 ohms, Antenna, BNC; Scan speed 38 ch/sec. in scan & search; IF 750.00, 45.0275, 5.5 MHz 455 kHz; Increments 5, 12.5, and 25 kHz; Power 120 VAC, 13.8 VDC, 300mA. Dimensions (HWD) 2¼" × 5⅝" × 6½". AR2500 . . . . . **$499**

AR2800

Programmable scanner covers identical frequency range as AR1000 handheld scanner in 1000 channels, and has same

specifications as AR1000, except includes front panel attenuator switch, BFO built-in to receive SSB and CW, also features sound squelch. Includes 12 VAC adapter for base use and 12 VDC adapter for vehicle use. Dimensions same as AR950. Weight approx. 1½ lbs **$449**

AR3000

Programmable scanner covers continuous from 100kHz to 2036MHz in 400 channels. AM, FM, WFM, LSB, USB, and CW modes; attenuation programmable by channel; manual tuning knob; tuning increments down to 50Hz; 4 scan and search banks, lockout in search; 4 priority channels; RS232 control through DB25 connector; delay, hold features; 15 band pass filters, RF amp; sleep and alarm features; telescopic antenna; AC adaptor/charger, DC power cord.

Specifications: Sensitivity .35μV NFM, 1.0μV WFM, 1.0μV AM/SSB/CW; Selec-

tivity FM and NFM 12 & 20 kHz at −6dB and 60dB, SSB 2.4 kHz −6dB and 4.5 kHz −60dB, WFM 180 kHz/1000 kHz at −6dB and −60dB; Audio output 1.2W at 4 ohms; Antenna, BNC; Display, LCD; Scan speed 20 ch/sec. scan and search; IF 736.23 (352.23) (198.63) 45.0275, 455 kHz; Increments, 50Hz and greater; Power 120 Vac, 13.8 dc, 500mA. Dimensions (HWD) 3⅛" × 5⅝" × 7⅞" **$1,095**

Cobra

SR900

Programmable scanner covers 29-29.7, 29.7-50, 50-54, 136-144, 144-148, 162.4-162.55, 148-174, 406-420, 420-450, 450-470, and 470-512 MHz in 16 channels. Features include direct channel access, LED channel display showing channel number being received, status of lockout and weather functions; channel 1

priority, automatic delay, weather button to access NOAA broadcasts, lockout function, review, and telescoping antenna. Includes AC adapter.

Specifications: Sensitivity 29-54 & 136-174 MHz 0.3μV; 406-512 MHz 0.5μV (±3 kHz deviation 12dB SINAD); IF Selectivity −55dB @ ±25 kHz, Audio output, 800mW; Power AC adapter. Dimensions 7⅛" × 9½" × 2½". Weight approx. 1½ lbs **$180**

ICOM

IC-R100

Programmable scanning receiver covering 100 kHz-1856 MHz AM, FM & WFM modes, in 100 memory channels. Features include RF attenuator, preamplifier, priority channel, built-in clock/timer with sleep function. Also includes automatic noise limiter, mobile mounting bracket, DC power cable, wire and telescoping antenna. Optional items include AC adapter, cigarette lighter cable with noise filter and external speakers.

Specifications: Sensitivity 500 kHz-1.6295 MHz AM 3.2μV; 1.63-49.99 MHz AM 1.6μV, FM 0.56μV; 50-904.995 MHz AM 0.56μV, FM 0.2μV, & WQFM 0.63μV, 905-1380.487 MHz AM 1.0μV, FM 0.32μV, & WFM 0.79μV; 1380.5-1800 MHz AM 1.4μV, FM 0.45μV, & WFM 1.1μV. Selectivity AM more than 6 kHz −6dB,

FM more than 15 kHz −6dB, and WFM more than 180 kHz −3dB; Audio output more than 2.5W, Power 13.8 VDC (or AC with optional adapter). Dimensions (HWD) approx. 2″ × 6″ × 7″. Weight approx. 3 lbs **$707**

Radio Shack

PRO-58

Programmable scanner covers 30–50, 50–54, 138–144, 144–148, 148–174, 380–450, 450–470, and 470–512 MHz in 10 channels. Features include 2-second delay feature, LCD, and lockout function, memory backup keeps channel frequencies for up to one hour in the event of power failure or if scanner is unplugged.

Specifications: Sensitivity (20 dB S/N at 3 kHz deviation), 1.0 μV; Selectivity ±10 kHz, −6dB, ±20 kHz, −50dB; Spurious rejection 30–54 MHz 50dB at 40 MHz, 138–174MHz 50dB at 154 MHz, 380–512 MHz, not specified; Audio output 1W maximum; Scan speed 8 ch/sec.; IF 10.7 MHz and 455 kHz. Power 120 VAC. Dimensions (HWD) 2″ × 8¼″ × 7″. Weight 1½ lbs **$130**

PRO-59

Programmable scanner covers 137–144, 144–148, 148–174, 406–420, 420–450, 450–470, and 470–512 MHz in 8 channels. Features include weather band key giving access to NOAA weather broadcasts on seven frequencies, memory backup keeps channel frequencies for up to 24 hours in the event of power failure. Automatic 2-second scan delay and lockout function.

Specifications: Sensitivity FM: 20 dB signal-to-noise radio at 3 kHz Deviation 137–174 MHz 0.7μV, 406–512 MHz; Selectivity ±11 kHz, −6dB, ±15 kHz, −50dB; IF rejection 10.85 MHz, 70dB at 155 MHz; Scan speed 14 ch/sec.; IF 10.85 MHz and 450 kHz; Audio output 1.3W maximum, 8 ohms. Power 120 VAC (with AC adaptor), 12 VDC. Dimensions (HWD) approx. 2″ × 9⅜″ × 7 1/16″. Weight approx. 1½ lbs **$100**

PRO-2006

Programmable scanner covers 25–520, 760–823.945, 851–868.945 and 896–1300 MHz in 400 channels. Features include LCD, memory backup (with 9V battery) in the event of power failure, lockout function, 10 storage banks (40 channels each), selectable priority channel, telescoping antenna, search mode, monitor banks, allowing saving of up to ten additional channels located during a frequency search, sound squelch that keeps the scanner from stopping on a channel that is only transmitting a carrier, with no voice or other sound.

Specifications: Sensitivity WFM: 30 dB S/N at 22.5 kHz deviation 25–520 MHz 3μV, 760–1100 MHz 3μV, 1100–1300 MHz 10μV; NFM: 20dB S/N at 3 kHz deviation 25–520 MHz 0.5μV, 760–1100 MHz 0.5μV, 1100–1300 MHz 3μV; AM: 20dB S/N at 60% modulation 25–520 MHz 2μV, 760–1100 MHz 2μV, 1100–1300 MHz 5μV; IF rejection 610 MHz at 70 MHz 60dB, 608MHz at 1000 MHz 60dB; Selectivity NFM and AM ±9kHz, −6dB and ±15kHz, −50dB; WFM: ±150kHz, −6dB and ±300 kHz, −50dB; Scan speed: fast 26 ch/sec. and slow 13 ch/sec; Delay time, 2 seconds; Audio output 1.3W nominal. Power 120 VAC or 13.8 VDC. Dimensions (HWD) 2⅞″ × 8½″ × 8¼″. Weight approx. 4½ **$400**

PRO-2022

Programmable scanner covers 30–50, 50–54, 108–136, 136.005–144, 144–148, 148–174, 380–450, 450–470, 470–512, 806–823.9375, 851.1125–868.9375, and 896.1125–960 MHz in 200 channels (10 banks of 20 channels each). Includes selectable priority channel, two-speed search with capability of storing up to 10 channels in a monitor bank. Two speed scan, lockout and two-second delay, telescoping antenna.

Specifications: Sensitivity (20dB S/N with 60% modulation) 30–54 MHz 0.5μV, 108–136 MHz 2.0μV, 136.005–174 MHz 1.0μV, 380–512 1.0μV, and 806–960 MHz 2.0μV; Selectivity ±9 kHz, −6dB and ±15 kHz, −50dB; IF rejection 10.7 MHz, 70dB at 154 MHz; Scan speed: fast 8 ch/sec. and slow 4 ch/sec.; Delay time, 2 seconds; Audio output 1.2W maximum. Power 120 VAC or 13.8 VDC. Dimensions (HWD) 2⅞″ × 8⅝″ × 8¼″. Weight approx. 3½ lbs **$300**

PRO-2023

Programmable scanner covers 29–29.7, 29.7–50, 50–54, 108–136, 136–144, 144–148, 148–174, 406–450, 450–470, and 470–512 MHz in 20 channels. Includes weather band key that lets you scan pre-programmed NOAA weather frequencies for current weather conditions, LCD, memory backup keeps frequencies stored for up to three days in the event of a power failure, lockout function, channel-1 priority and delay feature.

Specifications: Sensitivity AM: 20 dB S/N at 60% modulation and FM: 20dB S/N at 3 kHz deviation, 108–136 MHz 2.0μV, 29–54 0.5μV, 136–174 MHz 0.7μV and 406–512 MHz 1.0μV; Spurious rejection 29–54 MHz 50 dB at 40 MHz, 108–136 MHz 50dB at 120 MHz, 136–174 MHz 50dB at 154 MHz; Selectivity ±11 kHz −6dB and ±15 kHz −50dB; IF rejection 10.85 MHz 60dB at 155 MHz; Scan speed 10 ch/sec.; Delay time, 2 seconds; IF frequencies 10.85 MHz and 450 kHz; Audio output 1.7W maximum. 1.5W nominal; Power 120 VAC. Dimensions (HWD) 2⅜″ × 9 7/16″ × 7 3/32″. Weight approx. 2 lbs **$160**

PRO-2024

Programmable scanner covers 30–50, 50–54, 118–136, 138–144, 144–148, 148–174, 380–450, 450–470 and 470–512 MHz in 60 channels. Includes LCD, memory backup keeping frequencies stored for up to one hour if scanner loses power, lockout, 6 storage banks, priority channel, search function, storage in a monitor bank of up to 6 additional channels located during search function.

Specifications: Sensitivity 30–54 MHz 0.5μV, 118–136 MHz 2.0μV, 138–174 1.0μV and 380–512 MHz 1.0μV; Selectivity ±9 kHz −6dB, ±15 kHz −50dB; Spurious rejection 30–54 MHz 50dB at 40 MHz, 118–136 50dB at 126 MHz, and 138–174 MHz 50dB at 156 MHz. IF rejection 10.7 MHz 70 dB at 156 MHz; Scan speed, fast 16 ch/sec., slow 8 ch/sec.; Search rate, fast 16 steps/sec., slow 8 steps/sec.; Delay time 2 seconds; IF frequencies 10.7 MHz and 455 kHz; Audio output 1.2W nominal; Power 120 VAC. Dimensions (HWD) 2 5/16″ × 9 13/16″ × 7 1/16″. Weight approx. 3¼ lbs **$180**

PRO-2025

Programmable scanner covers 29–29.7, 29.7–50, 50–54, 136–144, 144–148, 148–174, 406–450, 450–470 and 470–512 MHz in 16 channels. Includes LCD, automatic 2-second delay, memory back-

up keeps channel frequencies stored in memory for up to 60 days, even if power switch is in off position, lockout function, priority channel-1, weather band key permits scanning of NOAA weather channels.

Specifications: Sensitivity (20dB S/N at ±3 kHz deviation) 29-54 MHz 0.5μV, 136-174 MHz 0.8μV, 406-512 MHz 1.0μV; Selectivity ±11 kHz −6dB, ±15 kHz −50dB; IF rejection 10.85 MHz 70dB at 155 MHz; Scan speed 12 ch/sec.; IF frequencies 10.85 MHz and 450 kHz; Audio output 2.2W maximum, 4 ohms; Power 13.8 VDC; Dimensions (HWD) 1¾" × 5½" × 6⅞". Weight 1½ lbs. **$140**

Shinwa

SR001

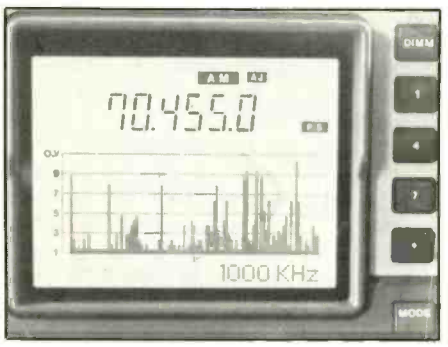
Programmable scanner covers 25.0 to 999.995 MHz AM and FM in 200 channels (10 groups of 20 channels each). Includes full-featured wireless remote control, timer, priority channel, LCD, selectable priority channel, and optional RS232 interface (at press time the interface and interface parameters were not available).

Specifications: Sensitivity NFM below −4dB, WFM, below 12dB and AM below 4dB; Memory backup achieved by battery; Audio output (to an external speaker jack) over 1W; Dimensions (HWD) approx. 2" × 7" × 6"; Weight approx. 3 lbs. SR001 . . . . . **$499**

Standard

AX700

Programmable scanner/receiver covering 50 to 904.995 MHz in 100 channels, AM, NFM and WFM modes. Features in-



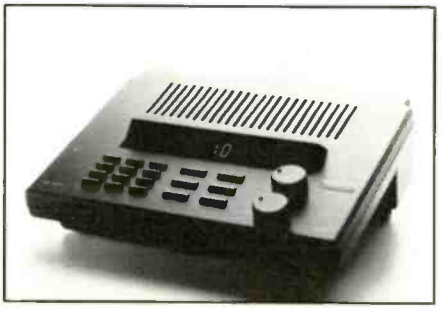
clude 10 bands and a spectrum display, 20dB attenuator switch, jacks for external speaker and record, brightness control, LCD frequency display, tone, dimmer control and headphone jack.

Specifications: Sensitivity AM (10dB S/N) 3μV, NFM (12dB SINAD) less than 1.5μV, WFM (12dB SINAD) less than 1μV. Audio output 2W. Power 13.8 VDC. Dimensions (HWD) approx. 3" × 7" × 7". Weight approx. 4½ lbs **$999**

Uniden

BC 142XL

Programmable scanner that features a built-in delay function that adds a 2-second delay on all channels. Coverage is



29-29.7, 29.7-50, 50-54, 136-144, 144-148, 148-174, 406-420, 420-450, 450-470, and 470-512 MHz in 10 channels. Includes telescoping antenna, memory backup that retains frequencies entered for up to four hours without batteries during a power failure, lockout, LED display, weather search, channel 1 priority, review (to check frequency entered on each channel) and patented "track tuning" that allows unit "to peak on each transmission for better reception at band edges."

Specifications: Sensitivity 29-54 MHz 0.3μV for 12dB SINAD, 136-174 MHz 0.3μV for 12dB SINAD and 406-512 MHz 0.5μV for 12dB SINAD; Selectivity −55dB ±25 kHz; Scan speed 15 ch/sec.; Audio output, 800mW; Power 117 VAC. Dimensions (HWD) 2⁹⁄₁₆" × 9¾" × 8"; Weight approx. 1¾ lbs **$180**

BC 147XLT

Programmable scanner covering 29-29.7, 29.7-50, 50-54, 136-144, 144-148, 148-174, 406-420, 420-450, 450-470, 470-512 MHz in 16 channels. Includes

LED display, review, channel 1 priority, memory backup retains frequencies more than 3 days without batteries during a power failure, lockout, direct channel access, weather scan, built-in 2-second delay and "track tuning."

Specifications: Sensitivity 29-54 MHz 0.4μV for 12dB SINAD, 136-174 MHZ 0.5μV for 12dB SINAD, 406-512 MHz, 0.7 μV for 12dB SINAD; Selectivity −50dB ± 15 kHz; Scan speed 15 ch/sec.; Audio output, 0.9W maximum. Power 117 VAC. Dimensions (HWD) 2¾" × 9" × 6½"; Weight 1¼ lbs **$190**

BC 172XL

Programmable scanner covering 29.0-29.7, 29.7-50.0, 50.0-54.0, 108.0-136.0, 136.0-144.0, 144.0-148.0, 148.0-174.0, 406.0-420.0, 420.0-450.0, 450.0-470.0, 470.0-512.0 in 20 channels. Includes telescoping antenna, channel 1 priority, search function, LCD, weather key to access NOAA, lockout, selectable delay.

Specifications: Sensitivity 30.0-50.0 MHz 0.5μV, 118-135 MHz 2.0μV, 140-170 MHz 0.7μV, 410-510 MHz 1.0μV,

FM ±3 kHz deviation (S + N)/N = 20dB, AM 60% (for aircraft band) (S + N)/N = 20dB; Scan speed 10 ch/sec.; Audio output, 1.5W maximum. Power 120 VAC. Dimensions (HWD) 2⅜" × 9½" × 7". Weight 2¼ lbs **$250**

BC 177XLT

Programmable scanner covering 29-29.7, 29.7-50, 50-54, 118-136, 136-144, 144-148, 148-174, 406-420, 420-450, 450-470, and 470-512 MHz in 16 channels. Features include channel lockout, LCD displaying frequencies programmed and being monitored along with operation modes, search function, automatic squelch (also manual), memory backup retains frequencies more than 3 days without batteries during power failure, two scan speeds, direct channel access and weather scan.

Specifications: Sensitivity 29-54 MHz 0.3μV for 12dB SINAD, 118-136 MHz 0.6μV for 12dB SINAD, 136-174 MHz 0.4μV for 12dB SINAD, and 406-512 MHz

0.5μV for 12dB SINAD; Selectivity ±15 kHz −50dB; Scan speed fast 15 ch/sec.; slow 5 ch/sec.; Audio output 0.9W maximum. Power 117 VAC. Dimensions (HWD) 2¾" × 9" × 6½". Weight 1¼ lbs.
BC 177XLT **$250**

BC 210 XLT

Programmable scanner covering 29.0-29.7, 29.7-50, 50-54, 118-136, 136-144, 144-148, 148-174, 406-420, 420-450, 450-470, 470-512 MHz in 40 channels (2, 20-channel banks). Includes telescoping antenna, vacuum fluorescent display, weather search, channel 1 priority, programmable delay function, search function, automatic squelch (with manual operation also), "track tuning," direct channel access.

Specifications: Sensitivity 29-54 and 136-174 MHz 0.3μV, 118-136 MHz 0.8μV, 60% (1 kHz modulation 12dB SINAD), 406-512 MHz 0.5μV; Selectivity −55dB at ±25 kHz; Scan speed 15 ch/sec.; Audio output, 2.2W at maximum. Power 120 VAC or 13.8 VDC. Dimensions (HWD) 3½" × 10⅜" × 8"; Weight 5 lbs.
BC 210 XLT **$230**

BC 560XLT

Programmable scanner covering 29-29.7, 29.7-50, 50-54, 136-144, 144-148, 148-174, 406-420, 420-450, 450-470, 470-512 MHz in 16 channels. Includes review key, LED display, Channel 1 priority, memory backup allows channel frequencies to be retained for up to 2 months without batteries or external power, lockout function, direct channel access, weather search, built-in delay (automatically adds two-second delay to transmissions received), and mobile mounting bracket.

Specifications: Scan speed 15 ch/sec.; Audio output, 3W maximum. Power 13.8 VDC (or optional ac adaptor). Dimensions (HWD) 1¾" × 5½" × 6⅞"; Weight approx. 1¾ lbs **$180**

BC 590XLT

Programmable/preprogrammed scanner covering 29-29.7, 29.7-50, 50-54, 118-136, 136-144, 144-148, 148-174, 406-420, 420-450, 450-470, 470-512 MHz in 100 channels (five 20-channel banks). Includes weather search and "service scan" that allows user to push one button to scan preprogrammed police, fire, emergency services, aircraft, and marine frequencies. Also includes lockout function, memory lock to prevent accidental programming or erasure and programmable delay function. Direct channel access and channel one priority. Mobile mounting bracket included.

Specifications: Sensitivity 29-54 and 136-174 MHz 0.4μV, 118-136 MHz 0.8μV, 406-512 MHz 0.5μV; Scan speed 15 ch/sec.; Audio output, 3W maximum. Power 13.8 VDC (or optional ac adaptor) and 2 AA batteries for 1 year memory backup. Dimensions (HWD) 1⅝" × 7⅜" × 6⁵⁄₁₆". Weight approx. 1¼ lbs **$400**

BC 760XLT

Programmable/preprogrammed scanner covering same frequencies as 590XLT, but additionally covers 806-956 MHz (excluding 823.9875-849.0125 and 868.9875-894.0125 MHz) in 100 channels (five 20-channel banks). Includes single button access to preprogrammed frequencies for police, fire, emergency services, aircraft, and marine frequencies. Weather search, channel one priority, lockout function, programmable three second delay function, LCD shows current frequency, channel and other features and operating modes; direct channel access and memory lock.

Specifications: Sensitivity 29-54 and 136-174 MHz 0.4μV (nominal), 118-136 MHz 0.8μV (60% AM) (12dB SINAD), 406-512 0.5μV, 06-956 MHz 1.0μV; Selectivity −55dB at ±25 kHz; Scan speed 15 ch/sec.; Audio output, 3W maximum. Power 13.8 VDC (or AC adaptor) two AA batteries for memory backup. Dimensions (HWD) 1⅝" × 6⁵⁄₁₆" × 7⅜". Weight approx. 1¼ lbs **$500**

BC 800XLT

Programmable scanner covers same frequencies as 760XLT, except 800 band coverage is from 806-912 MHz, complete, no restrictions in 40 channels (two banks of 20-channels each). Includes two telescoping antennas (one for 800 MHz), instant weather access button, programmable scan delay function, search function, direct channel access, automatic squelch (or manually adjusted), channel one priority and lockout function.

Specifications: 29-54 and 136-174 MHz 0.3μV, 118-136 MHz 0.8μV (60% (1 kHz modulation 12dB SINAD), 406-512 MHz 0.5μV, and 840-912 MHz 0.7μV (±3 kHz deviation 12dB SINAD); Selectivity −55dB at ± 25 kHz; Scan speed 15 ch/sec.; Audio output, 1.5W; Power 117 VAC or 13.8 VDC, two AA batteries required for memory backup. Dimensions (HWD) 4½" × 12½" × 9¼". Weight 7 lbs.
BC800XLT **$450**

BC 855XLT

Programmable scanner covers same frequencies as 800XLT, except 800 band coverage is from 806-956 MHz, complete, no restrictions in 50 channels. Includes same basic features as 800 XLT except scan speed is user programmable (high or low setting). Display: LCD.

Specifications: 29-54 MHz 0.4μV (12dB SINAD), 118-136 MHz 0.8μV (12dB SINAD), 136-174 MHz 0.4μV (12dB SINAD), 406-512 MHz 0.5μV (12dB SINAD), and 806-956 MHz 1.0μV (12dB SINAD); Selectivity −55dB ±25 kHz; Scan speed 5 or 15 ch/sec.; Audio output, 1.3W maximum. Power 117 VAC. Dimensions (HWD) 2¾" × 9" × 6½". Weight approx. 1⅜ lbs **$380**

MR8100

Covering same frequency bands as 855XLT in 100 channels. Large LCD wtih up to 20 alpha-numeric characters. Designed for public service professional. "Supervisor" control of field programming via supervisors PC system. Dimmer control, contrast control, two scanning speeds and direct channel access. Includes lockout function and selectable priority channel. Built-in delay and antenna switch disables receiver of unit. Includes mounting bracket.

Specifications: Sensitivity is typically less than 1μV at 12dB SINAD for all bands; Intermediate frequencies 10.85 MHz and 450 kHz; Scan speed 93 or 32 ch/sec.; Audio output, 3.0W minimum; Power nominal 10-14 VDC. Dimensions (HWD) approx. 5¾" × 8" × 2". Weight 4½ lbs . . . . . **no price available**

Handheld Scanners

The following section covers handheld scanners. Usually powered by rechargeable AA, standard alkaline AA batteries or battery packs, handheld scanners come in a wide variety of frequency coverage and features. Remember that prices are suggested retail/list prices and vary considerably from actual "street" prices. Shop around for the best deals.

AOR Ltd.

AR900

Programmable handheld scanner covering 27-54, 108-174, 406-512 and 830-950 MHz with unrestricted 800 MHz coverage in 100 channels. Same features and listed specifications as AR950,

except powered by NiCd battery w/ charger, included. Dimensions (HWD) 5¾" × 2" × 1½" **$269**

AR1000XC

Programmable handheld scanner covering 500 kHz to 1300 MHz continuous in 1000 channels (unrestricted 800 MHz coverage). Includes antenna, antenna attenuator switch (10dB), manual tuning knob, earphone, AM, FM and WFM tuning modes, backlighted LCD display, 10 scan and 10 search banks, selectable priority channel, delay, hold features, selectable search increments from 5-955 kHz, permanent memory backup. Includes 4 AA NiCd batteries and charger, carry case, cigarette lighter charger, and belt clip.

Specifications: Sensitivity NFM .35μV, WFM 1.0μV, AM 1.0μV; IF, 561.225, 58.075, 455 kHz or 10.7 MHz; Scan speed 20 ch/sec. scan and 40 ch/sec. search;

Audio output, .4W; Power 9-13.8 VDC. Dimensions 6⅞" × 2½" × 1¾". Weight ¾ lb **$429**

Cobra

SR-11

Programmable handheld scanner covering same frequency range as SR900, with addition of 400-406 MHz, in 10 channels. Features include LCD showing channel number and frequency, plus status of lockout, squelch and keylock. Includes lockout function, keylock, automatic (preset factory) squelch, ex-

press tuning and manual stepping through channels and automatic delay. Also features low-battery indicator. Includes telescoping antenna.

Specifications: Sensitivity and selectivity listed same as SR900. Audio output, 250mW; Power 4 AA batteries (not included). Dimensions 6⅛" × 2¾" × 1⅛", Weight 7.5 oz. **$220**

Fairmate

HP2000

Programmable handheld scanner covering 500 kHz to 1300 MHz, continuous in 1,000 channels, AM, FM, and WFM modes. Features include 10 banks of 100 channels, 20-channel/sec. scan rate, 10 independent search bands, selectable 10dB attenuator, keypad and rotary tune controls, three antennas (telescopic, VHF and UHF), belt clip, carry case, NiCd batteries and charger, earpiece and shoulder strap, priority function.

Specifications: Sensitivity below 2 MHz less than 10μv for 20dBQ AM. 15-1300 MHz less than 0.5μv for 12dB SINAD FM, 15-600 MHz less than 2μv for 30dB S/N (WFM). Audio output more than 100mW. Power 4 AA NiCds (included), AC charger, DC lighter cord (all included). Dimensions (HWD) approx. 6¾" × 2⅜" × 1⅜". Weight ⅝ lb **$429**

ICOM

IC-R1

Programmable handheld scanner covering 100 kHz to 1300 MHz in 100

channels. Features include small size, power saver function, keyboard lock, sleep timer and auto-on timer, low battery indicator, line out jack for tape recording, manual tuning control, search function,

built-in NiCd batteries, wall charger, antenna and belt clip.

Specifications: Sensitivity: 2-24.99 MHz AM, 1.6μV; FM 0.79μV; WFM 6.3μV, 25-905 MHz AM 1.26μV; FM 0.63μV, 25-905 MHz AM 0.63μV; FM 0.32μV. Selectivity AM more than 15 kHz −6dB, FM more than 15 kHz −6dB, and WFM more than 150 kHz −6dB. Audio output 150mW; Power 7.2 VDC (from internal battery) (or optional battery pack) or external DC power source from 6-16 VDC. Dimensions (HWD) approx. 4″ × 2″ × 1⅜″. Weight approx. ⅝ lb **$624**

Radio Shack

PRO-35

Programmable handheld scanner covering 29-29.7, 29.7-50, 50-54, 108-136.975, 137-144, 144-148, 148-174, 406-450, 450-470 and 470-512 MHz in 100 channels. Features include LCD showing frequency and other indicators, selectable 2-second scan delay, memory

backup keeps channel frequencies stored in memory for up to one hour without the battery, (included NiCd battery pack and charger) lockout function, selectable priority channel and weather band key giving access to NOAA weather broadcasts. Also includes frequency search and a monitor bank for saving a frequency located during search mode.

Specifications: Sensitivity AM −20dB S/N at 60% modulation 108-136.975 MHz 1.6μV, FM −20dB S/N at 3 kHz deviation 29-54 MHz 0.5μV, 137-174 MHz 0.7μV and 406-512 0.7μV; Spurious rejection 29-54 MHz 50dB at 40 MHz, 108-136.975 MHz 50dB at 120 MHz, 137-174 MHz 50dB at 154 MHz and 406-512 not specified; Selectivity ±11 kHz −6dB, and ±15 kHz −50dB; Audio output, 0.4W maximum; Scan speed 14 ch/sec. Power 12 VDC, 500mA. Dimensions (HWD) 7 7/16″ × 2 23/32″ × 1⅜″. Weight approx. 1 lb **$230**

PRO-36

Programmable handheld scanner covering 30-50, 50-54, 108-136, 136.005-144, 144-148, 148-174, 380-450, 450-470, and 470-512 MHz in 20 channels. Features include LCD showing channel number, frequency, error indicator, function indicators and low battery indicator; memory backup retains channel frequencies for up to one hour without batteries, search function, and selectable 2-second delay.

Specifications: Sensitivity 20dB S/N ratio, 30-54 MHz 1.0μV; 108-136 MHz 2.0μV; 136.005-174 MHz 1.0μV; 380-512 MHz 2.0μV. Spurious rejection 30-54 MHz 50dB at 40 MHz, 108-136 MHz 50dB at 124 MHz, 136.005-174 MHz 50dB at 154 MHz and 380-512 not specified. Selectivity ±10 kHz −6dB, and ±20 kHz −50dB; IF rejection 10.7 MHz 50dB at 154 MHz; Audio output, 200 mW nominal; Scan speed 8 ch/sec.; IF frequencies 10.7 MHz and 455 kHz; Power 9 VDC, 6 AA batteries, or a suitable adapter. Dimensions (HWD) 6½″ × 2¾″ × 1 13/16″. Weight approx. ¾ lb **$200**

PRO-37

Programmable handheld scanner similar to PRO-36, but also covers 806-823.9375, 851.1125-868.9375, and 896.1125-960 MHz in 200 channels.

Features include LCD showing selected channel and frequency, 2-second scan delay, memory backup keeps channel frequencies stored in memory for up to one hour without the battery. Also includes lockout function, selectable priority channel and monitor banks allowing user to save up to 10 frequencies located during search.

Specifications: Sensitivity (20dB S/N ratio) 30-54 MHz 1.0μV, 108-136.975 MHz 2.0μV, 137-174 MHz 1.0μV, 380-512 MHz 1.0μV, and 806-960 MHz 2.0μV; Spurious rejection 30-54 MHz 50dB at 40 MHz, 108-136.975 MHz 50dB at 124 MHz, 137-174 MHz 50dB at 154 MHz, 380-512 and 806-960 MHz not specified. Selectivity ±10 kHz −6dB, and ±20 kHz −50dB; IF rejection 10.7 MHz 50dB at 154 MHz; Audio output, 200 mW nominal; Scan speed, fast 25 ch/sec.; slow 8 ch/sec.; IF frequencies 10.7 MHz and 455 kHz; Power 9 VDC, 6 AA batteries, or a suitable adapter. Dimensions (HWD) 6½″ × 2¾″ × 1 13/16″; Weight approx. ¾ lb **$300**

PRO-41

Programmable handheld scanner covering 29-50, 50-54, 137-144, 144-148, 148-174, 406-450, 450-470, and 470-512 MHz in 10 channels. Features include LCD showing selected channel and frequency, automatic 3-second scan delay, memory backup keeps frequencies stored in memory for up to 30 minutes without the batteries, and also low battery alarm.

Specifications: Sensitivity (FM: 20dB S/N ratio at 3 kHz deviation) 29-54 MHz 0.3μV, 137-174 MHz 0.7μV, and 406-512 MHz 0.7μV; Selectivity ±10 kHz −6dB and ±17 kHz −50dB; IF Rejection 10.85 MHz 45db at 155 MHz; Audio output, 260 mW nominal; Scan speed 10 ch/sec.; Power 5 AA batteries or 5 AA rechargeable NiCd batteries or AC adapter. (batteries or adapter not included). Dimensions (HWD) 7″ × 2⅝″ × 1⅜″. Weight approx. ¾ lb **$120**

PRO-42

Programmable handheld scanner covering 30-50, 50-54, 13-144, 144-148, 148-174, 380-450, 450-470 and 470-512 MHz in 10 channels. Features include LCD showing channel number, frequency, and several other indicators, 2-second delay, memory backup keeps frequencies stored in memory for up to one hour if you unplug unit or if power failure occurs. Also includes lockout function.

Specifications: Sensitivity (20dB S/N at 3 kHz deviation), 30-54 MHz 1.0μV, 138-174 MHz 1.0μV and 380-512 MHz 1.0μV; Selectivity ±10 kHz −6 dB and ±20 kHz −50dB; Audio output, 250 mW maximum; Scan speed 8 ch/sec. Power 9 VDC, 6 AA batteries or a suitable adapter. Dimensions (HWD) 6⅜″ × 2¾″ × 1⅝″. Weight approx. ¾ lb **$140**

Handheld Scanners (cont.)

Uniden

BC 55XLT

Programmable handheld scanner covering 29–512 MHz in 10 channels. Features include keyboard lock switch to prevent accidental reprogramming, 2- digit LCD display showing channels being scanned and monitored, review function, lockout, battery-low indicator, memory backup retains frequencies for 30 minutes without battery. Also includes built-in delay, direct channel access, patented "track tuning" and built-in rechargeable NiCd battery pack.

Specifications: Sensitivity 29–54 MHz 0.4μV, 136–174 MHz 0.5μV, and 406–512 MHz 0.7μV (all 12dB SINAD); Selectivity ±25 kHz −55dB; Audio output, 300 mW maximum; Scan speed 15 ch/sec.; Power 7.5 VDC (5 AA batteries, not included) or 6 VDC (5 NiCd rechargeable batteries, included). Also optional adapters allow 120 VAC or 12 V vehicle operation. Dimensions (HWD) 1½″ × 2⅝″ × 6¾″. Weight approx. ¾ lb **$230**

BC 70XLT

Programmable handheld scanner covering same frequencies as 55XLT, except in 20 channels. Features include search, selectable 2-second delay, lockout, channel 1 priority, LCD display showing current frequency and channel and other features and operating modes. Selectable display light for night use. Also includes direct channel access and built-in rechargeable NiCd battery pack.

Specifications: Sensitivity and selectivity same as 55XLT. Audio output, 200 mW at maximum; Scan speed 15 ch/sec.; Power 4.8 VDC, 4 AA NiCd batteries (built-in to battery pack), internal capacitor memory back-up. Dimensions 6″ × 2¾″ × 1″. Weight approx. ¾ lb **$300**

BC 100XLT

Programmable handheld scanner covering 29–29.7, 29.7–50, 50–54, 118–136, 136–144, 144–148, 148–174, 406–420, 420–450, 450–470, and 470–512 MHz in 100 channels. Features include weather search, 10 priority channels, lockout, selectable 3-second delay, search, LCD showing current frequency and channel as well as other features and operating modes. Snap-on battery pack, direct channel access and carrying case.

Specifications: Sensitivity 29–54 & 136–174 MHz 0.4μV (nominal) and 118–136 MHz 0.8μV, and 406–512 MHz 0.5μV; Selectivity ±25 kHz −55dB; Audio output, 450 mW maximum; Scan speed 15 ch/sec.; Power 13.8 VDC external or 120 VAC adapter. Dimensions (HWD) 7½″ × 2 1/16″ × 1⅜″. Weight 1¼ lbs. **$340**

BC 200XLT

Programmable handheld scanner covering same frequency range as 100XLT, except includes 806–956 MHz in 200 channels (excludes 823.9875–849.0125 and 868.9875–894.0125 MHz). Features are basically identical to 100XLT.

Specifications: Sensitivity figures identical to 100XLT, with 806–956 MHz at 1.0μV. Dimensions, and weight also same. **$510**

Amateur Radio Transceivers

The following alphabetized section covers amateur mobile and handheld transceivers. Remember, you need an amateur license to use these transceivers. (An excellent article in our Guide by Fred Maia discusses ham radio and the licensing procedure). Prices given are suggested retail/list prices and are subject to change. Actual "street" prices vary considerably, so be sure to shop around for the best deals.

Alinco Electronics Inc.

DR110T

Two-meter FM mobile amateur transceiver. Features include 14-multi-function memory channels; each stores frequency, standard offset and other information. Also includes 6 channel spacing steps, 5, 10, 12.5, 15, 20 and 25 kHz; 4 scanning modes: VFO-Scanning of entire band, memory-scanning of selected memories, programmed band-scanning of a selected segment of band. Restricted access operation feature allows for programmable encode/decode audible tones. Standard mic offers following features: up/down buttons for frequency/memory selection, LED on-air indicator, and DTMF encoder built-in. Other features include function lock key, reverse key-inverts TX-RX, memory skip, odd offset, and multiple standard offsets. Includes mounting bracket, hardware and DC power cable.

Specifications: Frequency coverage: 144–147.995 MHz. Ant Impedance 50 Ohms unbalanced, Current drain 13.8 VDC at transmit does not exceed 500mA. Output power, high: 45W, low 5W. Spurious emission: more than 60dB below carrier. Mic electret condenser type. Operating mode: simples, duplex: ±600 kHz from receive frequency and odd offsets programmable. Receiver is superheterodyne, dual conversion. Sensitivity 12dB SINAD less than 0.16μV. Selectivity more than ±6 kHz at −6dB. Audio output more than 1.5W. Dimensions (HWD) 2″ × 5½″ × 6¾″. Weight approx. 2½ lbs. **(price not available, order from dealers)**

DR112T

Same basic transceiver as DR110T except has backlit display and contemporary looking mic has lockout button **(price not available, order from dealers)**.

DR-570T

Dual band VHF/UHF FM mobile amateur transceiver features include full duplex cross band operation. Can operate on 2-meters while simultaneously receiving on 70cm. Also includes twin band receiver with volume/squelch for each band independently adjustable, color LCD, illuminated front-panel controls, multiple sub-audible tone programmability with user choice of 37 encoding/decoding sub tones available to be programmed into both "main" and "sub" bands. Automatic band exchange, duplexer allowing for a single dual band antenna, 4 scanning modes; program scan, memory scan, band scan and priority scan. User can also monitor a single frequency and a priority frequency in each band at same time, twin priority function, 50 different beep tones indicating individual function confirmation, bell function, one-touch band selection, independent "call" channels (one in each band), one-touch band ignore and locking reverse that allows monitoring of an "input" frequency. Includes mic, mounting bracket and hardware and DC power cable.

Specifications: Frequency coverage transmit 144–147.995, receive 130–169.995 MHz, and transmit 440-449.995 transmit/receive. Frequency resolution 5,10, 12.5, 20 and 25 kHz steps. Ant impedance 50 ohms unbalanced, Output power high approx 45W at VHF, approx 35W at UHF, and low approx 5W both bands. Mic is electret condenser type, Receiver superheterodyne, dual conversion. Sensitivity 12dB SINAD −16dBμ, Selectivity more than ±6 kHz at −6dB, less than ±12 kHz at −60dB. Audio output more than 2W. Dimensions (HWD) 2″ × 5⅞″ × 6⅞″. Weight approx 3¾ lbs **(price not available, order from dealers)**.

DR-590T

Twin band VHF/UHF mobile amateur transceiver features dual watch function enabling receiving both VHF and UHF at same time, independent VHF/UHF controls, cross band full duplex operation by transmitting on one band and simultaneously receiving on other, optional remote kit allows removal of front panel from main body, allowing installation of main body under seat, etc., DSQ (DTMF squelch) function, code squelch function allows programming of a 3-digit code opens squelch only when same code signal is received from another transceiver and can be separately established for each band. Also features various paging functions for group or individual calling. Remote control mic allows direct setting of frequencies in VFO mode, up/down of memory channels in memory mode, shifting to call mode, auto repeater mode, VHF/UHF switching, up/down by 1 MHz steps, setting and selecting DSQ codes and setting/selecting automatic dialer. Scanning functions include VFO scan, program scan, memory scan, ARM scan, band scan (simultaneously and independently), busy stop, free channel stop and pause/start. Unit has 28 memory channels, one independent "call" channel (T only) and 10 ARM memory channels. ARM feature allows 10 repeater channels to be memorized automatically. While ARM is active scanning stops at vacant channels and pauses, then starts again automatically. ABX (auto band exchange) function allows incoming signal on the sub-band to be exchanged to the main band automatically. Three transmit powers: high, middle and low. Also includes bell function, light control, function cancellation, reverse function, priority functions, mute function and auto dialer and key lock.

Specifications: Frequency coverage transmit 144–147.995, receive 137–173.995 MHz; transmit 440–449.995, receive 410–469.995 MHz. Frequency resolution 5, 10, 12.5, 20 and 25 kHz steps. Ant impedance 50 ohms unbalanced. Transmit power VHF high 45W, middle 10W, low 5W; UHF high 35W, middle 8W, and low 4W. Mic is electret condenser type. Sensitivity 12dB SINAD −16dBμ. Selectivity ±6 kHz or under at −6dB and ± 12 kHz or under at −60dB. Audio output 2.5W. Dimensions (HWD) 2″ × 5⁹⁄₁₀″ × 7″. Weight approx. 3 lbs **(price not available, order from dealers)**.

DJ-120T

VHF FM handheld amateur transceiver. Offers the following features standard: Power is 2.5W, but with optional batteries power can be as much as 6.5W. Frequency coverage 144–147.995. LCD inclines from front to rear by 18 degrees. Also includes "momentary" on/normally off button on side of unit below PTT which illuminates the LCD, 10 tuneable memories, automatic battery save, function and frequency lock, and subaudible tone encoder.

Specifications: Frequency resolution 5, 10, 12.5 and 20 kHz steps. Ant impedance is 50 ohms unbalanced. Output power 6.5W with optional NiCd pack, 2.5W standard. Mic is built-in electret condenser type. Sensitivity 12dB SINAD less than $-12dB\mu$, Selectivity more than ± 7.5 kHz, less than ± 15 kHz. Includes rubber flex antenna, NiCd battery, AC wall charger, hand strap and belt clip. Dimensions (HWD) 6½″ × 2⅜″ × 1 3/16″. Weight ¾ lbs **(price not available, order from dealers)**.

DJ-460T

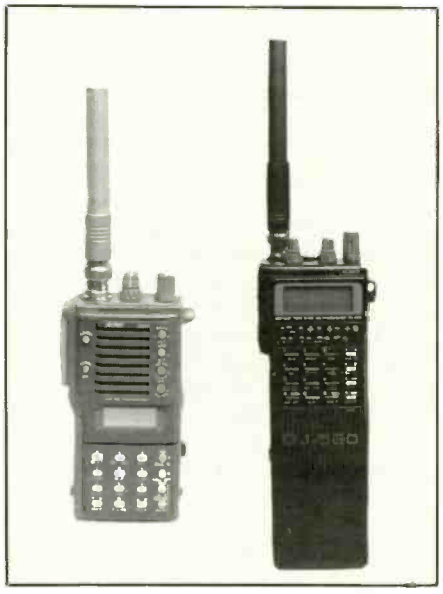
VHF FM handheld amateur transceiver. Offers the following standard features: Power is 2W with supplied NiCd battery. Features code squelch function, built-in paging function, wildcard function, 3 methods of frequency selection, 20 memory channels and 1 call channel, DTMF with monitor memory, busy scan and timed scan, 14 scanning modes, priority functions, transceiver can perform two versatile scan/priority combination (simultaneous use of band scan and memory priority function and simultaneous use of memory scan and VFO priority). Also includes 2 dual watch functions, reverse function, auto power off and battery save function, timed LCD illumination, one-touch squelch deactivation, 5 channel steps, lock functions and auxiliary power sources. Includes rubber flex antenna, NiCd (EBP-10N) battery, wall charger, hand strap and belt clip.

Specifications: Frequency coverage transmit and receive 144–146 MHz. Frequency resolution 5, 10, 12.5, 20 and 25 kHz; Output power 2W standard, but with optional battery packs is either 2W or 5W; Sensitivity 12dB SINAD less than $-15dB\mu$, Receiver is double conversion-superheterodyne. Dimensions (HWD) 5⅜″ × 2″ × 1¼″. Weight approx. ¾ lb with supplied battery pack **(price not available, order from dealers)**.

DJ-F1T

VHF FM handheld amateur transceiver. Offers the following standard features: 40 memory channels, wide band receiving range, triple stage selective power setting, Output power 2.5W at 9V (on high), built-in tone encoder, 8 scan modes, programmable VFO range function, half duplex operation, 6 channel steps (5, 10, 12.5, 15, 20 and 25 kHz), frequency lock, PTT lock functions, one-touch squelch de-activation function, beeper on/off function, battery save function, dial control reverse, and automatic lamp off function.

Specifications: Frequency coverage transmit 144–147.995 MHz, receive 138–173.995 MHz. Sensitivity 12dB SINAD less than $-15dB\mu$, Receiver is double-conversion superheterodyne. Dimensions (HWD) approx. 4″ × 2″ × 1½″. Weight approx. ¾ lb with standard battery pack **(price not available, order from dealers)**.



DJ-560T

VHF/UHF FM handheld amateur transceiver. Offers the following standard features: Power is 2W (high) with standard battery pack, dual watch function, independent VHF and UHF with separate control knobs for volume and squelch, LCDs and terminals for outer speaker, cross band full duplex operation, DSQ (DTMF) allows code squelch and paging, quiet listening by code squelch function, group calling, private calling, wildcard function, busy scan, timed scan, and empty channel scan, 21 scanning modes, 3 methods of frequency selection, bell function, 40 memory channels (20 each in VHF and UHF), ABX function, reverse function, 2 LCD illuminations for night use, lock function, auxiliary power source, auto dialer, priority function, reset function, 38 waves tone squelch built-in, single band function, battery save function/ auto power off, and one-touch squelch de-activation. Includes rubber flex antenna, NiCd battery pack, wall charger, hand strap and belt clip.

Specifications: Frequency coverage VHF transmit 144–147.995 and receive 130–173.995 MHz, UHF transmit 440–449.995 and receive 400–519.995 MHz. Sensitivity 12dB SINAD less than $-15dB\mu$. Receiver is double-conversion superheterodyne. Dimensions (HWD) 6½″ × 2¼″ × 1¼″. Weight approx. 1 lb **(price not available, order from dealers)**.

ICOM America Inc.

IC-229A

VHF mobile amateur transceiver offers the following standard features: auto dialing with 14 DTMF memory channels from hand mic, Power output 50W, 20 memory and 1 call channels (all memory channels memorize operating, offset and subaudible tone frequencies and duplex shift direction. An independent call channel is built-in for storing most-used frequencies. For programmed scan function, the transceiver has 2 scan edge channels separately). Other frequencies include memory transfer function, memory split for split frequency operation, high/low selectable audio tone, 4-step adjustable RF output power, 20dB RF attenuator, programmed, memory scan functions and a priority watch with selectable resume conditions, memory skip; function, 7 tuning steps 5, 10, 12.5, 15, 20, 25 kHz or 1 MHz, pager and code squelch functions, pocket beep and tone squelch functions.

Specifications: Frequency coverage transmit 144-150, receive 136-174 MHz. Sensitivity: less than $0.16\mu V$ for 12dB SINAD. Audio output 2.4W, Antenna impedance 50 ohm unbalanced. Dimensions (HWD) approx. 1½″ × 5½″ × 4″. Weight approx 1¾ lbs **$423**

IC-2410A

VHF/UHF mobile amateur transceiver with the following standard features: Power output 25W, 10W and 1W selectable on each band. Includes dual watch on same band, switches perform dual functions by pressing for several seconds, 36 memory channels, electronic squelch, independent volume controls and squelch setting switches, 20dB RF attenuator, built-in duplexer, programmed scan, memory scan and priority watch functions, illuminated switches and controls, selectable LCD intensity, and auto-dialing capability.

Specifications: Frequency coverage

transmit 140–150, receive 136–174 MHz and transmit/receive 440–450 MHz. Sensitivity: less than 0.16μV for 12dB SINAD. Audio output more than 2.4W, Antenna impedance 50 Ohms unbalanced. Dimensions (HWD) approx. 1½" × 5½" × 7". Weight 3 lbs **$855**

IC-02A

VHF handheld amateur transceiver with the following standard features: Power output 3W, includes 10 memory channels, 3 scanning functions provide following: programmed scan that repeatedly scans a desired frequency range set with a specified tuning increment, memory scan repeatedly scans the memory channels, and priority function checks memory channel 4 while operating on another frequency. Accepts wide variety of supply voltages, power saver circuit, programmable call channel on channel 3, repeater functions, splash/dust resistant body.

Specifications: Frequency coverage transmit/receive 140–149.994 MHz. Sensitivity: less than 0.25μV for 12dB SINAD. Audio output more than 500mW, Antenna impedance 50 Ohms unbalanced. Dimensions (HWD) approx. 6" × 2½" × 1½". Weight approx. 1 lb **$321**

IC-2SA

VHF handheld amateur transceiver with following standard features: Power output (at 13.8 V) more than 5W, features small size, external DC power jack with charging capability, 48 memory channels and 1 programmable call channel. Each memory channel stores operating frequency and offset information required for repeater operation. Scan functions include both VFO and memory scan. Frequency skip function allows user to skip unwanted stations during VFO scan. Memory scan sequentially scans all programmed memory channels. Other features include top panel tuning control, 100 kHz tuning steps, monitor function allows checking of a repeater input frequency, power saver and auto power off timer function, function display lighting with timer function for night operation, and 4 selectable output power levels.

Specifications: Frequency coverage transmit/receive 140–150 MHz. Sensitivity: less than 0.18μV for 12dB SINAD. Audio output more than 200mW, Antenna impedance 50 ohm unbalanced. Dimensions (HWD) approx. 4" × 2" × 1⅛". Weight ¾ lb **$419**

IC-2SAT

VHF handheld amateur transceiver with same basic features as 2SA transceiver, except includes touch-tone pad.
IC-2SAT **$439**

IC-3SAT

Handheld amateur transceiver for 220 MHz with the following standard features: Compact size, keyboard control activates memory writing, recall, duplex, scan functions, priority watch, clock, and many other functions. Includes built-in NiCd batteries, DTMF code memory dialing with 10 DTMF code memory channels. Each stores up to 15 digits for DTMF code. Operating frequencies can be selected by keyboard, top panel tuning con-

trol, dial select function lets user change operating frequency in 100 kHz or 1 MHz steps or memory channels in VFO mode. Provides the following scan functions: full scan, programmed scan, memory scan and memory skip function. Selectable scan resume conditions-either the pause or timer function is selectable for the scan resume condition. When receiving a signal, the pause function pauses until signal disappears; the timer function pauses for approx. 10 sec. Priority watch monitors a call channel, memory or memory channels every 5 sec while user operates on VFO frequency. Includes 48 memory channels and a programmable call channel, built-in clock with timer function, external DC power jack with charging capability, repeater functions, power saver function, DTMF code, and tone squelch function. Function display, beep tone on/off, memory masking function for temporarily 'hiding' seldom-used memory channels, selectable tuning step increments, PTT lock, and keyboard lock function.

Specifications: Frequency coverage transmit/receive 220–225 MHz. Sensitivity less than 0.22μV for 12dB SINAD. Audio output more than 200mW, Antenna impedance 50 ohms unbalanced. Receiver is double-conversion superheterodyne. Dimensions (HWD) approx. 4" × 2" × 1½". Weight ¾ lb **$337**

IC-2GAT

VHF handheld amateur transceiver with the following standard features: Power output is 7W at 13.2 VDC. Includes power saver, 20 memory channels, programmed scan and memory scan, programmable call channel, built-in DTMF keyboard for repeater access, instant monitoring of repeater frequency, and splash resistant case.

Specifications: Frequency coverage transmit 140–150 MHz, receive 138–174 MHz. Sensitivity less than 0.25μV for 12dB SINAD. Audio output more than 400mW, Antenna impedance 50 Ohms unbalanced. Receiver is double-conversion superheterodyne. Dimensions (HWD) approx. 6" × 2½" × 1½". Weight 1 lb **$358**

IC-4GAT

UHF handheld amateur transceiver with the same basic features as the 2GAT, except is UHF transceiver.
IC-4GAT **$358**

IC-W2A

VHF/UHF handheld amateur transceiver with the following standard features: Power output at 13.5 VDC on high more than 5W. Includes receive on one band, transmit on another, keyboard control, display lighting, 3-way tuning: top panel control, digit keys and up/down keys. Independent speaker jacks provide audio for each band. User can listen to VHF signal through the internal speaker and UHF through earphone. Total of 60 memory channels (30 per band) and two call channels. User can store operating

frequency, offset direction, offset frequency and subaudible tone frequency (optional tone squelch unit is required), built-in pager and code squelch functions, 24-hour clock with on/off timer, high-speed scan and priority watch, auto dialing capability, mono band function, programmable offset frequency, monitor function allows user to check the repeater input frequency, external DC power jack with charging capability, memory masking function, memory transfer function, PTT lock, keyboard lock, auto power saver and power off timer, variety of tuning steps and "set" mode assures critical settings.

Specifications: Frequency coverage transmit 140–150, receive 136–174 MHz, transmit/receive 440–450 MHz. Sensitivity less than 0.16μV for 12dB SINAD. Audio output 180mW, antenna impedance 50 Ohm unbalanced. Dimensions (HWD) approx. 7″ × 21″ × 1½″. Weight approx. 1 lb **$629**

Kenwood U.S.A. Corporation

TH-225A/315A/415A

Handheld amateur transceiver 225A–144 MHz, 315A–220 MHz, 415A–440 MHz with the following standard features: Power output 6W (225A–6W with optional battery pack), high/low power switch, wide range of power supplies, multi-scan function. Uses "scan-map" on display. The 3 × 3 scan modes include band, memory and programmable band scans with 3 scan stop modes. Scan modes include band scan, programmable band scan, memory scan plus memory channel lockout. Scan stop modes include time operated resume, carrier operated resume, seek-operated resume. Wide range of battery options, twist-lock locking battery case, selectable CTCSS tone encoder built-in, large LCD display. Ten memory channels allow storage of frequency in steps 5–25 kHz in 5 kHz steps, any offset (100 kHz–9.9 MHz in 100 kHz steps) subtones, and reverse switch position. Memory channel "0" stores transmit and receive frequencies independently for odd split operation. Two-way battery saver circuit, frequency lock function and audible beep to confirm keypad operation.

Specifications: 225A transmits 144–148 MHz receives 141–163 MHz including NOAA weather channels, 315A transmits 220–225 MHz, receives 215–230 MHz, 415A transmits/receives 440–450 MHz. Sensitivity: 12dB SINAD less than 0.2μV on 225A and 315A, less than 0.25μV on 415A model. Selectivity more than 12 kHz –6dB and less than 24 kHz –40dB. Audio output more than 350mW. Antenna impedance 50 Ohms. Dimensions (HWD) approx. 7″ × 2½″ × 1½″. Weight 225A approx. 1¼ lbs, 315A approx. 1¼ lbs and 415A approx. 1¼ lbs.

TH-225A **$400**
TH-315A **$420**
TH-415A **$420**

TH-27A/TH-47A

Handheld amateur transceiver 27A–144 MHz, 47A–440 MHz, with the following standard features: Power output 5W, Dual Tone Squelch System (DTSS) allows DTMF access to transceiver. Only opens when proper 3-digit tone sequence is received, pager function, multi-function scanning: Scan modes include band scan, dual programmable band scan, MHz scan, memory scan plus programmable memory channel lockout, V/M scan, C/V scan, C/M scan. Scan stop modes include carrier operated scan, time operated scan and seek operated scan. Power output is selectable in four ranges: high/mid/low and economy. Also includes DC direct-in with recharge function allows both operation and recharging from 6.3–16 VDC external power sources. Total of 40 multi-function memory channels plus a call channel allows odd splits in all channels, DTMF memory function for auto-dial operation, lamp lock key, frequency step selection of 5, 10, 12.5, 15, 20 or 25 kHz steps, large LCD display, rotary encoder allows frequency changes and allows control of frequency steps, memory channels, scan direction and tone frequency (with optional TSU-7). Features also include direct keyboard frequency selection, tone alert system with receive time indicator, auto repeater offset (on 27A), auto power off function, auto battery saver circuit and repeater offset switch and reverse switch ±600 kHz (27A) and ±5 MHz (47A) or simplex may be selected. Monitor switch, F. lock switch, programmable VFO and built-in timer are standard.

Specifications: 27A transmits 144–148 MHz receives 118–165 MHz, 47A transmits/receives 438–450 MHz. Sensitivity for both is 12dB SINAD less than 0.18μV. Selectivity: both models more than 12 kHz –6dB and less than 28 kHz –40dB. Ant impedance 50 Ohms. Audio output more than 200mW. Dimensions (HWD) both models approx. 5″ × 2″ × 1½″. Weight approx. ½ lb.

TH-27A **$420**
TH-47A **$430**

TH-77A

VHF and UHF handheld amateur transceiver with the following standard features: Power output 5W at 13.8 VDC with high/low power switch, dual receive function with dual displays, built-in DTSS allows user DTMF access to transceiver, pager function, DTMF memory for auto-dial operation, built-in two VFOs for main and sub bands. Frequency step selection VHF is 5, 10, 12.5, 15, 20 and 25 kHz, and UHF 10, 12.5, 20, and 25 kHz. Programmable VFO allows operator to select and program variable tuning ranges in 1 MHz band increments. dual indicator LCD display, selectable full duplex-cross band operation, dual squelch controls, tone alert system with elapsing time indicator, independent AF control for main and sub band, auto band change function, selectable band mode, selectable dual and single band operations, auto repeater offset on 2 meters, repeater offset switch and reverse switch, memory recall of 42 multi-function memory channels for main and sub band with lithium battery back-up, multi-mode scanning: Scan mode has band scan, programmable band scan, memory scan plus programmable memory channel lockout, MHz scan, V/M scan, C/V scan, C/M scan and V/M/C scan. Scan stop modes include carrier operated scan and time operated scan. Also includes standard switchable speaker mode function, switchable monitor mode function, auto-battery saver circuit, auto-power off function, lamp lock key and various lock functions.

Specifications: Transmits 144–148 and 438–450 MHz. Receives 136–165 MHz. Sensitivity: 12dB SINAD less than 0.18μV, Selectivity: more than 12 kHz –6dB, less than 28 kHz –40dB. Audio output more than 200mW. Dimensions (HWD) approx 5½″ × 2¼″ × 1″. Weight approx. 1 lb.

TH-77A **$600**

Amateur Radio Transceivers (cont.)

TM-741A

VHF/UHF mobile amateur transceiver with the following standard features: Power output 50W on 144 MHz and 35W on 440 MHz. Also includes 3-position power switch allows to a reduction of 10W and 5W low. Includes independent receive function with display for each band, full features and functions: independent band switch for each band, independent AF gain controls for each band, 101 memory channels for each band, plus one call channel. 100 memories are

divided into 5 groups of 20 channels each. Consecutive banks may be joined for ease of operation. Multi-function scan: scan modes include band scan for each band, programmable band scan, memory channel scan, memory bank scan plus programmable memory channel lockout, MHz scan, C/V/M scan, C/V scan, C/M scan, auto memory scan. Scan stop modes include: time operated scan and carrier operated scan. Tone alert system with receiving time indicator, optional DTMF unit, optional CTCSS unit, independent functions for each band including auto repeater offset, MHz function (a 1 MHz step function provided for maximum convenience), repeater reverse switch and offset switch, selection of frequency step, programmable VFO, memory shift function, built-in clock with lithium battery backup, illuminated keys, auto band change function, muting function, beeper tone confirms transmitter band when PTT is pressed, beeper for operating band, auto power off function, time-out-timer, multi-function mic supplied, lock functions, keyboard frequency selection, dimmer switch, automatic lock tuning function (1200 MHz) to compensate for frequency drift, three individual antenna and speaker ports on rear of unit, adjustable beeper tone and repeater operations (modification required). Includes DC cable with fuse, manual, mounting bracket and multi-function DTMF hand mic.

Radio Shack

HTX-202

Handheld VHF (2-meter) amateur

transceiver with the following standard features: Power output 5W minimum at 12 VDC (high), NiCd battery pack/charger, multi-function scanning system, 16 memory channels and one calling and 3 priority channels, individually programmable repeater offsets, subaudible tone encoder and tone squelch built-in, touch-tone (DTMF) memory dialer and DTMF squelch built-in, memory dialer stores up to five 15-number sequences for selective calling or autopatch, programmable power saver, keypad lock, and priority scan. Includes NiCd battery pack/charger and alkaline battery case (batteries not included).

Specifications: RF Output at 7.2 VDC (High) 2W minimum, 9VDC (High) 3W minimum, 12 VDC (High) 5W minimum. Low power 1W minimum.

Sensitivity: 12dB SINAD 0.25μV max. and 20dB NQ: 0.4μV max. Condenser mic. Frequency steps 5, 10, 20, 50 and 100 kHz. Dimensions (HWD) approx. 4¾" × 2½" × 1½" **$260**

Yaesu U.S.A.

FT-290RII

VHF/UHF portable amateur transceiver with the following standard features: Power output at 13.8 VDC, 2.5W. (25W with optional linear amplifier FL-2025) Features include three selectable FM channelized tuning/scanning step sizes, plus 1 MHz steps, analog S/PO meter, and a full set of functions for operation through repeaters such as push button reverse split. Selectable SSB and CW tuning/scanning steps of 25/100/2500 Hz are provided along with 100 kHz steps. Semi break-in CW keying and sidetone, and all-mode noise blanker and receiver clarifier control. Features only three control knobs and ten keys, includes 10 memories holding mode, simplex or split

(repeater) frequencies and CTCSS tone squelch status (when the FTS-7 is installed), two independent VFOs, priority monitoring and full or limited band scanning, one touch reverse split, and all-mode squelch.

Specifications: Transmits in 2-meter band. Requires 8-15.8 VDC. Sensitivity: SSB/CW 0.2dB for 10dB SN and FM 0.25μV for 12dB SINAD. Selectivity (−6/−60dB) SSB and CW 2.4/5.2 kHz, FM 12/25 kHz. Audio output 1W (into 8 Ohms). Dynamic mic, 400 Ohms. Dimensions (HWD) approx. 2¼" × 6" × 7¾". Weight approx. 2¾ lbs.

FT-290RII **$610**
FT-690RII (6-meter transceiver) . . . **$752**
FT-790RII (UHF-70cm transceiver) . . **$681**

FT-2400H

VHF amateur transceiver with the following standard features: Power output 50W. Includes double-sided glass circuit boards and chip-mounted components extensively, backlit LCD display, knobs and major buttons automatically controlled by a photosensor, and front-panel buttons have a flip-down protective cover. Includes 31 tunable memories, each programmable with 4-character channel names (which can be displayed in placed of frequency and toggled, as desired) Each memory offers complete programmability and scanning functions, including independent transmit/receive frequencies, independent repeater shift, offset and CTCSS tone, programmable scan limits, selectable scan resume modes and memory skip, priority monitoring and a 1-touch instant-recall call channel. Channel steps user selectable from 5 to 50 kHz, and auto repeater shift sets standard repeater shifts when user tunes to a repeater subband. A 38-tone programmable CTCSS encoder built-in as standard (FTS-17A CTCSS decoder unit can be installed to provide tone squelched private channels and a CTCSS paging bell feature to sound a paging alert tone when the tone squelch opens) DTMF based selective calling and private paging capabilities is added with optional FRC-6 DTMF Paging Unit, controlled from front panel.

Specifications: Transmit 140-150 MHz, receive 140-174 MHz. Sensitivity: better than 0.2μV for 12dB SINAD. Selectivity: (−6/−60dB) 12/30 kHz. Audio output 2W into 8 Ohms. Power output (high/med/low, 50, 25 and 5W at 13.8 VDC. Dimensions: (HWD) approx. 2" × 6½" × 7". Weight 3⅓ lbs **$419**

FT-23R

Handheld VHF amateur transceiver with the following standard features: Power output 2.5-5W depending upon battery installed. Includes housing of zinc and aluminum die-cast alloys, rubber gasket seals around all external controls and connectors, 10 memory channels that store repeater shifts (optional CTCSS tone controlled squelch system), busy channel and priority channel scanning, 1 MHz up/down stepping, top-panel rotary dial for memory and frequency selection. Seven of the memories can also be programmed for non-standard repeater shifts. LCD shows six frequency digits, memory channel selection and CTCSS tone frequency during tone selection and includes a bargraph S/PO meter. DTMF keypad is an available option along with battery chargers, cases and accessories for mobile operation.

Specifications: Transmits 2-meter band. Sensitivity: better than 0.25μV for 12dB SINAD. Selectivity: better than 60dB. Audio output 0.4W into 8 Ohms. Dimensions (HWD) approx. 5" × 2" × 1¼". Weight approx ¾ lb.

FT-23R/17 (2.5W) **$306**
FT-23R/12 (5W) **$325**
FT-33R (220 MHz transceiver) **$328**
FT-73R (440 MHz transceiver) **$315**

Base/Mobile CB Radios

In this section, listed alphabetically, are Citizens Band radios. Where available, retail/suggested list prices are given. They vary considerably from "street" prices so shop around for the best deal. Today's CB radios are all 40-channel transceivers except some walkie talkies. Remember that most CB radios come with a microphone and internal speaker, but most don't include an antenna or coaxial cable. Be sure to check our "accessories" listing for antennas and other accessories.

Cobra

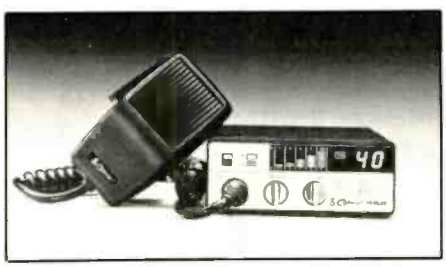
10 Plus-AT

CB radio with microphone, magnetic mount antenna and coaxial cable. Features include electronic up/down tuning, detachable front-panel microphone,

transmit/receiver indicators, volume/squelch control, pre-set noise limiter, and jack for external speaker. Power requirement 13.8 VDC. Dimensions (HWD) ¼" × 4¾" × 6¼". Weight 1¾ lbs **$90**

19 Plus

CB radio with detachable front-panel microphone. Features include electronic up/down tuning, instant channel 9 con-



trol, transmit indicator, S/RF LED bar-graph meter, volume/squelch control, pre-set noise limiter, PA function and jack for external speaker. Power requirement 13.8 VDC. Dimensions (HWD) 1¾" × 4⁹⁄₁₆" × 6⅝". Weight 2 lbs **$80**

20 Plus

CB radio with same basic features as 19 Plus model (see photo). Power requirement 13.8 VDC. Dimensions (HWD) 1¼" × 4½" × 7⅛". Weight 1½ lbs **$90**

23 Plus

CB radio with same basic features as 19 Plus model, except includes weather band receiver built-in, electronic rotary tuning. Power requirement 13.8 VDC. Dimensions (HWD) 2⅞" × 6" × 6⅞". Weight 4 lbs **$110**

18 RV

CB radio features front speaker, detachable microphone, instant channel 9 control, weather band receiver built-in,

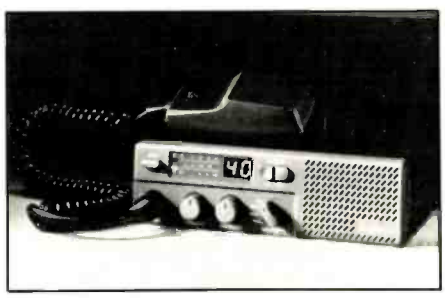
transmit/receive indicators, S/RF LED bar-graph meter, volume/squelch control, pre-set noise limiter and external speaker jack. Power requirement 13.8 VDC. Dimensions (HWD) 2" × 7¼" × 6⅞". Weight 3 lbs **$110**

41 Plus

CB radio features detachable front-panel microphone, instant channel 9 control, weather band receiver built-in, electronic rotary tuning, transmit/receive indicators, S/RF LED bar-graph meter, RF gain switch, mic gain control, volume/squelch control, switchable auto noise limiter and external speaker jack. Power requirement 13.8 VDC. Dimensions (HWD) 2" × 6⅞" × 7". Weight 4 lbs.
41 Plus **$140**

19 LTD Classic

CB radio features detachable front-panel microphone, rotary tuning, LED channel indicator, S/RF meter, non-switchable noise limiter, volume/squelch



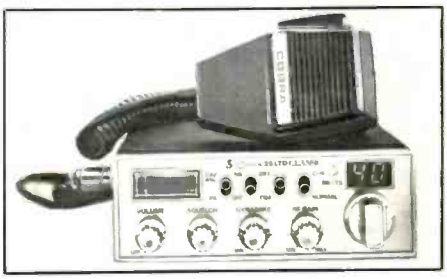
controls and external speaker jack. Power requirement 13.8 VDC. Dimensions (HWD) 1¾" × 5⅜" × 7". Weight 2⅓ lbs.
19 LTD Classic **$80**

21 LTD Classic

CB radio features include same basic features of 19 LTD Classic, except includes RF gain switch, mic gain control, transmit indicator and switchable auto noise limiter. Power requirement 13.8 VDC. Dimensions (HWD) 1¾" × 5⅜" × 7". Weight 2⅓ lbs **$100**

25 LTD Classic

CB radio features include microphone, RF gain control, mic gain control, rotary tuning, LED channel indicator, transmit/receive indicator, S/RF meter, non-switchable noise limiter, bright/dim switch, noise blanker, instant channel 9, PA function, volume/squelch controls, external speaker jack and PA speaker



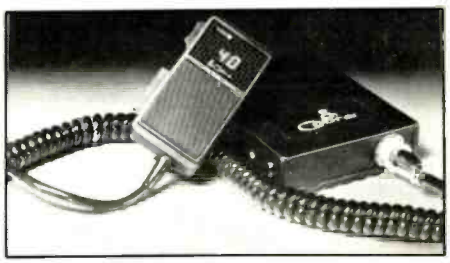
jack. Power requirement 13.8 VDC. Dimensions (HWD) 2⅛" × 6¼" × 8⅝". Weight 3⅝ lbs **$160**

29 LTD Classic

CB radio features include same basic features of the 25 LTD Classic, except with SWR calibrate control, S/RF-SWR-MOD meter, switchable noise limiter, antenna warning indicator. Power requirement 13.8 VDC. Dimensions (HWD) 2¼" × 7¼" × 8⅝". Weight 4⅜ lbs **$200**

70 LTD Remote

CB radio features two-piece remote CB with controls on microphone, elec-



tronic up/down tuning, custom microphone cradle, speaker in microphone. Also includes instant channel 9 access, transmit/receive indicator, non-switch-

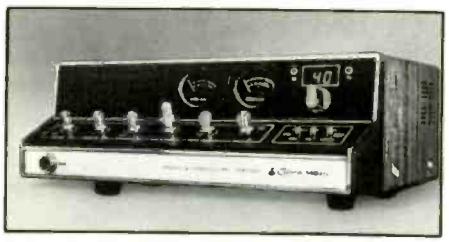
able noise limiter, RF gain switch, volume/squelch controls and external speaker jack. Power requirement 13.8 VDC. Dimensions 1 5/16" × 4¾" × 6½". Weight 3 lbs. **$180**

90 LTD

CB radio features rotary tuning, LED channel display, transmit indicator, instant channel 9 access, S/RF meter, slide volume and squelch controls, RF gain control, switchable noise limiter, noise blanker, dynamic microphone, PA function, external speaker and PA jacks. Power requirement 120 VAC. Dimensions 3¾" × 9¼" × 9¼". Weight 9 lbs. **$180**

142 GTL

CB radio features AM/SSB operation, mike gain control, SWR calibrate control,



S/RF-SWR-MOD meter, rotary tuning, LED channel display, RF gain control, clarifier control for SSB, detachable front panel microphone, S/RF meter, switchable noise limiter, transmit/receive indicators, PA function, PA and external speaker jacks. Power requirement 120 VAC or 13.8 VDC. Dimensions (HWD) 5" × 13½" × 13". Weight 15 lbs. **$390**

2000 GTL

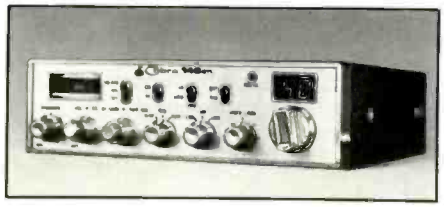
CB radio features include same as 142 GTL except also includes six-digit frequency counter, clock with alarm, backlit mode indicators, separate speaker component, headphone jack and aux recording jack. Power requirement 120 VAC. Dimensions (HWD) 5¾" × 15" × 13⅜". Weight 23 lbs. **$750**

146 GTL

CB radio features include AM/SSB, rotary tuning, LED channel display, dynamic microphone, clarifier control, RF gain control S/RF meter, switchable noise limiter, noise blanker, transmit/receive indicator, PA function, PA speaker and external speaker jacks. Power requirement 13.8 VDC. Dimensions (HWD) 2¼" × 7¼" × 9 1/16". Weight 4½ lbs. 146 GTL. **$270**

148 GTL

CB radio features include AM/SSB including same basic features as 146 GTL, except with mike gain control, SWR cali-



brate control, S/RF-SWR-MOD meter, tone control, meter function switch and bright/dim switch. Power requirement 13.8 VDC. Dimensions (HWD) 2⅜" × 7⅞" × 9¼". Weight 5 lbs. **$330**

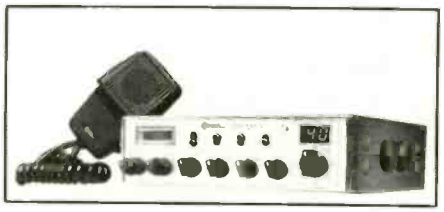
39 Plus S.O.S.

CB radio features include self-contained, handheld type radio for emergency portable use. Features electronic up/down tuning, LED channel display, volume/squelch control, instant channel 9, press-to-talk bar, built-in microphone/speaker, magnetic telescopic antenna, cigarette lighter power cord and carry pouch. Power requirement 13.8 VDC cigarette lighter receptacle. **$90**

Fanon-Courier

Galaxy V

CB radio features include AM/SSB including mic gain control, volume/squelch, SRF/SWR calibration meter, clarifier control for SSB, digital LED channel indicator, transmit/receive indicator, chan-



nel 9 priority switch, high/low tone switch, switchable noise blanker, and jacks for external speaker, and PA speaker. Power requirement 13.8 VDC. Dimensions (HWD) 2⅜" × 9¼" × 7⅞". **$200**

Galaxy VI

CB radio features AM/SSB and basically same features as Galaxy V, except includes five digit LED frequency counter. Dimensions and weight same as Galaxy V. Galaxy VI. **$300**

Midland

76-300

CB radio features LED channel indicator, mic gain control, RF gain control, volume/squelch control, switchable noise limiter, switchable noise blanker, instant channel 9 access, illuminated S/RF meter, separate transmit and channel 9 LED

monitoring lights, front panel microphone, and external speaker and PA speaker jacks. Power requirement 117 VAC Dimensions (HWD) 3¾" × 8 1/16" × 9". Weight approx. 8 lbs. **$200**

77-094

CB radio features LED channel indicator, front panel microphone, volume/squelch control, full-time noise limiter, separate LED systems for transmit and receive, quick-disconnect mounting bracket and external speaker jack. Power requirement 13.8 VDC Dimensions (HWD) approx. 1¼" × 4¼" × 6¼". Weight approx. 2 lbs. **$100**

77-099

CB radio features LED channel indicator, full-time noise limiter, front-panel microphone, volume/squelch control, quick-

disconnect mounting bracket and external speaker jack. Power requirement 13.8 VDC. Dimensions (HWD) 1½" × 4¼" × 6¼". Weight approx. 2 lbs. **$100**

77-104

CB radio features LED channel indicator, automatic noise limiter, volume/squelch control, and external speaker jack. Power requirement 13.8 VDC. Dimensions (HWD) 1¼" × 4½" × 6 1/16". Weight approx. 3 lbs. **$100**

77-106

CB radio features LED channel indicator, up/down channel selection buttons on front-panel microphone, volume/squelch control, instant channel 9 button, multicolored S/RF meter, automatic noise limiter, external speaker and PA speaker jacks, and quick disconnect power cord and mounting bracket. Power require-

ment 13.8 VDC. Dimensions (HWD) 1¼" × 4½" × 6¹⁵⁄₁₆". Weight approx. 2 lbs.
77-106 ..... $130

77-116

CB radio features LED channel indicator, volume/squelch controls, instant channel 9 switch, receives NOAA weather broadcasts, noise limiter switch, S/RF meter and quick disconnect bracket and DC cord. Power requirement 13.8 VDC. Dimensions (HWD) 1¼" × 5½" × 6". Weight approx. 3 lbs $150

77-118

CB radio features LED channel indicator, switchable noise limiter, instant channel 9 switch, volume/squelch controls, receives NOAA weather broad-

casts, noise limiter switch, front mounted speaker, memory-hold circuit (retains last channel used when unit is turned off), channel access via front panel or microphone switches and quick-disconnect bracket and DC cord. Power requirement 12 VDC. Dimensions (HWD) 2" × 6¾" × 6". Weight approx. 4 lbs $165

77-160

CB radio features LED channel indicator, volume/squelch controls, RF gain control, bright/dim switch, multi-colored metering system, rubberized overlay on control knobs, instant channel 19 access, external speaker and PA jacks, and quick release bracket and DC cord. Power requirement 13.8 VDC. Dimensions (HWD) 1⅞" × 5⅜" × 6⅞". Weight approx. 4 lbs $180

77-202B

CB radio features LED channel indica-

tor, volume/squelch controls, built-in SWR bridge, front-mounted microphone, high/low tone switch, illuminated analog S/RF/SWR meter, switchable noise limiter, instant channel 9 access, mic gain control, local/DX system (eliminates distortion of nearby signals), external speaker and PA jacks, and quick disconnect mounting bracket and DC cord. Power requirement 13.8 VDC. Dimensions (HWD) 2¹⁄₁₆" × 6⅜" × 7¹⁄₁₆". Weight approx. 5 lbs.
77-202B $200

77-225A

CB radio features LED channel indicator, all microphone-mounted controls (to allow user to mount radio portion under seat, in trunk, etc.) on/off/volume, squelch, up/down channel selector, local/distant switch, channel 9 switch. Also includes two-speed channel scan, memory retention circuit, automatic noise limiter, and

jacks for external speaker and PA. Includes mounting bracket and quick disconnect power cord. Power requirement 13.8 VDC. Dimensions (HWD) 1¼" × 4¾" × 6½". Weight approx. 3½ lbs $250

77-250

CB radio features LED channel indicator, front mounted microphone with long cord, volume/squelch controls, mic gain switch, bright/dim switch, RF gain control, SWR calibration control, multi-colored S/RD/modulation/SWR bar meter, switchable noise blanker, switchable noise filter, instant channel 9 and 19 access, slide-in/out mounting system, rubberized shock mounts, and quick disconnect power cord. Power requirement 13.8 VDC. Dimensions (HWD) 2¼" × 7¼" × 7¼". Weight approx. 5 lbs.
77-250 ..... $200

77-909

CB radio features LED channel indicator, magnetic mount antenna, instant channel 9 access, volume/squelch controls, built-in condenser microphone, carrying case, telescopic antenna, separate up/down channel selection buttons (with two speeds) and cigarette lighter plug. Power requirement 12 VDC. Dimensions (HWD) 7" × 2¼" × 1⅜". Weight approx. 2 lbs $150

77-912

CB radio features basically same as model 77-909, except includes snap-on battery pack, LED bar graph metering system, LED off switch to conserve bat-

tery power, high-low power switch, battery-low indicator, carrying case, flexible rubber duck antenna with magnetic mount. Power requirement 12 VDC or 8 AA batteries for battery pack. Dimensions (HWD) 6½" × 2¼" × 1½". Weight approx. 4 lbs $190

77-913

CB radio features basically same as model 77-912, except includes built-in noise filter and receives NOAA weather broadcasts. Power requirement 12 VDC or 8 AA batteries for battery pack. Dimensions (HWD) (without battery pack) 6⅝" × 2¾" × 1⅝", and 9⁵⁄₁₆" × 2¾" × 1⅝" (with battery pack). Weight approx. 4 lbs.
77-913 ..... $220

Radio Shack

TRC-409

CB radio features LED channel indica-

tor, channel up/down buttons, instant access to channel 9, built-in microphone, telescopic magnetic mount antenna, cigarette lighter plug, and volume control. Power requirement 12 VDC. Dimensions (HWD) 10½" × 4⅝" × 2¼" **$70**

TRC-415

CB radio features LED channel indicator, built-in noise limiter, front panel microphone, RF output/signal strength LED meter, external speaker jack, volume and squelch controls, and mounting bracket. Power requirement 12 VDC. Dimensions (HWD) 2" × 4⁹⁄₁₆" × 6½" **$70**

TRC-430

CB radio features LED channel indicator, side mount microphone with channel switches, volume/squelch controls, also panel-mounted channel up/down buttons, noise limiter, instant channel 9 access, jacks for external speaker and PA and mounting bracket. Power requirement 12 VDC. Dimensions (HWD) 1⅜" × 4⅝" × 7¼" **$80**

TRC-435

CB radio features basically same as TRC-430, except includes RF gain and tone control. Dimensions (HWD) 1⅝" × 5½" × 6⅝". Weight approx. 2 lbs. . . **$130**

TRC-465

CB radio features AM/SSB, LED channel indicator, with switchable noise limiter/noise blanker, RF gain control, volume/squelch controls, side-mounted microphone, 5-step LED power/signal meter, jacks for external speaker and PA, and mounting bracket. Power requirement 12 VDC. Dimensions (HWD) 2" × 6¼" × 8⅛". Weight approx. 2½ lbs.
TRC-465 . . . . . **$200**

TRC-477

CB radio features LED channel indicator, front-mounted microphone, volume/squelch controls, built-in noise limiter, transmit/receive indicators, channel up/down controls, remote speaker jack, and mounting bracket. Power requirement 12 VDC. Dimensions (HWD) ⅛" × 4½" × 6½".
TRC-477 . . . . . **$60**

TRC-479

CB radio features LED channel indicator, front-mounted microphone, volume/squelch controls, transmit/receive indicators and external speaker jack. Power requirement 12 VDC. Dimensions (HWD) 1⅛" × 4½" × 6½". Weight approx. 1½ lbs.
TRC-479 . . . . . **$50**

TRC-492

CB radio features LED channel indicator, front-mounted microphone, volume/squelch controls, signal strength meter shows relative RF output and strength of received signal, modulation indicator, RF gain control, memory back-up stores last channel used for about 48 hours after power disconnect, external speaker and headphone jacks. Power requirement 120 VAC or 12 VDC. Dimensions (HWD) 2¹⁵⁄₁₆" × 11⅛" × 8¼". Weight 5 lbs **$150**

Thomson Consumer Electronics (GE Brand)

3-5809

CB radio features LED channel indicator, front-mounted microphone, volume/squelch controls, built-in noise limiter, receive/transmit LED and quick-disconnect mounting bracket. Power requirement 12 VDC. Dimensions (HWD) 1⅓" × 4½" × 6¼" **$55**

3-5909S

CB radio features telescoping magnetic mount antenna, travel case, cigarette lighter plug, instant channel 9 access, and LED channel indicator. Power requirement 12 VDC. Dimensions (HWD) 6⅞" × 2¼" × 1⅝". Weight 3 lbs.
3-5909S **$70**

Uniden

PC 66

CB radio features side-mounted microphone, LED channel indicator, lighted analog S/RF meter, volume/squelch controls, RF gain control, transmit/receive indicator, instant channel 9 access, switchable noise blanker, auto noise limiter, mike gain control, dimmer control, jacks for remote speaker and PA, and mounting bracket. Power requirement 13.8 VDC. Dimensions (HWD) 2¼" × 6½" × 8⅔". Weight approx. 2½ lbs **$160**

PC 122

CB radio features front-mounted microphone, AM/SSB, LED channel indicator, volume/squelch controls, RF gain and clarifier controls, switchable noise limiter, transmit indicator, S/RF indicator, jacks for external speaker and PA, and mounting bracket. Power requirement 13.8 VDC. Dimensions (HWD) 2" × 6" × 7⁹⁄₁₆". Weight approx. 2½ lbs **$230**

PRO 310e

CB radio features LED channel indicator, built-in microphone, magnetic mount antenna, carry case, transmit indicator, battery low LED, volume/squelch controls, high/low power switch and snap-on battery pack. Power requirement 12 VDC or 8 "AA" batteries (not included). Dimensions (HWD) 5½" × 2⅝" × 1½". Weight approx. 2½ lbs **$150**

Base/Mobile CB Radios (cont.)

PRO 330e

CB radio features LED channel indicator, built-in microphone, transmit indicator, instant channel 9 access, noise limiter switch, volume/squelch controls, antenna built-in to mic power cord, power connection built-in to mic hanger for direct connection to battery of vehicle. Dimensions (HWD) 5½" × 2⅝" × 1½". Weight 1⅜ lbs **$180**

510AXL

CB radio features LED channel indicator, volume/squelch controls, front-mounted microphone, 4-segment bar LED meter, transmit indicator, automatic noise limiter, mounting bracket, magnetic mount antenna, and cigarette lighter plug. Power requirement 13.8 VDC. Dimensions (HWD) 1⅜" × 4½" × 6¾". Weight approx. 1½ lbs **$100**

510XL

CB radio features basically same as 510AXL, except does not include antenna or cigarette lighter plug. Power requirement 13.8 VDC. Dimensions and weight same as 510AXL **$80**

520XL

CB radio features LED channel indicator, front-mounted microphone, volume/squelch and RF gain controls, transmit indicator, LED S/RF meter, switchable noise limiter, instant channel 9 access,

jacks for external speaker and PA, mounting bracket. Power requirement 13.8 VDC. Dimensions same as 510XL. Weight approx.1½ lbs **$100**

535e

CB radio features LED channel indicator, front-mounted microphone, volume/squelch and RF gain controls, switchable noise limiter/blanker, instant channel 9 and 19 access, front-mounted speaker, 15-segment LED meter shows signal strength at transmit and receive, jacks for external speaker and PA, mounting bracket. Power requirement 13.8 VDC.

Dimensions (HWD) 2" × 6¼" × 8¼". Weight approx. 3 lbs **$140**

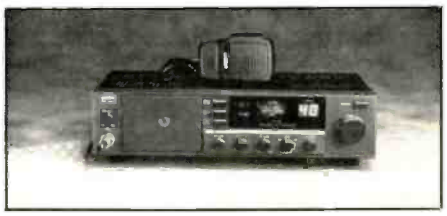
538w

CB radio features basically same as model 535e, except without channel 19 access. Includes access to NOAA weather broadcasts. Dimensions are the same as 535e. Weight approx. 3 lbs **$150**

PRO 710e

CB radio features LED channel indicator, lighted analog S/RF meter, switchable noise blanker/limiters, volume/squelch/RF gain and tone controls, front-mounted microphone and mic gain, and

front-mounted speaker, and instant channel 9 access, transmit/receive indicators. Power requirement 120 VAC. Dimensions (HWD) 3¾" × 13⅜" × 7⅞". Weight approx. 8 lbs **$220**



PRO 810e

CB radio features AM/SSB and same basic features as model PRO 710e, including clarifier for SSB modes. Power requirement 120 VAC. Dimensions same, Weight approx. 8½ lbs **$340**

Handheld CB Radios/Walkie-Talkies

The following section features handheld CB radios/walkie talkies. As with other communications products listed in this book, remember that the prices are suggested retail/list and that "street" prices are considerably lower. Shop around for the best deals.

Cobra

HH-40

Handheld CB radio features 40 channels, instant channel 9 access, full LCD status display, snap-on rechargeable battery system (requires 10 rechargeable AA NiCds or 8 AA alkaline batteries-not included), AC charger, belt clip, battery

contact cover, cigarette lighter plug with 5′ cord for vehicle operation, built-in mike, high/low power switch (high provides 4 watts), push button up/down channel select, charge indicator, light button, and detachable rubber duck antenna with BNC connector. Power requirements 10 rechargeable AA or 8 alkaline AA batteries (not included) or 12 VDC. Dimensions (HWD) (with battery case attached) 7⅝″ × 2½″ × 1 1/16″. Weight 1 lb **$170**

Fanon-Courier

CWT-40

Handheld CB radio features 40 channels, automatic channel 9 switch, LED channel display/battery saver on/off switch, selectable RF power of 4W or .4W, LED meter indicates signal strength,

transmit/receive power and percent modulation, transmit/battery low indicator, adjustable squelch, auto noise limiter circuit, carry case, jacks for earphone, external antenna, and 12 V power supply, cigarette lighter adapter included. Power requirements 10 AA rechargeable NiCds or 8 AA alkaline batteries (not included). Dimensions (HWD) 9″ × 3″ × 2″. Weight 2 lbs **$125**

Midland

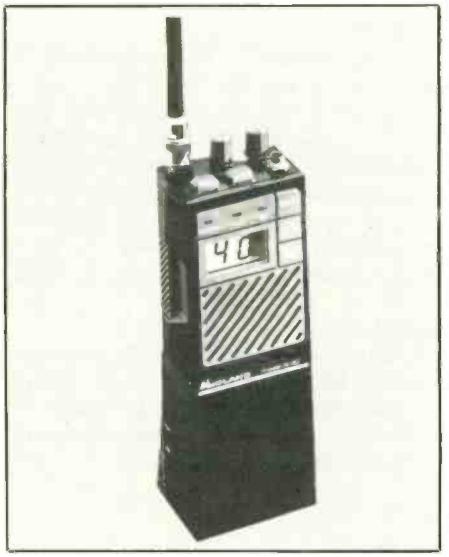
75-777

Handheld CB radio features 40 channels, LED channel indicator, detachable rubber duck antenna and battery pack, up/down buttons for channel selection, volume/squelch controls, high/low power

switch (high is 4 watts RF output), bar-type LED meter for signal strength and power output, instant channel 9 access and battery-low indicator. Power requirements 10 AA rechargeable NiCds or 8 AA alkaline batteries, or 12 VDC (batteries and car cord are optional). Dimensions (HWD) (less battery pack) 6½″ × 2⅝″ × 1½″. Weight 2 lbs **$150**

75-781

Handheld CB radio features include rechargeable NiCd battery (and wall charger), carry case and auto power cable, transmit indicator light, dial light on/off switch. Features similar to 75-777, but less instant channel 9 access, and S/RF meter. Scan Circuit searches for busy-in-use channels. Jacks include optional earphone, remote PTT mic, speaker/mic



combination, boom-style mic/earphone headset or earphone-mic/earphone. Power requirements rechargeable battery (included) or 12 VDC. Dimensions (HWD) 6½″ × 2½″ × 1¾″. Weight 4 lbs. 75-781 . . . . . **$170**

Radio Shack

TRC-87

Handheld CB radio with 100mW output power. Includes channel 14 crystal. One channel operation. Requires one 9V battery **$20**

TRC-89

Handheld CB radio with 300mW power. Three channel operation (includes crystals for channel 14 operation) Features include battery test button, telescoping antenna. Separate speaker and microphone. Requires 6 AA batteries (not included). Dimensions (HWD) 7½″ × 2 13/16″ × 2″. Weight ¾ lb **$30**

TRC-207

Handheld CB radio with 40 channels and high/low power switch. High is maximum legal power. Includes removable flexible antenna, battery low indicator, channel up/down buttons, volume/squelch control, LED channel display, transmit indicator, and jacks for external antenna,

Handheld CB Radios/Walkie-Talkies (cont.)

charger or DC power. Requires optional 8 AA or 10 rechargeable AA batteries or DC adapter. Dimensions (HWD) 7 9/16" × 2 13/16" × 2 1/8". Weight approx. 1 lb . . . **$100**

TRC-218

Handheld CB radio with 2W power and three channel operation. Comes with channel 14 crystals. Includes battery test with LED indicator, battery charging jack, external power and antenna jacks. Built-in noise limiter. Includes telescoping antenna, volume/squelch control. Requires optional 8 AA or 10 rechargeable AA batteries. Dimensions (HWD) 10 1/4" × 3 1/8" × 2 1/2" **$50**

TRC-219

Handheld CB radio with 3W power and three channel operation. Includes crystals for channel 14 operation, telescoping antenna with center loading coil, battery test with LED indicator, adjustable squelch/volume control, LED modulation indicator, external power jack, battery charging jack, and built-in noise limiter. High/low power switch. (High is 3W). Requires 8 AA or 10 rechargeable AA batteries. Dimensions (HWD) 10 1/4" × 3 1/8" × 2 1/2" **$60**

TRC-221

Handheld CB radio with maximum legal power output and 40 channels. Features include automatic modulation and gain control, automatic noise limiter, high/low power, LCD display shows channel number, battery condition, RF power and received signal strength, center-loaded telescopic antenna and jacks for external mic, speaker, power, antenna, earphone and charging. Volume/squelch controls and light button. Requires 8 AA batteries or 10 AA rechargeable batteries or DC adapter. Dimensions (HWD) 7 9/16" × 2 13/16" × 2 1/8" **$140**

TRC-475

Handheld CB radio with maximum legal power on 40 channels. Includes NOAA weather broadcast channels, telescoping antenna (for use in magnetic mount base or on top of CB), channel 9 priority, battery test button, DC power cord for auto, LCD display and volume control. Requires 8 AA batteries or 12 VDC operation with supplied cigarette lighter adapter. Dimensions (HWD) 11" × 6 1/2" × 2 1/2" **$100**

Thomson Consumer Electronics (GE Brand)

3-5979

Handheld CB with maximum legal

power on 40 channels. Features include volume/squelch controls, LCD channel display, 3-position power saver switch, telescoping antenna, LED battery check and jacks for 12 VDC power and earphone. Power requirement 13.8 VDC or 8 AA batteries. Dimensions (HWD) 12 1/2" × 3 1/2" × 3". Weight 1 3/4 lbs **$55**

3-5985

Handheld CB with maximum legal power on 40 channels. Receives NOAA weather broadcasts. LCD for channel

and strength meter, 3-position power saver switch, volume/squelch controls, telescoping antenna, belt clip and mounting bracket. Jacks for 12 VDC power and external antenna. Power requirement 8 AA batteries or 12 VDC power **$100**

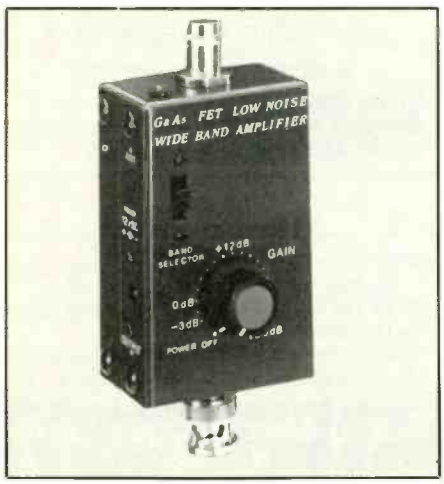
Miscellaneous Accessories

The following alphabetized section includes manufacturers of accessories from antennas to software packages. In many instances the products are available directly from the manufacturer. In other cases the products may be purchased from dealers. Be sure to check the listings of Manufacturers and Dealers in the back of our Guide for their addresses and phone numbers. Remember, prices given are suggested retail/list prices and can vary considerably from actual "street" prices. Of course, shipping charges are usually extra. Every attempt has been made to include a reasonable variety of products to enhance your listening/talking pleasure. Naturally all products, from all manufacturers could not be included.

ACE Communications

GW-2 Preamp

Preamp improves receiver sensitivity. Offers variable −3 to +25dB gain over 100 kHz to 1500 MHz range. GaAsFET design gives ensures noise figure better

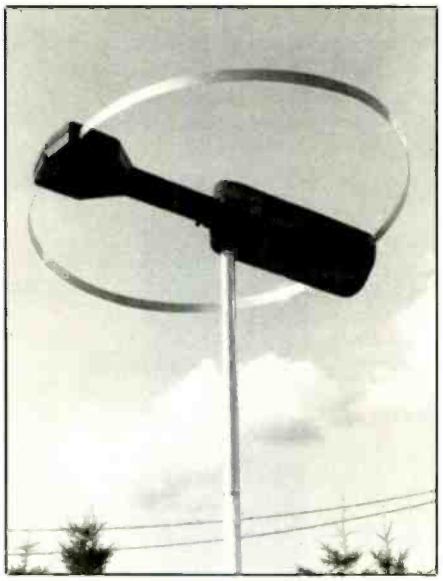


than 1.5dB. BNC connectors male and female connectors for mounting even on handheld. Comes with 9 VDC battery. Dimensions (HWD) 3″ × ⅛″ × 1⅛″. Weight 5 oz **$89**

AEA

IsoLoop 10-30 HF Antenna

43″ outside diameter loop. No ground radials or ground plane required. No mechanical joints. For apartments or houses with antenna restrictions, portable use, RVs, marine use. Tuned with included LC-2 loop controller (optional frequency indicator available). Requires no antenna tuner. 150W. 14 lbs **$349**



PK-232MBX

Multi-mode controller can receive seven different types of data signals including Morse code, Baudot, ASCII, TDM, WEFAX, NAVTEX and packet. Also features SIAM which automatically identifies many types of digital signals. Special-

ized support software available for PCs, Macs and Commodore 64 & 128; also runs with standard modem software.
PK-232MBX **$379**

AEA-FAX

Grey scale facsimile demodulator and display software. Up to 16 grey levels on a VGA system, false color separation on EGA, fewer grey levels on CGA and Hercules. Stand-alone hardware demodulator - plugs into com 1 or com 2. Has "daisy-chain" RS-232 input to share the com port with a Hayes-compatible device

(such as the PK-232). Slide-show mode to cycle through several maps on the screen. Save to disk and automatic (unattended) operation **$109**

Alden Electronics

Faxmate

Fax recorder can also be used as a computer printer. Mounts vertically or horizontally. Operates from 115 Vac or 12 Vdc with optional inverter. Uses plain or

thermal paper. Prints in 8″ wide format operating at 120 SPM. Index of cooperation IOC 576, 144 lines/inch. Copy resolution 960 dots per 8″ line. Dimensions (HWD) approx. 1⅜″ × 5″ × 4″. Weight 1 lb **$995**

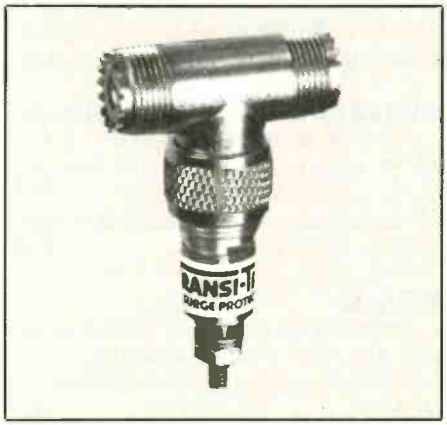
KitFax

Weather chart recorder with 120 SPM rate, Index of cooperation: IOC 576 CCIR, 169 lines/inch. Control signals include: automatic start, stop, frame; manual start and frame. Solid state circuitry. Recording paper: Alfax electrosensitive paper in throw-away cassettes with built-in printing electrode. Each cassette contains 35 feet of 11-inch wide paper. Power requirement is 115 VAC. Dimensions: (HWD) 3⅝″ × 17 1/16″ × 10½″. Weight approx. 10 lbs **$495**

Alpha Delta Communications, Inc.

Transi-Trap Surge Protectors

Gas surge arresters designed to protect sensitive electronic equipment from damage due to excess voltages or currents generated by lightning or static



build-up. Replaceable Arc-Plug cartridge. Model R-T, 200W thru 500 MHz (all UHF connectors); Model HV 2000W thru 500 Mhz; and Model LT, T-type 200W thru 30 MHz.

Model R-T **$33**
Model HV **$36**
Model LT **$23**
(replacement cartridges cost between $13 and $18 each)

Delta-4

Lightning surge protected 4-position RF coax switch, rated at 1500W RF. Four positions (two on either side of a "com-

mon" center connector. Requires separate ground wire and rod. Available for either SO-239 or type N connectors.

Delta-4 ..... **$75**
Delta-4N **$90**
(replacement cartridges for coax switches is $9)

CLP

CLP Control Line Protector, lightning surge protected provides protection against lightning-induced surge voltages (not for direct lightning strike protection) that occur on control lines to rotors, remote switch boxes, modems, phone units and other control line connected equipment. Each of the control lines used (up to 8) is individually protected **$50**
(replacement cartridge is $9)

CLP

DX-SWL Shortwave "Sloper" Antenna Multi-band antenna covering MW, 120, 90, 60, 49, 41, 31, 25, 21, 19, 16 and 13 meters. Quarter wave sloper antenna with standard SO-239 connector attached to down lead. Fully assembled, uses stainless steel hardware and UV protected coils and components and No. 12 wire. Insulators and support rope are included. Overall length approx. 60 feet. Another model the DX-SW-S is same except it covers 90 through 13 meters and is 40 feet long. This is accomplished by eliminating the last coil and MW element C.

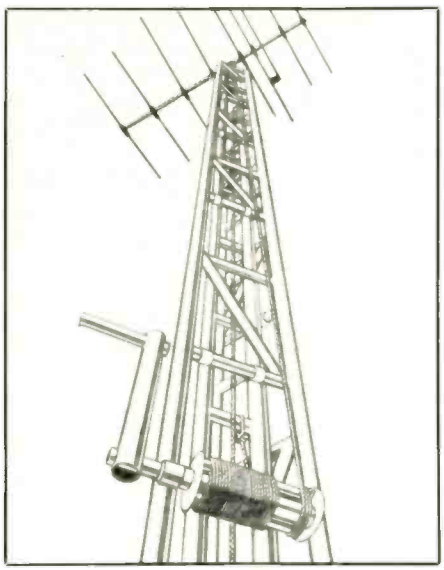
DX-SWL Sloper **$70**
DX-SW-S **$60**

DX-EE

Forty foot long SWL dipole that covers 5-30 MHz. No trap design **$90**

Aluma Tower Company, Inc.

Lightweight aluminum towers, including crank-up towers, stack sections, mobile van-mounted towers and trailer towers. Crankups range from 35 to 100 feet. Lightweight, durable units are for ham, CB, radio telephone, TV and similar communication. T-140 (crank-up tower shown



in photo) is comprised of 2, 20-foot triangular sections (requires mounting base) weighs 59 lbs. Includes 5 foot mast,(less antenna) Comes with safety stop device and includes counterbalanced locking crank to assure safe sure up and down positioning.

T-140 ..... **$995**

AMC Sales, Inc.

AMC Model 2712 - 12 Hour Recorder

Long playing (record up to 12 hours ...

6 hours per side using a TDK cassette) Features include one-touch recording, cue/review, lockable pause control, built-in condenser microphone, rewind autoplay, digital tape counter, separate volume control, one TDK 120 tape, auto stop function. Powered by 4 "C" size batteries (not included) or 110 Vac cord, included. Jacks for remote mike and speaker. Dimensions (HWD) 2 1/16" × 5½" × 9⅞". Weight (without batteries) approx. 2 lbs.

AMC Model 2712 ..... **$119**

Amherst International Corporation

Dust covers

Anti-static vinyl dust covers (and fabric covers) for computers, communications equipment, FAX machines. Catalog details keyboard covers, $10; monitor covers $13-$16 and printer covers from $10-$16.

Covers for ham radios/receivers **$9**

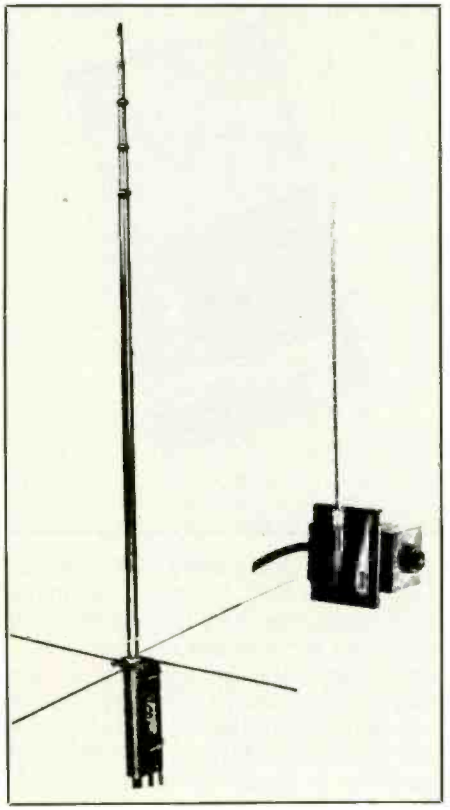
Antenna Specialists Co.

HM-2010

Base antenna for 6-meters. Omnidirectional, half-wavelength design provides 3dB gain. Collapses into compact portable for easy transportation. Handles 500W, Bandwidth 1 MHz, VSWR less than 1.5:1, Impedance 50 ohm nominal. Accepts PL-259 connector. rated at 99 mph wind velocity. Length 110 inches. Weight 8 lbs **$136**

HM-85

Cowl mount, disguise antenna for 6-meters. Stainless steel tapered whip includes hardware for cowl, fender or deck mounting. Similar to standard broadcast reception antenna. Power 150W, gain unity, Bandwidth 4 MHz, VSWR less than



1.5:1, Whip length 55 inches. Mount is swivel adjustable to 35 degrees. Cable not included. Accepts PL-259 connector.
HM-85 ..... $46

HM-2011

Two-meter antenna, omnidirectional collinear base antenna. Is a ⅝ wave over ¼ wave configuration provides 6dB gain over conventional ground plane. Power 250W. VSWR 1.5:1. Recommended for "field day" or portable use. Bandwidth 4 MHz, Impedance 50 ohms, Accepts PL-259 connector, Rated wind velocity 78 mph. Length 8½ feet. Weight 4 lbs.
HM-2011 ..... $155

HM-220.3G

On glass antenna ideal for fiberglass vehicles. Features include 3dB gain on 1¼ meter band. Mounts on windshield or rear window or to fiberglass up to ⅜"-thick. Removes easily for installation on another vehicle. Comes with instructions, hardware, cable and connectors. Power 100W, VSWR less than 1.5:1, Impedance 50 ohms. Whip length 17 inches. Connector is PL-259.
HM-220.3G $52

HM-748

Universal cowl mount antenna for 2-meters. Power 100W continuous, Bandwidth 6 MHz, VSWR less than 1.5:1, Impedance 50 ohms nominal, whip length 33 inches, PL-259 connector.
HM-748 ..... $103
HM-778 (narrow fender mount) $103
HM-788 (Chrysler mount) $108

AV-240 Moon Fantom

On Glass mount ½ wave CB antenna. No tools needed. Works on metal or fiberglass vehicles. Stainless steel whip with center load $54

M-906 Black Stallion

Cellular appearance CB antenna mounts on glass. Stainless steel construction. Whip is 12 inches long. Includes 15 feet coax cable and connector $50

M-711 Formula-1

Magnetic mount CB antenna with 3½" diameter magnet. Stainless steel whip and ¼ turn disconnect $68

M-904 Black Stallion

Magnetic mount CB antenna with 42" long stainless steel whip. Comes with 12 feet coax cable and connector. (not for vinyl roofs) All-black finish $25

MR276

Trunk-lid mount CB antenna with base loaded coil. Stainless steel whip and steel shock spring. Miniature in-line connector for feeding through ½" holes $50

M-518

Side-body mount CB antenna for use on AM, FM, and CB. Coupler hides under dash. No visible coil $54

M-1D

Full quarterwave 102" whip for mobile CB operation. Chrome-plated professional-grade swivel ball mount plus heavy duty stainless steel spring $58

MR125

Roof mount CB antenna with base load design. Stainless steel shock spring. Mounts on any flat metal surface. Requires ⅜" hole $42

M621

Mirror mount CB antenna with 47" sturdy white fiberglass whip. PL-259 connector on end of cable. Also available in M-622 model as "Dual Roadmatcher" with cable harness and connectors.
M621 ..... $44

MS119 Super Scanner

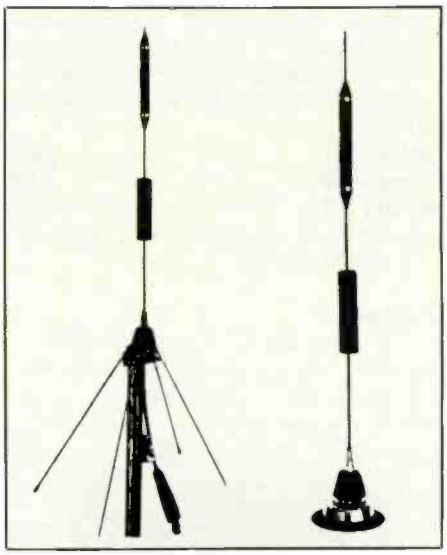
Base CB antenna. Selectable omni or high gain beam. Gain 5.75dB in beam mode. Height 18 feet. Width 6 feet. Uses standard 50 ohm cable (not supplied) and accepts standard PL-259 connector. Weight 17 lbs. Requires 1½-2" outside diameter mast (not supplied) $263

AV-122 PDL II Dual Polarity Beam

Base CB antenna with VSWR 1.3:1 on all 40 channels. Boom length 58". Requires medium-duty rotor (not included) Forward gain 12dB, rejection 32dB. Weight 13½ lbs $192

MON-58

Base station scanner antenna covers 25-1000 MHz and enhanced 800 MHz performance. One-clamp installation.
MON-58 ..... $46



MON-52

No holes trunk lid mount scanner antenna. Includes coax cable $56

MON-64

Base scanner antenna (discone). Comes with double U-clamp bracket. Requires cable and mast mount $26

MONR31

Base station scanner antenna covers 25-1000 MHz $56

Antenna Supermarket

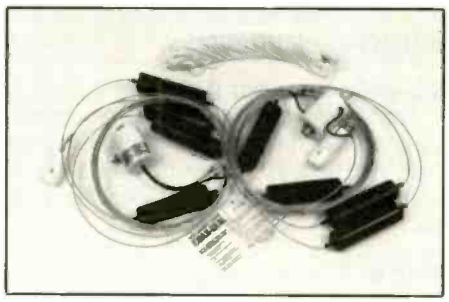
EDPR/T Eavesdropper/Twinlead Antenna

Shortwave trap dipole covers all international shortwave broadcast bands. Includes feedline, completely assembled ready for hanging. Includes 50 feet of 450 lb nylon support rope. Utilizes 8 traps to provide automatic bandswitching by electrically separating antenna segments. Hermetically sealed, UV protected high-impact ABS trap covers. No exposed coils. Includes Gas Tube Lightning Arrestor. Made with 14-gauge antenna

wire. Includes 100 feet of twinlead attached to antenna. Total 42 feet long. Includes installation instructions **$80**

EDPR/C

Same antenna as EDPR/T except instead of twinlead feedline, comes with a sealed, weather-resistant center con-



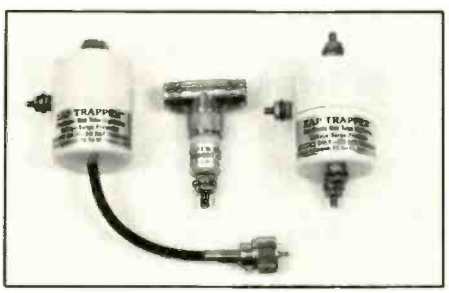
nector to accept a PL-259 connector. Includes Gas Tube Lightning Arrestor and an envelope of Coax Seal; enough to seal two connections. Does not include coax. EDPR/C **$80**

EDPR/"Sloper"

End-fed coil-loaded antenna with an underslung parallel element, meant to be mounted in a sloping configuration. Includes coax model maximum-sensitivity electronic Gas Tube Lightning Arrestor. Fully assembled. Includes 50 feet nylon support rope with coils soldered in place and enclosed in ultrasonically-welded, hermetically-sealed, UV protected high-impact ABS coil covers. Antenna constructed of 14 gauge wire. Total of 67 feet long. Covers AM broadcast band, 120 and 90 meters, and all international shortwave broadcast bands, 75 through 13 meters. Comes with installation instructions and Coax Seal. Does not include coax cable **$80**

RCVR-T

Maximum-sensitivity receive-only Gas Tube Lightning Surge voltage protector. Fires at only ½ of the voltage buildup that is required to activate the lowest power



(200W) transmitting-type lightning arrestors available. Uses two gas tubes. T model for twinlead-fed and longwire antennas. Input is two binding posts. Output is also two binding posts. Model "C" is configured for coax-fed antennas and uses only one gas tube. Input is an SO-239 and output is a PL-259 on a short piece of coax. Plugs directly between receiver and antenna. No patch cable required **$20**

LP/T

Low power transmitting type electronic Gas Tube Lightning Arrestor built on UHF M-358 "T" adapter. Handles 200W PEP limit. Good through 150 MHz with negligible loss, adding an SWR of 1.15:1 at 150 MHz. Solid brass hardware. Complete installation and operational information included **$15**

Antennas West

World Probe

Antenna designed for enhancing reception from 5 to 400 MHz. Comes with hook for easy hanging indoors or out. Includes 25-foot shielded feedline with connectors for nearly any receiver. Designed for portable receivers with whip antennas. Antenna portion is 6-foot long probe. Additional cost for Motorola connector. Includes alligator clip for users with no other type of connection **$30**

HotWire World Band Antenna

Longwire antenna designed for improved shortwave reception. Constructed with corrosion-proof weather-sealed material. Includes 15-foot shielded feedline. Total length of antenna is 45 feet. Includes same connectors as World Probe antenna **$40**

OmniLoop Receiving Antenna

Large closed loop antenna includes coaxial cable and PL-259 connector. Comes in 3 sizes. Features 1.2dB gain over dipole. Includes mounting hardware, 100 feet of feedline and instructions. OmniLoop 100 is designed for shortwave listening and circumference is 100 feet. OmniLoop 250 increases DX results and improves broadcast band reception with circumference of 250 feet. OmniLoop500 extends reception down to the VLF range further increasing shortwave DX results. Circumference is 500 feet.

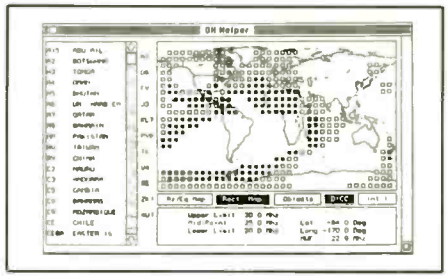
OmniLoop 100 . . . . . **$90**
OmniLoop 250 . . . . . **$110**
OmniLoop 500 . . . . . **$160**

QRV-QL Antenna Installation System

One-person antenna installation system comes complete with a total of 200 feet launch line, projectile and complete instructions. Allows installation of antenna for shortwave or ham use from 35 to 50 feet high **$30**

DX Helper

Software package for use with Mac. Features world map with current sun location and "gray-line" to show current situation. Gray-line and sun position automatically updates every ten minutes. Shows latitude/longitude, sunrise/sun-



set. Allows user to position cursor on any country and see latitude/longitude and MUF to that point. Also includes 24-hour propagation chart for selected location. Features asimuthal-equidistant display custom computed for user location. Includes international prefix identifier. Also includes CW practice option. Requires 512K memory, double sided disk drive, imagewriter or laser printer **$50**

Ashton ITC

Scorpio

Shortwave radio computer software package features combination (simultaneous) radio control/log/terminal program, includes log database with 100 active HF frequencies and printed manual, intelligent log scanning by type, location, ID, mode, frequency, remarks, etc. Automatically inserts frequency, mode, time and date into log database. Autolog function builds a non-duplicate database automatically from "hits." Search log by station, location, date, time, frequency, mode, service or remarks. Print and/or capture digital data, log based scanning using search criteria with UTC and data capture options, record "hits" (frequency, mode, date, time & data) to disk during radio based scan. Log scan has real time, frequency range TU tracking (Auto TU) options. Optional log databases, sorts logs by frequency, mode, service, date, station, or location. Use mouse or simple keypresses to execute, add, change or delete items from log files as needed. Export data to ASCII function, import from ASCII. Selectively load radio's memories from log, run other programs while Scor-

pio and your data stay resident in memory. Works on ICOM (with ICOM CT-17 interface) and UX-14 on R71A). Kenwood - all IF-232C compatible radios (requires Kenwood IC-10 Kit and IF-232C interface) Ten-Tec - Paragon (requires Ten-Tec interface) and Yaesu 757 MKII and 767 (requires FIF-232C interface). IBM PC/XT/AT/PS-2 (or 100% compatible), 256K memory, 2 drives/640K and hard disk recommended **$90**

Astron Corporation

Heavy duty, rugged power supplies to operate 13.8 VDC equipment from 120 VAC, featuring solid state electronically regulated, fold-back current limiting, low ripple, heavy duty heat sink, chassis mount fuse, three-conductor power cord. All units (except one) available in 220 VAC.

SL Series (price range given) .. **$91-102**
RS-L Series (built-in cigarette lighter receptacle) **$58-64**

Austin Antenna Ltd.

The Ferret

Fiberglass radome, 8-foot long antenna for performance from 30-1300 MHz. For scanner use, features include "N" connector and aluminum mounting tube. (For reception, a 10dB broadband preamp module is also available.) Features dielectrically tuned chokes, multi-tuned parallel resonant circuits and asymmetrical elements yield transmit operation on 40, 100, 122, 146, 310, 465, 865 and 1280 MHz. Weight 4 lbs **$270**
Ferret w/preamp **$300**

DFQ Series

Stacked 5/8 wave radiators in fiberglass radome for frequencies from 130-1600 MHz. No radials. Features include 3dB gain in 134-174 and 216-245 MHz. Wind survival 100 mph. No assembly required. Comes pre-tuned. Power capacity 180W.

DFQ Series 144 Amateur **$65**
DFQ Series 220 Amateur **$60**
DFQ Series 450 Amateur **$60**

Spectra

Four-band tuned antenna for mobile or base scanner use. For mobile use ½ wave elements provide coverage on UHF and 800-1000 MHz. Low and high band coverage provided by offset fed ¼ wave elements. Length is 33 inches. Includes Motorola connector. Thru hole body mounts and magnet mounts available. Pole mount is also available for base station use. Enhances performance on low and high band by increasing those elements to ½ wave length. Pole mount is 48 inches long. With Spectra attached, overall length is approx. 7 feet **$85**
Spectra with pole mount **140**

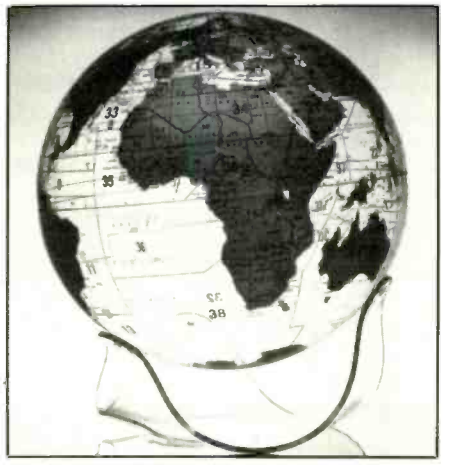
Condor

Multi-band design flexible antenna for scanner use. Tuned ¼ wave elements provided for improved high band, VHF, UHF and 800/1000 MHz performance. BNC connector is embedded in urethane housing. Height 12" **$30**

Azimuth Communications Corporation

World Radio Sphere

A crystal clear acrylic world globe with all zones and radio prefixes shown by country. Shows international date line,



cities, countries and more in 12-inch globe. Pencil included to allow user to mark glove as needed. Gray land, clear oceans, red radio information and black. World Radio Sphere **$120**

Benjamin Michael Industirs, Inc.

Nitelogger

Automatic recorder activator powered by AC adapter (included). Connects to tape recorder and turns on recorder when there is activity on a scanner channel. Eliminates dead space on tapes. Includes all connecting plugs/cables and instructions. Features VOX level light to assure proper adjustment of controls, monitor volume allows user to listen to calls, and delay time adjusts to hold for reply messages. Dimensions (HWD) 1¾ × 3¾ × 5¾". Weight: less than 1 lb.
Nitelogger **$70**

973A Clock

Large 14 inch OD 24-hour format clock with sweep second hand. Black textured case and clear glass crystal area featured. Operates on 1 AA battery. Also available in smaller 10 inch version (OD).
973A Clock **$60**

Butternut Electronics

SC-3000 Scanner Antenna

Trombone phasing sections covers 30-512 MHz ranges. Gain on UHF up to 7dB, VHF up to 3dB. Omnidirectional coverage. Height 11 feet. Shipping weight 4½ lbs **$92**

2MCV

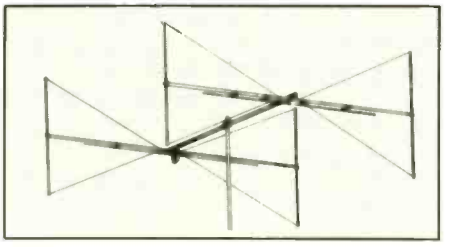
Base antenna for 144-148 MHz operation. Two collinear sections. VSWR at resonance 1.1:1 or less. Wind survival 100 plus mph. Gain 3dB. Height 9.8 feet. Shipping weight 3 lbs $75

2MCV-5

Base antenna for 144-148 MHz operation. Three collinear sections. Gain 5dB. Wind survival 90 mph. Height 15¾ feet. Shipping weight 4 lbs **$90**

1011 Butterfly

Base antenna for CB operation. Adjustable frequency coverage 27-30 MHz. Includes two elements, 1 driven, 1 reflec-



tor. Boom length 4 feet. SWR at resonance 1.5:1 or less. Front-to-side 20dB, front-to-back 15dB+. Polarization: Horizontal. Forward gain over dipole 5dB. Requires 50 ohm coax. Wind survival 80 mph.
1011 Butterfly **$150**

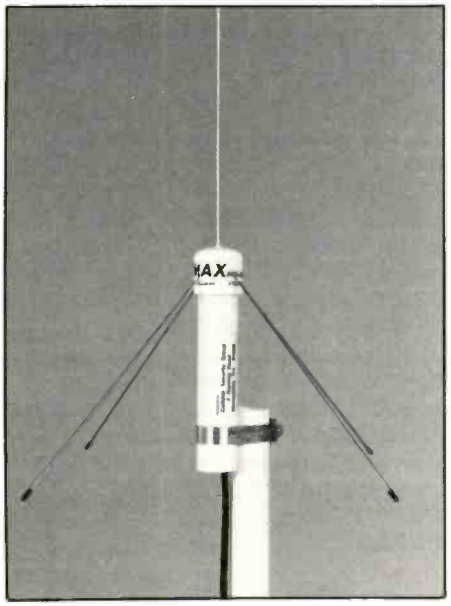
Cellular Security Group

MAX System Antennas

A series of receiving (for scanner use) ground plane antennas for specific frequency bands, including 110-140, 150-170, 250-350, 450-500 and 500-600 MHz. Each comes standard with 6-inch stub mounting mast or (with several optional adapters available) on top of scanner itself.

800 MAX System Antenna **$20**
Adapter (BNC) **$12**

Miscellaneous Accessories (cont.)



Aero Band MAX antenna **$34**
VHF-High MAX antenna **$33**
Mil-UHF MAX antenna **$32**
UHF MAX antenna **$31**
T-Band MAX antenna **$30**
Telescopic BNC Whip for handheld scanners **$13**
Telescopic Magnetic Mount (either BNC or PL-259) **$30**

MAX 146 - 220 - 440

A series of transmitting ham antennas each features four radials and weighs less than ½ lb. Connector is SO-239. Options include type N connectors (recommended for 440) and 38-inch long mounting masts ($5 extra).
MAX 146 or 220 or 440 (each) **$30**
Type "N" connector termination .. **$5**

Cushcraft Corporation

AR-2 Ringo

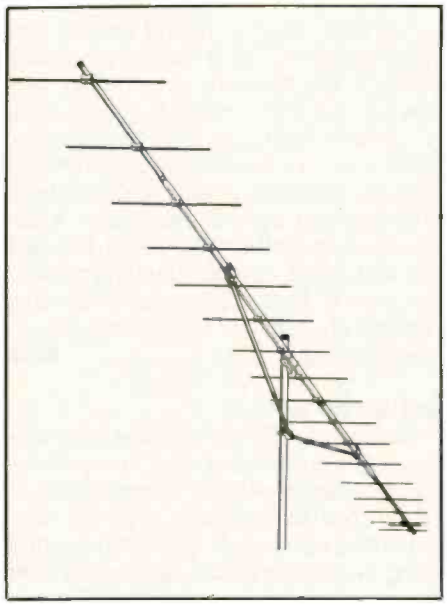
Two-meter half-wave base antenna. No radials. Gain 3.75dB over a quarter-wave vertical. Frequency range is 135-174 MHz, SWR 2:1 bandwidth greater than 6 MHz. Height approx. 4 feet. Power handling capability 1000W. Weight 1½ lbs.
AR-2 Ringo **$43**

AR-270 Dual-Band Ringo

Two-meter, and 70 cm antenna. Gain is 3.7dB on 2-meters, 5.5dB on 70 cm. Power 250W. Less than 4 feet high. Weighs 2 lbs **$80**

17B2 Boomer Sideband/CW Yagi

Two-meter antenna features forward gain of 18.0dBd. New N connectors. Frequency range 144-145 MHz, 17 elements, front-to-back ratio 26dB. Handles 2000W



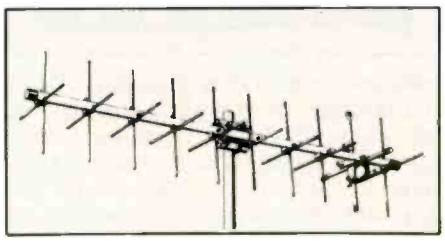
PEP. Boom length 31 feet, with 17 foot turn radius. Weighs 16 lbs **$220**
424B (for 70 cm) **$145**
617-6B (for 6 meters) **$375**
220B (for 1¼ meters) **$170**

Lightning arresters

Protects valuable equipment from surges up to 5,000 amperes. Uses replaceable gas discharge tube which clamps voltage surges to less than 50 volts in about 100 nanoseconds.
LAC4 (200W w/SO-239 conn.) **$39**
LAC4H (2KW w/SO-239 conn.) **$42**
LAC4N (200W N conn.) **$50**
LAC4NH (2KW w/N connectors) ... **$52**
LC2 (Replacement cartridge) **$16**
LC2KW (2KW replacement cartridge) **$18**

A144-20T Oscar

For 145.9 MHz OSCAR use. Total 20 elements, forward gain 12.2dBd, front-to-back ratio 20dB, Power 800W, boom



length approx. 11 feet, turn radius 6 feet. Weight 6½ lbs **$135**

Data Communications International

Radio Control Program

Software radio control that allows user to monitor and automatically log frequencies from 100 kHz to 2 GHz. System provides facility of manual logging and control of radios. Applicable to both traffic studies or actual computer enhanced monitoring of wide range of frequencies with minimal personal involvement. Runs on all IBM PC or compatible computers with at least one serial port, a monochrome or LCD screen (though preferable color), VGA or EGA monitors. A printer allows reports to be printed, though files may be displayed on screen if a printer isn't available. Operating system - MS DOS or IBM PC-DOS. Radios: Datacom package runs on Icom radios that adhere to the Icom CI-V interface or accept the ICOM UX-14 adapter. For a broad spectrum monitoring effort, the R71A and R-7000 provide coverage from 97 kHz through 2 GHz. Datacom program allows program to act transparently, permitting scan of HG and VHF/UHF frequencies, with the correct radio being selected automatically by frequency range. Reads and displays radio memory channels and displays on screen. Frequency and mode may be set from keyboard.

Radios may be swept between any two frequencies with full range of radio. Radio may be set to any of the memory channels from the keyboard and the active frequency transferred to a memory channel.

Optional Diagnostic program and a terminal program may also be accessed from utility menu. Many more features. Technical telephone line also set up to help user with program, if necessary.
Datacom program for ICOM **$130**
Datacom program for JRC **$200**
Datacom program for Kenwood and Yaesu **$130**
Datacom program commercial version for all radios **$300**
(full line of hardware, cables, etc. also available)

Datametrics, Inc.

Communications Manager

Provides computer control over ICOM R7000 or R71A receiver. Menu driven software includes full monitoring display, digital spectrum analyzer and system ed-

itor. Hardware design requires no internal connections. Extends Icom capabilities, including autolog recording facilities, 1000 channel capacity per file, and much more. Requires ICOM receiver and IBM PC with 512K and serial port. The R71A also requires an ICOM UX-14.
Communications Manager **$349**

Delta Research

Deltacomm 1.04

Custom interface and optimized software controls and maximizes potential of ICOM R7000. Spectrum log at speed in excess of 1300 channels/min. while automatically generating a histogram of frequency/activity. Cyberscan allows programmed scan file tracking of systems employing frequency hopping techniques. Quick Tune permits instant control of R7000 from computer keyboard. During a scanning session interfering frequencies may be temporarily eliminated. Flexible control of DOS path for Deltacomm frequency/search data files. DOS shell command. On-screen help, scanfile channel lock-out features allows scanning around channels without removing that frequency from database. Birdie log during frequency search automatically characterizes your R7000, then locks out those frequencies. Auto frequency detection and storage during search and spectrum log. Advanced priority channel monitoring and program control, by channel, of remote tape recorders during scanning. Many more features. Requires MS-DOS microcomputer with minimum 512K memory. Deltacomm's performance is proportional to baud rate setting, style of display card and type of computer used **$299**

ICR71 SWL/HF Communication Manager

Computer program designed to be used with HF receivers, but also when used in conjunction with an external terminal node controller offers unlimited automatic frequency control and logging capability. New upgraded program controls the following ICOM receivers/transceivers: IC-R72, R725, R735, R751/IC, R751A (UX-14 required), R761/IC-R765, and IC-R781. In Spring 1992, Kenwood R5000 and Drake R8 will be added. Fully compatible with Hercules BW, liquid crystal, fluorescent or 16-bit super VGA displays and is designed around pull-down menus, simplified function selection and no MS-Windows requirement. Features include: sort data base by frequency, call sign, target area, country, type of service and timer selection, Each frequency record contains the following information: frequency, call sign, seven-day time activity, service type, country, target area, notes (140 characters) TNC terminal node controller (73 characters), interface relay contact control, front-panel knob positions - pre-off-att, W-filter-N, RF gain position, P.B.T. position, Notch position, QSL status. All Delta Research software updates are supplied to registered users free-of-charge **$299**

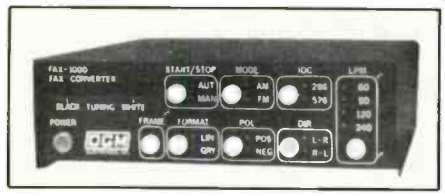
Deltatone 2.0

Sixteen-digit DTMF repeater programmer offers unlimited 16-digit tone generation for local or remote programming of your repeater controller. Accepts programming commands from a file created using word processor. Commands and comments can be freely mixed within file. Driver conveniently sends only the commands to the Deltatone interface via your printer port. Uses less than 2K memory. Transformer coupled, balanced 600 ohm adjustable to -10dbm output level. Software controlled relay contacts for PTT or COR switching. Four wire connection interfaces directly to controller, radio or user supplied approved telephone coupler.
Deltatone 2.0 ..... **$149**

DGM Electronics, Inc.

FAX-1000 Facsimile Converter

Copy facsimile signals w/ Epson compatible graphics printer. Product connects between your receiver and printer to allow user to print weather charts, satellite and press photos. Includes LED tuning bargraph. Images can also be printed out as a positive or negative. Copies speeds of 60, 90, 120, and 240 LPM and index of cooperation (IOC) of 288 and 576. Auto or manual operation. Selectable line or gray scale printout. Contains AM and FM demodulators. Required 115 VAC power. Wall transformer included.
FAX-1000 ..... **$349**



Digital Radio Systems, Inc.

PC Packet Adapter System

Plugs into any IBM-PC or compatible. Adds a complete, dual port packet radio capability to your PC. Includes pop-up menu windows and complete software package on diskette and operator's manual. Packet adapter is contained on a half length plug-in option card. Uses Zilog 8530 SCC for hardware HDLC and a single-chip crystal-controlled CMOS low-power modems for no-tune 1200 baud AFSK. The PCPA Type 2 has two internal 1200 baud modems for dual VHF or VHF/UHF operation. Type 1 has one internal 1200 baud modem and one external modem to interface everything from 300 baud HF Modem to networking modems at up to 38,400 baud. Software setting allows user to cross-band digipeat. Dimensions approx. 4" high, 5¾" long.
PCPA/1 ..... **$150**
PCPA/2 ..... **$180**

DX Computing

Shortwave Navigator

Software program for Macintosh computers that plots broadcaster schedule on grid, searches for unknown frequencies and programs, logging, sounds, reports, keeps track of receiver memory channels. Purchase includes one free upgrade. Includes on-screen help. Displays local/UTC time, SW index, utilities card, English broadcasts and more **$70**

E.H. Yost & Co.

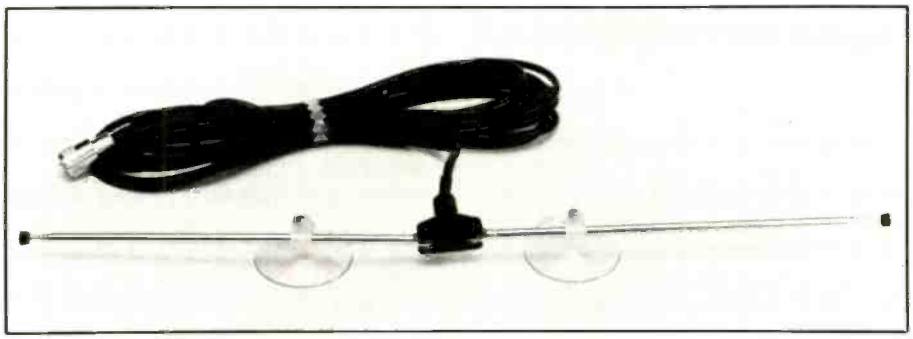
Full line of batteries-rechargeable, NiCd, sealed lead acid, lithium, alkaline, mercury, zinc air, silver oxide, solar, nickel hydrite and solar panels. AA batteries include standard charge, high capacity and fast charge types. N-600AA (standard charge AA each) **$1.80**
N-700AAE (high capacity AA each) **$2.50**
AA × 8 (8 AA batteries in pack at 600mAh) **$18**
AA × 8 (8 AA batteries in pack at 700mAh) **$25**

Electron Processing, Inc.

Antenna Plus-3

Indoor scanner antenna covers all scanner bands. Amplifier 15-20dB. Filtered to reduce interference. Comes with whip antenna 36 inches high. Powered by 115 VAC. Includes jumper cable for scanner connection **$90**

Plus-3 (version with 12 VDC) **$94**
Plus-3-Dual (for two scanner operation) **$110**



Scanner Stick
Scanner antenna designed for outdoor mounting. Mounts to masts up to 1.5 inch diameter. Sealed with 35 inch PVC tube. Receives 25-1000 MHz. Comes assembled with 25 feet of coax. Specify connector needed **$40**

Vak-Tenna
Window mount scanner antenna covers 27-800 MHz. Suction cups hold antenna to window. Whips telescope to 79 inches and collapse and fold to 12 inches. Comes with 15 feet coax and choice of connector **$35**

Super Vak-Tenna
Shortwave and scanner antenna. Indoor mount with suction cups. Internal amplifier 15-22dB. Covers 0.5-800 MHz. Powered by 115 VAC. Includes 15 feet coax and jumper cable included.
Super Vak-Tenna **$120**
Super Vak-Tenna (for outdoor mount) **$150**
Super Vak-Tenna (with 12 Vdc adapter) **$124**

Tape Saver
Connects between scanner and tape recorder to eliminate dead time on tapes. Turns on recorder when activity detected on channel. Plugs provided. Speaker lets user listen to calls while connected. Powered by 115 VAC (12 VDC and 9V battery models available) **$60**

Scanner Booster
Covers 20-1000 MHz with 13dB gain. Powered by 115 VAC with type F connectors (TRV type). For receive only **$35**
Scanner Booster (for mobile use) **$35**

Multiple Receiver Adapter
Allows user to connect three scanners to one antenna. Covers .5-1300 MHz. Low noise amplifier eliminates signal loss. Receive use only. Power 115 VAC. Includes BNC connectors. Multiple Receiver Adapter **$70**
Multiple Receiver Adapter (for 12 VDC use) **$74**
Multiple Receiver Adapter (with UHF-SO239 connectors) **$75**

Multiwire-4
SW antenna covers all bands. Total length 130 feet. Four different wire length elements. Comes with 50 feet coax feedline, 100 feet of rope and static bleed mounted at antenna-coax junction. User must specify either receiver type or connector desired. Requires 2 to 5 end supports depending upon configuration desired. For receive only **$100**

Static Bleed
Static and noise reduction for long wire antennas. Grounds static. Item is NOT a lightning arrester. BNC connectors provided, but UHF available **$30**

Low-Pass Filter for Shortwave
Eliminates strong VHF/UHF signals from shortwave bands. Also effectively reduces signals from TV, FM and two-way radio stations. Connects in the antenna lead and designed to filter out signals above 50 MHz. Housed in 2 ″ × 2 ″ × 1 ″ metal enclosure with BNC female connectors **$20**

Future Scanning Systems

Scan7000
Software program for ICOM R7000 that has 1000 channels per file, generates speech, by-channel lockout, mode, tape, frequency, says time, frequency and users comment. Range scan generates custom scan files. Auto time and date stamping of hits. Auto lockout mode. Scan by comment. High resolution graphics. Scans at over 1300 channels per minute on any speed Amiga. Generates ASCII scan files. Programmable delays. No radio mods required. Includes the custom hardware interface for radio and cassette player, software, manual.
Scan7000 . . . . . **$149**

GAP Antenna Products

Challenger DX-VI
Six band multi-band vertical antenna for several ham bands including 2 and 6 meters. SWR less than 2:1, Height approx. 32 feet, weight 16 lbs. Mast construction fully telescoping aluminum tubing (with added tensile strength). Self-supporting with 3 foot drop in ground mount. Wind rating: 60 mph minimum. Hardware: stainless steel screws and washers, PL259 connector and nut driver. Assembly time 30 minutes. Feed point: 16 feet from antenna base **$229**

G&G Electronics of Maryland

ART-1
Complete interface system for send and receive on CW, RTTY (Baudot and ASCII) and AMTOR, for use with Commodore 64 or 128 computer. Operating program on disk included. Four mode AMTOR and full speed RTTY 60 to 132 WPM, CW to 150 WPM and 110/300 Baud ASCII. Normal/invert keyboard control. Choice of full or split screen display with large type ahead buffer and programmable memories. On-screen tuning indicators. RTTY "scope" cross-hatch and "red-dot" signal acquisition monitor on the screen **$199**
AIR-1 (for Commodore VIC-20) **$100**

SWL
A receive only cartridge for CW, RTTY (Baudot and ASCII) for use with Commodore 64 or 128 computer. Operating program in ROM. Includes cable to connect radio's speaker/earphone jack, demo cassette, and manual. On screen tuning indicators. Manual or auto keyword control of Commodore printer for paper copy and 24 HR on screen clock and direct keyboard text input to printer. No extra power supply or computer connections needed. Plugs into the "expansion" port. Optional AIRDOS disk program allows saving received data on disk. Hand-key input reads user sending for code practice **$70**

Morse Coach
Complete teaching and testing program for learning Morse code in a cartridge. For Commodore 64 or 128 . . . **$50**

Gitlin, Scott

PC Shortwave Monitor
Software program that allows SWLs to create a variety of customized listening schedules, based on information input into a master file containing logging records. On-screen help appears throughout the program to guide computer novice and

beginning SWL. Listening schedules can be printed out containing records to match a particular country/station, or a listening schedule can be created combining language, program and "broadcasting to" codes. For IBM or compatible computer **$20**

GRE America, Inc.

Super Converter II

For handheld scanners, 800 MHz converter provides coverage of 810-912 MHz. Connects between scanner and antenna. Powered by 9V battery or external power adapter. Includes bypass allowing

user to return to original 400 MHz coverage without disconnecting unit. Connector: BNC. Features include LED power indicator. Dimensions (HWD) 2⅝" × 1 9/16" × 1 7/16" **$90**

Super Amplifier

Compact pre-amp designed for use on handheld scanners and amplifies reception of frequencies 100 MHz-1 GHz as high as 20dB. Gain is adjustable. Powered by 9V battery. Features include LED power indicator. Connectors: BNC. Dimensions (HWD) 2⅝" × 1 9/16" × 1 7/16" ... **$60**

Super Converter 9001

Designed for base scanner users who want to scan frequencies from 810-950 MHz with no restrictions. Scanner must cover 410-550 MHz to operate converter. Bypass switch converts back to original frequencies. BNC connectors. Includes 12 inch BNC to Motorola plug adapter cable. Uses 9V battery or external AC adapter. (not included) Dimensions (HWD) 1¼" × 5¾" × 3½". Weight 1 lb **$96**

Super Amplifier 3001

Designed for base scanner users. Amplifies weak signals from 100 MHz - 1 GHz by as much as 20dB. Adjustable gain and bypass switch converts back to original gain. BNC connectors and includes 12 inch BNC to Motorola plug adapter cable. Uses 9V battery or external AC adapter (not included) Dimensions (HWD) 1¼" × 5¾" × 3½". Weight 1 lb **$70**

All-Band Antenna

Rubber duck 8" antenna with BNC connector for scanner use. Covers 25 MHz to 1 GHz **$14**

Grove Enterprises, Inc.

Scanner Beam

Covers 30-50, 108-136, 137-174, 225-400, 406-512 and 806-960 MHz. Can also be used for transmitting up to 25W on 144, 220 and 420 MHz bands. 50/75

Ohms nominal impedance. Used with TV rotor. Approx. size: 8 feet high × 5 feet long.
ANT1 ..... **$60**

Hidden Antenna

Covers 30-1000 MHz for scanner use. Indoor antenna, 66-inch flexible.
ANT6 ..... **$20**

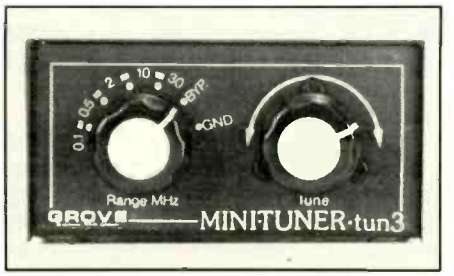
Scanner Filter

Features adjustable 100-220 MHz 30dB notch filter allowing user to reduce or eliminate single-frequency interference from aircraft, mobile telephone repeaters, paging signals, etc. High-Q circuitry features custom-wound inductors. Rugged weatherproof construction allows mast mounting. Includes standard F connectors. Diode shunt array protects scanner from nearby lightning strokes and high-powered transmitters. A high-pass filter removes SW feedthrough, while band-reject filters remove FM and TV broadcast interference automatically. Dimensions 6" long × 1¼" diameter. Weight 3 oz. Insertion loss: less than 3dB. Rejects 0-30, 50-118, and 174-225 MHz. Frequency range: 30-2000 MHz. (nominal). Full instructions included.

FTR-5 ..... **$49**
FTR5B (BNC connectors) **$54**
FTR5M (Motorola connectors) **$54**
FTR5P (PL259 connectors) **$54**
FTR5N (N connectors) **$54**

Minituner

Tunable, unamplified signal filter for improved shortwave, medium wave and long wave reception when using a wire antenna. Improves low frequency reception on all receivers in the 100-540 kHz range. Connects between antenna cable and receiver. User adjusts for peak reception. Bypass function allows unit to be switched out of the circuit without removing from antenna line. An antenna ground-



ing selector protects receiver from nearby (not direct) lightning strokes and transmitters. (Not for VHF/UHF scanning.) Frequency range 100 kHz-30 MHz in 4 bands, Circuit: series-tuned L-section filter. Tuner: 365 pF air-variable capacitor, ball bearing drive, input connector: SO-239 with random wire provision. Output connector: PL-259 on 24 inches coax cable. Enclosure: custom formed aluminum. Dimensions (HWD) 2" × 4" × 3". Weight ¾lb **$70**

Minituner Plus

Combination tuner and preamplifier for shortwave use. Allows user to select between two antennas, connect two separate receivers to either antenna. Removes from circuit with switch. Frequency range 100 kHz-30 MHz in 4 bands.

Gain: approx. 20dB, preselector type: series-tuned L-section filter. Power required 9-18 volts DC (12V nominal) at 30mA. Connectors 4, SO238 signal line, 2.1 mm DIN power. Cabinet: Custom formed aluminum, baked enamel finish. Dimensions (HWD) 3″ × 9¼″ × 4″. Weight 1½ lbs.
TUN4 ..... **$140**

HAL Communications Corp.

ST-5000

RTTY demodulator on HF and VHF bands. Hard limiting front end, active discriminator, and active detector. Standard features include 170 and 850 Hz shifts, normal or reverse sense, autostart, built-in loop supply, an audio tone keyer, and RS-232 input and output. Available in either standard 2125 Hz MARK (high tone) or 1275 MARK (low tone) versions. Audio input 600 Ohm nominal receiver audio. Tuning indicator on front panel and internally adjustable output level. Power 105-125 or 210-250 VAC. Dimensions (HWD) 2¾″ × 12″ × 8″. Weight 6 lb.
ST-5000 ..... **$295**

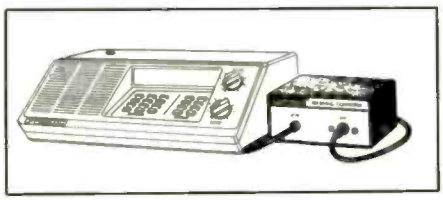
ST-6000

Demodulator includes an active filter demodulator stage, wide dynamic range limiter, FM or AM detector, active filter discriminator, low-pass filters, crystal AFSK tone keyer, and a 1-inch oscilloscope for tuning. Automatic Threshold Control (ATC) and Decision Threshold Hysteresis (DTH) circuits minimize effects of selective fading and multipath distortion. Available in either "high" or "low" one-frequency models, as well as other tone sets on special order. All three standard shifts of 170, 425, and 850 Hz are supported. Other features include an internal loop supply, keyboard operated switch automatic PTT circuit, autostart, and a rear panel with multiple I/O connections for flexible interfacing to all data handling equipment. Power requirement: 105-125 VAC or optional 210-250 VAC. Dimensions (HWD) 3½″ × 17″ × 9″. Weight 12 lbs **$1295**

Hamtronics

Scanner Converters

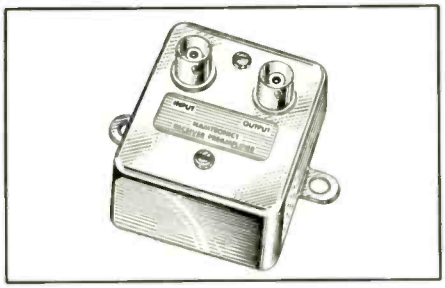
Ready-to-use converters allow user to tune 72-76 or 135-144 or 240-270 or 400-420 or 806-894 or 880-960 MHz. Each is compatible with popular crystal or programmable scanners. Converts out-of-



band signals to a frequency covered on scanner. Built-in voltage regulator takes power directly from some scanner radios. Motorola jack for antenna and Motorola plug on output cable to match antenna connector on scanner. Scanner Converter (separate model for each of above ranges) **$88**
PS-1 (12 VDC power supply Adapter for 115 VAC operation) **$10**

Broadband Preamp

Originally designed for amateur use, may be used to improve sensitivity of



scanners. Provides 10-15dB gain with low noise figure over 20-950 MHz range without tuning. 50 or 75 Ohms. Has BNC jack and requires regulated 12 VDC power. Noise figure avg. 1dB.
PSR Broadband Preamp **$36**

J & J Enterprises

SCANCAT

Computer Aided Scanning Program for many of the newer SW and VHF scanning radios. Supports Yaesu, Kenwood, JRC and AOR3000. Software program allows complete control of all functions supported by these radios through the manufacturer's interface. Allows user to enter any one frequency and increment up-down from that point, enter any two frequencies and scan between them with any increment and variable time delay or pause, scan a file of frequencies, search by description or wildcards, create frequency files. User can sort by any field, and save to disk and/or send to printer. Also allows creation of 30 personal "Preset" frequency bands for SW, aircraft, etc, including an increment and mode. With Kenwood and AOR3000 user can read to a file the radios memories including the splits and mode and store them on a disk file. Includes on-line help. Allows creation of unlimited files of up to 500 frequencies each. Files can be sorted by any field. Requires IBM/PC compatible computer with at least 512K RAM, 1 drive, minimum 1 serial port. Color screens are user selectable but you do NOT need a color or graphics card. Comes in 5¼″ or 3½″ disks **$50**

Jo Gunn Enterprises

JG 3 + 3 Star

CB base antenna with horizontal and vertical polarization. Gain 14.5dB. Front-to-back radio 40dB, side rejection 40-45dB, back rejection 40dB. Wind survival 100 mph and SWR 1.1. Length 8 feet, Weight 28 lbs **$259**

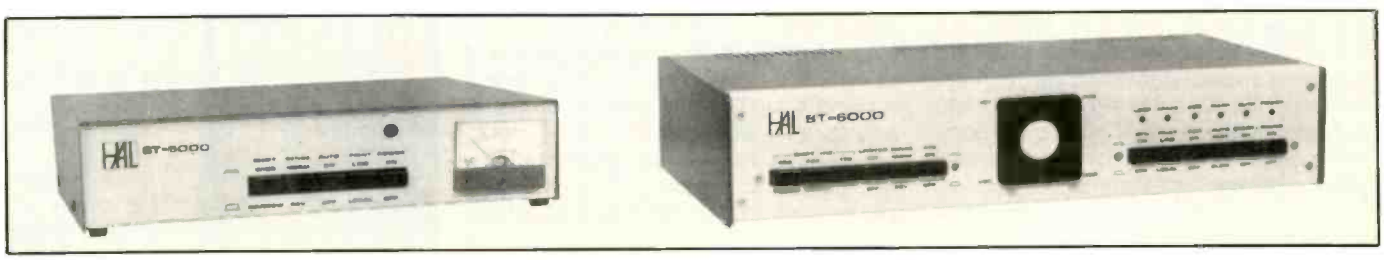
JG 6 + 6 Star

Similar to 3+3 Star antenna for CB, but gain is 18dB, front-to-back ratio 50dB, side rejection 55-60dB, back rejection 45dB. Length 25 feet, Weight 54 lbs. Wind survival 100 mph **$689**

KAGIL

Equipment dustcovers

Made of PAK nylon, water repellent,



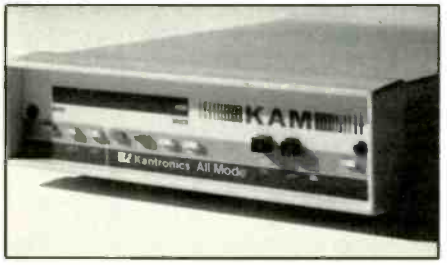
non-static, choice of colors. Can include call letters (additional small charge). Also makes covers for computers. Measure HWD, then total the figures. Cost varies according to size, below. Postage less than $2 each.

Mini (up to 15″) **$4**
Small (15¼″ - 20″) **$8**
Medium (20¼″ - 32″) **$9**
Large (32¼″ - 40″) **$11**
Extra Large (40¼″ - 48″) **$13**

Kantronics

KAM All Mode

Dual port unit capable of HF and VHF packet. User replaceable EPROMS. Accepts new features as technology changes. Operates simultaneously HF and VHF, supports terminal, HOST, KISS, BBS, CW, RTTY, ASCII, ARQ, FEC, NAV-



TEX, and AMTOR-625. Supports WEFAX, KA-NODES & HF/VHF gateway. Personal mailbox with reverse forwarding, software/internal/external carrier detect, programmable mark/space/CW filters & bargraph tuning. RS-232 and TTL interfacing with watchdog timers. Options include MSK and 2400 baud modems and battery backup. AC/DC transformer, cables and connectors included. Indexed manual, pre-punched for 3-ring binder for easy updates. Requires 12 VDC. Dimensions (HWD) 1¾″ × 6″ × 9″ **$320**

Key Research Company

Search and Store Module

Company manufacturers two products; Search and Store Module (SS-45) has one mode of operation. Both work only with Radio Shack PRO 2004/5 and 2006 models. Using squelch state and operating mode signals, modules electrically activate the same sequence of keyboard functions an operator would use for manual searches. Modules automate storage of frequencies so searches can be done while owner is at work, or sleeping, etc. When activated, unit automatically stores, in the monitor memories up to 10 of those frequencies found during a frequency search. When the module is de-activated (by hitting "manual", "scan", or "program," the frequencies stored in the monitor memories can be reviewed and transferred to the main memory in the normal manner. Over-lay control scheme allows all of the scanner's normal functions to be retained. No external computer is required. Modules are user installed w/out drilling any holes or cutting circuit patterns. Installation requires attachment of 8-10 wires (depending upon module purchased) to the receiver circuitry. Should require less than an hour to install. Works with all of the popular modifications to the scanner. May not work properly in 2004/5's which have had the normal 7 MHz microprocessor crystal replaced by a 10 MHz unit to speed scanning. Modules come assembled and with complete instructions. Size: 2½″ × 3″ × ⅜″. Weight: approx. 1 oz. Carry a "no questions" guarantee. Shipping included.
SS-45 Module **$25**

PS-90 Module

Power Search and Store Module is most powerful and flexible of the two modules. Has two modes of operation: A simple mode like SS-45, where frequencies found during search are stored in the ten monitor memories, and a complex mode where frequencies are stored directly in the scanner's main memory. An 8-pole DIP switch is provided on module to permit user to set a limit on how many searched frequencies (up to 255) will be stored in main memory before module is automatically de-activated. With a few scanner keyboard entries, user has full control over where main memory storage of searched frequencies is to begin. The two settings allow control of how many, and which memory channels are to be used for search and store. None of scanner's normal functions are lost when unit is installed. Size: 2¾″ × 3½″ × ⅜″. Weight 2 oz **$45**

Kiwa Electronics

MAP

An outboard device to improve the selectivity and audio performance of SW receiver. Improved selectivity result of using 6 ceramic filters and audio is result of using low distortion synchronous detector and a high-quality monitor amplifier and speaker with special filtering. Hookup requires no receiver modifications. Microclip attaches to a component on receiver's printed circuit board to extract receiver's IF signal. Complete instruc-

tions are included. With MAP attached to receiver, the receiver is used for tuning and the MAP is used for bandwidth control and for listening. Adjustment of MAP audio controls can tailor audio to user needs. Speaker size: 4.5 inch. Specifications: ultimate IF selectivity better than 80dB, ultimate rejection better than 90dB. High frequency filter tunes 1.1 to 4.5 kHz. Tone tilt 16dB from 50 Hz to 2.7 kHz. Includes power supply/DC adapter, direct pickup, ground wire, receiver cable and manual/service manual.
MAP-1 ..... **$340**

Krueger Communications

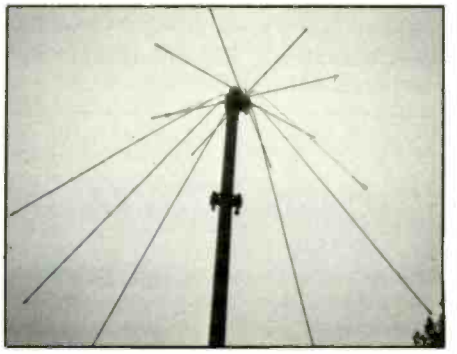
Scanner, Transceiver Modifications

Numerous modifications to popular scanners. Mods include, but are not limited to faster search/scan rates, improved squelch action, cellular restoration, disabling keyboard beep, voltage/surge/spike protection, better tape record quality, auto tape record switch and improved headphone audio. Many, many more upon request.
MOD15A (100 extra channels for PRO 2004 scanner) **$20**
MOD12A or **13A** (add an S-meter). ..... **$35-$100**

Lakeview Company, Inc.

Discone Scanner Antenna

Eight cone elements and 8 disk elements. All aluminum. Mount attaches to 1-1½″ mast. Receives all frequencies on



AM, SSB and FM from 100 MHz-2.5 GHz. Can be used for transmitting on 2 meters and 70 cm.
D-16 Discone **$29**

1/4 Wave Base Antenna

Designed for 2 meters, 1¼ meters, ¾ meters and scanner use. Aluminum mount and radials. Accepts PL-259 connector and includes mounting hardware.
1/4 Wave Antenna **$13**

5/8 Wave Mobile Antenna

Designed for 2 and 1¼ meters. Either magnet, trunk, permanent or fender mount. Includes 15 feet coax with PL259 connector, 3 inch magnet, SWR 1.5:1 over entire band and 3dB gain **$30**

MetroWest

Scanner accessories

Taper box (T-102) plugs into recharge jack on scanner. Plugs into scanner; control circuitry limits charge time to the proper 15 hours for AA NiCds, then switches to a true phase modulated trickle charge to keep batteries at full charge. LED flashed to indicate charging, and is on solid during trickle charge, alerting user that scanner is fully charged. Shown is Taper Box for Bearcat 100XLT, 200XLT or 205XLT and Regency 4020/30 scanners.
T-102 ..... **$21**

Pro-Power II

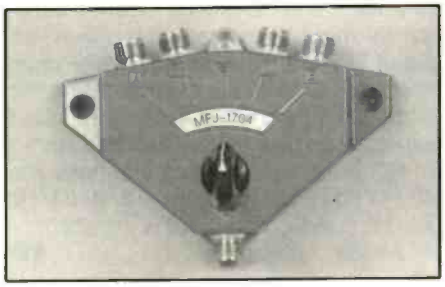
Drop-in charger stand for proper NiCd charge rate control. Plastic case provides angle-up positioning of scanner.

Power supply is matched to scanner (specify model: Bearcat 100, 100XL/XLT, 205XLT, Regency 4020/30, HX-1000/1200/1500, or Radio Shack Pro-30 through Pro-36 ..... **$45-47**

MFJ Enterprises, Inc.

Heavy Duty Coax Antenna Switch

Four-position SO-239 switch. Allows user to select any of four antennas or the center ground position. Provides replaceable lighting surge protection to protect against distant lightning-induced surges



and static. Handles 2.5KW PEP. Low SWR. Isolation rated from better than 60dB at 30 MHz to better than 50dB isolation at 500 MHz. 50 Ohm.
MFJ-1704 ..... **$70**

VHF SWR/Wattmeter

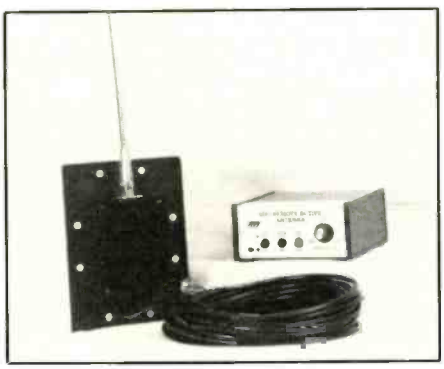
Covers 144 through 220 MHz band. Read forward and reflected power in 2 ranges (30 or 300W) Also lets user read relative field strength from 1-170 MHz. SWR can be read from 20 meters in HF through the 220 MHz band. Two color meter.
MFJ-812B **$30**

LW/MW/SW Preselector/Tuner

Boosts signals while rejecting images, intermod. Improves reception of signals from 1.5 - 30 MHz, especially below 2 MHz. Connects between receiver and antenna. Has tuner bypass and ground receiver positions. Dimensions (HWD) 3″ × 2″ × 4″.
MFJ-956 ..... **$40**

Outdoor Active Antenna

Mounts outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 kHz to 30 MHz. Remote unit has 54 inch whip, 50 feet of coax and connector. 12 VDC or 110 VAC (with optional adapter) On-LED, 20dB attenuator and gain control.
MFJ-1024 ..... **$130**



SSB/CW Audio Filter

All mode dual tunable filter lets user notch out interference and pull in stations. Two independently tunable filters let user peak, notch, low or high pass signals to eliminate heterodynes and interference. Tune from 300-3000 Hz. Vary

bandwidth from 40 Hz to almost flat. Notch depth to 70dB. Inputs for two rigs. Switch selectable. Switchable noise limiter for impulse noise through clipper removes background noise. Uses 9-18 VDC or 110 VAC (with optional adapter). Dimensions (HWD) 2″ × 6″ × 10″.
MFJ-752C **$100**

Indoor Active SWL Antenna

Tuned circuitry minimizes intermod, improves selectivity, reduces noise outside the tuned band. Use as preselector with external antenna. 0.3-30 MHz. Tune, band, gain, on-off/bypass controls. Uses 9V battery (not included), 9-18 VDC or 110 VAC (with optional adapter). Dimensions (HWD) 2″ × 6″ × 5″.
MFJ-1020A **$80**

Receiver Antenna Tuner/Preamplifier

Provides proper impedance matching to transfer maximum signal from antenna to receiver. Covers 1.6-30 MHz. A 20dB preamp with gain control boosts weak stations. A 20dB attenuator prevents overload. Select from 2 antennas, 2 receivers. Use 9-18 VDC or 110 VAC (with optional adapter) Dimensions (HWD) 2″ × 9″ × 6″.
MFJ-959B **$90**

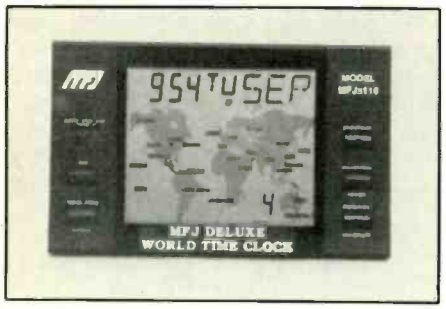
12/24 Hour Clocks

Read both UTC or local time with model 108B that displays both simultaneously. Mounted in brushed aluminum frame. Features ⅝ inch LCD numerals and sloped face. Quartz controlled. Battery included.
MFJ-108B **$20**
MFJ-107B (reads 24-hour UTC time) **$10**

Miscellaneous Accessories (cont.)

DXers' World Map Clock

Shows time at any QTH around world, and gives user map. Shows day of week, month, date and year. Push-button controls allow user to move display to a QTH



in every time zone. Recall feature moves display back to local time. Alarm. Tan map on gold background with black border. Dimensions (HWD) 3¼" × 5¼" × ⅔".
MFJ-110 ..... **$25**

MFJ-1278

Multi-mode data controller enables user to see RTTY, Amtor ship-to-shore, Navtex, slow scan TV, ASCII, Morse Code and packet radio on computer screen. Copies news photos, WeFAX Weather maps, and more. Requires HF and/or VHF/UHF receiver and computer. Automatic Signal Analysis tells user what unknown digital signals are. With optional MFJ Multicom 1289 (for IBM computers) user sees AP photos and weather maps with up to 8 gray levels. MFJ Multicom64 1282B (for Commodore 64/128 computers) gives multiple gray levels. Programs computer with serial port and simple terminal program. Dual radio ports let user connect two radios (each HF or VHF/UHF); 20 LED precision tuning indicator lets you tune in signals with 10 Hz accuracy. Includes AC power supply (or use 12 VDC); RS-232 and TTL serial ports work with virtually any computer.
MFJ-1278 ..... **$280**
MFJ-1289 software for IBM computers **$60**
MFJ-1282B software for Commodore 64/128 computers **$40**

Two-Meter Portable 3-Element Beam

Up or down in seconds, antenna elements screw into the boom. Can be mounted on end or center of 2½ foot boom. Elements and boom constructed of aluminum and mounts to mast or leg of a tower with a single included U-bolt. Boom is 30½" × 1¾" × 1¼". Weight 2 lbs.
MFJ-1763 ..... **$40**

MFJ Pocket Roll-Up

Two meter halfwave Vertical J antenna. Comes with BNC connector. Omni-directional with gain over a ¼ wave. For handhelds.
MFJ-1730 ..... **$15**

MFJ-1740

The model MFJ-1740 is a shunt feed 300 watt ¼ wave ground plane antenna for 2 Meters. It minimizes feedline radiation for more useful radiated power, reduced TVI and noise pickup by the coax shield. The unit utilizes a low loss ceramic antenna insulator for maximum radiated power. It can be mounted easily to any 1" to 1½" mast using a single U-bolt. The MFJ-1740 can be cut for 220 or 440 MHz operation. A Cutting Chart is included.
MFJ-1740 ..... **$13**

5/8 Wave Ground Plane 2-Meter Antenna

Shunt fed matching network. Low SWR over entire 2 meter band. Ceramic antenna insulator for low RF loss. Fits masts 1-1½" with included single U-bolt.
MFJ-1748 ..... **$20**
MFJ-1752 (for 220 MHz) **$20**

AC Line Monitor

Plugs into AC socket and shows line voltage. Voltage scale reads from 95-135 volts. 2¼" × 2¼" × 1½".
MFJ-850 ..... **$20**

Multiple DC Power Outlet

Eight pairs of binding posts. Switch, fuse. DC volts meter. Dimensions 13¼"

× 2⅝" × 2". Connect unit to 12 VDC power supply and get 6 DC outlets for accessories.
MFJ-1116 ..... **$45**

Microcraft Corportion

Code Scanner

Copies Morse, Baudot and ASCII code. Characters displayed on built-in LCD. Auto speed tracking 3-70 WPM, built-in code practice oscillator, Morse alphabet in practice mode, digital and analog filtering 16dB AGC, tuning LED and speaker. Character display 32 characters. Power 12 VDC (adapter not included) or 120 VAC (adapter included). Dimensions (HWD) 5¾" × 3½" × 1⅛". Weight 8 oz ... **$189**

Code Star

All-mode code reader with built-in code practice oscillator, copies Morse, Baudot and ASCII codes, digital and analog filtering with 16dB AGC, auto speed tracking 3-70 WPM, tuning LED. Use with Commodore VIC-20 computer to print out incoming code on video screen. Readout: 8 character, 14 segment alphanumeric. Power 12 VDC (adapter not included) or provided 120 VAC. Dimensions (HWD) approx. 3½" × 7½" × 5¾". Weight 2 lbs.
Code Star (kit) **$130**
Code Star (wired) **$170**

Mirage/KLM

B23s 2 Meter All Mode Amplifier

FM, SSB and CW, automatic changeover. Frequency coverage 144-148 MHz. RF power in: 100mW to 5W, RF Power out: 30W (2 in - 30 out) Power 13.6 VDC, 5 amps. Dimensions (HWD) 2¼" × 4¾" × 4". Weight 1¼ lbs **$80**

Mobile Mark, Inc.

RM Series Antennas for Amateur Use

RM series with 3dB gain, brass coil fittings, quick disconnect mechanism standard on all models, spring loaded center contactor, neoprene O-ring, grounded coil for noise/static suppression. Frequency range 136-225 MHz, Power 200W, Bandwidth/VSWR 8 MHz for 1.5:1 typical, nominal impedance 50 Ohms. Constructed of stainless steel, whip length (at lowest frequency) 49", coil material ABS plastic with brass fittings.
RM Series Antennas ..... **$45 to $50**

Mosley Electronics, Inc.

Super 5/8 Wave

Two meter antenna, omni-directional vertically polarized antenna. Constructed of aluminum, four ground radials. Impedance 52 Ohms, Power rating 1KW FM/CW, 2KW PEP SSB. Fits masts up to 1 1/2" OD. Gain 3.4dB compared to 1/4 wave ground plane. Weight 1 3/4 lbs. Height 4 feet. VSWR 1.5:1 or better **$52**

A-311-S

CB 3-element beam antenna. Boom length 12 feet. Maximum element length 18'5". Front-to-back ratio 20dB. Vertical wind load 60 lbs. Forward gain 8dB compared to reference dipole. Feed point impedance is 52 Ohms, radiation is uni-directional. Shipping weight 14 lbs. . . **$185**

A-56S

Five element, 6-meter yagi antenna. Forward gain 11dB, front-to-back ratio 20dB, SWR 1.1, Maximum element length 9' 8 3/4". Windload 38 lbs. Turning radius 8'5". Assembled weight 11 1/2 lbs. . . **$180**

MoTron Electronics

Touch-tone Decoder/Display & ASCII Converter Board

Decodes and displays all 15 DTMF digits and provides an ASCII serial output. Digits displayed on 8 LEDs, 32 character memory can be scrolled. Accepts almost any audio source; scanner, tape recorder, telephone answering machine, etc. Serial output can be connected to computer. IBM software included for displaying, storing and/or printing time, date and number for automatic logging. Board size: 6 × 2 3/8". Serial output 1200 baud, 8 data bits, no parity. 110 VAC to 12 VDC power pack optional. Audio and computer cables optional.

TDD-8 ..... **$99**

NCG Companies

NCG-1422B Antenna

Comet brand Dual band, 146/220 MHz ham antenna for base use. 1/2 wave on 146 MHz and 2/15dB gain; 5/8 wave on 220 MHz and 3.4dB gain. Impedance 50 ohms, VSWR 1.7:1 or less. Max power 200W. Length 3' × 8". Connector is UHF. Constructed of fiberglass. Weight 2 1/2 lbs **$120**

Naval Electronics

Amplified Speaker

For use with handheld radios, model is compact with 3 1/2 inch speaker and 10dB internal amplifier. Includes built-in NiCd battery charger and auto shut-off feature that stops power to amplifier whenever there is no input audio. When manually switched off, amplifier is by-passed and input jack is connected directly to speaker. Uses positive or negative ground and includes remote jack for recording. Also has level control, which, once adjusted, is set by transceiver volume control. Power from internal batteries or any external 6–15 VDC through a DC jack **$30**

Newtronics Antenna Corporation

Hustler Antennas

Many antennas for 2 and 6 meter applications, including G-3754 for 6 meters, that is a fixed antenna and features 4.2dB gain. Length is 9'2". DC grounded for lightning protection. Power 300W. Bandwidth 1 MHz. Shunt fed. Wind survival 100 mph and fits masts up to 1 1/4".

G-3754 ..... **$110**

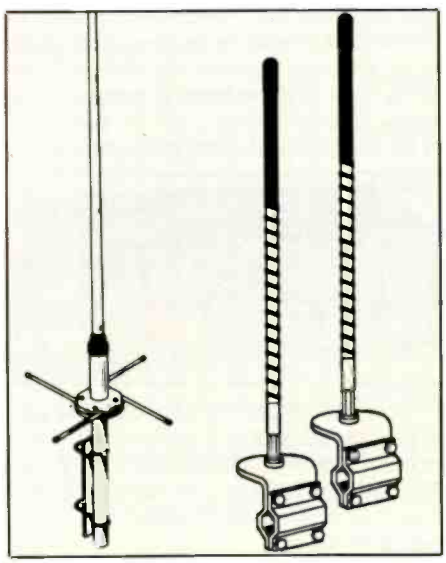
G7-220

Fixed base antenna for 220 MHz with 7dB omnidirectional gain. DC-grounded radiator. Power 1KW FM, Length 10'2". Impedance 50 Ohms. Connector is "N" type and requires mast up to 1 3/4" OD. SWR 1.2:1 at resonance. Weight 7 lbs.

G7-220 ..... **$180**

G6-440

Fixed base antenna for 440 MHz with 6dB gain. Stacked 5/8 wave antenna constructed of fiberglass. Shunt fed/DC ground. Bandwidth 18 MHz under 2:1 VSWR. Wind survival 120 mph. Length 88". Weight 5 lbs. Frequency coverage 430-450 MHz **$170**



Antler CB and Monitor Antennas

Magnetic mount mobile CB antenna, 41", includes 15 feet of coax. One-piece plastic housing covers coil and magnet. Available in black or white.

IC-100 ..... **$22**

F-73

Dual mirror-mount CB antenna constructed of 3 foot fiberglass with high-quality aluminum. Includes 18 feet of coax **$37**

DCX

Scanner discone antenna for 40-999 MHz. Solid aluminum rod, hardware and mounting assembly included. Mounts on vertical support to 1 1/4" OD. Cone elements 55", disc elements 20". Weight 2 1/2 lbs.

DCX **$22**

DCL

Discone same as DCX, except includes 50' coax and installed PL-259 connector on one end, and monitor pin-plug on other end. Weight 4 1/2 lbs **$32**

Optoelectronics, Inc.

PC10 Counter Timer Board

Operates as stand-alone 1 MHz-2.4 GHz RF counter. Instant direct tune. Set receiver to a frequency detected by counter. Data logging and data file creation to keep records or measure frequency drift. Menu selection for units includes CPM/RPM, Hz, kHz, MHz, GHz, Sec, mS, uS and Ns. Software timebase calibration of 1ppm TCXO timebase. Windows 3.0 operating environment with fully developed operating and signal conditioning controls accessible through pull-down menus. 10 digit 10 Hz to 2.4 GHz frequency range. Measurement Period (Gate Time) continuously variable from 1 millisecond to 28 seconds. Reciprocal counting for high resolution measurement. Input sensitivity is less than 10mV from 10 Hz to over 1.6 GHz. Direct count frequencies over 200 MHz with 1 Hz resolution in 1 second **$339**

Handi-Counters

For scanner users or electronics experimenters; find frequencies with these units. Frequency range 10Hz-3 GHz. With 10-digit LCD, period, ratio, interval and signal level bargraph. Hold button locks detected frequency on display. Four pushbutton selectable Gate times. NiCd battery pack and AC adapter/charger included. Factory options include Precision ±0.2ppm 20-40 degree C temper-

Miscellaneous Accessories (cont.)

ature compensated crystal oscillator; low-power Back Light for LCD display illumination. Two-step audible signal level indicator. Improved high impedance amplifier and additional NiCd battery pack doubles operation time while battery powered. (optional battery pack not available with back light option installed).

Model 3000 ..... **$375**
Model 8030 (NiCd batteries optional - bench unit) **$579**
Model 2600 HA (1 MHz to 3 GHz) ... **$225**
Model 2810 (10 Hz to 3 GHz) **$259**
Model 2600H (1 MHz to 3 GHz) with bargraph **$325**
Model 2300 (1 MHz-2.4 GHz available with NiCds and AC charger adapter. Complete package **$128**
Model 2210A (10Hz-2.4 GHz with NiCds and AC charger/adapter **$199**

Palomar Engineers

Super-Snooper

SWL antenna for users with space restrictions. Whip should be placed outside in noise-free location. Active antenna passive matching network delivers nearly full whip antenna signal to receiver. Covers 1.6-30 MHz and MW band. Height 3 feet. Cable is optional (#20 for 30 foot cable with PL-259 connectors). Connector at antenna base is SO-239. Case is white PVC encapsulated and waterproof. All hardware is stainless steel. Whip is plated brass. Body diameter 1⅝". Weight 3½ oz. Mounting bracket supplied.

Model PA-355 Super Snooper **$40**

Loop Antenna

Eliminates interference to allow user to hear DX stations. Amplifier serves as mounting base, contains a turning capacitor to resonate loop and amplifier to boost signal and preserve the high "Q" of loop. Connects to receiver through any convenient length of coax. Six plug-in loops are available. Three cover low frequencies from 10-550 kHz. A BCB loop for 550-1500 kHz is available; a 160/80 loop is designed for noisy locations and has less noise pickup than a vertical an-

tenna. Signal pickup is considerably less than that of a full-size antenna in these bands, but low noise feature enables reception of otherwise buried signals. User must specify loop with order. Specifications: Amplifier 20dB gain. Controls: tune, on/off. Connector is SO-239. Asimuth scale 0-360 degrees in 5 degrees increments. Power: 9V battery (clip provided). Dimensions (HWD) 2¼" × 7¼" × 6".

LA-1 Loop Amplifier **$100**

Receiver preamplifier

Improves reception and reduces image and spurious response. Coverage 1.8-54 MHz. Features include up to 20dB gain. Connects between receiver and antenna. Gain is controlled by a panel knob and a 20dB attenuator can be switched in. Switch select of either of two antennas

for best reception. In "off" position antenna connects direct to receiver. Two models. Dimensions (HWD) 3" × 8½" × 5" ×. Weight I lb. Cabinet is brushed aluminum with black vinyl cover.

Model P-408 (for 115 VAC) **$160**
Model P-405 (for 9VDC) **$150**

Channel Cleaner

Designed for small portable radios to reduce unwanted stations 15-30dB. Radio is placed on platform and antenna is extended to same height as loop. Device is tuned according to directions and interference can be nulled out. No radio modification is needed. Frequency range 6-16 MHz. Power: none required. Dimensions (console) HWD 2" × ¼" × 2½". Platform: 5½" × 9" and Loop: 1½" × 17½".

Channel Cleaner SWL Loop **$80**

Amplifilter

Connects between antenna and receiver. Designed for use with antennas fed with coax feedline. Works with random wire antennas and those fed with twinline. Features include an amplifier with 20dB gain, 3 MHz highpass filter, a 30 MHz lowpass filter and 20dB attenuator. Each of the four functions has its own panel switch and indicator lamp. May be used separately or in any combination. Filters out unwanted BCB stations or VHF FM, TV and utility stations. Also 20dB attenuator reduces overload from in-band signals. For short antenna users, the 20dB amplifier boosts signals. All functions except amplifier and lamps work without optional power supply. Connectors: SO-239 for receiver and antenna. Dimensions (HWD) 1¾" × 4½" × 4¼". Cabinet is brushed aluminum panel with black vinyl cover. Amplifier frequency range is 0.1-1000 MHz.

Model PA-360 Amplifilter **$80**
Model PS-90 115 VAC Adapter **$10**

P.C. Electronics

TC70-1d Transceiver

Plug in any video camera, camcorder, VCR or computer with a composite video output to front panel 10-pin VHS jack or rear panel phono jacks for both audio and video. Amateur ATV all-in-one box transceiver with following features: Sensitive GaAsfet converter tunes 420-450 MHz with 25dB gain down to your TV set on Ch. 3. Two frequency 1W PEP transmitter properly matches liner amps with adjustable internal sync stretcher and blanking level set. Full 25 kHz dev. broadcast standard 4.5 MHz sound subcarrier. Ten pin VHS color camera and RCA phono jack camcorder or VCR inputs, type N antenna input, and F TV output connectors. Transmit RF detected video outputs to camera and phono jack. In receive you see your own direct camera video at this jack. Must specify 439.25, 434.0, 427.25 or 462.25 MHz transmit frequency when ordering. One crystal included. Second add

$15. NOTE: Company sells transmitting equipment only to licensed radio amateurs verified in the Callbook for legal purposes. If newly licensed or upgraded, send copy of license **$329**

Periphex Inc.

Replacement batteries - Highest capacity ICOM, Kenwood and Yaesu replacement batteries for many models handhelds. For ICOM 2SAT, 4SAT, W2 radio family, BP-7, IC 2/3/4 AT, IC 02/03/04 AT and IC 2GAT, 4GAT, and 32AT radios. Also for Kenwood TH25AT/45AT/26AT/75AT/77AT. Many offer twice capacity of original batteries. Also for Yaesu FT23/33/73 and FT411/811/470 radio families and FT109/209/709/727 and FT103/203/703 radios.
Super Pack Batteries (prices vary)..**$59-76**

Quorum Communications, Inc.

Weather Facsimile System

Totally integrated system for reception of weather satellite images on user PC. Selection of HF NAFAX, GOES WEFAX, GOESTAP, METEOSAT, NOAA and METEOR APT (including satellite downlink frequency selection) are made under complete program control from your PC keyboard. Menu-driven program allows user to capture, store, retrieve view and print images with simple keystrokes. Images can be colorized from a palette of up to 262,000 colors when using a VGA display. System configurations capable of NAFAX reception **$399**

Radio Shack

Discone Scanner Antenna

Designed to receive frequencies between 25-1300 MHz. Also transmits effectively at 144, 220, 440, 990 and 1296 MHz. Power handling capability is 200W. Features stainless steel hardware and radiator rods with SWR of 1.5:1 over entire range. Uses standard SO-239 and PL-259 connectors. Fits masts up to 1½" diameter.
Discone 20-013 . . . . . **$60**

Coaxial Gas Tube Surge Protector

Designed to protect communications equipment from static discharge and transients that occur at your antenna. Can be use anywhere coax lead in is used. Installs outdoors and requires ground wire and 8 foot heavy-duty grounding rod, sold separately. Gas-tube element is replaceable. FSWR 1.20 Max, Insertion loss less than 0.3-0.4dB. Power handling capability: 500W PEP DC-500 MHz and 200W PEP 500 MHz-1.5 GHz. Impulse life 10 × 1000μsec, 500 amps more than 500 times.
Coaxial Gas-Tube Surge Protector 20-021 . . . . . **$20**

Ham Radio SWR/Power Meter

Compact meter designed for use on 2 meter and 70cm ham bands. Features include low insertion loss, wide range accuracy lets user measure power up to

60W, and sealed diecast aluminum enclosure. Frequency range: 140-150 and 430-450 MHz. Insertion loss 0.3dB maximum, SWR measurement up to 5:1. Dimensions approx. 2½" × 2¼" × ½". Weight approx. 5 oz.
SWR/Power Meter 19-320 . . . . . **$40**

Amplified Extension Speaker

Built-in 7.5W amplifier gives user extra volume needed for mobile installations. For CBs, scanners, cellular phones and ham radios with ⅛" external speaker jacks. Comes with 4 foot cable, hardware and mounting bracket. Eight ohms.
21-541 . . . . . **$24**

Extension Speaker

Heavy-duty speaker. Includes 10 foot cable with ⅛" mini plug. 5 W capacity. Eight ohms.
21-549 . . . . . **$14**

Dummy Load

For tuning transceivers with an SWR/Power meter or checking power measurements of coax cable. DC-500 MHz. Handles up to 100W.
Dummy Load 21-506 . . . . . **$22**

Shakespeare Electronics and Fiberglass Division

Gold Band Big Stick

Base CB antenna made of 3-sectioned fiberglass. Total 18 feet. Trimmable for exacting performance. Accepts PL-259 connector. Coax and connectors extra.
376-GB **$85**

PogoStick

Three-sectioned 18 foot base CB antenna, tunable (no cutting needed) for minimum SWR, fiberglass construction and aluminum tip section is telescoping. Inverted Tri-radial broadens bandwidth.
318-GBT **$77**

5016-3

Magnetic mount CB mobile antenna with center-loaded coil. Length 20". Two inch magnet. Comes with 12 foot cable and connector. Stainless steel construction and molded ABS loading coil . . . **$23**

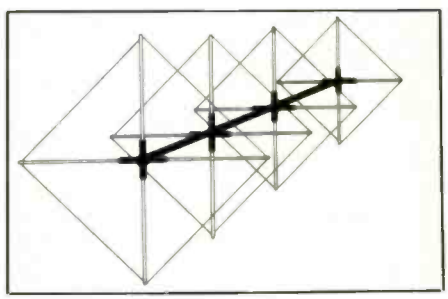
Signal Engineering

Superhawk

Base CB antenna, 2-element quad, with 10.6dB gain, front-to-back ratio of 36dB. VSWR 1.3:1. Total boom length is 5'. Constructed of aluminum. Wind survival 100 mph. Fasteners are plated for corrosion resistance and elements are full-length enamel-protected copper wire. Either horizontal or vertical polarization. Requires rotor assembly **$115**

White Lightning

Four-element quad base CB antenna with 14.6dB gain. Front-to-back ratio 38dB. Front-to-side ratio 38dB. VSWR



1.4:1, vertical or horizontal polarization. Weight 20 lbs. Wind survival 100 mph. Boom is 15' long, 2" diameter aluminum. Spreaders constructed of fiberglass, and elements are full-length enamel protected copper wire. Fasteners are all plated for corrosion resistance. Turning radius: 10'1". Requires rotor assembly . . . **$200**

Thunder 8XB

Electronically steerable base CB antenna with side rejection of 35dB and gain of 6.8dB (bidirectional) VSWR 1.5:1 maximum. Transmission line: 50 Ohm

coax (2 required) Radiation pattern is figure-8. Balun feed; connect coax lines to SO-239 connectors. No adjustment necessary and no rotor required. Height 14'7". Weight 11 lbs **$150**

Software Systems Consulting

PC SWL

Allows user to decode Morse code, RTTY, FEC, SELCAL and NAVTEX. Uses processor in your PC. Features include tuning oscilloscope, digital waveform presentations, auto calibration and code recognition, continuously tunable filter frequencies, variable shift, adjustable CW filter sensitivity and unattended capture and printing. Requires IBM/compatible computer and receiver. Product includes demodulator, digital signal processing software, reference manual, world press frequency list and audio cassette with samples **$99**

PC HF Facsimile 5.0

Complete reception system for shortwave FSK facsimile on IBM PC/compatibles. Includes an FSK demodulator, tutorial audio cassette, 250 page manual and signal processing software. Includes many of the advanced features of PC GOES/WEFAX 3.0 but less expensive.
PC HF Facsimile 5.0 . . . . . **$99**

PC GOES/WEFAX 3.0

Professional wefax image reception and analysis system for IBM PC/compatibles. Includes demodulator that handles both AM and FM fax signals, signal processing software, tutorial cassette, and 325 page manual. Software includes following features; menu driven, start/stop tone recognition, unattended operation, tuning oscilloscope, resolution up to 1280 × 800 × 256, Programmable colorization, brightness and contrast control, pixel photomery and histograms, image zoom, scroll, pan, rotation, CGA, HGA, EGA, VGA and Super VGA, orbital prediction and display, time-lapse frame looping, slide shows, export to PCX and GIF files, grayscale on all printers, programmable IOC and line rates, infrared thermal analysis, and also APT latitude and longitude grids **$250**

Somerset Electronics, Inc.

Microdec "Series"

Decodes Morse code, CW, RTTY, ASCII, AMTOR/SITOR. Basic Microdec (MD100) features include autospeed, software filter and speed display, de-

codes RTTY at 60, 67, 75 and 100 WPM (major shifts), decodes ASCII (110 and 300 baud), smart display/intensity control, on/off with volume, serial interface and code oscillator. Additionally, MD200 Plus model does same as above, but also RTTY (bit inversion), ASCII (bit inversion), AMTOR/SITOR mode A-ARQ, (and B-FEC). Model MD300 Maxim also does same as MD200, but includes a VIP50 interface adapter. NiCd batteries for portability extra $30.

Microdec MD100 Basic **$230**
Microdec MD200 Plus **$330**
Microdec MD300 Maxim **$430**

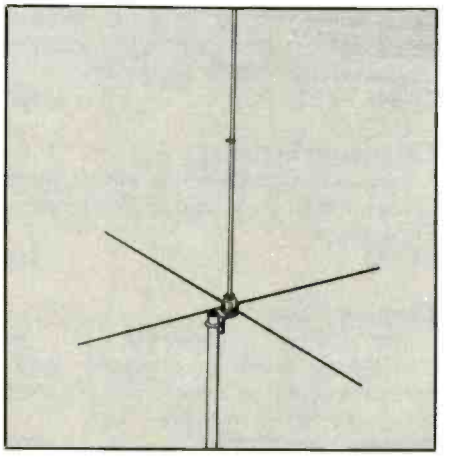
Telex Communications

GPG-2B

⅝ wave groundplane antenna for 2 meters. Omnidirectional gain of 3.4dB. Antenna is tunable from 142-168 MHz. Weight 1 lb **$48**

HG-37SS

Antenna tower with two sections. Crank-up and self supporting. Requires concrete base. Tower is constructed of all steel and is 37 feet high. Retracted



height is 20½'. Base width is 13¾". Shipping weight 265 lbs. Towers come complete with base hinge, foundation steel cage and a pre-drilled rotator mounting plate. Requires no guying and conforms to EIA specifications and Uniform Building Code. Includes freight **$2,082**

The Pouch

Washable "quick-draw" holster made for handie talkies, scanners, cordless phones and pagers. Constructed of neoprene and nylon with web belt-loop over top of unit to secure radio with a Velcro™ tab. Standard in black, but a variety of colors and camouflage design available on special order. Nine sizes available. Over 150 dealers. The Pouch, based on size, under **$20**

TNR Technical

Complete line of replacement batteries for ICOM, Kenwood, Yaesu, and Alinco transceivers. Super Packs, desk chargers, double and triple operating time. Note that there are many various types of batteries, packs, and super packs available. Also chargers and accessories.
Yaesu high-capacity packs in 500, 600, 1000, and 1400 mAh, priced at **$34-59**; Kenwood packs and super packs from **$12-65**; ICOM packs and super performance packs **$13-65**.

TRS Consultants

Receiver Control Programs

For JRC 525, NRD 535, and Kenwood R5000 receivers. Purpose is to manipulate receiver memories, not to offer keyboard control of receiver. User tunes radio directly. Programs remove the tedium of manually entering many frequencies and other settings into many receiver memories. Features include: create and manage multiple files containing lists of frequencies and descriptions, files may be edited, saved, deleted and reloaded in original or different memory channels and printed for reference. Set mode per frequency. NRD 525 and 535 versions also allows setting of bandwidth filter, AGC and attenuation. Scan memories or range of frequencies (time-based). For Kenwood R5000 version, the VS-1 Voice Synthesizer (if installed) announces frequency when scanning is paused. Poll current memory settings to create a data file. Upon stopping scanning a range of frequencies, optionally capture current receiver settings to a file. VHF support, requiring optional module (JRC CMK-165 or Kenwood VC-20) included. (The JRC NRD-535 has no VHF capability). File management includes combining multiple files into one file, renaming files and adding file names without creating the frequency file (to facilitate file-sharing with other users of the software). The JRC

NRD-535 and Kenwood R-5000 versions additionally allows manual control of the receiver, including VFO and memory selections and settings, and other control options as prescribed by the respective companies. Requires IBM/PC and close compatibles. 640KB and a fixed hard disk are required. Monochrome, CGA, EGA and VGA monitors may be used. All diskettes are 5¼".

Memory Management Receiver Control **$60**
Event Management Receiver Control (R-5000) **$75**
English Language SW Broadcast Schedules **$20**
Update service (1-year data files down-load subscription) **$25**
Schedules Update disk via mail **$5**
Utility DXer's Logbook **$20**

Trylon Manufacturing Co. Ltd.

Titan towers

Newly designed base and lower section for rugged stability. Modular design towers shipped in kit form or in factory assembled 8 foot sections. Requires crane or boom truck to erect. Alternative is "Gin Pole Method." Contact company for details.

T200 Tower is 96' **$2,500**
T400 Tower is 80' **$2,380**
T600 Tower is 64' **$2,225**
T800 Tower is 48' **$2,020**

Universal Radio Inc.

M-7000

Permits user to intercept and decode Morse code, various forms of RTTY, FDM and FAX. Simple connections to receiver and video monitor enable user to monitor with sophistication. No computer required. Features user-programmable memories, selcals, alphabets and power-on initialization of mode and speed can be set and stored in 11 user-programmable and recallable memories. Special features include auto filter tuning, auto-tune, split screen ARQ, speed readout, literal mode (displays "non-printing" control characters on screen), data bit mode, print squelch, screen saver (blanks the screen after 15 minutes of inactivity), multi-function audible tone, multiple scroll inhibit (prevents multiple line fees from wasting paper and screen room), bit inverted Baudot (allows decryption of this security code), diversity (allows diversity reception when two similar receivers are connected to unit's two audio inputs) and real time clock. Power requirements (built-in power supply, regulated and power line filtered) 115/230 VAC. Dimensions (HWD) 3½" × 16⅜" × 12¾". Weight 9 lbs. Can be modified with custom software to meet special operating conditions. Options available: rack mount brackets **$1159**

M-900

Compact decoder that copies most important SW transmission modes; CW, regular baudot RTTY, SITOR Mode A (ARQ), SITOR Mode B (FEC), FEC-A, FAX FM, variable and standard shift. Requires 12 VDC. Dimensions (HWD)3¾" ×9" × 13¼". Weight 5 lbs **$500**

Universal Manufacturing Company

Free-standing aluminum towers from 30-90" high. Bases, flat roof mounts and rotor mounts are extra.

Towers (price range) ..... **$335-$2375**
(Heavy duty towers up to $3884)

US Tower Corporation

Crank-up tubular towers from 40–85 feet handles 10 foot antenna at 50 mph winds. No guying of tower required when tower is anchored to eave of roof. Some with motor drive. Models without motor drives come standard with manual hand winches with load actuated brakes for maximum safety. Free-Standing Crank-Up Towers (price range) **$1019-6599**

W & W Associates

Replacement batteries for ICOM, Kenwood, Yaesu/Maxon. For most battery packs/inserts prices range from $18-$80. Also custom-made battery packs and inserts made to user specifications.

ICOM CM8, BP8 pack (1000 mAh 8.4 V) **$65**
ICOM BP83A (7.2V, 750 mAh) **$45**
Kenwood KNB-1 (10.8V, 500 mAh) **$40**
Kenwood PB-7 (7.2V, 1500 mAh) **$57**
Yaesu FNB-2 (11.0V, 500 mAh) **$21**
Yaesu FNB-12 (12.0V, 500 mAh) **$43**

Wilson Antenna Inc.

Wilson 1000

CB and amateur antenna (mobile) handles 3000W, silver-plated coil and internal connections, stainless steel trunk mount. Frequency range 26-30 MHz. Includes 17 foot coax cable.

1000 Trunk Lip Series **$70**
1000 Gold Series **$120**
1000 Magnetic Series (white or black) **$80**
1000 Roof Top Series (white or black) **$60**

Who's Who in Manufacturers/Importers

The following directory gives valuable information on manufacturers and/or importers of radio equipment and supplies.

Beyond being a handy source of phone numbers and addresses, it also gives you insight to a company's business longevity and size, the latter by number of employees. Moreover, you'll learn which companies sell their own products directly to end users, usually through mail order, rather than only to dealers for resale.

Another directory that follows, "Who's Who in Dealers," presents retail operations that sell radio products made or imported by companies listed here.

Company names in color have display ads in this Guide. See them for added product and services information. Many will also send free literature upon written request.

A

ARRL
225 Main Street
Newington, CT 06111
Phone: 203 666-1541; *FAX:* 203 665-7531
Established: 1914; *Employs* 120
Sells direct and through dealers.
Major Lines: Publications, including QST, QEX, National Contest Journal, ARRL Letter.

A.X.M. Inc.
11791 Loara Street
Garden Grove, CA 92640
Phone: 714 638-9556; *FAX:* 714 638-9556
Established: 1965; *Employs* 4
Sells direct and through dealers.
Major Lines: VHF UHF wide-band transceivers base and mobile antennas, ACSSB equipment.

Ace Communications
10707 E. 106th Street
Fishers, IN 46038
Phone: 800 445-7717, 317 842-7115
FAX: 317 849-8794
Established: 1986; *Employs* 12

Advanced Electronic Applications Inc. (AEA)
2006 196th St. SW
PO Box C-2160
Lynnwood, WA 98036
Phone: 206 774-5554; *FAX:* 206 775-2340
Tech. Support: 206 775-7373
Established: 1977
Sells through dealers.
Major Lines: Packet controllers, multi-mode data controllers, HF/UHF/VHF antennas, UHF/VHF handheld antennas, high speed radio modems, antenna tuners, linear amplifiers, SSTV and ATV products, CW keyers and trainers.

Advanced Radio Devices
22560 Glenn Drive
Sterling, VA 22170
Phone: 703 450-5595; *FAX:* 703 450-1865
Established: 1981; *Employs* 26
Sells through dealers.
Major Lines: Heavy-duty rotator, linear amplifiers, microprocessor controlled equipment.

Alden Electronics, Inc.
40 Washington Street
Westborough, MA 01581
Phone: 508 366-8851; *FAX:* 508-898-2427
Established: 1946; *Employs* 140
Sells direct.
Major Line: Weather chart recorder kit.

Alexander Batteries
Box 1508
Mason City, IA 50401
Phone: 800 247-1821; *Tech:* 515 423-8955
FAX: 515 423-1644
Established: 1967; *Employs* 220
Sells through dealers.
Major Lines: Portable two-way radio batteries; battery chargers; battery analyzers conditioners; portable two-way radio antennas.

Alinco Electronics, Inc.
438 Amapola Ave., Suite 130
Torrance, CA 90501
Phone: 213 618-8616; *FAX:* 213 618-8758
Established: 1985; *Employs* 7
Sells through dealers.
Major Lines: VHF & UHF mobile transceivers, HT's, linear amplifiers, roof top towers.

Alliance Rotators
Philips ECG
Baldwin Green Comman, #110
Woburn, MA 01801
Phone: 617 932-9070; *FAX:* 617 932-3553
Established: 1950; *Employs* 175
Sells direct and through dealers.
Major Line: Manufacturers of antenna rotators.

Alpha Delta Communications, Inc.
PO Box 51117
Phoenix, AZ 85076
Phone: 602 966-2200
Established: 1981
Sells direct and through dealers.
Major Lines: Lightning/EMP ceramic gas tube Transi-Trap surge protectors, lightning/emp protected DELTA-4 precision coaxial switches, HF (160 through 10 meter) NO-TRAP space-limited sloper and dipole DX SERIES wire antennas.

Aluma Tower Co., Inc.
PO Box 2806
Vero Beach, FL 32961
Phone: 407 567-3423; *FAX:* 407 567-3432
Established: 1974; *Employs* 25
Sells direct and through dealers.
Major Lines: Aluminum crank-up towers, aluminum stack towers, aluminum trailer towers, aluminum mobile van towers, tower accessories.

American Antenna Corp.
1500 Executive Drive
Elgin, IL 60123
Phone: 800 323-6768; 708 888-7200
FAX: 708 888-7094
Established: 1977; *Employs:* 125
Sells direct and through dealers.
Major Lines: Manufacturers of HF & VHF mobile antennas and accessories.

Antenna Mart
PO Box 699
Loganville, GA, 30249
Phone: 404 466-4353
Major Lines: Antenna remote switch, rotating side mount.

Antenna Specialists Co.
30500 Bruce Industrial Pkway.
Cleveland, OH 44139
Phone: 216 349-8400; *FAX:* 216 349-8407
Established: 1953; *Employs* 500
Sells through dealers.
Major Lines: Two-way mobile and base communications antennas for CB, VHF, UHF, 800 MHz, 900 MHz, cellular, marine, aviation, amateur, monitor.

Antenna Supermarket
PO Box 563
Palatine, IL 60078
Phone: 708 359-7092; *FAX:* 708 359-8161
Established: 1974
Sells: direct and through dealers.
Major Lines: SWL antennas, multi-band SWL antennas, lightning surge arrestors.

Antenna Systems, Inc.
Rt. 2 Box 478
Hillsboro, OR 97123
Phone: 503 628-3687
Established: 1987; *Employs* 4
Sells direct and through dealers.
Major Lines: Antenna products, baluns, center insulators, multiband antennas, single-band dipoles.

Antennas West
1500 North 150 West
Provo, UT 84605
Phone: 801 373-8425; Sales: 800 926-7373
FAX: 801 375-4664
Established: 1987; *Employs* 10
Sells direct and through dealers.
Major Lines: Antennas for shortwave and scanner reception, quicklaunch antenna installation systems, high-frequency antennas, emergency antenna packs, 160-10 dipole, inverted-V, sloper & shortened trapless antennas, solar power supplies for repeaters and remote/portable operation.

Antique Radio Classified
PO Box 802-C11A
Carlisle, MA 01741
Phone: 508 371-0512
Established: 1984
Sells direct.
Major Lines: Antique radio monthly magazine, books on collecting old radios.

Artsci Inc.
PO Box 1848
Burbank, CA 91507
Phone: 818 843-4080
FAX: 818 846-2298
Established: 1978; *Employs* 6
Sells direct and through dealers.
Major Lines: Modification books, license manuals, frequency book and repeater map books.

Ashton ITC
PO Box 830
Dandridge, TN 37725-0830
Phone: 615 397-0742; *FAX:* 615 397-0466
Established: 1969; *Employs* 7
Sells direct.
Major Lines: SWL and amateur radio software.

Astatic/CTI Audio, Inc.
PO Box 120
Harbor & Jackson
Conneaut, OH 44030
Phone: 216 593-1111
Sells through dealers.
Major Line: Complete line of microphones.

Austin Custom Antenna
10 Main Street
Gonic, NH 03839
Phone: 603 335-6339; *FAX:* 603 335-1756
Established: 1973; *Employs* 8
Sells direct and through dealers.
Major Lines: VHF/UHF fixed and mobile antennas, microwave and multiband-design antennas.

Azimuth Communications Corporation
3612 Alta Vista Avenue
Santa Rosa, CA 95409-4049
Phone: 800-882-7388; *Tech:* 707 577-8007
FAX: 707 573-1482
Established: 1980; *Employs:* 6
Sells direct and through dealers.
Key Employee: Merrill, K6OXU.
Major Lines: WeatherStar Computerized Weather Stations, Azimuth Awards QSL Library Albums, AwardsBase Computer Software, Azimuth world radio sphere globe with all CQ zones and radio prefixes and 24 hour station clocks.

B

B & B Instruments
408 La Cresta Heights Road
El Cajon, CA 92021
Phone: 619 579-2258; *FAX:* 619 579-8598
Established: 1985; *Employs:* 4
Sells direct and through dealers.
Major Lines: Manufacturers of electronic frequency counters for amateur, commercial and bus band radio use from 10 Hz to 1.4 GHz.

Barker and Williamson
10 Canal Street
Bristol, PA 19007
Phone: 215 788-5581; *FAX:* 215 788-9577
Established: 1932; *Employs* 25
Sells direct and through dealers.
Major Lines: HF antennas, HF amplifiers, HF antenna tuners, baluns, coax switches, filters, coils, dummyload wattmeters, plate chokes, filament chokes, antenna wire, insulators, center connectors.

Belden Wire and Cable
PO Box 1980
Richmond, IN 47375
Phone: 800-BELDEN-1; *Tech:* 317 983-5200
Established: 1902; *Employs:* 3500
Sells: direct and through dealers.
Major Lines: Broadcast cable and connectors.

Benjamin Michael Industries, Inc. (BMI)
202 Tully
Prospect Heights, IL 60070
Phone: 708 253-0463
Established: 1980
Sells direct and through dealers.
Major Lines: "NiteLogger" automatic recorder activator and military time format clocks.

Bilal Company
137 Manchester Drive
Florissant, CO 80816
Phone: 719 687-0650
Established: 1980
Sells direct and through dealers.
Major Line: Reduced-space HF Antennas.

Butternut Electronics
405 E. Market Street
Lockhart, TX 78644
Phone: 512 398-7117
Established: 1976; *Employs* 22
Sells through dealers.
Major Line: HF Antennas.

C

CQ Communications, Inc.
76 N. Broadway
Hicksville, NY 11801
Phone: 516 681-2922; *FAX:* 516 681-2926
Established: 1979; *Employs:* 41
Sells direct and through dealers.
Major Products: Publishers of CQ magazine, Popular Communications, ComputerCraft, Electronic Servicing & Technology, CQ Amateur Radio Equipment Buyer's Guide, CQ Antenna Buyer's Guide, CQ Radio Amateur (Spanish CQ) and various amateur radio books.

CRB Research Books, Inc.
PO Box 56
Commack, NY 11725
Established: 1967
Sells direct and through dealers.
Major Lines: Communications books and frequency guides.

Cellular Security Group
4 Gerring Road
Gloucester, MA 01930
Phone: 508 281-8892
Established: 1990; *Employees:* 3
Sells direct.
Major Line: VHF/UHF antennas.

Centurion International, Inc.
PO Box 82846
Lincoln, NE 68501-2846
Phone: 402 467-4491; *FAX:* 800 848-3825
Major Lines: Replacement antennas and batteries for two-way portable radios, cordless telephones and specialized OEM applications.

Cleveland Inst. of Electronics
1776 East 17 Street
Cleveland, OH 44114
Phone: 216 781-9400; 800 321-2155
Established: 1934
Major Line: Electronics education.

Cobra Electronics Group/Dynascan
6500 W. Cortland Street
Chicago, IL 60635
Phone: 312 889-8870; *FAX:* 312 794-1930
Established: 1965; *Employs:* 350
Sells through dealers.
Major Lines: CB radios, CB antennas (magnetic & lip), radio receiver scanners and radar detectors.

Command Productions
PO Box 2824
San Francisco, CA 94126
Phone: 415 332-3161
Major Line: FCC test/answer book.

ComTek
PO Box 202
Hopkinton, MA 01748
Phone: 508 529-6330
Established: 1988
Sells direct and through dealers.
Major Lines: HF/VHF/UHF antennas and accessories, phased arrays.

Cushcraft, Inc.
PO Box 4680
48 Perimeter Road
Manchester, NH 03108
Phone: 603 627-7877; *FAX:* 603 627-1764
Established: 1950
Sells through dealers.
Major Lines: HF/VHF/UHF antennas and accessories.

Custom Clocks by Mike Traffie
RR 2, Box 106 Jones Hill Road
Ashby, MA 01431
Phone: 508 386-7966

D

DGM Electronics, Inc.
901 Elmwood Avenue
Beloit, WI 53511
Phone: 608 362-0410
Established: 1971; *Employs* 5
Sells direct.
Major Lines: Radio facsimile (Weather Fax) converter, radioteletype and Morse code communications products.

DX Computing
232 Squaw Creek Road
Willow Park, TX 76087
Phone: 817 441-9188
Established: 1988; *Employs* 1
Sells direct.
Major Lines: Software for the Macintosh computer (Shortwave Navigator/Copilot/Autopilot).

DAIWA Ind. Co. Japan
(See Electronic Distributors Corp.)

Datacom, Int.
7678 Venetian St.
Miramar, FL 33023
Phone: 305 987-9505; *FAX:* 305 987-4026
Established: 1988; *Employs:* 4
Sells direct and through dealers.
Major Lines: Software and hardware to interface with radio equipment and terminal units with computers.

Datametrics, Inc.
2575 S. Bayshore Drive, Suite 8A
Coconut Grove, FL 33133
Phone: 305 856-8649; *FAX:* 305 856-8237
Sells direct by mail and through dealers.
Major Lines: Computer aided scanning systems.

Datong
(See Electronic Distributors Corp.)

Delta Loop Antennas, Inc.
PO Box 274
Weston, VT 05161
Phone: 802 824-8161
Established: 1987
Sells direct.
Major Line: HF antennas.

Delta Research
PO Box 13677
Wauwatosa, WI 53213
Phone: 414 353-4567; *Tech:* Ext. 22
Established: 1980; *Employs:* 7
Sells direct.
Major Lines: Software and interfaces for complete communication control of receivers, scanners and transceivers (MS-DOS version); repeater controller DTMF programmer software and interface (MS-DOS version).

Diamond Systems, Inc.
PO Box 48301
Niles, IL 60648
Phone: 312 763-1722
Established: 1978; *Employs:* 5
Sells direct and through dealers.
Major Lines: Publisher of Amateur Radio licensing material, computer software, books and tapes (novice through extra).

Digital Electronic Systems
565 Paul Morris Drive
Englewood, FL 34223
Phone: 813 474-9518; *Tech:* 813 474-9519
Established: 1975; *Employs:* 6
Sells through dealers.
Major Lines: Digital demodulators, commercial phone patch and custom designs.

Digital Radio Systems, Inc.
2065 Range Road
Clearwater, FL 34625
Phone: 800 999-0204; *Tech:* 813 461-0204
FAX: 813 447-4369
Established: 1987; *Employs* 10
Sells direct and through dealers.
Major Lines: Packet radio hardware and software for IBM PC and compatibles.

Drake Company, R. L.
PO Box 3006
Miamisburg, OH 45342
Phone: 800 937-2534
Service: 513 866-3211
Sells direct and through dealers.
Major Line: R8 Worldband Communications Receiver.

E

Electron Processing, Inc.
PO Box 68
Cedar, MI 49621
Phone: 616 228-7020
Established: 1984; *Employs* 10
Sells direct.
Major Lines: Receiver preamplifiers, antennas, assorted accessories for Hams and SWL's.

Electronic Distributors Corp. (EDCO)
325 Mill St. NE
Vienna, VA 22180
Phone: 703 938-8105; *FAX:* 703 938-6911
Established: 1989; *Employs:* 8
Sells through dealers.
Major Lines: Create log periodic antennas and roof top towers and rotors; DAIWA coax switches, SWR/power meters, power supplies, amplifiers; Datong audio filters; Emoto rotators; Novex hand sets, SWR/power meters, speaker mics, chargers, Nevada discone antenna.

Emoto
(See Electronic Distributors Corp.)

F

Fanon Courier
14811 Myford Road
Tustin, CA 92680
Phone: 714 669-9890; *FAX:* 714 669-1081
Established: 1955; *Employs* 30
Sells through dealer.
Major Lines: CB radios—AM/SSB mobiles, 40 ch/5W walkie talkies, VHF & UHF handheld transceivers, megaphones and pocket paging systems.

Future Scanning Systems
PO Box 654
Bartlesville, OK 74005
*Phone:*918 333-7474

G

GAP Antenna Products Inc.
6010 Bldg. J, N. Old Dixie Hwy.
Vero Beach, FL 32967
Phone: 407 778-3728
Established: 1989; *Employs:* 6
Sells direct.
Major Line: HF vertical and beam antennas utilizing GAP technology.

GRE America, Inc.
425 Harbor Blvd.
Belmont, CA 94002
Phone: 415 591-1400; 800 233-5973
FAX: 415 591-2001
Established: 1979; *Employs:* 25
Sells direct and through dealers.
Major Lines: Scanner accessories, pre-amplifiers, frequency converters, all band antennas, 900 MHz spread spectrum products and other wireless telecommunications products.

GRF Computer Services
6170 Downey Avenue
Long Beach, CA 90805
Phone: 213 531-4852
Established: 1980; *Employs:* 1
Sells through dealers.
Major Lines: N6RJ 2nd OP logging program for IBM and TS-COMM computer control of Kenwood radios.

Garant Enterprises
(See Canada Listings)

Gitlin, Scott
86-29 155th Avenue, Suite 5N
Howard Beach, NY 11414
Phone: 718 738-8943

Grove Enterprises, Inc.
140 Dog Branch Road
PO Box 98
Brasstown, NC 28902
Phone: 800 438-8155 (orders only)
Sales: 704 837-9200; Tech: 704 837-7081
FAX: 704 837-2216
Established: 1980; *Employs* 14
Sells direct and through dealers.
Major Lines: Shortwave receivers, scanners, antennas, software, receiver preselectors, preamplifiers, books and Monitoring Times magazine.

Grundig (Lextronix, Inc.)
3520 Haven Avenue, Unit L
Redwood City, CA 94063
Phone: 415 361-1611; *FAX:* 415 361-1724
Established: 1945; *Employs:* 60
Sells through dealers.
Major Line: Shortwave receivers.

H

HAL Communications Corp.
1201 W. Kenyon Road
PO Box 365
Urbana, IL 61801
Phone: 217 367-7373; *FAX:* 217 367-1701
Established: 1972; *Employs* 25
Sells direct.
Major Lines: RTTY modems and terminals, AMTOR/RTTY/CW plug-in cards for MS-DOS PCs, and other radio data communications equipment.

Hamstuff, 7-Mike
PO Box 14455
Scottsdale, AZ 85267-4455
Phone: 602 998-2418
Established: 1990; *Employs:* 1
Sells direct.
Major Lines: QSL card boxes, index dividers, Sparky and Runner T-shirts, DXers excuse shirt, wooden covers for Bencher paddles.

Hamtronics, Inc.
65 Moul Road
Hilton, NY 14468
Phone: 716 392-9430
Established: 1963
Sells direct.
Major Lines: VHF/UHF FM exciters, receivers, repeaters, PA's, preamps, RCVG & XMTG converters, autopatches & other repeater accessories, computer data links.

Heights Mfg. Co.
1721 Indian Rd.
Lapeer, MI 48446
Phone: 313 667-1700; 1 800 745-1780
Established: 1960; *Employs:* 4
Major Lines: Aluminum towers and accessories.

Heil Sound Ltd.
2 Heil Drive
Marissa, IL 62257
Phone: 618 295-3000
Established: 1966
Sells direct and through dealers.
Major Lines: Specialized audio equipment, equalizer microphones, boomset, speakers, remote base intertie, ten meter FM kits.

Hightext Publications, Inc.
7128 Miramar Road, Suite 15
San Diego, CA 92121
Phone: 619 693-5900; *FAX:* 619 693-3225

Hustler Antennas
One Newtronics Place
Mineral Wells, TX 76067
Phone: 817 325-1386; 800 327-9076
FAX: 817 328-1409
Established: 1968; *Employs* 100
Sells through dealers.
Major Line: Amateur, land-mobile, CB antennas and scanner antennas.

I

ICOM America, Inc.
2380 116th Avenue NE
Bellevue, WA 98004
Phone: 206 454-8155; *Tech:* 206 454-7619
Established: 1979
Sells through dealers.
Major Lines: HF/VHF/UHF base and mobile/handheld transceivers, 1.2GHz/144 MHz/220 MHz/440 MHz repeaters, accessories, amplifiers, power supplies, antenna tuners.
Branch: Regional Sales/Service 201
Atlanta, GA 30349
Phone: 404 991-6166
Branch: 18102 Skypark South, #52B
Irvine, CA 92714
Phone: 714 852-8026
Branch: 3071 #5 Road
Unit 9, Richmond
BC, Canada
Phone: 604 273-7400

Industrial Comm. Engineers
PO Box 18495
Indianapolis, IN 46218-0495
Orders: 1 800 423-2666; *FAX:* 317 545-9645
Customer Svc.: 317 547-1398

International Electronic Wire & Cable Co.
520 Business Center Drive
Mt. Prospect, IL 60056
Phone: 800 323-0210; *Tech:* 708 299-0021
FAX: 708 298-8433
Sells through dealers.
Major Lines: Electronic wire and cable, coaxial cable, antenna wire and rotor cable.

J

J & J Enterprises
4001 Parkway Drive
Bossier City, LA 71112
Phone: 318 631-3081 *FAX:* 318 631-3082
Established: 1989; *Employs:* 4
Sells direct.
Major Lines: Software, "SCANCAT" computer control program for Kenwood, Yaesu, Japan Radio, ICOM and AOR, receivers, scanners and transceivers.

JSC Wire & Cable
PO Box 248
Wayne, NJ 07474
Phone: 800 572-9473; *Tech:* 201 694-6200
FAX: 201 694-8297
Established: 1942; *Employs* 50
Sells: through dealers/distributors.
Major Lines: Electronic wire & cable: coaxial, 450 ohm open line, audio, instrumentation, multi conductor cables.

Japan Radio Company Ltd.
430 Park Avenue, 2nd Floor
New York, NY 10022
Phone: 212 355-1180; *FAX:* 212 319-5227
Established: 1915
Sells through dealers.
Major Lines: HF transceivers, general-coverage receivers, linear amplifiers.

Jo Gunn Enterprises
Route 1, Box 32C, Hwy. 82
Ethelsville AL 35461
Phone: 205 658-2229; *FAX:* 205 658-2259
Established: 1976; *Employs* 5
Sells direct, through distributors and dealers.
Major Lines: Mobile and base CB antennas, 10M amateur antennas, coax and accessories.

K

KAGIL Dustcovers
PO Box 86750
Portland, OR 97286
Phone: 503 774-2924
Established: 1985 ; *Employs* 3
Sells direct.
Major Line: Radio, VCR & computer dust covers.

Kantronics, Inc.
1202 E. 23rd Street
Lawrence, KS 66046
Phone: 913 842-7745; *Tech:* 913 842-4476
FAX: 913 842-2021
Established: 1971; *Employs* 45
Sells through dealers.
Major Lines: Digital data interfaces between radios & computers/terminals for packet, CW, RTTY, AMTOR, ASCII, WEFAX on HF and VHF.

Kenwood USA Corporation.
2201 E. Dominguez Street, PO Box 22745
Long Beach, CA 90801
Phone: 213 639-4200; *Tech:* 213 639-7140
BBS: 213 761-8284 (8N1, 300/1200/2400)
Established: 1975
Sells through dealers.
Major Lines: HF/VHF/UHF base, mobile, portable transceivers and receivers, amplifiers, power supplies, manual and automatic antenna tuners, external speakers for base and mobile use, SWR and RF power meters, HF mobile antenna, dual band (2m/70cm) mobile antenna, headphones, microphones, and accessories.

Key Research Co.
PO Box 846-G
Cary, NC 27512-0846
Established: 1989; *Employ:* 1
Sells direct.
Major Lines: Search and store modules for Radio Shack Pro-2004/5/6 receivers.

Kilo-Tec
PO Box 10
Oak View, CA 93022
Phone: 805 646-9645; *FAX:* 805 646-9645

Kiwa
612 South 14th Avenue
Yakima, WA 98902
Phone: 509 453-KIWA

KODE Company
Dept. K1
PO Box 29095
Dallas, TX 75229

L

Lakeview Co. Inc.
3620-9A Whitehall Road
Anderson, SC 29624
Phone: 803 226-6990
Established: 1979; *Employs* 7
Sells direct and through dealers.
Major Lines: WD4BUM mobile antennas and mounts for HF, VHF and UHF. Fixed station ground plane antennas for 10 M, UHF and VHF.

Lanz Company
3523 Dayton Avenue
Louisville, KY 40207
Phone: 502 897-2468
Sells direct and through dealers.
Major Lines: Theory study guides, code practice. For Commodore 64/128 and IBM compatibles, VCR/VHF tapes.

Larsen Electronics, Inc.
3611 NE 112th Avenue
PO Box 1799
Vancouver, WA 98668
Phone: 206 944-7551
Established: 1965; *Employs* 100 +
Sells direct and through dealers.
Major Lines: Mobile, portable and base antennas from 27 MHz to 1.3 GHz and accessories.
Branch: Canadian Larsen Electronics Ltd.
149 West 6th Avenue
Vancouver, BC, Canada, V5Y 1K3
Phone: 604 872-8517

M

M² Enterprises
7560 N. Del Mar Avenue
Fresno, CA 93711
Phone: 209 432-8873; *FAX:* 209 432-3059
Established: 1985; *Employs:* 6
Sells direct and through dealers.
Major Lines: HF, VHF and UHF antennas and antenna related products.

MFJ Enterprises, Inc.
PO Box 494
Mississippi State, MS 39762
Phone: 800 647-1800; 601 323-5869
FAX: 601 323-6551
Established: 1972; *Employs* 100
Sells direct and through dealers.
Major Lines: Antenna tuners, keyers, wattmeters, packet controllers, dummy loads, antenna bridge, noise bridge, antenna current probe, clocks, coaxial switches, filters, speaker mics, mobile speaker, telescoping antennas, interfaces, code oscillators, books, licensing, code and theory programs.

MacTrak Software
PO Box 1590
Port Orchard, WA 98366
Phone: 206 871-1111
Established: 1987; *Employs:* 1
Major Lines: Amateur Radio Software for the Macintosh Computer.

Martin Engineering, Glen
Rt. 3 Box 322
Booneville, MO 65233
Phone: 816 882-2734
Established: 1917; *Employs* 12
Sells direct.
Major Lines: Aluminum communications towers and the "Hazer" tower elevator system.

Maxcom, Inc.
1309 SW 5th Court, PO Box 502
Ft. Lauderdale, FL 33312
Phone: 305 527-5172, 305 523-6369
FAX: 305 522-8159
Established: 1982; *Employs* 5
Sells direct and through dealers.
Major Line: Automatic passive antenna matcher.

Metro West
822 N. Spring Avenue
LaGrange Park, IL 60525-1475
Phone: 708 354-2124
Established: 1988; *Employs* 4
Sells direct and through dealers.
Major Lines: Handheld scanner accessories, antennas, cords, books, batteries and Bearcat scanners.

Microcraft Corporation
PO Box 513
Thiensville, WI 53092
Phone: 414 241-8144
Established: 1978; *Employs* 10
Sells direct.
Major Lines: Code Readers: CODE*STAR and CODE SCANNER all mode decoders, Professor Morse CW trainer, digital signal processing development system, Chip Checker in circuit IC tester, tri-voltage power supply, TELESCAN, tele-radiology system.

Midland International Corp.
1690 N. Topping Avenue
Kansas City, MO 64120
Phone: 800 669-4567
Major Lines: CB radios, FM two-way 49 MHz radios, VHF marine radios, remote switches, weather monitors, antennas.

Mirage/KLM
PO Box 1000
Morgan Hill, CA 95038
Phone: 408 779-7363; *FAX:* 408 779-8845
Established: 1979; *Employs* 40
Sells through dealers.
Major Lines: Amateur radio amplifiers and antennas.

Mobile Mark, Inc.
3900-B River Road
Schiller Park, IL 60176
Phone: 708 671-6690; *FAX:* 708 671-6715
Established: 1948; *Employs:* 50
Sells through distributors and dealers.
Major Lines: Mobile antennas for cellular, trunking, UHF, VHF, and low band frequencies. Base station antennas also available in all frequency ranges.

Mosley Electronics
1344 Baur Blvd.
St. Louis, MO 63132
Phone: 800 325-4016; 314 994-7872
Established: 1940
Sells direct.
Major Lines: Beam antennas, verticals, dipoles, and mobiles for HF, VHF and UHF use.

Motron Electronics
310 Garfield St., Ste. 4
Eugene, OR 97402
Phone: 800 338-9058; Tech; 503 687-2118
FAX: 503 687-2492

N

N.C.G. Companies
1275 N. Grove Street
Anaheim, CA 92806-2114
Phone: 714 630-4541; 800 962-2611
FAX: 714 630-7024
Established: 1968; *Employs* 4
Sells through dealers.
Major Lines: US and Canadian distributor of the COMET Multi-Band Antenna Line. 900-MHz FM transceivers. Exclusive distributor for Comet Co. Ltd. antennas, phone patches.

National Amateur Radio Association
16541 Redmond Way, Suite 232
Redmond, WA 98052
Phone: 919 847-4545

Naval Electronics, Inc.
5417 Jetview Circle
Tampa, FL 33634
Phone: 813 885-6091; *FAX:* 813 885-3789
Established: 1984; *Employs* 6
Sells direct and through dealers.
Major Lines: Docking booster, HTS-1 audio booster, voice operated squelch.

Nemal Electronics Int., Inc.
12240 NE 14th Avenue
N. Miami, FL 33161
Phone: 305 893-3924; *FAX:* 305 895-8178
Established: 1977; *Employs* 15
Sells direct and through dealers.
Major Lines: Coaxial cable, connectors, transmission lines, crimping tools.

O

OFS WeatherFAX
6404 Lakerest Court
Raleigh, NC 27612
Phone: 919 847-4545

Optoelectronics, Inc.
5821 NE 14th Avenue
Ft. Lauderdale, FL 33334
Phone: 800 327-5912; 305 771-2050
FAX: 305 771-2052
Established: 1973; *Employs* 20
Sells direct and through dealers.
Major Line: Frequency counters, Universal timer-counters, active pre-selectors, cellular filters and PC-Based Universal timer-counters.

Orion Business International
7560 N. Delmar Ave.
Fresno, CA 93711-6856
Phone: 209 432-4155; *FAX:* 209 432-3059
Established: 1985
Sells through dealers.
Major Lines: Rotators and HT antennas.

Outbacker Antenna Sales
330 Cedar Glen Circle
Chattanooga, TN 37412
Phone: 615 899-3390
Sells direct.
Major Lines: Importers of mobile HF, multiband vertical antennas manufactured by Terlin Aerials of Australia.

P

P.C. Electronics
2522 Paxson Lane
Arcadia, CA 91007
Phone: 818 447-4565; *FAX:* 818 447-0489
Established: 1965; *Employs* 10
Sells direct.
Major Lines: Fast scan amateur television equipment, transmitters, transceivers, down converters, antennas, linear amps, accessories.

Pac Comm Packet Radio Systems, Inc.
3652 W. Cypress Street
Tampa, FL 33607
Phone: 800 223-3511; *Tech:* 813 874-2980
FAX: 813 872-8696; *BBS:* 813 874-3078 (300-2400, 8N)
Established: 1985; *Employs* 13
Sells direct and through dealers.
Major Lines: A broad range of packet equipment for both amateur and commercial use.

Pacific Cable Company
7325½ Reseda Blvd.
Reseda, CA 91335
Phone: 818 716-5914

Palomar Engineers
PO Box 455
Escondido, CA 92033
Phone: 619 747-3343; *FAX:* 619 747-3346
Established: 1965; *Employs* 7
Sells direct and through dealers.
Major Lines: HF whip antenna, HF directional antenna, HF preamplifiers, VLF, MF and HF loop antennas; and VLF converters.

Panasonic Company
One Panasonic Way
Secaucus, NJ 07094
Phone: 201 348-7000
Established: 1960; *Employs* 1,137
Sells through dealers.
Major Line: Multi-band portable radios.

PASS Publishing
Box 570
Stony Brook, NY 11790
Established: 1987; *Employs* 2
Sells direct.
Major Line: Motivational (visualization and autosuggestion) tapes to improve Morse code skills.

Periphex, Inc.
115-1B Hurley Road
Oxford, CT 06478
Phone: 800 634-8132; 203 264-3985
Established: 1982; *Employs* 14
Sells direct and through dealers.
Major Lines: Replacement batteries and battery packs, featuring super packs for longer operating time, for hand held radios and scanners; battery packs for cordless and cellular phones.

Q

QSL'S by W4MPY
682 Mt. Pleasant Rd.
Monetta, SC 29105
Phone: 803 685-7117 (Phone *or* FAX)
Established: 1981; *Employs* 2
Sells direct.
Major Lines: QSL cards, logbooks.

Quorum Communications
1020 S. Main St.
Grapevine, TX 76051
Phone: 817 488-4861; *FAX:* 817 481-8983
BBS: 817 421-0228
Established: 1988; *Employs* 3
Sells direct and through dealers.
Major Lines: Weather facsimile products—scan converters, receivers, down converters, preamps, antennas, feeds.

R

RF Concepts, Div. of Kantronics
PO Box 11039
Reno, NV 89510-1039
Phone: 702 324-3290; *FAX:* 702 324-3289
Established: 1987
Sells through dealers.
Major Lines: VHF all mode RF amplifiers 144-148 MHz, UHF all mode RF amplifiers 432-450 MHz, dual-band amplifiers.

RF Limited
PO Box 1124
Issaquah, WA 98027
Phone: 206 222-4295; *FAX:* 206 222-4294
Established: 1976; *Employs:* 15
Sells through dealers.
Major Lines: Inline wattmeters for amateur and CB, amateur transceivers, mobile and base microphones, base and mobile antennas.

R.F. Parts Co.
1320 Grand Avenue
San Marcos, CA 92069
Phone: 800 854-1927; 619 744-0728
Tech: 619 744-0720
Established: 1968; *Employs* 10
Sells direct.
Major Lines: Diamond Antennas VHF/UHF antennas, duplexers, wattmeters, accessories, RF power transistors for transmitters, amplifiers.

Radio Amateur Callbook Inc.
PO Box 2013
Lakewood, NJ 08701
Phone: 908 905-2961
Established: 1920
Sells direct and through dealers.
Major Lines: North American and International Callbooks, Gordon West Radio School, maps, and atlas.

The Radio Collection
PO Box 149
Briarcliff Manor, NY 10510

Radio Shack
1500 One Tandy Center
Ft. Worth, TX 76102
Phone: 817 390-3011
Established: 1921; *Employs* 39,000
Nearly 7,000 stores in the U.S.
Major Lines: Computers, scanners, antennas, transceivers, coax, plugs, jacks, parts and supplies.

Ramsey Electronics, Inc.
2575 Baird Road
Penfield, NY 14526
Phone: 716 586-3950
Established: 1976; *Employs* 27
Sells direct and through dealers.
Major Lines: Frequency counters, oscilloscopes, service monitors, hobby kits.

React International, Inc.
242 Cleveland
Wichita, KS 67214
Phone: 316 263-2100

Renaissance Development
PO Box 640
Killen, AL 35645
Phone: 205 757-5928

ROBOT Research Inc.
5636 Ruffin Road
San Diego, CA 92123
Phone: 619 279-9430; *FAX:* 619 279-7931
Established: 1969
Sells direct.
Major Line: Color SSTV converter (model 1200C only).

ROHN
PO Box 2000
Peoria, IL 61656
Phone: 309 697-4400; *FAX:* 309 697-5612
Established: 1948
Sells through dealers, distributors.
Major Line: Towers.

Rutland Arrays
1703 Warren Street
New Cumberland, PA 17070
Phone: 717 774-5298
Established: 1986; *Employs* 2
Sells direct and through dealers.
Major Lines: VHF Yagi antennas designed by K1FO, power dividers, stacking frames.

S

Sangean America, Inc.
2651 Troy Ave.
South El Monte, CA 91733
Phone: 818 579-1600; *FAX:* 818 579-6806
Established: 1965; *Employs* 18
Sells through dealers.
Major Line: Multi-band SW radio receivers.

Satellite Data Systems, Inc.
PO Box 219
Cleveland, MN 56017
Phone: 507 931-4849
Established: 1963; *Employs:* 5
Sells direct and through dealers.
Major Lines: Weather Satellite Interface Card for IBM/compatibles and software, and Quadrifilar Helix antenna for weather satellites.

Shinwa Communications of America Inc.
3501 Melcat Drive, Suite E
Oklahoma City, OK 73179
Phone: 405 686-0006; *FAX:* 405 686-0500
Established: 1988; *Employs:* 30
Sells through dealers.
Major Line: SR001-wide band receiver (25-999.999 MHz, AM, FM W and FM N.)

Shure Brothers
222 Hartrey Avenue
Evanston, IL 60202
Phone: 708 866-2200; *FAX:* 708 866-2279
Established: 1925
Sells through dealers.
Major Lines: Base station microphones, mobile communications microphones, hands-free cellular microphone systems, DTMF microphones.

Signal Engineering
2624 Fayette Drive
Mountain View, CA 94040
Phone: 415 948-3833; Tech: 415 948-3834
FAX: 415 949-5953
Established: 1973; *Employs* 8
Sells direct and through dealers.
Major Line: Antennas.

Software Systems Consulting
615 S. El Camino Real
San Clemente, CA 92672
Phone: 714 498-5784
FAX: 714 498-0568; *BBS:* 619 259-5554
Established: 1981; *Employs* 7
Sells direct and through dealers.
Major Lines: FAX, SSTV, RTTY interfaces and software, receivers and antennas.

Somerset Electronics
1290 Highway A1A
Satellite Beach, FL 32937
Phone: 1 800 678-7388
Tech./FAX: 1 407 773-8097
Sells direct and through dealers.
Major Lines: Multi Mode Decoder video/printer interface, standard and portable (battery operated).

Sony Corporation of America
1 Sony Drive
Park Ridge, NJ 07656
Phone: 517 777-5613

Spectrum International Inc.
PO Box 1084
Concord, MA 01742
Phone: 508 263-2145
Established: 1970
Sells direct and through dealers.
Major Lines: Antennas, tranverters, filters, crystal filters and accessories, converters, pre-amps.

Spi-Ro Manufacturing, Inc.
PO Box 5500
Lakeland, FL 33807
Phone: 813 646-7925
Established: 1970; *Employs* 6
Sells direct and through dealers.
Major Lines: Antennas, antenna traps, antenna connectors, insulators, transmission lines, antenna wire, antenna shorteners, limited space antennas, lightning-surge protectors, baluns, custom inter-connect coax cables, multi-band & mono-band antennas and Ferrite products.

Systems & Software
4639 Timber Ridge Drive
Dumfries, VA 22026-1059
Phone: 703 680-3559; *FAX:* 703 878-1460

T

T.D.S.
2420 Superior Dr. "B"
Pantego, TX 76013
Phone: 817 861-5864
Major Line: ATV equipment.

TRS Consultants
PO Box 2275
Vincentown, NJ 08088-2275
Phone: 609 859-2447; *FAX:* 609 859-3226
Established: 1986; *Employs:* 2
Sells direct and through dealers.
Major Lines: IBM PC software for receiver control of Japan Radio Company and Kenwood, other SWL-related software.

Telex Communications Inc.
Hy-Gain Division
9600 Aldrich Avenue South
Minneapolis, MN 55420
Phone: 612 887-5528; 612 884-4051
FAX: 612 884-0043
Established: 1936; *Employs* 1,800
Sells through dealers.
Major Lines: HF & VHF beams, HF & VHF verticals, HF dipoles, antenna accessories, antenna rotators, crank-up towers and accessories, log antennas.
Branch: Customer Service Parts
8601 E. Cornhusker Hwy.
Lincoln, NE 68505
Phone: 402 465-7021 (rotator parts); 402 465-7022 (antenna parts)
Major Lines: Rotators, antennas, towers and headset.

Telrex
PO Box 879
Asbury Park, NJ 07712
Phone: 908 775-7252
Established: 1921; *Employs* 15
Sells direct.
Major Lines: HF, VHF & UHF antennas.

Tri-Ex Tower Corp.
7182 Rasmussen Avenue
PO Box 5009
Visalia, CA 93278
Phone: 209 651-2171; *FAX:* 209 651-1739
Established: 1951; *Employs:* 65
Sells direct and through dealers.
Major Line: Manufactures and designs communication towers.
Branch: Eatontown, NJ 07724
Phone: 201 389-2222; 201 389-1311

U

US Tower Corporation
1220 Marcin Street
Visalia, CA 93291
Phone: 209 733-2438; *FAX:* 209 733-7194
Established: 1985; *Employs* 10
Sells direct and through dealers.
Major Lines: Crank-up towers, tubular and triangular towers, all sizes and accessories.

Uniden Corporation of America
4700 Amon Carter Blvd.
Ft. Worth, TX 76155
Phone: 817 858-3300; *Tech:* 317 842-2483
Established: 1979; *Employs* 470
Sells through dealers and distributors.
Major Lines: Corded & cordless telephones, TADs, cellular telephones, scanners, radar detectors, citizen band radios, satellite receivers & dishes, 2-way commercial radios, marine radios, and pagers.

United Ropeworks USA, Inc.
151 Commerce Drive
Montgomeryville, PA 18936
Phone: 215 368-6611; *FAX:* 215 362-7956
Established: 1972; *Employs* 33
Sells through dealers.
Major Line: Manufacturers of Phillystran brand non-metallic antenna tower guys.

Universal Manufacturing
43900 Groesbeck Hwy.
Mt. Clemens, MI 48043
Phone: 800 542-3450; 313 463-2560
FAX: 313 463-2964
Established 1969; *Employs* 7
Sells direct and through dealers.
Major Line: Freestanding aluminum towers.

V

Valor Enterprises
185 W. Hamilton Street
West Milton, OH 45383
Phone: 800 543-2197, 513 698-4194
FAX: 513 698-7273
Employs: 130
Sells through dealers.
Major Lines: Pro-Am brand of amateur and commercial antennas, cellular antennas, RV antennas and accessories.

Van Gorden Engineering
PO Box 21305
S. Euclid, OH 44121
Phone: 216 481-6590; *FAX:* 216 481-8329
Established: 1964. *Employs:* 7
Sells direct and through dealers.
Major Lines: Dipole antennas, shortened antennas, baluns, insulators, coils, traps, wire, feedline, and cable for amateur, SWL and commercial use.

W

W5YI Group
PO Box 565101
Dallas, TX 75356
Phone: 817 461-6443
Established: 1982; *Employs* 6
Sells direct and through dealers.
Major Lines: License study guides and practice tapes, The W5YI Report newsletter.

W9INN Antennas
PO Box 393, 811 Cathy Lane
Mt. Prospect, IL 60056
Phone: 708 394-3414
Established: 1982; *Employs* 2
Sells direct.
Major Lines: Space-restricted antennas, HF multi-band dipoles, ½ and full slopers, MARS & marine wire antennas, multi-antenna systems, remotely-tuned antenna systems, and accessories.

WA9YWY Products
907 Baxter Avenue
Superior, WI 54880
Phone: 715 394-4418
Established: 1987
Sells direct.
Major Lines: Engraved call letter plaques (glass mounted in gold colored frame), mugs and cups.

W & W Associates (Batteries "R" US)
29-11 Parsons Blvd.
Flushing, NY 11354
Phone: 800 221-0732, 718 961-2103
Established: 1975
Sells direct and through dealers.
Major Lines: Replacement battery packs for hand-held radios, cordless telephones, cellular phones, and camcorders.

West Radio School, Gordon
Published by: Radio Amateur Callbook Inc.
PO Box 2013
Lakewood, NJ 08701
Phone: 908 905-2961; *FAX:* 714 434-0666
Established: 1976
Sells direct and through dealers.
Major Lines: Amateur radio code courses on cassette tapes, radio theory books, theory cassette tapes, and Ham Classroom Instruction.

Will-Burt Co.
PO Box 900
Orrville, OH 44667
Phone: 216 682-7015; *FAX:* 216 684-1190
Established: 1918; *Employs* 250
Sells direct.
Major Line: Pneumatic telescoping antenna masts.

Who's Who in Manufacturers/Importers

Wilson Antenna, Inc.
1181 Grier Dr., Suite A
Las Vegas, NV 89119
Phone: 800 541-6116, 702 896-0399
FAX: 702 896-0409
Established: 1985
Sells through dealers.
Major Lines: Amateur and CB mobile antennas.

Worldradio, Inc.
2120 28th Street
Sacramento, CA 95818
Phone: 916-457-3655
Sells direct and through dealers.
Major Line: Publishes Worldradio, a monthly amateur radio magazine.

X

Xantek, Inc.
PO Box 834
Madison Square Station
New York, NY 10159
Established: 1981
Sells direct and through dealers.
Major Lines: DX Edge software and other communications aids.

Y

Yaesu
17210 Edwards Road
Cerritos, CA 90701
Phone: 213 404-2700; *FAX:* 213 404-1210
Established: 1956
Sells through dealers.
Major Lines: HF, VHF, UHF all-mode transceiver, VHF & UHF FM mobiles & portables, HF amplifiers, antenna tuners, portable HF transceiver, HF receivers VHF/UHF receivers, headphones, microphones, power/SWR meters, antenna rotors, computer software, power supplies, speakers, and other related accessories.

Yost E.H., & Company, Mr. Nicad
7344 Tetiva Road
Sauk City, WI 53583
Phone: 608 643-3194; *FAX:* 608 643-4439
Major Line: Batteries—NiCd sealed lead, gel cells, mercury, alkaline, lithium, etc.

Z

Zihua Software
PO Box 51601
Pacific Grove, CA 93950
Phone: 408 372-0155
Established: 1986; *Employs* 2
Sells direct and through dealers.
Major Line: Macintosh software.

CANADA

Garant Enterprises
227 County Blvd.
Thunder Bay, ON P7A 7M8, Canada
Phone: 807 767-3888; *FAX:* 807 767-0888
Established: 1963
Sells direct and through dealers.
Major Lines: Amateur radio antennas.

Interactive Image Tech., Ltd.
49 Bathurst St., Suite 401
Toronto, ON M5V 2P2, Canada
Phone: 416 361-0333
Established: 1981; *Employs:* 16
Sells direct and through dealers.
Major Lines: Electronics learning/circuit design software for IBM PC.
Branch: 908 Niagara Falls Blvd.
North Tonawanda, NY 14120-2060
Phone: 416 361-0333

North Atlantic Radio Service
PO Box I
Marion Bridge, Nova Scotia BOA1PO
Canada
Phone: 902 727-2913
Established: 1990; *Employs* 3
Sells direct
Major Lines: Shortwave receivers. North American distributor for Lowe Electronics, U.K.

Trylon Mfg. Co. Ltd.
PO Box 186
21 Howard Avenue
Elmira, ON N3B 2Z6, Canada
Phone: 519 669-5421
Established: 1960; *Employs* 50
Sells direct.
Major Lines: Self-support and guyed towers, Titan series, safety fall arrest systems, safety cable, safety rail.

FOREIGN

Klingenfuss Publications
Hagenloher Street 14
D-7400 Tuebingen, Germany
Phone: 49 7071 62830
Established: 1967
Sells direct and through dealers.
Major Lines: International reference books for radio amateurs, monitors and shortwave listeners.

Lowe Electronics
Chesterfield Road
Matlock, Derbyshire DE 4 5LE
ENGLAND
Phone: 629 580800; *FAX:* 629 580020
Established: 1974; *Employs* 32
Sells direct.
Major Line: Shortwave receivers.

Maldol Antennas
Hokushin Industry Co.
1111-1 Nagasaku-Cho
Phone: 0472-57-1581; *FAX:* 0472-59-6000
Sells through dealers.
Major Lines: Mobile and base station antennas, mounting bases for mobile stations, duplexers, SWR meters, speaker microphones, extension speakers, roof towers.

Tonna F9FT
Antennes Tonna
132. Boulevard Dauphinot
51100 Reims, France
Phone: 26-07-00-47; *FAX:* 26-02-36-54
Major Line: High-performance VHF/UHF antennas.

Who's Who in Dealers

The following directory consists of retailers who sell other makers' brands of radio products either through a retail store(s) or by mail order, or both. (Manufacturers or importers who sell only their own brands to end users are listed in the previous section, "Who's Who in Manufacturers/Importers.")

Top lines they carry are noted, as well as information concerning equipment trade-ins and on-site repairs. Additionally, the year the company was established, the number of employees, and branch store information, if any, are also indicated. Furthermore, key employee names and call signs are shown, enabling you to personalize your buying contacts.

Note that toll-free "800" telephone numbers should only be used to place a purchase order, not to gather general information, for repairs, etc. This reduces the time that other callers have to wait (it might be you!) for someone to take their order.

Company names in color have display ads in this Guide. See them for added product and services information. Many will also send free literature upon request.

A

A-B-C Communications
17550 15th Avenue NE
Seattle, WA 98108
Phone: 206 364-8300
Sells via showroom.
Top Lines: ICOM, books and all major antenna lines.

A.M.C. Sales, Inc.
9335 Lubec St., Box 928
Downey, CA 90241
Established: 1970; *Employs:* 3
Sells via mail order.
Top Lines: Long play cassette recorders, telephone recording adapters, VOX Switches, Bug detectors, telephone scramblers, hands-free telephones and voice changers.

A-TECH Electronics
2210 W. Magnolia Blvd.
Burbank, CA 91506
Phone: 818 845-9203; 818 845-9149
FAX: 818 846-2298
Established: 1987; *Employs* 5
Sells via showroom and mail order.
Key Employees: Bill, N6MQS; Tony, KB6WWI.
Top Lines: Alinco, Larsen, Comet, Mirage, Kenwood, Yaesu, ICOM, NCG, ArtSci.
Accepts trade-ins and provides repairs.

AXM Incorporated
11791 Loara St.
Garden Grove, CA 92640-2321
Phone: 714 638-8807; FAX: 714 638-9556
Established: 1976; *Employs:* 3
Sells via mail order and direct.
Key Employees: Gar, W6AXM; Sue, N6ORA; Jared KB6WCM.
Top Lines: TAD, Ranger (RCI), Ritron, Jobcom, Mobile-Marr Antennas, Larsen antennas and Centurion batteries.
Provides repairs.

Ack Radio Supply Company
3101 4th Avenue South
Birmingham, AL 35233
Phone: 205 322-0588; 800-338-4218
FAX: 205-322-0580
Established: 1947; *Employs* 5
Sells via showroom and mail order.
Key Employees: Larry N4HYX; Mike KC4OIT; Bill; Steve.
Top Lines: ICOM, Ten-Tec, MFJ, ARRL, Larsen, Vibroplex, Bencher, Hustler, DAIWA.
Accepts Trade-Ins.
Branch: 554 Deering Road
Atlanta, GA 30367
Phone: 404 351-6340; *FAX:* 404 351-1879
Key Employees: Tommy W4RRW; Jim WA4APG.

All Band Radio Products
(See Canada Listings)

All Electronics
PO Box 567
Van Nuys, CA 91408
Phone: 800 826-5432; *Tech:* 818 904-0524
FAX: 818 781-2653
Established: 1967; *Employs* 35
Sells via showroom and mailorder.
Top Lines: Full line of parts—rechargeable batteries, capacitors, semi-conductors, fuses, fasteners, lamps, optoelectronics, switches, etc.
Branches: 905 S. Vermont Avenue
Los Angeles, CA 90006
Phone: 213 380-8000
6228 Sepulveda Blvd.
Van Nuys, CA 91411
Phone: 818 997-1806

Allied Appliance & Radio
4253 S. Broadway
Englewood, CO 80110
Phone: 303 761-7305
Established: 1975; *Employs* 4
Sells via showroom and mail order.
Key Employees: Oliver, NØJBK; Sharon, NØJBG.
Top Lines: Yaesu, JRC, Grundig, Metz, Kenwood, ICOM, Ten-Tec, MFJ, Alpha-Delta, Sony, T.D. Systems, ATV Equipment, Comet.
Accepts trade-ins.

Amateur & Advanced Communications
3208 Concord Pike, Rt 202
Wilmington, DE 19803
Phone: 302 478-2757
Established: 1977; *Employs* 2
Sells via showroom and mail order.
Key Employees: Gisele, K3WAJ; Bill, WB3DPJ.
Top Lines: ARRL, Alinco, Ameritron, Cushcraft, MFJ, Ten-Tec, Alpha Delta, Hustler, Butternut, Larsen, Rohn, ProAm, Bencher, Henry, Kantronics, Astron. Shortwave Equipment, Ham Classes.
Provides repairs.

Amateur Communications, Etc.
263 Mink
San Antonio, TX 78213-3949
Phone: 512 733-0334; 512 734-7793,-7794
Established: 1969; *Employs* 2
Sells via showroom and mail order.
Key Employees: Frank, WD5GZU; Steven, KA5SWI.
Top Lines: Ten-Tec, Tempo, Alinco, MFJ, Valor, Azden, William Nye, Hustler, Ranger.
Accepts trade-ins and provides repairs.

Amateur Electronic Supply, Inc.
5710 Good Hope Road
Milwaukee, WI 53223
Phone: 800 558-0411, 414 358-0333
Established: 1957; *Employs* 39
Sells via showroom and mail order.
Key Employees: Paul, W9KHO.
Top Lines: Kenwood, Yaesu, ICOM, Cushcraft, Hy-Gain, AEA, Kantronics, Nye-Viking, MFJ, Ten-Tec, Hustler. Large used gear inventory.
Accepts trade-ins and provides repairs.

Amateur Electronic Supply, Inc.
28940 Euclid Avenue
Wickliffe, OH 44092
Phone: 800 321-3594, 216 585-7388
Employs 8
Sells via showroom and mail order.
Key Employees: Kevin, N2ABV; Dave, WB8BAG; Bob, WB8WEN; Phil, WD8AAN; Ed, N8FIN.
Top Lines: Kenwood, Yaesu, ICOM, Alinco, Cushcraft, MFJ, Hy-Gain, AEA, Kantronics and Ten-Tec.
Accepts trade-ins and provides repairs.

Amateur Electronic Supply, Inc.
621 Commonwealth Avenue
Orlando, FL 32803
Phone: 800 327-1917; 407 894-3238
Employs 11
Sells via showroom and mail order.
Key employees: Grant, K4IQW.
Top Lines: Kenwood, Yaesu, ICOM, Cushcraft, Hy-Gain, AEA, Kantronics, Nye-Viking, MFJ, Ten-Tec, Hustler. Large used gear inventory.
Accepts trades-in and provides repairs.

Amateur Electronic Supply, Inc.
1898 Drew Street
Clearwater, FL 34625
Phone: 813 461-4267; FAX: 813 443-7893
Employs 3
Sells via showroom and mail order.
Key Employees: Len, K4BDP.
Top Lines: Kenwood, Yaesu, ICOM, Cushcraft, Hy-Gain, AEA, Kantronics, Nye-Viking, MFJ, Ten-Tec. Large used gear inventory.
Accepts trade-in and provides repairs.

Amateur Electronic Supply, Inc.
1072 N. Rancho Drive
Las Vegas, NV 89106
Phone: 800 634-6227; 702 647-3114
FAX: 702 647-3412
Employs 6
Sells via showroom and mail order.
Key Employees: Squeak, AD7K.
Top Lines: Kenwood, Yaesu, ICOM, Cushcraft, Hy-Gain, AEA, Kantronics, Nye-Viking, MFJ, Ten-Tec. Large used gear inventory.
Accepts trade-ins and provides repairs.

Amateur Radio Supply, Co.
5963 Corson Avenue S. Suite #140
Seattle, WA 98108-2707
Phone: 206 767-3222; 800 457-2277
FAX: 206 763-8176
Established: 1956; *Employs* 8
Sells via showroom and mail order.
Key Employees: Austin, KB7RA; Chad, KB7HHM; Sharon, KA7GEL; Al, KW7U; Eric, N7DLV.
Top Lines: Kenwood, ICOM, Rohn, AEA, Cushcraft, Bird Wattmeters, Kantronics, Yaesu, Ten-Tec, Comet.

Amateur Radio Team Of Spokane
S. 25 Girard
Spokane, WA 99212
Phone: 509 928-3073
Established: 1976; *Employs:* 2
Sells via showroom and mail order.
Key Employees: Art, WB7AUK and Joann, KA7SUZ.
Top Lines: ICOM, Astron, International Wire, MFJ, ARRL, Van Gordon, Bencher, AEA.
Accepts trade-ins.

American Electronics
PO Box 301
173 East Broadway
Greenwood, IN 46142
Phone: 317 888-7265; 1 800 872-1373
FAX: 317 888-7368
Established: 1965; *Employs:* 10
Sells via showroom and mail order.
Key Employees: John Stiles, Susan Stiles, Jon Herndon.
Top Lines: Professional 2-way, CB, scanners, tools and electronic equipment.
Provides repairs.

Antenna Service
165 Olympia Street
Pittsburgh, PA 15211
Phone: 412 431-5171

Antennas Etc.
PO Box 215BV
Andover, MA 01810-0814
Phone: 508 475-7831; 508 975-2711
Established: 1986; *Employs* 11
Sells direct and through dealers.
Top Lines: Unadilla antennas, James Millen equipment.

Antique Electronic Supply
6221 South Maple
Tempe, AZ 85283
Phone: 602 820-5411; *FAX:* 602 820-4643
Employs: 15
Key Employee: George A. Fathaver.
Sells via mail order.
Top Lines: Vacuum tubes and parts for tube equipment.

Arnold Company
PO Box 512
Commerce, TX 75428
Phone: 214 395-2922. *FAX:* 214 395-2340.
Established: 1981; *Employs* 5.
Sells via showroom and mail order.
Key Employees: Roger; Brenda; Harlan.
Top Lines: Commander, Citizen, Amphenol, J & I, Pyramid, public domain software.
Accepts trade-ins and provides repairs.

Associated Radio Comm.
PO Box 4327 8012 Conser
Overland Park, KS 66204
Phone: 913 381-5900; *FAX:* 913 648-3020.
Established: 1945.
Sells via showroom and mail order.
Top Lines: Kenwood, ICOM, Ten-Tec, Yaesu, Kantronics, R.F. Concepts, Cushcraft, Maxrad, Hustler, B&W, NYE-Viking, Panasonic, Sangean, Uniden-Bearcat, Drake, Collins.
Accepts trade-ins and provides repairs.

Austin Amateur Radio Supply
5325 North IH-35
Austin, TX 78723
Phone: 512 454-2994; 800 423-2604.
Established: 1986.
Sells via showroom and mail order.
Top Lines: Kenwood, ICOM, Yaesu, AEA, MFJ, Astron, Cushcraft, Hustler, Butternut, Larsen, Telex-HyGain.
Provides repairs.

B

B.C. Communications, Inc.
The 211 Bldg-Depot Road
Huntington Station, NY 11746
Phone: 516 549-8833; 516 549-1277.
FAX: 516 549-8820.
Established: 1972; *Employs* 12.
Sells via showroom and mail order.
Key Employees: William, W2WBY.
Top Lines: Yaesu, MFJ, Larsen, William Nye-Viking, DAIWA, Kantronics, Astatic, Hustler-Newtronics, Valor, Mobile Mark, Bearcat, Uniden, Maxon, Mirage, B&W.
Accepts trade-ins and provides repairs.

BCD Electro
PO Box 450207
Garland, TX 75045-0207
Phone: 214 343-1770, *FAX:* 214 343-1854.
Established: 1980; *Employs* 6.
Sells via mail order.
Key Employees: Bob, KA5RDU.
Top Lines: Sprague, Bourns, Allen Bradley, TRW, Kings, Universal, National, Motorola, Intel, TI, Epson.

Barry Electronics, Corp.
512 Broadway
New York, NY 10012
Phone: 212 925-7000; *FAX:* 212 925-7001
Established: 1950; *Employs* 8
Sells via showroom and mail order.
Key Employees: Kitty, WA2BAP; Jan, KB2RV; Lew, W2BIE; Emil, N2EZZ.
Top Lines: Kenwood, Yaesu, ICOM, Bird, Nye-Viking, Hy-Gain, Motorola, AEA, MFJ, Larsen, Hy-Gain, Maxon, Uniden, Astron, B&W, Sony, Panasonic.
Provides repairs.

Base Station, Inc.
1839 East Street
Concord, CA 94520
Phone: 510 685-7388
Established: 1976; *Employs* 5
Sells via showroom and mail order.
Key Employees: Art, VE2AQV/W6; Darrin, KB6WAS.
Top Lines: Yaesu, Mirage, Cushcraft, Larsen, MFJ, AEA, Nye-Viking, Barker & Williamson, Bearcat, Uniden, Butternut, Astron, Sony, Hustler, Bencher, Astatic, Ameco, Tab Books, Gordon West Books & Tapes.
Accepts trade-ins and provides repairs.

Boucher Electronics
4813 Lexington Avenue
Erie, PA 26509

Broadcast Systems, Co.
PO Box 3536
Albuquerque, NM 87190-3536
Phone: 800 777-1412; 505 884-8235
Employs 3
Sells via showroom and mail order.
Key Employees: Dennis, WV5G; Clyde, Marietta.
Top Lines: ICOM, Hustler, Cushcraft, Antenna Specialist, MFJ, Nye-Viking, Rohn, Larsen, Budwig, Butternut.
Accepts trade-ins and provides repairs.

Burghardt Amateur Center, Inc.
PO Box 73, 182 N. Maple St.
Watertown, SD 57201-0073
Phone: 605 886-7314; 605 886-7382
FAX: 605 886-3444
Established: 1931; *Employs* 10
Sells via showroom and mail order.
Key Employees: Darrell, WD0GDF; Tim, WD0FKC; Stan, W0IT; Jim, WB0MJY and David, KA0JDN.
Top Lines: Kenwood, ICOM, Yaesu, AEA, Kantronics, Astron, Ten-Tec, Barker & Williamson, Cushcraft, Telex, MFJ.
Accepts trade-ins and provides repairs.

Burk Electronics
35 N. Kensington
LaGrange, IL 60525
Phone: 708 482-9310
Established: 1983; *Employs:* 5
Sells via mail order.
Key Employees: Wayne NA9B; Ann KA9TAC, Jeff, Maria, James.
Top Lines: AEA, Ameritron, Ameco, Antenna Specialist, Antler, ARRL Publications, Bencher, Butternut, Comet, Diamond, Hustler, Larsen, Lunar, Maxrad, Mobile Mark, MFJ, Radio Amateur Callbook, Radio Publications, Pyramid, Sams, Smiley Antenna, TAB Books, Valor, Wintenna, Yaesu.
Accepts trade-ins, provides repairs and technical assistance.

C

C.A.T.S.
7368 S.R. 105
Pemberville, OH 43450
Phone: 419 352-4465
Established: 1980; *Employs* 4
Sells via mail order.
Key Employee: Craig, N8DJB.
Major Lines: Parts and service on all American rotators, Hy-Gain/CDE, Alliance and Channel Master, cable, wire and rotator accessories.
Accepts trade-ins.

CBC International, Inc.
PO Box 31500
Phoenix, AZ 85046
FAX: 602 996-8700
Established: 1976; *Employs* 3
Sells via mail order.
Key Employees: Lou, K6NH.
Top Lines: CB-to-ham radio modification, plans and hardware; FM conversion kits, books, plans, high-performance CB accessories.

C-Comm
6115 15th Avenue NW
Seattle, WA 98107
Phone: 800 426-6528; 206 784-7337
FAX: 206 784-0541
Established: 1976; *Employs* 8
Sells via showroom and mail order.
Key Employees: Frank, K7DS; George, K7HBN; Joe, NY7X; Dan, N7PSH and Dale, W7GAB.
Top Lines: ICOM, Kenwood, Yaesu, Ten-Tec, AEA, Cushcraft, Telex/Hy-Gain, Astron, Hustler, Larsen.
Provides repairs.

C & S Sales
1245 Rosewood Avenue
Deerfield, IL 60015
Phone: 800 292-7711; 708 541-3800
FAX: 708 520-0085
Established: 1985; *Employs* 5
Sells via mail order.
Key Employees: Jim, Nate.
Top Lines: John Fluke, B&K Precision, Elenco, Hitachi test equipment, and standard amateur radio products.
Provides repairs.

Colorado Comm Center
525 E. 70th Ave Suite 1W
Denver, CO 80229
Phone: 800 227-7373, 303 288-7373
Established: 1984; *Employs* 4
Sells via showroom and mail order.
Key Employees: Craig, KMØQ; Joel, KJØI, Mike, KCØSM; Russ, WYØ.
Top Lines: Kenwood, Yaesu, ICOM, AEA, MFJ, Alinco, Astron.
Accepts trade-ins and provides repairs.

Communications Data Corporation
1051 Main Street
St. Joseph, MI 49085
Phone: 616 982-0404; *FAX:* 616 982-0433
Established: 1982; *Employs* 6
Sells via showroom and mail order.
Key Employees: Duane, KX8D; Barb, N8JML.
Top Lines: Yaesu, VoCom, Vibroplex, Comet, Hustler, Ameritron, Astron, MFJ, various computer products.

Communications Electronics Inc.
Emergency Operations Center
PO Box 1045 - PC 92
Ann Arbor, MI 48106-1045
Phone: 313 996-8888; *FAX:* 313 663-8888
Established: 1923; *Employs:* 38
Sells via showroom and mail order.
Key Employees: Ken, WB8LIT; Paul, W8UO.
Top Lines: Uniden, Cobra, Shinwa, Motorola, RELM, Ranger Communications, Grundig, Sangean, Midland, Super Disk.
Provides repairs.

Comm-Pute, Inc.
1057 East 2100 South
Salt Lake City, UT 84106
Phone: 801 484-7388; 801 467-8873; 800 942-8873
Established: 1988; *Employs:* 5
Sells via showroom and mail-order.
Key Employees: Preben, K7KMZ; Tim, W7IQY. Dave, KD7UM.
Top Lines: Kenwood, Yaesu, ICOM, Cushcraft, Larsen, AEA, Kantronics, Hustler, Bencher, Diamond.
Accepts trade-ins and provides repairs.

Consolidated Electronics
705 Watervliet Avenue
Dayton, OH 45420
Phone: 800 543-3568; 513 252-5662
FAX: 513 252-4066; *Telex:* 288-299

Contact East, Inc.
335 Willow St. So.
North Andover, MA 01845
Phone: 508 682-2000, 800 225-5370
FAX: 508 688-7829
Established: 1964; *Employs* 75
Sells direct via showroom and mail order.
Top Lines: Weller, Alpha Metals, Pace, Utica, 3M, Panduit.

Copper Electronics, Inc.
3315 Gilmore Industrial Blvd.
Louisville, KY 40213
Phone: 502 968-8500; 800 626-6343
FAX: 502 968-0449
Established: 1974; *Employs* 36
Sells via showroom and mail order.
Top Lines: Cobra, Uniden, Maxon, Antenna Specialists, Valor, Computer Equipment, PC, Shortwave receivers, 2-Way radio, Watt Meters.

D

DX Radio Supply
PO Box 360
Wagontown, PA 19376
Established: 1980
Sells via mail order.
Key Employee: Larry Miller
Top Lines: National Scanning Report Magazine, complete line of all monitoring-related books. Catalog available.

DANDYS
120 North Washington
Wellington, KS 67152
Phone: 316 326-6314
Established: 1985; *Employs* 5
Key Employees: Norm, NIØS; Dana, NØFYQ.
Sells via showroom, hamfests, and mail order.
Top Lines: Ameritron, ARRL, Astron, Butternut, Kantronics, MFJ, RF Concepts, Radio Shack, TEN-TEC, Valor, AEA, Comet, Diamond.
Accepts trade-ins.

De La Hunt Electronics
Highway 34E
Park Rapids, MN 56470
Phone: 218 732-3306
Top Line: ICOM.
Accepts trade-ins.

Delaware Amateur Supply
71 Meadow Road
New Castle, DE 19720
Phone: 302 328-7728, 800 441-7008
Established: 1975; *Employs* 6
Sells via showroom and mail order.
Key Employees: Paul, WA3QPX; Rob, WA3QLS; Gail, KA3ITN.
Top Lines: Kenwood, ICOM, Yaesu, Ten-Tec, Alinco, Hy-Gain, MFJ, Cushcraft, Butternut, AEA, Kantronics, Mirage, Ameritron, Uniden, Heath, Astron, Larsen, RF Concept, Heil Sound, Hustler, Bencher, Larsen, standard amateur radio.

Dentronics
6102 Deland Road
Flushing, MI 48433
Phone: 313 659-1776; 800 722-5488
FAX: 313 659-1280
Established: 1978; *Employs* 2
Sells via showroom and mail order.
Key Employee: Dennis, WB8QWL.
Top Lines: Kantronics, AEA, MFJ, DRSI, R.F. Concepts, Pac Comm, Diamond, Sierra Computers.
Accepts trade-ins.

Doc's Communications
702 Chickamauga Avenue
Rossville, GA 30741
Phone: 404 866-2302; 404 861-5610
FAX: 404 866-6113
Established: 1975; *Employs* 7
Sells via showroom and mail order.
Key Employees: Maxine, N4ECA; Doc, KC4EV; John, WD4AQO; Pat; Clyde, K4KTC.
Top Lines: ICOM, Kenwood, Yaesu, MFJ, Larsen, Cushcraft, Astron, Ten-Tec, Ameritron.
Accepts trade-ins and provides repairs.

E

El Original Electronics
1257 East Levee
Brownsville, TX 78520
Phone: 512 546-9846, 512 542-8507
Established: 1979; *Employs* 4
Sells via showroom.
Key Employee: Emilio, XE2XES.
Top Lines: Alinco, Azden, Kenwood, ICOM, Tempo, Yaesu, Regency, Uniden.

Electro-Comm
961 E. 65th Street
Tacoma, WA 98404-2237
Phone: 206 473-9225
Established: 1984; *Employs* 3
Sells via showroom and mail order.
Key Employees: Joe, KA7DEX; Dick, WB7CRR.
Top Lines: Alinco radios, Larsen antennas, Mirage amplifiers, Astron power supplies.

Electronic Center, Inc.
2809 Ross Avenue
Dallas, TX 75201
Phone: 214 969-1936
Established: 1960; *Employs* 2
Sells via showroom, hamfest, and mail order.
Key Employees: Mike, WB5E; George, N5AXR; and Matt, KE5BJ.
Top Lines: Kenwood, ICOM, Yaesu, Rohn, Hustler, AEA, ARRL, Encomm, Larsen, MFJ, Mirage/KLM.
Accepts trade-ins and provides repairs.

Electronic Equipment Bank (EEB)
323 Mill Street NW
Vienna, VA 22180
Phone: 800 368-3270, 703 938-3350
FAX: 703 938-6911
Established: 1971; *Employs* 22
Sells via showroom and mail order.
Key Employees: Ted, AA4GM; Dick, K4EIH; Bob, K7RDH; Ken, KC4YMD; Mike N3GVA.
Top Lines: ICOM, Sony, Kenwood, Yaesu, Panasonic, Sangean, Magnavox, AOR, Bearcat.
Accepts trade-ins and provides repairs.

Helpful Hints

• Getting your antennas as high as possible will give you better reception *and* reduce interference from electrical appliances. Always remember to observe safety precautions when erecting your antenna . . . *you can be electrocuted!*

• Keep your coax cable runs as short as possible to cut down on signal loss, especially at higher frequencies where long coax lines can *substantially* reduce signal levels.

• Protect your communications equipment by installing inexpensive *properly grounded* lightning arresters between your antenna and radio. The signal loss is insignificant. Remember though, that **nothing** can protect your equipment from a direct lightning strike! It's best to completely disconnect your antenna from your equipment if electrical storms are in the area.

• Remember the Golden Rule when using your CB radio; keep channel 9 open for emergency/assistance communications and report dangerous situations to your local police.

• Did you know that you can now become an amateur radio operator **without** knowing Morse code? It's easy, and ham Fred Maia's article in our Guide tells you how.

• Shortwave broadcasters change their schedules and frequencies often. Be sure to subscribe to *Popular Communications* to stay on top of the latest changes.

• When writing to broadcast band and regional shortwave stations for QSLs, be sure to use the station's *local date AND time;* use UTC when reporting to major shortwave broadcasters and utility stations.

• One of the best ways to learn the shortwave bands is to get acquainted with band segments . . . one at a time. For example, for a few nights repeatedly tune 9500 to 9900 kHz until you become familiar with the various stations found there. That way you'll recognize an unusual signal or station.

• Use your local broadcasting station and TV news as a barometer for what's happening in the world and in your community, then tune in the news from its source on shortwave or your scanner.

• Are you taking a language in school? Listen to shortwave broadcasters in virtually any imaginable language and brush up on your listening and speaking skills.

Who's Who in Dealers (cont.)

Electronic Engineering
PO Box 337
Barrington, IL 60011
Phone: 708 540-1106

Electronic International Services
11204 Spur Wheel Lane
Rockville, MD 20854
Phone: 301 983-3033

Electronic Module
601 North Turner
Hobbs, MN 88240
Phone: 800 688-0073; 919 791-8885

Eleven Meter Communications
PO Box 3569
Poughkeepsie, NY 12603
Phone: 914 452-1614; 1 800 955-5960
Established: 1990
Sells via mail order.
Top Lines: Cobra, Uniden (Bearcat), Midland, Ranger, Regency, Maxon, Astatic, Para Dynamics, Antenna Specialists, JoGunn.
Accepts trade-ins.

Eli's Amateur Radio, Inc.
2513 SW Ninth Avenue
Ft. Lauderdale, FL 33315
Phone: 305 525-0103, 305 944-3383, 800 780-0103; *FAX:* 305 944-3383
Established: 1980; *Employs* 5
Sells via showroom and mail order.
Key Employees: Eli, AA4BK; Al, N4AXQ; Jose, WT4G.
Top Lines: ICOM, Kenwood, Cushcraft, Hustler, AEA, Kantronics, Bird, DAIWA, MFJ, Antenna Specialists.
Accepts trade-ins and provides repairs.

Erickson Communications
5456 N. Milwaukee Avenue
Chicago, IL 60630
Phone: 800 621-5802; 312 631-5181
Established: 1969; *Employs* 5
Sells via showroom and mail order.
Key Employees: Vince, KA9ZDM; Henry, WD9FTJ; Pat, WZ9H; Verne, K9TMR; Paul, KI4RL.
Top Lines: Kenwood, Yaesu, ICOM, Cushcraft, Hy-Gain, AEA, Kantronics, Nye-Viking, MFJ, Ten-Tec, Hustler.
Accepts trade-ins.

F

F & M Electronics
3520 Rockingham Road
Greensboro, NC 27407
Phone: 919 299-3437
Established: 1978; *Employs* 6
Sells via showroom and mail order.
Key Employees: Mae, KB4LMX; Frank, N4AZM.
Top Lines: ICOM, Ten-Tec, Bencher, Callbook, Ameco, MFJ, Antenna Specialists, Hustler, Lunar, Barker & Williamson, Alinco, Uniden, Alliance, Ranger, Wilson, Sangean, Butternut.
Accepts trade-ins and provides repairs.

Fair Radio Sales
1016 E. Eureka Street
Lima, OH 45802
Phone: 419 227-6573, 419 223-2196
FAX: 419 227-1313
Established: 1947; *Employs* 12
Sells via showroom and mail order.
Top Lines: Military surplus, receivers, test equipment, vacuum tubes, electronic parts.

First Call Communications (FCC)
3 Chestnut Street
Suffern, NY 10901
Phone: 800 426-8693, 914 357-7339
Top Line: US Towers.

Floyd Electronics
2213 Vandalia Street
Collinsville, IL 62234
Phone: 618 345-6448
Established: 1973; *Employs* 5
Sells via showroom and mail order.
Key Employees: Scott, N9GXQ; David Sr., W9MPD; Verda, KA9JRC; David Jr, KA9QNG and Larry, WA9KJV.
Top Lines: Amp Supply, Astron, ICOM, Kenwood, Yaesu, Alinco, Azden, Santec, Ten-Tec, Tad.
Accepts trade-ins and provides repairs.
Branch: Radio World
1656 Nevada Hwy
Boulder City, NV, 89005
Phone: 702 294-2666
Key Employees: David; Cathy, KA9SND.

G

Galaxy Electronics
PO Box 1202, 67 Eber Avenue
Akron, OH 44309
Phone: 216 376-2402
Established: 1982; *Employs* 6
Sells via mail order.
Key Employees: Robert, KA8VWR; Al, WD8KTR; Mary, Rose, Steve.
Top Lines: Uniden, AOR, Regency, Cobra, ICOM, Kenwood, Yaesu, Sony, Grundig, Sangean.
Accepts trade-ins.

Gilfer Shortwave
52 Park Avenue
Park Ridge, NJ 07656
Phone: 201 391-7887, 800 GILFER 1
Established: 1953; *Employs* 6
Sells via showroom and mail order.
Key Employee: Lee, WK2T.
Top Lines: Japan Radio Company, Datong, Dressler, Yaesu, Kenwood, Sony, Kantronics, CQ and ARRL Publications.

H

H.R. Electronics
722-24 Evanston Avenue
Muskegon, MI 49442
Phone: 616 722-2246
Established: 1978; *Employs* 3
Sells via showroom and mail order.
Key Employees: Russ, W8BXS; Sue, N8MMH; Allen.
Top Lines: Ten-Tec, ICOM, Alinco, Cushcraft, DAIWA, Hustler, Mirage/KLM, Van Gorden, Butternut, Rohn, B&W, Astron, Larsen, Spi-ro, MFJ, A/S, Grundig, ARRL, Callbooks, Bencher, Vibroplex, AEA.
Accepts trade-ins and provides repairs.

H.S.C. Electronic Supply
6819 Redwood Blvd.
Cotati, CA 94931
Phone: 707 792-2277, 707 792-2357
FAX: 707 792-0146
BBS: 707 527-7734 8N1 (300-2400)
Established: 1963; *Employs* 7
Sells via showroom and mail order.
Key Employee: George, KS6W.
Top Lines: MFJ, Larsen, Antenna Specialists, ARRL, Ameco, Call Books, software.

Ham Buerger, Inc.
417 Davisville Road
Willow Grove, PA 19090
Phone: 215 659-5900; *FAX:* 215 659-5902
Established: 1956; *Employs* 6
Sells via showroom and mail order.
Key Employees: Jeff, WB3HOF; Bob, WA3ZID.
Top Lines: ICOM, Ten-Tec, MFJ, Astatic, Hustler, Antenna Specialist, Uniden Bearcat, B&W, W2AW Baluns, RF Concepts, Bencher, Larsen, Astron, Alliance Rotators, Sangean, LMB Boxes, Code Alarm, Crime Stopper, Chemtronics, Nutone, Ademco, Cushcraft.
Accepts trade-ins and provides repairs.

Ham Radio Outlet
933 N. Euclid Street
Anaheim, CA 92801
Phone: 800 854-6046; *Local:* 714 533-7373
FAX: 714 533-9485
Established: 1971; *Employs* 15
Sells via showroom and mail order.
Key Employee: Jim, N6RJ.
Top Lines: Kenwood, ICOM, Yaesu, Alinco, US Tower, RFC, Cushcraft, MFJ, Ameritron, Standard.
Accepts trade-ins and provides repairs.

Ham Radio Outlet
6071 Buford Highway
Atlanta, GA 30340
Phone: 404 263-0700; 800 444-7927
FAX: 404 263-9548
Established: 1971; *Employs* 5
Sells via showroom and mail order.
Key Employee: Mark, KJ4VO.
Top Lines: Kenwood, ICOM, Yaesu, Alinco, US Tower, RFC, Rohn, AEA, Cushcraft, Hy-Gain, Butternut, Ten-Tec, Bird.
Accepts trade-ins.

Ham Radio Outlet
2210 Livingston Street
Oakland, CA 94606
Phone: 415 534-5757, 800 854-6046
FAX: 415 534-0729
Established: 1971; *Employs* 4
Sells via showroom and mail order.
Key Employee: Rich, WA9WYB.
Top Lines: Kenwood, ICOM, Yaesu, US Tower, RFC, Rohn, AEA, Cushcraft, Hy-Gain, Butternut, Ten-Tec, Bird.
Accepts trade-ins.

Ham Radio Outlet
1702 W. Camelback Road, Suite 4
Phoenix, AZ 85015
Phone: 602 242-3515, 800 854-6046
FAX: 602 242-3481
Established: 1971; *Employs* 5
Sells via showroom and mail order.
Key Employee: Gary, WB7SLY.
Top Lines: Kenwood, ICOM, Yaesu, US Tower, RFC, Rohn, AEA, Cushcraft, Hy-Gain, Butternut, Ten-Tec, Bird.
Accepts trade-ins.

Ham Radio Outlet
224 N. Broadway
Salem, NH 03079
Phone: 603 898-3750, 800 444-0047
FAX: 603 898-1041
Established: 1986; *Employs* 8
Sells via showroom and mail order.
Key Employee: Paul, NW1U
Top Lines: Kenwood, ICOM, Yaesu, Cushcraft, HyGain/Telex MFJ, Alinco, Ten-Tec, Rohn, Mosley, Mirage/KLM, Alliance, Kantronics, RF Concepts, TE Systems, Nye-Viking, Ameritron, AEA, Bird.

Ham Radio Outlet
5375 Kearny Villa Road
San Diego, CA 92123
Phone: 619 560-4900, 800 854-6046
FAX: 619 560-1705
Established: 1971; *Employs* 5
Sells via showroom.
Key Employee: Tom, KM6K.
Top Lines: Kenwood, ICOM, Yaesu, US Tower, RFC, Rohn, AEA, Cushcraft, Hy-Gain, Butternut, Ten-Tec, Bird.
Accepts trade-ins.

Ham Radio Outlet
6265 Sepulveda Blvd.
Van Nuys, CA 91411
Phone: 818 988-2212, 800 854-6046
FAX: 818 988-4326
Established: 1971; *Employs* 5
Sells via showroom and mail order.
Key Employee: Jon, KB6ZBI.
Top Lines: Kenwood, ICOM, Yaesu, US Tower, RFC, Rohn, AEA, Cushcraft, Hy-Gain, Butternut, Ten-Tec, Bird.
Accepts trade-ins.

Ham Radio Outlet
14803 Build America Drive, Bldg B
Woodbridge, VA 22191
Phone: 800 444-4799, 703 643-1063
FAX: 703 494-3679
Established: 1977; *Employs* 9
Sells via showroom and mail order.
Key Employee: Curtis, WB4KZL.
Top Lines: Kenwood, ICOM, Yaesu, Cushcraft, Telex/Hy-Gain, MFJ, Alinco, Ten-Tec, Rohn, Mosley, Mirage, Alliance, Kantronics, RF Concepts, TE Systems, Nye-Viking, Ameritron, AEA, Bird.
Accepts trade-ins and provides repairs.

Ham Station, Inc.
220 N. Fulton Avenue
Evansville, IN 47710
Phone: 800 729-4373, 812 422-0231
FAX: 812 422-4253
Established: 1979; *Employs* 11
Sells via showroom and mail order.
Key Employees: Dan, N9APA; Rick, WB9SAN; Mark, N9JBP.
Top Lines: ICOM, Yaesu, Ten-Tec, Hy-Gain, Cushcraft, Hustler, AEA, MFJ, Astron.
Accepts trade-ins and provides repairs.

Hamtronics/Trevose
4033 Brownsville Road
Trevose, PA 19053
Phone: 215 357-1400; 800 426-2820
FAX: 215 355-8958
Established: 1954; *Employs* 11
Sells via showroom and mail order.
Key Employees: Dave, N3TS; Sam, N3DFV; Chuck, N2FUO; Dave Jr., KA3BKG ; Gene, WA3STW, Eva, WA3USJ; Marrion, WA3VEP; Jim, KA3JSO; Mike, KA3WVZ.
Top Lines: Kenwood, Yaesu, ICOM, AEA, MFJ, Cushcraft, Hustler, Astron, Ten-Tec, JRC.
Accepts trade-ins and provides repairs.

Hardin Electronics
5635 E. Rosedale Street
Ft. Worth, TX 76112
Phone: 817 429-9761, 817 457-2200; 800 433-3203
FAX: 817 457-2429
Established: 1965; *Employs* 20
Sells via showroom and mail order.
Key Employees: Larry, WB5HMH; Jane, WB5JYN; Ron, WB5PKB; Richard, K5ZIM.
Top Lines: Kenwood, ICOM, Cushcraft, Kantronics, MFJ, Larsen, Ten-Tec, Spiro, Diamond, Ameco.
Accepts trade-ins and provides repairs.

Hatry Electronics
500 Ledyard Street
Hartford, CT 06114
Phone: 203 296-1881; *FAX:* 203 296-7110
Established: 1928; *Employs* 20
Sells via showroom and mail order.
Key Employees: Lenny, WA1VPT; Spiro, KJ1R.
Top Lines: ICOM, MFJ, B&W, Alinco, Ameco, Sangean, Van Gorden, Cushcraft, Larsen, Hustler.
Accepts trade-ins.

Heaster, Inc., Harold
84 North Timber Creek Road
Ormond Beach, FL 32174
Phone: 904 672-2878
Established: 1984; *Employs* 4
Sells via showroom and mail order.
Key Employees: Harold, KE8MR; Barb, KA8RRD; Lewis, KC4DSQ; Jeff, KA8RRE.
Top Lines: Kenwood, ICOM, Tokyo Hy-Power, Larsen Antennas & Accessories.
Accepts trade-ins and provides repairs.

Henry Radio Inc.
2050 Bundy Drive
Los Angeles, CA 90025
Phone: 800 877-7979, 213 820-1234
FAX: 213 826-7790
Established: 1941; *Employs* 51.
Sells via showroom.
Key Employees: Ray, WW6X; Fred, N6SFD; Mario, WS6C; Leo, KJ6HI; Nate, KI6IK; Andy, N6UPM and Ted, W6YEY.
Top Lines: Kenwood, ICOM, Yaesu, Henry Amps, Tempo, Astron, Bird, Hy-Gain, Cushcraft, MFJ.
Accepts trade-in and provides repairs.

Hialeah Communications
630 E. 9th Street
Hialeah, FL 33010
Phone: 305 885-9929; *FAX:* 305 888-8768
Established: 1978; *Employs* 12
Sells via showroom.
Key Employees: Sara Ciro, Rueben, Rijo.
Top Lines: ICOM, Kenwood, Yaesu, Mirage/KLM, CES, Larsen, Hustler, Cushcraft, Decibel, Bird, MFJ, Hy-Gain and all major brands.
Provides repairs.

Hirsch Sales Company
219 California Drive
Williamsville, NY 14221
Phone: 716 632-1189, 716 634-0634, 800 888-VSWR
FAX: 716 632-6304
Established: 1961; *Employs* 14
Sells via showroom and mail order.
Key Employees: Jerry, WA2ZFA; Joe; Rick; Mike, Jack.
Top Lines: All popular brands stocked.
Accepts trade-ins and provides repairs.

Hobbytronique Inc.
(See Canada Listings)

Honolulu Electronics
819 Keeaumoku Street
Honolulu, HI 96814
Phone: 808 949-5564, 808 949-5565
FAX: 808 949-1209
Established 1932; *Employs* 20
Sells via showroom and mail order.
Key Employees: Tom, KH6BM; Richard, AH6IO; Dennis, Melvin.
Top Lines: Kenwood, ICOM, Yaesu, Tri-Ex Towers, Belden Cables, Eimac Tubes, Alexander Nicad Batteries, Astron Power Supplies, KLM Antennas, AEA, Hy-Gain, MFJ, Cushcraft, Larsen, Fluke Meters, Maxrad Antennas.
Provides repairs.

Hooper Electronics
1702 Pass Road
Biloxi, MS 39531
Phone: 601 432-1100; 601 432-0584
FAX: 601 432-7651
Established: 1960; *Employs* 110
Sells via showroom and mail order.
Key Employees: Dave, WB5KDV; Bill, W5WWJ; Joyce, WB5LKC; Wayne, KB5JCI.
Top Lines: ICOM, Kenwood, AEA, MFJ, Cushcraft, Hustler, Astron, Bird, Larsen, Antenna Specialist.
Accepts trade-ins.
Branch: 1700 Terry Road
Jackson, MS 38204
Phone: 601 353-0922, 601 354-4531
FAX: 601 948-3807
Key Employee: Dave Anderson, WB5KDV.

I

International Radio & Computer
3804 South US #1
Fort Pierce, FL 34982-6620

International Radio Exchange
19 Ann Boulevard
Spring Valley, NY 10977
Phone: 800 321-1069; 914 356-4054
Established: 1989; *Employs:* 2

International Radio Systems
5001 NW 72nd Avenue
Miami, FL 33166-5622
Phone: 305 594-4313; *FAX:* 305 477-4449

J

J.R.S. Distributors, Inc.
646 W. Market Street
York, PA 17404
Phone: 717 854-8624; *FAX:* 717 854-8624
Established: 1925; *Employs* 3
Sells via showroom and mail order.
Key Employees: Jim, K3JFL; Jean, K3OAU.
Top Lines: Kenwood, ICOM, Yaesu, AEA, Bencher, Cushcraft, B&W, Butternut, Larsen, Nye-Viking, Trac, MFJ, Astron, ARRL Publications.
Accepts trade-ins and provides repairs.

Jones & Associates, Marlin P.
PO Box 12685
Lake Park, FL 33403-0685
Phone: 407 848-8236; *FAX:* 407-844-8764
Established: 1976
Sells via mail order catalogs.
Top Lines: Connectors, fans, motors, power supplies, meters, switches, knobs, LED's, semiconductors, tools, relays, lens, lasers, valves, nicads.

Juneau Electronics
8111 Glacier Hwy
Juneau, AK 99801-8035
Phone: 907 586-2260

Jun's Electronics
5563 Sepulveda Blvd.
Culver City, CA 90230
Phone: 213 390-8003, 800 882-1343
FAX: 213 390-4393
Established: 1975; *Employs* 8
Sells via showroom and mail order.
Key Employees: PJ, WA6IBY; Raul, KB6GMR; Lisia, N6YCR; Ray, KE6LE; and Rick, N6KIB.
Top Lines: ICOM, Kenwood, Yaesu, Alinco, Grundig, Mirage/KLM, RF Concepts, Astron, Ameritron, AEA.
Provides repairs.

K

K-Com
Box 82
Randolph, OH 44265
Phone: 216 325-2110

KComm, Inc.
5730 Mobud
San Antonio, TX 78238
Phone: 512 680-6110, 1 800 344-3144
Established: 1988; *Employs* 12
Sells: via showroom and mail order.
Key Employees: Craig, KB5BI; Gary, WD5DUL, Ed, KS5V, Oscar, AA5DB.
Top Lines: Kenwood, Yaesu, ICOM, Alinco, Cushcraft, Hustler, Mirage, AEA, Kantronics, DAIWA.
Accepts trade-ins and provides repairs.

KJI Electronics
66 Skytop Road
Cedar Grove, NJ 07009
Phone: 201 239-4389
Established: 1975; *Employs* 3
Sells via mailorder and hamfests.
Key Employees: Gene, K2KJI; Maryann, K2RVH.

Krueger Communications
PO Box 60
Pharr, TX 78577
Phone: 512 380-0764
Established: 1965; *Employs* 75
Sells via showroom and mail order.
Key Employees: James Krueger, A.J. Krueger, G.E. Krueger, S.D. Ogen, J.E. Hensel.
Top Lines: Uniden, Cobra, Midland, Wilson, Francis, Palomar, Turner, Astatic, Superior.
Accepts trade-ins and provides repairs.

L

LaCue Communications, Inc.
132 Village Street
Johnstown, PA 15902
Phone: 814 536-5500

LaRue Electronics
1112 Grandview Street
Scranton, PA 18509
Phone: 717 343-2124
Established: 1976; *Employs* 3
Sells via showroom and mail order.
Key Employees: Gene, K3HAM; Les, W3LPZ.
Top Lines: ICOM, Cushcraft, Bird, Astron, Amphenol, Belden, Larsen, Alpha Delta, AEA, Beckman, Weller/Xcelite.
Provides repairs.

Lentini Communications
21 Garfield Street
Newington, CT 06111
Phone: 203 666-6227, 800 666-0908
FAX: 203 667-3561
Established: 1954; *Employs* 5
Sells via showroom and mail order.
Key Employees: Alex, N1EBU; Mike, W1VLA; Bill; Jim, KA1TKG.
Top Lines: Yaesu, ICOM, Alinco, Standard, MFJ, Diamond, Cushcraft, Astron, AEA, Sony, Sangean.
Accepts trade-ins and provides repairs.

Lindsay Publications, Inc.
PO Box 12
Bradley, IL 60915
Phone: 815 468-3668

Litsche, N.E.
PO Box 191
Canandaigua, NY 14424-0191
Phone: 716 394-9099, 716 394-0148
Established: 1979; *Employs* 2
Sells via mail order.
Key Employee: Norm, KA2TYT.
Top Lines: Military surplus test equipment and radios.
Accepts trade-ins.

Longs Electronics
2700 Crestwood Blvd.
Birmingham, AL 35210
Phone: 205 956-6767

M

MacFarlane Electronic, Ltd., H.C.
(See Canada Listings)

Madison Electronics
12310 Zavalla Street
Houston, TX 77085
Phone: 713 729-7300, 800 231-3057
FAX: 713 358-0051
Established 1956; *Employs* 10
Sells via mail order.
Key Employees: Max, W5GJ; Don, K5AAD; Jim, N5DC, Ken, K5YCP; and Dave, N5LHA.
Top Lines: Kenwood, ICOM, Belden, Bird, Amphenol, B&W, industrial surplus.
Accepts trade-ins.

Maryland Radio Center
8576 Laureldale Drive
Laurel, MD 20707
Phone: 301 725-1212, 800 447-7489
FAX: 301 725-1198
Established: 1986; *Employs* 9
Sells via showroom.
Key Employees: Jerry, WA3WZF; Steve, KD3EH; Mike, WA8MCQ; Ike, WB3LRM; John, N3FNG.
Top Lines: Kenwood, Ten Tec, ICOM.
Accepts trade-ins and provides repairs.

McCarthy, N6CIO, Loraine
2775 Mesa Verde Dr. E., Ste E101
Costa Mesa, CA 92626
Phone: 714 979-CODE
Established: 1979; *Employs* 3
Sells via showroom and mail order.
Key Employee: Loraine, N6CIO.
Top Lines: Gordon West Radio School training materials, ARRL training materials, AMECO material.

McClaran Sales, Inc.
PO Box 2513
Vero Beach, FL 32961
Phone: 407 231-6464, 800 331-6186
Established: 1977; *Employs* 2
Sells via mail order.
Key Employees: Bob, W4ZGG; Lolly.
Top Lines: "Aluma" crank-up towers, mobile van towers, trailer towers, G.A.P., verticals, G.A.P. beams, phone identifiers.
Accepts trade-ins.

Memphis Amateur Electronics, Inc.
1465 Wells Station Road
Memphis, TN 38108
Phone: 800 238-6168; 901 683-9125
Established: 1966; *Employs* 8
Sells via showroom and mail order.
Key Employees: Bill, W4TNP; Marshall, KU4O; Stan, W4RMW; Ken, W4UFH.
Top Lines: Kenwood, ICOM, Ten-Tec, MFJ, Butternut, Cushcraft, Hustler, Larsen, Grundig, Van Gorden, Astron, Hy-Gain.
Accepts trade-ins and provides repairs.

Miami Radio Center Corp.
5590 W. Flagler Street
Miami, FL 33134
Phone: 305 264-8406
Established: 1970; *Employs* 6
Sells via showroom.
Key Employees: Mario, KC4DLP; Esteban, KC4DWJ; Jimi.
Top Lines: ICOM, Kenwood, Yaesu, Motorola, Azden, Tempo, Uniden Scanners, Cobra, Citizen Band, Bird, Cushcraft.
Provides repairs.

Michigan Radio
15000 E. Nine Mile Road
East Detroit, MI 48021
Phone: 313 771-4711
Established: 1980; *Employs* 6
Sells via showroom and mailorder.
Key Employees: Joe, K8IP; Box WB8B; Jerry, W8MR; Tom, KA8LSW.
Top Lines: ICOM, Yaesu, Kenwood, Alinco, Cushcraft, DAIWA, AEA, Sangean, Vibroplex, Ten-Tec.
Accepts trade-ins and provides repairs.

Mike's Electronics
1001 NW 52nd Street
Ft. Lauderdale, FL 33309
Phone: 305 491-7110, 800 427-3066
Established 1980; *Employs* 3
Sells via showroom and mail order.
Key Employees: Walt, KN4SL; Mike, WB4RFC.
Top Lines: ICOM, Sony, JRC, Rohn, Butternut, Astron, DAIWA, AOR, Nye-Viking, Yaesu, Kenwood, Cushcraft, Bencher, Hustler, AEA, Kantronics, RF, MFJ, TEKK, Ritron, Jabro, Ten-Tec, Uniden, Comet, RF Concepts, Belden.
Accepts trade-ins.

Mouser Electronics
2401 Hwy., 287 North
Manfield, TX 76063
Phone: 800 346-6873; *FAX:* 817 483-0931

N

N4EDQ Amateur Radio Sales & Service
4400 Hwy. 19A
Mt. Dora, FL 32757
Phone: 1 800 828-6433, 904 589-5576
Established: 1990; *Employs* 3
Sells via showroom and mail order.
Key Employee: Henry, N4EDQ.
Top Lines: Harris, JRC, Azden, B&W, NCG, Astron, Mosely, Comet and more.

N & G Distributing
1950 NW 94th Avenue
Miami, FL 33126
Phone: 303 592-9685
Top Lines: Heathkit, ICOM, Kenwood, Yaesu, Interconnect Spec., Astron, Hy-Gain, Cushcraft, AEA, C.E.S., Hustler, and many more.
Provides repairs.

National Tower Company
PO Box 15417
Shawnee Mission, KS 66215
Phone: 913 888-8864

North Olmsted Amateur Radio Depot
29462 Lorain Road
N. Olmsted, OH 44070
Phone: 216 777-9460
Established: 1988; *Employs:* 2
Sells through showroom and mail order.
Key Employees: Rick, K8SCI, Pauline, KA8FOE.
Top Lines: Ameritron, ARRL, DAIWA, Larsen, MFJ, Heath, Rohn Towers.
Accepts trade-ins; does repairs.

O

Ocean State Electronics
279 High Street
Westerly, RI 02891
Phone: 401 596-3080

Oklahoma Comm Center
9500 Cedar Lake Avenue., Suite 100
Oklahoma City, OK 73114
Phone: 405 478-2866, 800 765-4267
FAX: 405 478-4202
Sells via showroom and mail order.
Key Employees: Craig, WE5I; Glen, WN5J; Jim, KA5PSF; Rod, N5QKK.
Top Lines: ICOM, Ten-Tec, Yaesu, Kantronics, Cushcraft, Telex/Hy-Gain, Hustler, Diamond.

Omar Electronics
2130 GA. Hwy. 81 SW
Loganville, GA 30249
Phone: 404 466-3241, 404 466-1952
FAX: 404 466-9013
Established: 1974; *Employs* 4
Sells via showroom and mail order.
Key Employees: Omar, WA8FON; Mark, N4YHM.
Top Lines: MFJ, Alinco, ARRL-connectors, AEA, Drake, Kantronics.
Accepts trade-ins.

Omega Electronics
4209 Live Oak Road
Raleigh, NC 27604

Omni Electronics
1007 San Dario
Laredo, TX 78040
Phone: 512 722-5195, 512 722-6664, 1 800 827-6664; *FAX:* 512 722-8184
Established: 1980; *Employs* 5
Sells via showroom and mail order.
Key Employee: Eduardo, XE2HHC.
Top Lines: Alinco, ICOM, Kenwood, Yaesu, Antenna Specialists, Tempo, CES, CSI, Astron, Azden, Centurion, Hustler, Trip-Lite, Standard, Max Rad, Solarex.
Provides repairs.

P

P.A.C.E.
1720 West Wetmore Road
Tucson, AZ 85705
Phone: 602 888-3333

Page-Comm, Inc.
10935 Alder Circle
Dallas, TX 75238
Phone: 214 340-8876

Paramount Communications Elec.
PO Box 506
Dalton, OH 44618
Phone: 800 431-7777; 216 828-2071
FAX: 216 828-8308

Portland Radio Supply
234 SE Grand Avenue
Portland, OR 97214-1115
Phone: 503 233-4904
Established: 1932; *Employs* 5
Sells via showroom and mail order.
Key Employees: Joe, W7PNS; Judy; Bob, N7JXN; Mike, W7HYC.
Top Lines: ICOM, Kenwood, Yaesu, Rohn, Astron, Larsen, Hustler, B&W, ARRL, RF Concepts, MFJ.
Accepts trade-ins and provides repairs.

Q

Quad Electronics Co.
1420 N. Pace Blvd.
Pensacola, FL 32505
Phone/FAX: 904 438-3319
Established: 1978; *Employs* 2
Sells via showroom and mail order.
Key Employees: Dave, K4AKL.
Top Lines: ICOM, Kenwood, Ten-Tec, Cushcraft, Larsen, Hustler, Vibroplex, RF Concepts, Astron, Kantronics, AEA.
Provides repairs.

Quement Electronics
1000 S. Bascom Avenue
San Jose, CA 95128
Phone: 408 998-5900. *FAX:* 408 292-9920
Established: 1933
Sells via showroom and mail order.
Top Lines: ICOM, Yaesu, Larsen, Cushcraft, Telex/Hy-Gain, MFJ, Alpha Delta, B&W, Butternut, Rohn, Alinco.

R

R&D Electronics
10511 Phelps Streets
New Orleans, LA 70123
Phone: 206 364-8300
Sells via mail order.
Top Lines: Elsie Faser L/C Phase, Unit Broadband Dipoles.

R.F. Connection, The
213 N. Frederick Ave. Suite 11
Gaithersburg, MD 20877
Phone: 301 840-5477, 800 783-2666
FAX: 301 869-3680
Established: 1979; *Employs* 1
Sells via showroom and mail order.
Key Employee: Joel, KA3QPG.
Top Lines: RF connectors and coax.

R.F. Enterprises
HCR Box 43
Merrifield, MN 56465
Phone: 218 765-3254, 800 233-2482
FAX: 218 765-3308
Established: 1982; *Employs* 7
Sells via showroom and mail/telephone order.
Key Employees: George, AD0S; Ralph, K0IR.
Top Lines: Yaesu, Ten-Tec, Rohn, Cushcraft, Mirage/KLM, Butternut, Hustler, MFJ, Kantronics, ICOM, Heath, Alinco, AEA, Telex/Hy-Gain, Ameritron, Belden, Andrew, Amphenol, Astron, Heil, Diamond and Alpha Delta.
Accepts trade-ins and provides repairs.

R & L Electronics
1315 Maple Avenue
Hamilton, OH 45011
Phone: 800 221-7735, 513 868-6399
FAX: 513 868-6574
Established: 1980; *Employs* 18
Sells via showroom and mail order.
Key Employees: Larry, N8CHL; Rita, WD8POC; Troy, N8ASZ; Roger, N8EKG.
Top Lines: Yaesu, Kenwood, ICOM, MFJ, Ten-Tec, Rohn, AEA, DAIWA, Cushcraft, Hustler.
Accepts trade-ins.

R & S Electronics Ltd.
(See Canada Listings)

Radio Center USA
102 NW Business Park Lane
Kansas City, MO 64150
Phone: 800 821-7323, 816 741-8118
Established: 1980; *Employs* 9
Sells via showroom and mail order.
Key Employees: Larry, W0YY; Bill, N0CDH; Peggy, N0CNJ.
Top Lines: Kenwood, Yaesu, ICOM, AEA, MFJ, Hy-Gain, Cushcraft, Butternut, Kantronics, RF Concepts.
Accepts trade-ins and provides repairs.

Radio Center USA
12 Glen Carran Circle
Sparks, NV 89431
Phone: 800 345-5686, 702 331-7373
FAX: 702 331-3762
Established: 1986; *Employs* 3
Sells via showroom and mail order.
Key Employees: Jim, W6FHZ; Jane.
Top Lines: Kenwood, ICOM, Yaesu, AEA, MFJ, Hy-Gain, Cushcraft, Butternut, Kantronics, RF Concepts, Alinco.
Accepts trade-ins.

Radio Comm. of Charleston, Inc.
102 Farm Road
Goose Creek, SC 29445
Phone: 803 553-4101. *FAX:* 803 553-3564

Radio Inc.
1000 S. Main Street
Tulsa, OK 74119

Radio Place, The
5675A Power Inn Road
Sacramento, CA 95824
Phone: 916 387-0730; 916 387-0731
FAX: 916 387-0744
Established: 1976; *Employs:* 5
Sells via showroom and mail order.
Key Employees: Glenn, WR6O; Paul, KA6MHT; Roger, WD6CLZ; Rudy, KC6MUR; Dale, KF7MT.
Top Lines: Cobra, Uniden, Firestick, K4O, Wilson, Yaesu, Alinco, Sony, Grundig, Sangean.
Accepts trade-ins and provides repairs.

Radio Repair By Ed Kuhnley
4484 Tumbleweed Trail
Port Orange, FL 32127

Radio Wholesale Marketing
3132 Mercury Drive
Columbus, GA 31906
Phone: 404 561-7000; *FAX:* 404 568-4506
Established: 1974; *Employs* 21
Key Employee: John, WB4JUN.
Top Line: Motorola.
Accepts trade-ins and provides repairs.

Radio Works
PO Box 6159
Portsmouth, VA 23703
Phone: 804 484-0140
Established: 1984; *Employs* 4
Sells via mail order.
Key Employees: Jim, W4THU; Judy.
Top Lines: MFJ, B&W, Heil, Metz, ARRL and Radio Publications books, Spi-Ro, Ameco, Alpha-Delta, ProAm, Van Gorden, Smiley.

RadioKit
169 Jeremy Road
Pecham, NH 03076
Phone: 603 635-2235
Established: 1975; *Employs* 4
Sells via showroom and mail order.
Key Employees: Carl, KM1H; Bill, KM1N; Rick, K1BQT.
Top Lines: B&W, Ameritron, LMB, Hammond, JW Miller, Cardwell, Jackson Brothers, Micrometals, Mirage/KLM, LTA Antennas, Orion Rotators, MFJ, Ten-Tec, Rohn Towers, Create Antennas and rotators, Eimac and Penta tubes, International Wire, Radio Kit plate and filament transformers.
Provides HF amplifier repairs.

Reliable Electronics
3306 Cope Street
Anchorage, AL 99503
Phone: 907 561-5515

Rio Radio Supply, Inc.
515 S. 12th St. Box 1808
McAllen, TX 78501
Phone: 512 682-5224

Rivendell Electronics
8 Londonderry Road
Derry, NH 03038
Phone: 603 434-5371
Established 1982; *Employs* 6
Sells via showroom and mail order.
Key Employees: Joe, KC1D; Peter, KI1M; Nancy, N1CXC; Herb, AK1V; Jim, K3QIO, Marybeth.
Top Lines: ICOM, AEA, Astron, B&W, Cushcraft, Hustler, Larsen, MFJ, Rohn, Bencher.
Accepts trade-ins and provides repairs.

Rogus Electronics
250 Meriden-Waterbury Turnpike
Southington, CT 06489
Phone: 203 621-2252
Established: 1979
Key Employees: John, WA1JKR; Frank, W1FD; Joe, N1ECB; Jan, KA1NXX.
Sells via showroom and mail order.
Top Lines: Rohn Towers, Alinco, Kantronics, MFJ, Cushcraft, Butternut, B&W, Diamond.

Rosen's Electronics, Inc.
208 Logan Street
Williamson, WV 25661
Phone: 304 235-3677; *FAX:* 304 235-8038
Established: 1980; *Employs* 2
Sells via showroom and mail order.
Key Employees: Larry, WR8M; Bruce, KM4QY.
Top Lines: Azden, MFJ, Tandy Computers.
Accepts trade-ins and provides repairs.

Ross Distributing, Co.
78 S. State Street
Preston, ID 83263
Phone: 208 852-0830, 208 852-0832
FAX: 208 852-0833
Established: 1952; *Employs* 7
Sells via mail order.
Key Employees: Ross, WB7BYZ; Karen, KA7BLB; Paula, Kathy, Gae.
Top Lines: Kenwood, ICOM, Yaesu, AEA, Larsen, Kantronics, Cushcraft, Telex, MFJ, Astron, Butternut.
Accepts trade-ins and provides repairs.

S

Satellite City
2663 Country Road I
Minneapolis, MN 55112
Phone: 800 426-2891, 612 786,4475
Established: 1986; *Employs* 9
Sells via showroom and mail order.
Key Employees: Dan, KB0XC; Ron, N0KMR; Kirby, KA0ZTS, Dave, WB0SNM; Louis, KA0IPN, Denise; Maline, Dorothy and Jim, KB0GGT.
Top Lines: Yaesu, MFJ, Smiley, Butternut, Larsen, Spi-Ro, ICOM, AEA, Hustler, Kantronics, Astron, Vibroplex, Bencher, Cushcraft, Daiwa, Sony, Panasonic, Sangean, Grundig, cable and connectors.
Accepts trade-ins and provides repairs.

Scanner World USA
10 New Scotland Avenue
Albany, NY 12208
Phone: 518 436-9606

Slep Electronics
Highway 441, Franklin South
Otto, NC 28763
Phone: 704 524-7519
Established 1955; *Employs* 6
Sells via showroom and mail order.
Key Employee: Bill, W4FHY.
Top Lines: Ten-Tec, ICOM, Collins, Mirage/KLM, military surplus radios and test equipment, technical manuals, surplus parts.
Accepts trade-ins and provides repairs.

Sound Electronics
103 Arnold Blvd.
Lafayette, LA 70506
Phone: 318 984-4090

Soundnorth Electronics
1802 Highway 53
International Falls, MN 56679
Phone: 218 283-9290, 800 932-3337
Established: 1976; *Employs* 7
Sells via showroom and mail order.
Key Employees: Terry, WV0G; Gale, WV0O; Dan, WZ0A; Jami, WY0D; Mike, KB0DXW.
Top Lines: Alinco, DAIWA, NCG, Valor, ANTECO, Maxrad, JRC, T.E. Systems Amps, MFJ and all used gear.
Accepts trade-ins and provides repairs.

Spectronics Inc.
1009 Garfield Street
Oak Park, IL 60304
Phone: 708 848-6777; *FAX:* 708 848-3398
Established: 1967; *Employs:* 10
Sells via showroom and mail order.
Top Lines: Surplus two-way equipment and SW receivers, accessories for both.

Spokane Radio
S. 25 Girad
Spokane, WA 99212
Phone: 509 928-3073

Surplus Sales of Nebraska
1315 Jones Street
Omaha, NE 68102
Phone: 402 346-4750; *FAX:* 402 346-2939
Established: 1978 *Employs* 3
Sells via showroom and mail order.
Key Employee: Bob, WD0FDE.
Top Lines: B&W, RF transmitting components, connectors, Collins parts, AEA, Jackson Brothers, MicroMetals.

T

TNR Technical, Inc.
279 Douglas Avenue #1112
Altamonte Springs, FL 32714
Phone: 800 346-0601; *FAX:* 407 682-4469
Top Line: Batteries.

Tel-Com, Inc.
Electronic Communications
675 Great Road, Rt. 119
Littleton, MA 01460
Phone: 508 486-3400, 508 486-3040
Established: 1978; *Employs* 5
Sells via showroom and mail order.
Key Employees: Jim, Fred, Roy, Greg.
Top Lines: Kenwood, ICOM, Astron, Bencher, AEA, Diamond, Ameritron, Mirage/KLM, Hustler, MFJ, RF Concepts, DAIWA, Amphenol, Unadilla, Larsen, ARRL, Callbook, Cushcraft, Uniden, plus more.
Provides in-house repairs.

Texas Towers
1108 Summit Avenue Ste. 4
Plano, TX 75074
Phone: 800 272-3467, 214 422-7306
FAX: 214 881-0776
Established: 1976; *Employs* 6
Sells via showroom and mail order.
Key Employees: Gerald, K5GW; Matt.
Top Lines: Kenwood, ICOM, Yaesu, US Towers, Rohn, Telex/Hy-Gain, Cushcraft, Mirage/KLM, Butternut, Astron, AEA, Ameritron, MFJ, Nye-Viking, Kantronics, RF Concepts.

Transworld Cable Company
3958 Northlake Blvd.
Lake Park, FL 33403
Phone: 800 442-9333

Traxit
809 Quince Avenue
McAllen, TX 78501
Phone: 512 682-0844, 512 682-6559
FAX: 512 682-1658
Established: 1989; *Employs* 3
Sells via showroom and mail order.
Key Employees: Rafael, Felipe, Alfredo, Laura, Bruni.
Top Lines: Yaesu, Motorola, Larsen, Cushcraft, Hustler, Connect Systems, Astron, Uniden, Audiovox, Kantronics.
Branches: Puebla, Queretaro, Veracruz, Oaxaca, Mexico.
Key Employees: Mario, Miguel, Ricardo.

Tucker Surplus
1717 Reserve Street
Garland, TX 75042
Phone: 214 340-0631
Top Lines: Surplus Test, Military and General Equipment.

U

Universal Radio Inc.
1280 Aida Drive
Reynoldsburg, OH 43068
Phone: 614 866-4267, 800 431-3939
FAX: 614 866-2339
Established: 1942; *Employs* 15
Sells via showroom and mail order.
Key Employees: Steve, NI8F; Fred, N8EKU; Sam, N8JYV; Dave, N8FVL; Scott, KB2ARL.
Top Lines: Kenwood, ICOM, Yaesu, Japan Radio, AEA, Kantronics, Sony, Alinco, Standard, Drake.
Accepts trade-ins and provides repairs.

V

VHF Communciations
280 Tiffany Avenue
Jamestown, NY 14701
Phone: 716 664-6345; 800 752-8813 (orders only).
FAX: 716 487-0310
Established: 1971
Sells via showroom, mail order, and hamfests.
Key Employees: Gary, W2UCZ; Loretta.
Top Lines: ICOM, Unadilla, AEA, Van Gorden, Nye-Viking, Hamtronics, Leading Edge, RF Concepts, ACE Systems, ARRL, Larsen, Kantronics.
Accepts trade-ins and provides repairs.

Valley Radio Center
1522 N. 77 Sunshine Strip
Harlingen, TX 78550
Phone: 512 423-6407, 800 869-6439
FAX: 512 423-1705
Established: 1959; *Employs* 6
Sells via showroom and mail order.
Key Employees: Bob, WD5KBZ; Rick, WD5ADC; Pat, KB5AFG; Bill, WD5KBZ.
Top Lines: Kenwood, ICOM, Yaesu, Larsen, Astron, Hustler, ARRL, CES, Connect Systems, B&W, AEA, Cushcraft.
Accepts trade-ins and provides repairs.

Van Valzah Company, H.C.
1140 Hickory Trail
Downers Grove, IL 60515
Phone: 708 852-0472; *Orders:* 800 HAM-0073
FAX: 708 852-1469; *Tech line:* 800 852-8895
Established: 1981; *Employs* 3
Sells via mail order.
Key Employees: Howard, WB9IPG; Casey.
Top Lines: Cushcraft, Hustler, Antenna Specialists, Mobile Mark, MFJ, Butternut, Alpha Delta, B&W, Diamond.

W

W5YI Group, Inc.
2000 E. Randol Mill Road, Suite 608-A
Arlington, TX 76011
Phone: 817 461-6443, 817 274-0400, 800 669 9594; *FAX:* 817 548-9594
Established: 1979; *Employs* 10
Sells via mail order.
Key Employees: Fred, W5YI; Joe, AA5LD; Susan, N4IEC; Stew, AA5LX; Steve, NS5I.
Top Lines: Amateur Radio Operator License Preparation material, code tapes, study manuals, educational software, part 97 rulebooks, etc.

Western Radio Electronics
4797 Ruffner Street
San Diego, CA 92111
Phone: 619 268-4400, 800 777-4973
FAX: 619 279-7048

Williams Radio Sales
600 Lakedale Road
Colfax, NC 27235
Phone: 919 993-5881
Established: 1974; *Employs* 3
Sells via showroom, hamfests and mail order.
Key Employees: Wayne, K4MOB; Gerry, KB4SEL.
Top Lines: Alinco, Mirage/KLM, Larsen, AEA, Callbook, ARRL books, Comet.
Accepts trade-ins.

The Wireman, Inc. (Certified Communications)
261 Pittman Road
Landrum, SC 29356
Phone: 800 727-WIRE, 803 895-4195
FAX: 803 895-5811
Established: 1975; *Employs* 4
Sells via mail order.
Key Employee: Press, N8UG.
Top Lines: Wire & cable, wire antennas and accessories, baluns, kits, noise bridges.
Provides technical assistance.

Canada

All Band Radio Products
3378 CE9 Douglas Street
Victoria, BC V8L 3L3
Phone: 604 477-1829, 604 477-9665
Established: 1991; *Employs* 2
Sells via mail order.
Key Employee: W. Harold Gray.
Top Line: Grant Windom Antennas.

Atlantic Ham Radio, Ltd.
368 Wilson Avenue
Downsview, ONT M3H 1S9
Phone: 416 636-3636; *FAX:* 416 631-0747
Established: 1979; *Employs:* 14
Sells via showroom and mail order.
Key Employees: Lutz; Mike, VE3HQW; Harry, VE3LLR; Nick, VE3SEC; Mario, VE2MBZ.
Top Lines: Kenwood, ICOM, Yaesu, Sony, JRC, AEA, Kantronics, Hy-Gain, Cushcraft, MFJ.
Accepts trade-ins and provides repairs.

Com-West Radio Systems, Ltd.
8179 Main Street
Vancouver, BC V5X 3L2
Phone: 604 321-3200; *FAX:* 604 321-6560
Sells via showroom and mail order.
Key Employees: Ron, VE7XR; Bill, VE7CIM; Michael, VE7CIP; Fred, VE7EE; Stan, VE7STN.
Service: Brian, VE7BWM; Robert, VE7HBG.
Top Lines: ICOM, Kenwood, Yaesu, Cushcraft, Mirage/KLM, Larsen, AEA, Butternut, Hustler, Unadilla, Kantronics, ARRL, Astron, B&W, MFJ, Telex/HyGain, Alinco.
Accepts trade-ins and provides repairs.

Hobbytronique Inc.
8104-A Trans Canada Highway
Ville St. Laurent, Quebec H4S 1M5
Phone: 514 336-2423, 800 363-0930
FAX: 514 336-5929
Key Employees: Mel, VE2DC; Howard, VE2HNL.
Top Lines: ICOM, Kenwood, Yaesu and many others.

MacFarlane Electronic, Ltd., H.C.
R.R. #2
Battersea, ONT K0H 1H0
Phone: 613 353-2800; *FAX:* 613 353-1294
Established: 1958; *Employs:* 4
Sells via showroom and mail order.
Key Employee: Harold, VE3BPM.
Top Lines: Kenwood, Yaesu, Telex/Hygain, Cushcraft, Larsen, Hustler, Uniden, Ten-Tec, MFJ, Nye-Viking, Bencher, AEA, B & W, Ameritron, Trylon Towers.
Accepts trade-ins and provides repairs.

R & S Electronics Ltd.
157 Main Street
Dartmouth, Nova Scotia B2X 1S1
Phone: 902 434-5235; *FAX:* 902 434-5590
Established: 1976
Sells via showroom and mail order.
Top Lines: Kenwood, ICOM, Ten-Tec, Yaesu, Cushcraft, Mirage/KLM, JRC, MFJ, Uniden.
Accepts trade-ins and provides repairs.

Texpro Sales Canada Inc.
5035 North Service Road, Unit D16
Burlington, ONT L7L 5V2, Canada
Phone: 416 332-5944
FAX: 416 332-5946
Established: 1986; *Employs* 4
Sells via showroom and mail order.
Key Employee: John.

Verifying Reception

(from page 33)

the period report - a series of reports put together in a log format, extending over several days or weeks. You could compare reception of many of the station's frequencies. Only one of these includes the program details as proof of reception. A report such as this is more impressive and thus more likely to get a reply.

Much of the fun of QSL collecting is trying to figure out ways to pry a reply out of a reluctant station. Through the years, serious collectors have come up with some extremely inventive approaches. Each situation has its own unique aspects. What works in one situation, might well fall flat on the next attempt. Use your imagination and you'll begin to discover individual techniques that will work for you.

Though we've focused on shortwave broadcast, listeners collect QSLs from any kind of station, including utility transmissions (don't report what was said in two-way situations, though), hams, pirate broadcasters, AM BCB, FM and TV.

The tricks, techniques and fine points of the QSL game are many! If you're interested in a full discussion of the subject, I encourage you to read the book *Secrets of Successful QSLing* ($11.95 from Tiare Publications, P.O. Box 493, Lake Geneva, WI 53147). Here's hoping your mailbox will see a lot of foreign mail in the months and years ahead! ■

About The Authors

(from page 51)

and that the radio hobby has been on the receiving end (no pun intended) of many of the benefits which have resulted from the computer industry. Ken also operates one of the Fort Worth/Dallas area's major public packet radio bulletin boards; his favorite communications mode now being fully automated. "Packet radio was a natural," says Ken, who was active on shortwave bands with RTTY long before the FCC gave amateurs the okay to use the more modern mode of ASCII and allowed direct computer-to-computer communications. "RTTY remains one of the most exciting modes of communications on the shortwave bands and will continue for many years, even though most services are steadily moving to ASCII," says Ken. He is also an Emergency Coordinator in the Tarrant County, Ft. Worth Amateur Radio Emergency Service.

George Zeller is the Senior Researcher at the Council for Economic Opportunities in Greater Cleveland, where he publishes detailed annual reports on current poverty trends in Ohio. A Dxer since 1963 and an active member of several shortwave radio clubs, he tunes his receiver to SWBC, utility and unlicensed stations. George has heard more than 200 different pirate radio stations and has a QSL percentage that exceeds 50%. ■

Does Your Radio Go

(from page 69)

of your favorite frequencies. A pen and notepad are helpful too.

- A small micro-cassette recorder is a handy device. When you're not taping comms, your family can use it to make a tape to Grandma. A talking letter!
- Bring the World Radio TV Handbook, especially if you're leaving the country. It's an invaluable source.
- How about visiting an international broadcaster? Now, I'd bet everyone would enjoy being treated to a tour of a large broadcasting center, right?
- Have you written the make, model and serial number of your gear on a sheet of paper? A copy of that list should also be at home in a safe place.
- Some scanners are easier to program and use than others, but if you're like me, you might forget a certain operation, just when you need it. That's why I've typed some of my scanners' instructions on a small laminated card I carry with me on vacations.

A Final Thought

As a final tip, whatever you do, don't pack your equipment in the luggage. Use that case and carry it on the plane! Remember the last trip you took when the airline either lost your luggage or it looked like an elephant sat on it?

When you pass through airport security, it pays to have the scanner in plain view, fresh batteries installed, so you can explain to the security folks what it is. Chances are they'll ask you to operate it for them. Now, don't get carried away showing them how to tune in skip from Panama, just put it in the scan mode so they hear something. Of course, if you're flying, please don't turn it on while in flight. I'm told it could interfere with the aircraft's navigational system. Just sit back and enjoy the ride.

If you're traveling overseas, remember that many countries don't allow the use of scanners, period. And you thought the ECPA was tough! Check with the country's embassy in the U.S. *before* you leave. You'll also need a small (75 watt) step down transformer if you're traveling to Europe used for changing their 220 volts to 110 volts if you plan on using your wall charger. Don't simply buy an "adapter" and plug the charger in the wall. Don't laugh, it's been done before!

Taking your handheld scanner or portable shortwave along, whether it's only for the weekend or the "duration," might not be the highlight of your vacation or trip to Uncle Wesley's, but for those of us who can't leave home without it, it's always best to be prepared for the unexpected. You know, I never did figure out where those supply folks got those "AA" batteries and alligator clips. ■

Advertiser's Index

ACE COMMUNICATIONS

AOR Scanners.

Great Performance. Great Service. Great Value.

Free Freight
25-Day Money-Back Guarantee
Toll-Free Service and Support
No Credit Card Surcharge
One Year Warranty

AR1000 $429

1000 Channels. 500KHz to 1300MHz

Standard Features:

- Extremely compact size.
- Continuous coverage.
- Antenna attenuator switch, 10db.
- Manual tuning knob.
- Earphone jack, 3.5mm.
- AM, FM and wide band FM tuning modes.
- Backlighted LCD display.
- 10 Scan Banks, 10 Search Banks.
- Selectable Priority Channel.
- Delay, Hold Features.
- Selectable Search Increments, 5-955KHz.
- Permanent memory backup.
- 4 AA Ni Cad batteries included.
- AC adaptor/charger.
- Carry Case.
- Cigarette Lighter Charger.
- Belt Clip.
- Earphone.

Options:

External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs		$45/$55

Specifications:

Coverage:	500KHz-1300MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM
Speed:	20 ch/sec. scan. 40 ch/sec. search
IF:	561.225, 58.075, 455KHz or 10.7MHz
Increments:	5 to 955KHz selectable/ 5 or 12.5 steps.
Audio:	.4 Watts
Power:	Input 9 - 13.8 V. DC
Antenna:	BNC
Display:	LCD
Dimensions:	6 7/8H x 1 3/4D x 2 1/2W. 12oz wt.

AR950/AR900 $259/$269

100 Channels. Low, Air, High, UHF & 800MHz.

Standard Features:

- Extremely compact size.
- Unrestricted 800MHz coverage.
- 100 channels permanent memory.
- Earphone Jack.
- Delay, Hold features.
- Channel 1 Priority.
- 5 Scan Banks, 5 Search Banks.
- Two antennas included.
- AC & DC Power cord w/mobile mnt. hrdwr. (AR950)
- NiCad battery w/chgr adapter. (AR900)
- One Year Limited Warranty.

Options:

Base type antenna 25 to 1000MHz w 50'coax.	AS300	$59.95
Mag Mnt Mobile Antenna. 15' coax.	MA100	$25.00
Cigarette Lighter power adaptor.	CP100	$5.00
Wide band preamp	GW-2	$89.00
Extended Warranty. 2/3 yrs		$40/$55

Specifications:

Coverage:	27-54, 108-174, 406-512, 830-950MHz
Sensitivity:	.4uV Lo,Hi. .8uV Air. .5uV UHF. 1.0uV 800
Scan Speed:	15 ch/sec.
IF:	21.4MHz, 455KHz
Increments:	10,12.5,25,30
Audio:	1W
Power:	12.8VDC, 200MA
Antenna:	BNC
Display:	LCD w/backlight
Dimensions:	2 1/4H x 5 5/8W x 6 1/2D. 14oz wt. (AR950) 5 3/4H x 2W x 1 1/2D. 12oz wt. (AR900)

We offer 100's of communications products.

ACE COMMUNICATIONS

Unbelievable Price.

AR2500 $499

2016 Channels. 1 MHz to 1500 MHz

Standard Features:

- continuous coverage.
- AM,FM, wide band FM, & BFO for SSB, CW.
- 64 Scan Banks.
- 16 Search Banks.
- RS232 port built in.
- Includes AC/DC pwr crd. Antenna, Mntng Brckt.
- One Year Limited Warranty.

Options:

Earphone.	EP200	$2.00
External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs.		$65/$75
Mobile Mounting Bracket.	MM1	$14.90
RS232 Control Package (software & cable) offers spectrum display and database.	SCS2	$295.00
Wide band preamp	G-W2	$89.00

Specifications:

Coverage:	1MHz-1500MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM/SSB/CW
Speed:	38 ch/sec. scan. 38 ch/sec. search
IF:	750.00, 45.0275, 5.5MHz 455KHz
Increments:	5,12,5,25 KHz
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 300mA
Antenna:	BNC
Display:	LCD, backlighted
Dimensions:	2 1/4H x 5 5/8W x 6 1/2D Wt. 1lb.

AR3000 $1095

400 Channels. 100KHz to 2036MHz.

Standard Features:

- Extremely compact size.
- Continuous coverage.
- Attenuation Programmable by Channel.
- Manual tuning knob.
- Tuning increments down to 50Hz.
- AM, FM, wide band FM, LSB, USB, CW modes.
- Backlighted LCD display.
- 4 Scan and Search Banks, Lockout in Search.
- 4 Priority Channels.
- RS232 control through DB25 connector.
- Delay, Hold Features.
- 15 band pass filters, GaAsFET RF amp.
- Sleep and Alarm Features.
- AC adaptor / charger. DC power cord.
- Telescopic Antenna
- One Year Limited Warranty.

Options:

Earphone.	EP200	$2.00
External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs.		$65/$75
Mobile Mounting Bracket.	MM1	$14.90
RS232 Control Package (software & cable) offers spectrum display and database.	SCS3	$295.00
Wide band preamp	G-W2	$89.00

Specifications:

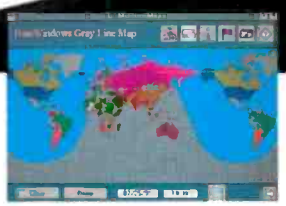
Coverage:	100KHz-2036MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM/SSB/CW
Speed:	20 ch/sec. scan. 20ch/sec. search
IF:	736.23, (352.23) (198.63) 45.0275, 455KHz
Increments:	50Hz and greater
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 500mA
Antenna:	BNC
Display:	LCD
Dimensions:	3 1/7H x 5 2/5W x 7 7/8D Wt. 2lb 10oz.

To Order Call 1•800•445•7717

In All 50 States and Canada. 24 Hours a Day. Fax Orders: 1-800-448-1084, 24 Hours a Day.
ACE Communications Monitor Division 10707 E. 106th Street, Fishers, IN 46038
Int'l Voice# 317-842-7115. Int'l Fax# 317-849-8794.
Service and Support Lines: Mon-Fri 9a.m. to 9p.m., Saturday 10-4. EST
MasterCard, Visa, American Express, Checks, Approved P.O.'s. & C.O.D. (add 5.00)
Prices and specifications subject to change.

See the world through Kenwood's HamWindows™

Amateur Radio enthusiasts Joe Rudi and his son Shaun use their PC to discover the new visual world of Kenwood's HamWindows.



HamWindows™ is an all new concept in the world of Amateur Radio.

This program pulls together eight full color "windows" including transceiver control, station log, world almanac, awards tracking, SWL data base, greyline maps, regional world maps, and packet TNC control.

Using a mouse to "point and click" HamWindows™ lets you see the world your transceiver hears. Use the almanac to learn more about the countries you contact, and then add the QSO to the logging program. You'll automatically track contacts for the DXCC award. The SWL data base lists thousands of frequencies and schedules from over 9,000 broadcast stations. And the greyline and regional maps put the world at your fingertips. With the proper interface you can even control your Kenwood HF transceiver.

HamWindows™ is the one program every amateur or shortwave listener needs. See your Kenwood dealer for system requirements and more information.

KENWOOD

...pacesetter in Amateur Radio

KENWOOD U.S.A. CORPORATION COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street, Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court, Mississauga, Ontario, Canada L4T 4C2