QST

November 1990 $3.00

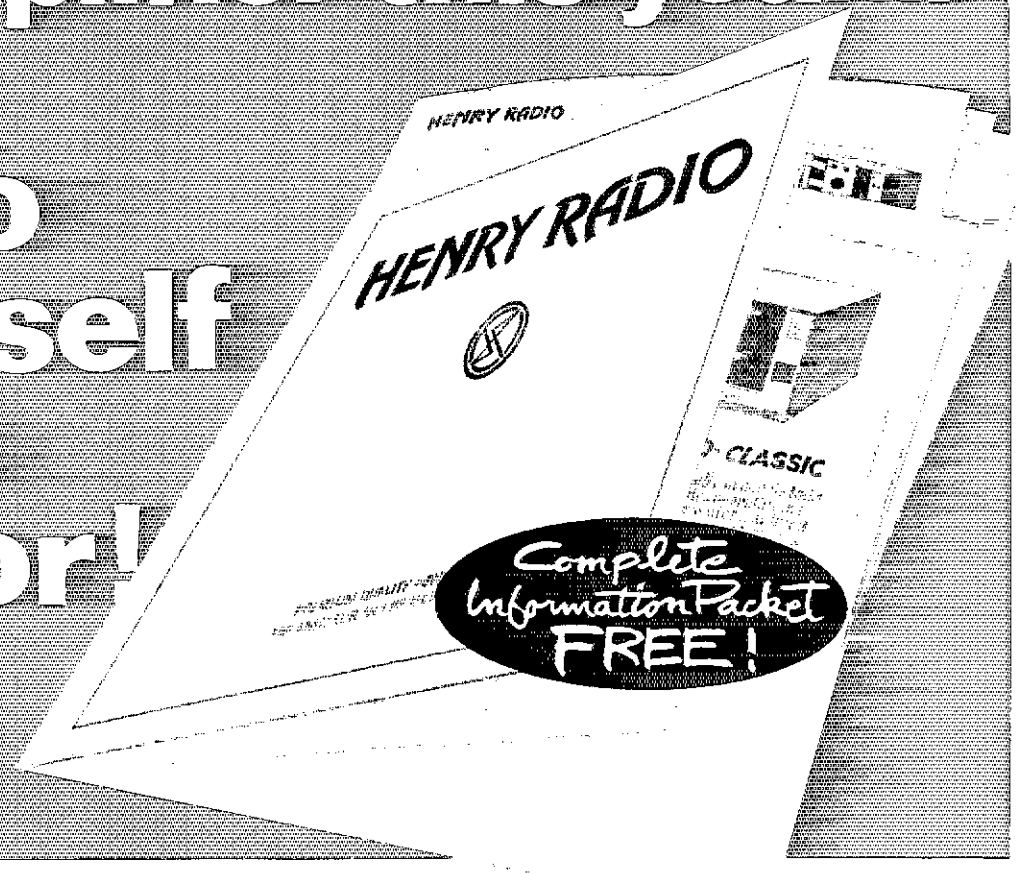
devoted entirely to Amateur Radio

Field Day '90!

0 843655 9 11

If you plan to buy an amplifier this year...

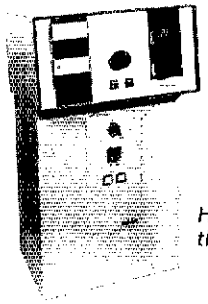
do yourself a favor!



You wouldn't buy a car from a dealer who offers only one model. . .so why buy an amplifier that way?

Henry Radio offers the widest choice of amplifiers in the world. We design and produce amplifiers to fit different needs and different budgets. We feel we offer the best equipment and there are a lot of amateurs who obviously agree. That's why we've sold over 40,000 amplifiers during the last 25 years. If you plan to buy an amplifier, do yourself a big favor. . .call, write, FAX, or come in. But make sure you have our new information packet in your hands before you make a decision. You owe it to yourself. Read it through, compare the specs, compare prices, compare VALUE.

And, of course, when you buy from Henry Radio you're buying factory direct.



Our present HF amplifier line includes the following models:

2KD STANDARD	Single 3-500Z Desk SSB Amp	**3K CLASSIC MKII**	Domestic Console
2KD CLASSIC	Desk Model Linear Amplifier	**3K CLASSIC MKII**	Export Console
2K CLASSIC	Console Amplifier	**3K CLASSIC RF**	RF Deck only
2K CLASSIC X	Domestic Console	**5K CLASSIC**	Export Console
2K CLASSIC X	Export Console	**5K CLASSIC RF**	RF Deck only
2K CLASSIC X RF	RF Deck only	**3K PREMIER**	Console Amp. with 160 meters
3KD CLASSIC	Single 3CX1200A7 Desk Amp	**3KD PREMIER**	Desk Amp. with 160 meters

Henry Radio. . .
the amplifier specialists

62 YEARS OF SERVICE

Henry Radio

2050 S. BUNDY DR. LOS ANGELES, CA 90025 (213) 820-1234

Toll free order number: (800) 877-7979 TELEX: 67-3625(Henradio) FAX (213) 826-7790

KENWOOD

Compact Champion!

TH-27A/47A

2 m and 70 cm Super Compact HTs

Here is a great new addition to Kenwood's HT family – the all new TH-27A for 2 meters and TH-47A for 70 cm! Super compact and beautifully designed, these pocket-sized twins give you full-size performance.

- **Large capacity NiCd battery pack supplied.** The standard battery pack is 7.2 volts, 700 mAh, providing extended transmit time with 2.5 watts. (TH-47A: 1.5 W.)
- **Extended receive coverage.** TH-27A: 118–165 MHz; TH-47A: 438-449,995 MHz. TX on Amateur bands only, (TH-27A modifiable for MARS/CAP. Permits required. Specifications guaranteed for Amateur bands only.)
- **Multi-function scanning.** Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Built-in digital clock** with programmable timer.
- **Dual Tone Squelch System (DTSS).** Compatible with the TH-26AT Series and the TM-941A Triple bander, as well as other Kenwood series transceivers, this selective calling system uses standard DTMF to open squelch.
- **Five watts output** when operated with PB-14 battery pack or 13.8 volts.
- **T-Alert for quiet monitoring.** Tone Alert beeps when squelch is opened.
- **Auto battery saver, auto power off function, and economy power mode extends battery life.**
- **DTMF memory.** The DTMF memory function can be used as an auto-dialer. All characters from the 16-key pad can be stored, allowing repeater control codes to be stored!

- **41 memories.** All channels store receive and transmit separately for "odd split."
- **DC direct in operation.** Allows external DC to be used (7.2 – 16 volts). When external power is used, the batteries are being charged. (PB-13 only.)

Optional accessories:
- **BC-14:** Wall charger for PB-13, 14
- **BC-15:** Rapid charger for PB-13, 14
- **BH-6:** Swivel mount
- **BT-8:** Six cell AA Alkaline battery case
- **HMC-2:** Headset with VOX and PTT
- **PB-13:** 7.2 V, 700 mAh NiCd pack
- **PB-14:** 12 V, 300 mAh NiCd pack
- **PG-3F:** DC cable with filter and cigarette lighter plug
- **PG-2W:** DC cable
- **SC-30:** Soft case
- **SMC-31:** Standard speaker mic
- **SMC-32:** Compact speaker mic
- **SMC-33:** Compact speaker mic with controls
- **WR-2:** Water resistant bag.

- **Automatic offset selection (TH-27A).**
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **CTCSS encode/decode built-in.**
- **Supplied accessories:** Rubber flex antenna, battery pack, wall charger, belt hook, wrist strap, dust caps.

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

Specifications and features are subject to change without notice or obligation.
Complete service manuals are available for all Kenwood transceivers and most accessories.

BREAKING THE BARRIER OF DUAL BAND COMMUNICATION

The dual banders of the future are here! ICOM's IC-24AT dual band handheld and IC-3220 dual band mobile provide you all the advantages with the most feature packed, power packed dual banders available.

Whether your needs require the mobility of the IC-3220 or the convenience of the IC-24AT mini-handheld, ICOM has the dual bander fit for you.

The IC-24AT mini-handheld and the IC-3220 mobile give you full operation on the 2-meter and 440MHz amateur bands with outstanding flexibility and performance!

The IC-24AT offers 40 memories, 5 watts, programmable scanning, priority watch, a battery saver, plus a DTMF pad for autopatching...the list is endless. Among the many features of the compact IC-3220 are a built-in duplexer, simultaneous dual band receive, auto dialing and a memory transfer function. For full details and specs on the IC-24AT and IC-3220, call the **ICOM Brochure hotline at 1-800-999-9877.** See them today at your quality ICOM amateur dealer.

ICOM
First in Communications

CORPORATE HEADQUARTERS: ICOM America, Inc.
2380-116th Ave. N.E., Bellevue, WA 98004
CUSTOMER SERVICE HOTLINE (206) 454-7619
CUSTOMER SERVICE CENTERS:
3150 Premier Drive, Suite 126, Irving, TX 75063
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada
2380-116th Ave. N.E., Bellevue, WA 98004

QST

QST (ISSN: 0033-4812) is published monthly as its official journal by the American Radio Relay League, Newington, CT USA.

Offices

225 Main St, Newington, CT 06111 USA
Telephone: 203-666-1541
Telex: 650215-5052 MCI
FAX: 203-665-7531 (24-hour direct line)

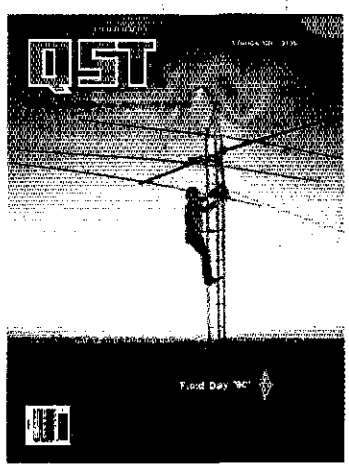
Membership in ARRL, including a subscription to *QST*, is available to individuals at the following rates: $30 per year in the US and possessions, $42 elsewhere, payable in US funds. Age 65 and over, with proof of age, $24 US, $36 elsewhere. Licensed radio amateurs age 17 and under may qualify for special rates; write for application. Membership and *QST* cannot be separated. Fifty percent of dues is allocated to *QST*, the balance for membership. Subscription rate for libraries and institutions: $30 per year postpaid in the US and possessions, $42 elsewhere. Single copies $3.00 in the US.

Foreign remittances should be by international postal or express money order or bank draft negotiable in the US and for an equivalent amount in US funds. Canadians apply to CRRL address; see page 9.

Second-class postage paid at Hartford, CT and at additional mailing offices. Postmaster: Form 3579 requested.

QST is available to blind and physically handicapped individuals on flexible disks from the Library of Congress, National Library Service for the Blind & Physically Handicapped, Washington, DC 20542.

Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No: 21-9421.



OUR COVER

Wouldn't it be nice if we all had a beautiful Pacific sunset backing up our Field Day sites? This one was captured by Jill Geilsel, who was manning the Eagle Rock Fire Lookout Tower some 50 miles south of San Francisco. Shown installing an 80-meter dipole is Tom Guyer, KG6AO, one of the gang at the N6TU (San Lorenzo Valley Repeater Club) FD 1990 setup. See the results and scores on page 75.

CONTENTS

November 1990
Volume LXXIV Number 11

TECHNICAL

NEWS AND FEATURES

OPERATING

DEPARTMENTS

KEEP YOUR COOL

with AEA's NEW LA-30 HF Linear Amplifier

WHAT DO HAMS EXPECT WHEN THEY SEE THE AEA NAME ON A PRODUCT?

Quality and Value.
They expect mechanical and electrical integrity.
They expect the best possible physical construction.
They expect a product that will look and perform as advertised for years to come.
They expect the support they need, before, during and after the sale.
They don't expect promises that can't or won't be delivered.
They don't expect the frustration that comes from products that don't perform as advertised, or technical support that's less than supportive.
They don't expect to spend their hard-earned money, just to lose their cool.

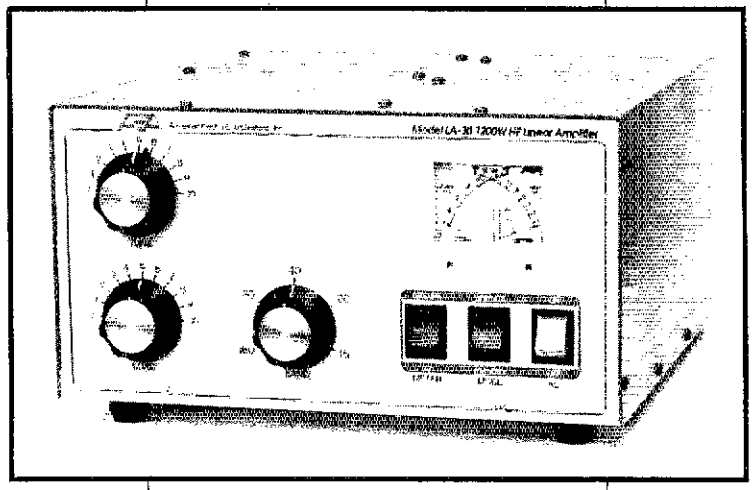
THE LA-30 DELIVERS!

The LA-30 HF Linear Amplifier delivers what hams expect from AEA.

Designed to provide reliable, stable, high RF output power, the LA-30 is equipped with a pressurized plenum and chimney cooling system to ensure extended periods of continuous use and longer tube life. We use a low-noise "squirrel-cage" blower that moves 30 cubic feet of air per minute past the tube and its base seal to help the LA-30 keep its cool. Others use computer type "muffin" blowers that don't cool the tube seals, and therefore shorten tube life.

Have you priced RF power tubes lately? They're not cheap. And when one goes out before you expect, you're bound to lose your cool.

QUALITY
We install parts that are designed to last, rather then cutting corners to reduce costs.



You won't find any shortcuts in our amplifiers. The LA-30 is the latest in a long line of high quality AEA products, going back over 12 years.

All aluminum parts are "alodized" to keep your LA-30 looking new. Alodizing is an expensive priming process that improves the metal's appearance and helps protect against scratching and corrosion. Make sure the amplifier you choose has alodized aluminum to keep it looking new for years to come.

We could cut manufacturing costs in other ways—such as using cheaper "self-tapping" screws and lower-quality aluminum—but then the unit just wouldn't meet our standards. Remember, only AEA amplifiers are built with AEA quality.

EASY TO USE.
With the LA-30's patent-pending cross-needle tuning bar meter system, we've eliminated the guesswork. You always know at a glance if the LA-30 is in tune. One dual-movement meter measures both plate and grid current simultaneously, which are both crucial to proper operation and extended tube life. The front panel controls are logically arranged and are marked with clear, easy-to-read markings and scales.

KEEP YOUR COOL!
Don't be fooled into buying an imitation when you can own an AEA. This compact self-contained tabletop unit will provide you with years of excellent performance. The LA-30 Linear Amplifier is the best HF amplifier value on the market today, because of AEA.

Engineering Makes the Difference!

SPECIFICATIONS:

Freq. Range	Amateur Bands 160-10 meters*
RF Input Power	SSB 1.2 KW P.E.P. CW/RTTY/AM/FM/ SSTV 1.0 KW
Power Tube	3-500Z zero-bias triode
Supply Voltage	110 VAC
Dimensions	14"W × 7½"H × 16½"D (36 × 19 × 42 cm)
Weight	35 lbs. (15.9 Kg.)

QSK modification available.
*10 meter mod. requires amateur license.

Advanced Electronic Applications, Inc.
2006-196th St. S.W./P.O. Box C2160 Lynnwood, WA 98036 (206)775-7373

Prices and applications subject to change without notice or obligation.

10, 12, 15, 17 and 20 Meters

cushcraft R5

HERE'S WHY

YOUR FELLOW HAMS AGREE THAT R5 IS THE PERFECT CHOICE.

"Best vertical I have used...Great antenna for hams with smallest of back yards." G4DTK

Only 7' off the ground and have worked over 50 countries in a month." W2JD

"R5 covered the whole world with only 100 Watts." JA1VJL

"Some stations find it hard to believe I'm not using a beam." GW0MOI

"A masterpiece of quality engineering and performance." N4OEQ

Performance is always your top criterion, and when space is at a premium the R5 is your best choice. It needs no ground radials and stands 17 feet tall.

10, 12, 15, 17 and 20 meters are yours with fully automatic band selection and RFI supression. The only connection needed is the 50 Ohm coax from your transceiver.

The unique counterpoise has four 48" x 0.1" stainless steel rods for excellent ground independence. This allows the antenna to be mounted anywhere from ground level to roof top.

With the R5 you get quick assembly, easy installation and the highest "performance to size" ratio of any antenna available to the amateur today. Whether your space is large or small, the R5 will make ham radio more fun.

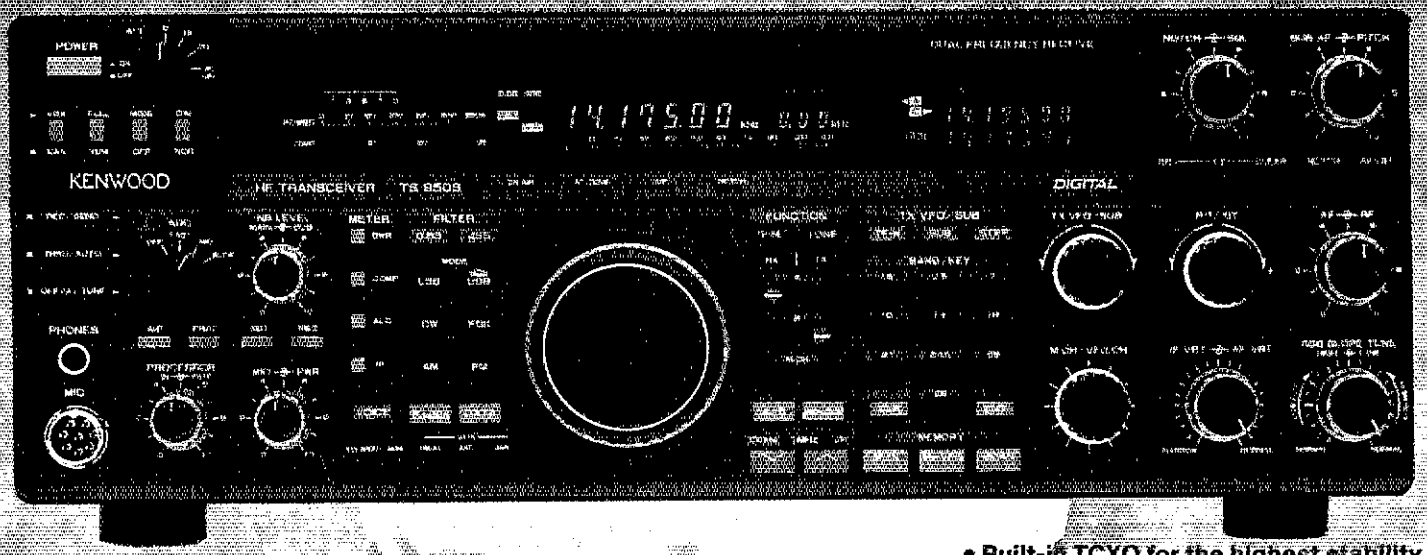
cushcraft

AVAILABLE THROUGH DEALERS WORLDWIDE

CIRCLE 30 ON READER SERVICE CARD

P.O. BOX 4680 • 48 PERIMETER ROAD • MANCHESTER, NH 03108 • 603-627-7877 • TELEX: 4949472 • FAX: 603-627-1764

KENWOOD



TS-950SD

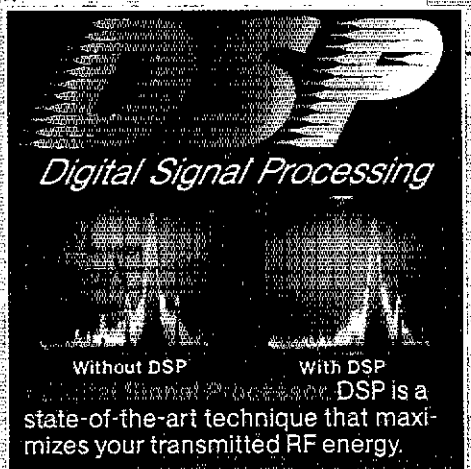
"DX-clusive" HF Transceiver

The new TS-950SD is the first Amateur Radio transceiver to utilize Digital Signal Processing (DSP), a high voltage final amplifier, dual fluorescent tube digital display and digital meter with a peak-hold function.

The Ultimate Signal.

- **Dual Frequency Receive Function.** The TS-950SD can receive two frequencies simultaneously.
- **New! Digital AF filter.** Synchronized with SSB IF slope tuning, the digital AF filter provides sharp characteristics for optimum filter response.
- **New high voltage final amplifier.** 50 V power transistors in the 150-watt final section, resulting in minimum distortion and higher efficiency. Full-power key-down time exceeds one hour.
- **New! Built-in microprocessor controlled automatic antenna tuner.**
- **Outstanding general coverage receiver performance and sensitivity.** Kenwood's Dyna-Mix™ high sensitivity direct mixing system provides incredible performance from 100 kHz to 30 MHz. The Intermodulation dynamic range is 105 dB.
- **Famous Kenwood interference reduction circuits.** SSB Slope Tuning, CW VBT (Variable Bandwidth Tuning), CW AF tune, IF notch filter, dual-mode noise blanker with level control, 4-step RF attenuator (10, 20, or 30 dB), switchable AGC circuit, and all-mode squelch.

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications, features and prices subject to change without notice or obligation.



DSP is a state-of-the-art technique that maximizes your transmitted RF energy.

- **High performance IF filters built-in†** Select various filter combinations from the front panel. For CW, 250 and 500 Hz, 2.4 kHz for SSB, and 6 kHz for AM. Filter selections can be stored in memory!
- ***Multi-Drive Band Pass Filter* (BPF) circuitry.** Fifteen band pass filters are available in the front end to enhance performance.

- **Built-in TCXO for the highest stability.†**
- **Built-in electronic keyer circuit.**
- **100 memory channels.** Store independent transmit and receive frequencies, mode, filter data, auto-tuner data and CTCSS frequency.
- **Digital bar meter.**

Additional Features: • Built-in interface for computer control • Programmable tone encoder • Built-in heavy duty AC power supply and speaker • Adjustable VFO tuning torque • Multiple scanning functions • MC-43S hand microphone supplied

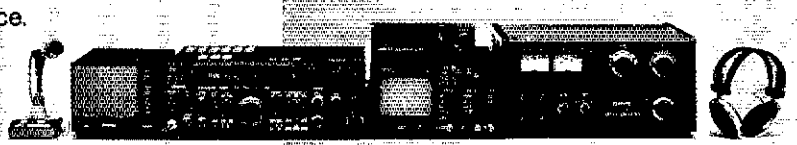
Optional Accessories
- DSP-10 Digital Signal Processor *
- SO-2 TCXO * • VS-2 Voice synthesizer
- YK-88C-1 500 Hz CW filter for 8.83 MHz IF *
- YG-455C-1 500 Hz CW filter for 455 kHz IF *
- YK-88CN-1 270 Hz CW filter for 8.83 MHz IF
- YG-455CN-1 250 Hz CW filter for 455 kHz IF *
- YK-88SN-1 1.8 kHz SSB filter for 8.83 MHz IF
- YG-455S-1 2.4 kHz SSB filter for 455 kHz IF *
- SP-950 External speaker w/AF filter
- SM-230 Station monitor w/pan display
- SW-2100 SWR/power meter
- TL-922A Linear amplifier (not for QSK)

* Built-in for the TS-950SD
† Optional for the TS-950S

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745

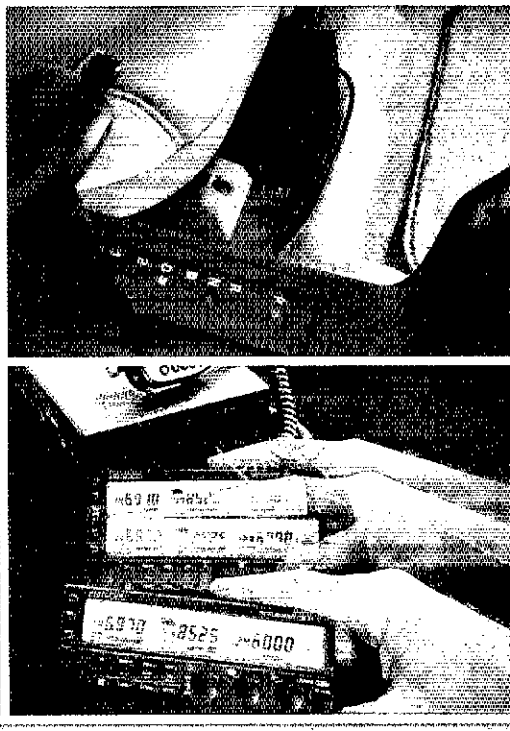
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

KENWOOD
...pacesetter in Amateur Radio



KENWOOD

Triple Play!



TM-941A

TRI-BAND FM Transceiver

Kenwood brings you yet another breakthrough — the TM-941A *TRI-BAND* FM TRANSCEIVER. Now you can operate on *three* bands — 144, 450, or 1200 MHz — with one radio! This rig even gives you full duplex, cross-band, triple-band repeat!

- **High power output.** 50 W on 144 MHz, 35 W on 450 MHz, and 10 W on 1200 MHz. (Selectable low power: 5 and 10 W, 1 W on 1200 MHz.)
- **Wide band receiver coverage.** 118-174, 438-450 (400-475 after modification), 1240-1300 (1210-1330 after modification) MHz. TX on Amateur bands only. Modifiable for MARS/CAP. Permits required.
- **CTCSS encode/decode built-in.** 38 sub-tones selectable from the front panel.
- **Cross-band repeat function.** Selectable single or dual input! Offset function on output, allows simplex to repeater repeat!
- **Simultaneous tri-band receive.** Individual volume and squelch controls help you "sort out" the signals.
- **Detachable front panel.** Use the optional PG-4K or PG-4L to mount the front panel remotely.
- **Selective calling option (DTU-2).** Selectively call a single station,or call a group with DTMF tones.
- **303 memory channels.** Store everything you need for efficient operation. All channels allow you to store "odd split" repeaters.
- **Versatile scanning functions.** Band scan, memory scan and programmed scan with carrier or time operated stop.
- **NEW! Auto memory scan.** Automatically memorizes a busy frequency while scanning the band!
- **Automatic repeater offset on 2 m.** Plus or minus 600 kHz for 144 MHz, ±5 MHz on 450 MHz, and ±12 or 20 MHz for 1200 MHz. (Manual offset for 450 and 1200 MHz.)
- **Fixed detect output.** For packet operators!
- **Multi-function DTMF mic supplied.**
- **Auto power off and time-out timer.**
- **4-step dimmer control.** Selectable 4-step dimmer control.
- **Three separate antenna and speaker connectors.** For maximum performance.

Optional Accessories:
- **DTU-2** Digital paging (DTMF) unit
- **PG-4K, PG-4L** Front panel cable kits
- **MC-45** Multi function mic.
- **MB-11** Extra mounting bracket
- **SP-41, SP-50B** External mobile speakers
- **PG-3B** DC line noise filter
- **PS-430** Power supply
- **PG-2N** DC power cable.

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications, features, and prices are subject to change without notice or obligation.

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

Directors

Atlantic Division
HUGH A. TURNBULL,* W3ABC, 6903 Rhode Island Ave, College Park, MD 20740 (301-927-1797)
Vice Director: Kay C.Craigie, KC3LM
5 Faggs Manor Lane, Paoli, PA 19301
(215-993-9623)

Central Division
EDMOND A. METZGER, W9PRN, 1917 Lindsay Rd, Springfield, IL 62704 (217-546-6870)
Vice Director: Howard S. Huntington, K9KM
25350 N Marilyn La, Hawthorn Woods, IL 60047
(708-438-3452)

Dakota Division
HOWARD MARK, WØOZC, 11702 River Hills Dr Burnsville, MN 55337 (612-890-9114)

Delta Division
JOEL M. HARRISON, WB5IGF, 528 Miller Rd, Judsonia, AR 72081 (501-729-3301)
Vice Director: Henry R. Leggette, WD4Q,
1555 Galveston St, Memphis, TN 38114
(901-744-7720)

Great Lakes Division
ALLAN L. SEVERSON, AB8P, 1275 Ethel Ave, Lakewood, OH, 44107, (216-521-1565)
Vice Director: George E. Race, WB8BGY, 3865 Gibbs Road, Albion, MI 49224 (517-531-4758)

Hudson Division
STEPHEN A. MENDELSOHN,* WA2DHF, 318 New Milford Ave, Dumont, NJ 07628 (201-384-0570/0680)
Vice Director: Paul Vydareny, WB2VUK
259 N Washington St, N Tarrytown, NY 10591-2314
(914-631-7424)

Midwest Division
PAUL GRAUER, WØFIR, Box 190, Wilson, KS 67490 (913-658-2155)
Vice Director: L. C. "Chuck" Miller, WAØKUH
7000 North East 120, Kansas City, MO 64166
(816-781-7313)

New England Division
TOM FRENAYE, K1KI, PO Box 386
West Suffield, CT 06093 (203-668-5444)
Vice Director: Clevis O. "Cliff" Laverty, W1RWG,
17 Fair St, Norway, ME 04268 (207-743-2353)

Northwestern Division
WILLIAM R. SHRADER, W7QMU, 2042 Jasmine Ave, Medford, OR 97501 (503-773-8624)
Vice Director: Mary Lou Brown, NM7N, 504 Channel View Dr, Anacortes, WA 98221 (206-293-9295)

Pacific Division
CHARLES P. McCONNELL, W6DPD, 1658 W Mesa Ave, Fresno, CA 93711 (209-431-2038)
Vice Director: Joe Lambert, W8IXD, PO Box 1201, Boulder City, NV 89005

Roanoke Division
JOHN C. KANODE, N4MM, RFD 1, Box 73A, Boyce, VA 22620 (703-837-1340)
Vice Director: James G. Walker, WD4HLZ,
Rte 1, Box 5395, Marion, SC 29571 (803-423-3645)

Rocky Mountain Division
MARSHALL QUIAT,* AGØX, 1580 Lincoln St, Suite 440, Denver, CO 80203 (303-830-6666)
Vice Director: William M. Sheffield, KQØJ,
1444 Roslyn St, Denver, CO 80220 (303-355-2488)

Southeastern Division
FRANK M. BUTLER JR,* W4RH
323 Elliott Rd, SE, Fort Walton Beach, FL 32548
(904-244-5425)
Vice Director: Mrs Evelyn Gauzens, W4WYR
2780 NW 3rd St, Miami, FL 33125 (305-642-4139)

Southwestern Division
FRIED HEYN, WA6WZO, 962 Cheyenne St
Costa Mesa, CA 92626 (714-549-8516)
Vice Director: Wayne Overbeck, N6NB
14021 Howland, Tustin, CA 92680 (714-731-6178)

West Gulf Division
SAM C. SITTON, KV5X, 920 Hickory Lane, Ardmore, OK 73401 (405-223-0578)
Vice Director: Tom Comstock, N5TC, 1700 Dominik, College Station, TX 77840 (409-693-1181)

*Executive Committee Member

Section Managers of the ARRL

Reports Invited: The ARRL Board of Directors (see list at left) determines the policies of ARRL. The 15 divisions of the League are further arranged into 69 administrative "sections," each headed by an elected Section Manager. Your SM welcomes reports of club and individual activity. ARRL Field Organization appointments are available covering a wide range of Amateur Radio volunteer interests. Whatever your license class, your SM has an appointment available. Check with your SM (below) for further information.

Atlantic Division
Delaware — Bob Pegritz, KC3TI, PO Box 9697, Newark, 19714
Eastern Pennsylvania — Bob Stanhope, KB3YS, 1359 Bon Bar Rd, York 17403 (717-843-0237)
Maryland-DC — Kenneth Cohen, NI3F, 7403 Hickory Log Cir, Columbia, MD 21045 (301-381-7883)
Southern New Jersey — Richard Baier, WA2HEB, 1226 Audubon Dr, Toms River 08753 (201-270-9292)
Western New York — William Thompson, W2MTA, RD 1—Rock Rd, Newark Valley 13811 (607-642-8930)
Western Pennsylvania — Bernie Fuller, N3EFN, RD #2, Box 122, Saegertown, 16433 (814-763-1529)

Central Division
Illinois — Sharon Harlan, WB9SFT, 5931 Alma Dr, Rockford, 61108 (815-398-2683)
Indiana — Peggy Coulter, W9JUJ, 12330 SCR 200 E, Muncie, 47302 (319-288-0481)
Wisconsin — Richard R. Regent, K9GDF, 5003 South 26th St, Milwaukee 53221 (414-282-0312)

Dakota Division
Minnesota — George E. Frederickson, KCØT, RR #2—Box 352, South Haven 55382 (612-558-6312)
North Dakota — Roger "Bill" Kurtti, WCØM, Rural Route—Box 34, Rock Lake 58365 (701-266-5646)
South Dakota — Roland Cory, WØYMB, 1010 7th St, W, Mobridge 57601 (605-845-2400)

Delta Division
Arkansas — Bob Harmon, W5SEP, Rt 1, Box 219, Winslow 72959
Louisiana — John M. Wondergem, K5KR, 600 Smith Dr, Metairie 70005 (504-837-1485)
Mississippi — Vessen "Butch" Magee, KF5DE, 2120 Belvedere Dr, Jackson 39205 (601-373-4325)
Tennessee — Harry Simpson, W4MI, 1830 Macaulay Ave, Memphis 38127 (901-357-8148)

Great Lakes Division
Kentucky — John A. Thernes, WM4T, 60 Locust Ave, Covington 41017 (606-331-0331)
Michigan — George E. Race, WB8BGY, 3865 Gibbs Rd, Albion 49224 (517-531-4758)
Ohio — David Kersten, N8AUH, 2197 McKinley Ave, Lakewood, OH 44107-5432 (216-221-6740)

Hudson Division
Eastern New York — Paul S. Vydareny, WB2VUK, 259 N Washington, North Tarrytown 10591 (914-631-7424)
NYC-Long Island — Walter M. Wenzel, KA2RGI, 373 Fifteenth St, West Babylon 11704 (516-957-5726)
Northern New Jersey — Richard S. Moseson, NW2L, 19 Linden Ave, Bloomfield 07003 (201-680-1585)

Midwest Division
Iowa — Robert W. Walstrom, WØEJ, 7431 Macon Dr NE, Cedar Rapids 52402 (319-393-8982)
Kansas — Robert M. Summers, KØBXF, 3045 North 72nd, Kansas City 66109 (913-299-1128)
Missouri — Bill McGrannahan, KØORB, 4826 Jarboe, Kansas City 64112-1335 (816-753-7100)
Nebraska — Vern J. Wirka, WBØGQM, 3106 Vinton, Omaha 68105 (402-341-4572)

New England Division
Connecticut — Caesar Rondina, N1DCS, 5 Bailey Dr, West Haven 06516 (203-934-2477)
Eastern Massachusetts — Barry Porter, KB1PA, 47 Erin Rd, Stoughton 02072 (617-341-2639)
Maine — Jeff Weinstein, K1JW, PO Box 646, Yarmouth, 04096 (207-846-0700)
New Hampshire — William Burden, WB1BRE, 11 Briand, Nashua 03063 (603-889-9322)
Rhode Island — William Foss, KA1JXH, 70 Mayfair Rd, Cumberland 02864 (401-334-3058)
Vermont — Mitchell Stern, WB2JSJ, PO Box 99, Essex 05451 (802-879-6589)
Western Massachusetts — Jean Hurtle, KA1IFC, 10 Hospital Rd, Baldwinville, MA 01436 (508-939-8108)

Northwestern Division
Alaska — Harley Steward, KL7IZZ, 12102 Lilac Cir, Anchorage, 99516 (907-345-1530)
Idaho — Don Clower, KA7T, 5103 W. Cherry Ln, Meridian 83642 (208-888-7020)
Montana — A. F. "Pete" Peters, KF7R, Rte 38, Box 2017, Livingston 59047 (406-222-2601)
Oregon — Randy Stimson, KZ7T, 9890 SW Inglewood St, Portland 97225 (503-297-1175)
Western Washington — Mary Lewis, W7QGP, 10352 Sand Point Way NE, Seattle 98125 (206-523-9117)
Eastern Washington — Tom Plaisance, KC7PH, 101 N 37th Ave, Yakima 98902 (509-966-4612)

Pacific Division
East Bay — Bob Vallio, W6RGG, 18655 Sheffield Rd, Castro Valley, CA 94546 (415-537-6704)
Nevada — Joseph D. Lambert, W8IXD, PO Box 1201, Boulder City 89005 (702-294-0505)
Pacific — Ronald Phillips, AH6HN, SR-6637, Keaau, HI 96749 (808-966-6113)
Sacramento Valley — Jettie Hill, W6RFF, 306 St Charles Ct, Roseville, CA 95661 (916-783-0383)
San Francisco — Richard Wilson, K6LRN, PO Box 4212, San Rafael, CA 94913
San Joaquin Valley — Byron Smith, WA6YLB, 504 S. Joyner, Exeter, CA 93221 (209-592-1038)
Santa Clara Valley — Steve Wilson, KA6S, 813 Berryessa St, Milpitas, 95035 (408-946-7410)

Roanoke Division
North Carolina — W. Reed Whitten, AB4W, 1208 Oxford Place, Cary 27511 (919-467-7464)
South Carolina — Charles E. Moeller, N4FVU, 116 Willow Winds Dr, Columbia 29210-4454 (803-772-1186)
Virginia — Edward Dingler, N4KSO, PO Box 1933, Lebanon 24266 (703-889-3250)
West Virginia — Karl S. Thompson, K8KT, Rte 7, Box 422K, South Charleston 25309 (304-744-7829)

Rocky Mountain Division
Colorado — William Sheffield, KQØJ, 1444 Roslyn St, Denver 80220 (303-355-2488)
New Mexico — Joe Knight, W5PDY, 10408 Snow Heights Blvd, NE, Albuquerque 87112 (505-299-4581)
Utah — Richard Fisher, NS7K, 1510 Celia Way, Layton 84041 (801-544-1928)
Wyoming — James E. Raisler, N7GVV, 1102 East 9th St, Gillette 82716 (307-686-0794)

Southeastern Division
Alabama — Mildred Cullen, AA4XF, 2331 Ivy Lane, Birmingham, AL 35226 (205-822-6130)
Georgia — Edmund J. Kosobucki, K4JNL, 5525 Perry Ave, Columbus 31909 (404-322-2856)
Northern Florida — Rudy Hubbard, WA4PUP, PO Box 843, Milton, FL 32572-0843 (904-626-0620)
Southern Florida — Richard D. Hill, WA4PFK, 12380 NW 30 St, Sunrise 33323 (305-572-3172)
Puerto Rico — Luis Lopez, WP4EPC, PO Box 20719, Rio Piedras, PR 00928 (809-765-6867)
Virgin Islands — Ronald Hall, Sr, KP2N, PO Box 3987, St Thomas 00803 (809-774-4740)

Southwestern Division
Arizona — James E. Swafford, W7FF, 5906 W Miramar Dr, Tucson 85715 (602-298-7793)
Los Angeles — Phineas J. Icenbice, Jr, W6BF, 19323 Halsted St, Northridge, CA 91324 (818-349-3186)
Orange — Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (714-687-8394)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (619-273-1120)
Santa Barbara — Thomas I. Geiger, W2KVA, 428 E Grant St, Santa Maria, CA 93454 (805-866-1359)

West Gulf Division
North Texas — W. W. "Dan" Dansby, W5URI, 5805 Walla Ave, Fort Worth 76133 (817-292-5019)
Oklahoma — Joseph Lynch, N6CL, PO Box 73, Oklahoma City 73101 (405-528-6625)
South Texas — Arthur R. Ross, W5KR, 132 Sally La, Brownsville 78521 (512-831-4458)
West Texas — Amelia "Milly" Wise, W5OVH, 8516 Mt Scott, El Paso 79904 (915-751-4160)

"It Seems to Us . . ."

Potpourri

There are lots of things to talk about this month.

• *WARC-92.* The FCC released the first-draft recommended US proposals for the 1992 World Administrative Radio Conference on October 1. This issue of *QST* went to press October 2. That didn't leave a lot of time to analyze a 150-page document, but thanks to some advance information made public through the FCC WARC Industry Advisory Committee structure we were able to get a few days' head start on the article you'll find beginning on page 42.

• *DXCC.* At the moment, the most popular DX awards program in the world is suffering from its own popularity. Our DXCC Branch at HQ was hit with a triple whammy: good propagation, the addition of several new countries to the DXCC list, and new single-band awards for 80, 40, and 10 meters. A six-month backlog of new and endorsement applications has built up, which is an unacceptable state of affairs.

In tackling the backlog we're not helped by the fact that DXCC is based on manual records. In simpler days this was fine, but now a single QSL card may be used for credit toward several different awards. Our manual system gives us no easy way of knowing that the card you had already submitted for credit toward a mixed DXCC should be credited to your CW DXCC and 40-meter DXCC, now that you've earned those additional awards. So, guess what? With the manual system you had to submit the card all over again—more postage expense for you, and more work for the staff. Also, the manual system doesn't lend itself to the addition or deletion of DXCC countries. Throwing more personnel at the problem would provide short-term relief, but wouldn't cure the disease.

There was only one thing to do: bring DXCC into the computer age. And we're doing it. From this point forward, information on cards inspected for DXCC applications and endorsements goes right into the computer. The transition is going pretty smoothly, but the "learning curve" on any new way of doing things means that unfortunately, the backlog is bound to get worse before it gets better. Before long, though, you'll see the improvement in both speed and quality of service. We're even working on an arrangement for volunteers to check most DXCC cards in the field, as a further convenience.

Administering DXCC is not inexpensive. Effective October 1, new DXCC participants, overseas nonmembers (US and Canadian amateurs who are not League members being ineligible to participate), and "frequent fliers" (DXCC participants who make more than one submission per year) are paying fees intended to help defray the costs of the program that otherwise would be shouldered by all League members, whether DXers or not.

• *Appeal of the 220-MHz Decision.* Having exhausted our administrative remedies for the FCC's decision to reallocate 220-222 MHz, we went to court with a petition for review. Briefs on behalf of the petitioner (ARRL), respondent (FCC), and intervenors (the land mobile interests) have been filed with the US Court of Appeals for the District of Columbia Circuit, and oral argument is scheduled for November 16.

We hope the Court will ask the FCC to explain the following string of occurrences:

June 6, 1985. ARRL files its "Novice Enhancement" petition for rule making with FCC. In it we argue for relief from the restriction to Novice power levels that apply to General, Advanced, and Extra class operators in the Novice subbands, since applying the principle to the proposed new Novice bands would amount to a reduction in privileges for those operators. We say that changing the rule won't affect the then-existing Novice bands very much, "[g]iven the relative absence of General, Advanced and Extra class operation on those frequencies."

February 12, 1987. FCC releases its infamous NPRM in PR Docket 87-14, proposing to reallocate 220-222 MHz to land mobile. Reaching from this proceeding into a totally unrelated one, the Commission quotes RM-5038 as if the comment about "the relative absence of General, Advanced and Extra class operation" refers to the 220-MHz band.

May 21, 1987. ARRL files comments in Docket 87-14, pointing out: "The *Notice* is mistaken. The reference [in RM-5038] was not at all a reference to the 220 MHz band, but rather to the then-extant Novice telegraphy subbands at 3, 7, 21 and 28 MHz. The full text of that Petition quite clearly revealed the context. The League has never noted any absence of amateur operation at 220-225 MHz, because, despite the cloud placed over the allocation since 1971, amateur use of the band has grown at a startling rate."

September 6, 1988. FCC releases its decision to make the reallocation as originally proposed, despite the protestations of the League and thousands of individuals and clubs. Later, the Commission declines to reconsider its action.

August 28, 1990. FCC files its brief in response to our court appeal. And on page 14, what to our wondering eyes should appear but the very same error the Commission made more than 3½ years earlier! And on September 12, in comes the brief from the small but faithful chorus of land-mobile intervenors, repeating the mistake.

That the Commission's proposed reallocation was based on an error is clear enough. That we pointed out the error is clear enough. What isn't at all clear, is why the Commission is still spouting the same error. But then again, in this particular proceeding we've always had the impression that facts were regarded as irrelevant.

The Commission doesn't seem to be able to correct its mistakes. Perhaps the Court of Appeals will do it for them. —*David Sumner, K1ZZ*

Get Above the Crowds and Noise.

100 Watts Power

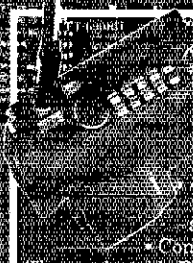
Noisy, crowded frequencies are about as productive as freeways at rush hour. Now you can skip the jams, zip up and head for the wide-open spaces with the FT-650 from Yaesu.

The three-frequency operation lets you win the battle of the bands and communicate clearly on 6m, 10m and 12m frequencies. These less crowded bands put your transmission high in the sky and above the noise.

The FT-650 packs substantial communications power in a streamlined, compact case. A flip-out handle makes it the perfect portable, while a built-in power supply (AC or DC) lets it function as a base station. Broadcast from anywhere—mountain tops, remote islands, boats, vehicles or just the suburbs—and hear the difference with the FT-650.

- Jump on the FT-650 three-band wagon and get above the crowds and noise.
- 100 Watts on all modes.
- DDS—Direct Digital Synthesis.
- Superior Receiver Performance — Low noise (NF 1.7dB) RF preamp with switched 5 MHz bandwidth BPF, varactor tuned.
- Extended receiver coverage — 24.5 to 56 MHz.
- Automatic notch IF Notch Filter.
- 100% continuous operation duty cycle.
- 105 Memory channels • 99 channel memories • programmable scan memories and 2 priority channels.
- All mode operation (SSB, CW, FM & AM).
- Optional accessories: DVS-2 Digital Voice Recording System module • MD-1B8 Desk top microphone • SP-5 External speaker with AF filter.

For complete information about these and other Yaesu products, call your local Yaesu dealer today.



- The choice radio for the serious field operations enthusiast...
- All-mode 6 meter (690RII) 10 watt mobile...25 watts on 2 meter (290RII) and 70cm (790RII).
- Convenient FM performance: Three selectable FM scanning steps • Analog S/PO meter • One-touch reverse split button.
- Selectable SSB and CW tuning steps: 25/100/2500 Hz.
- Full featured microprocessor operation: 40 memories — simplex or duplex • 2 independent VFOs • All-mode noise blanker • Optional CTCSS tone squelch (FTS-7) • Semi break-in CW keying and side tone.
- Includes MH-15C8 DTMF microphone and FL-6020 linear amp.

The FT-690RII is the only single band transportable 6 meter radio now available.

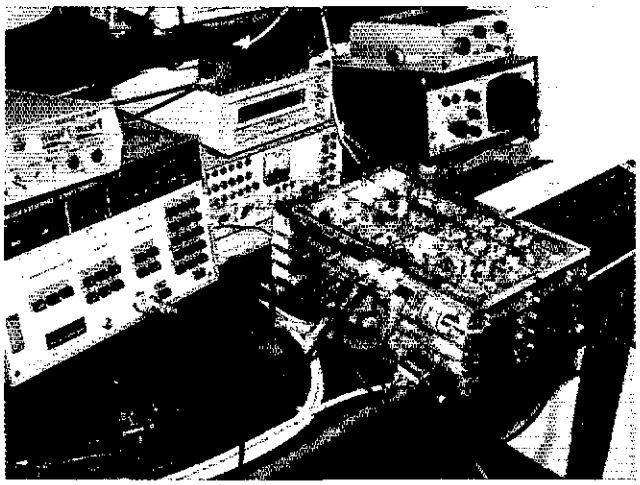
YAESU

*Performance without compromise.*SM

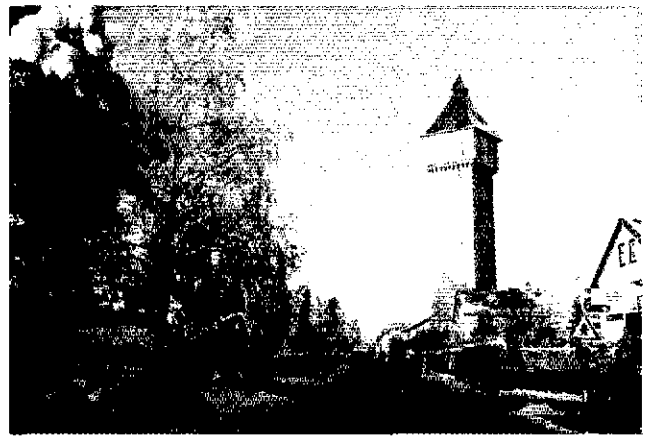
UP FRONT in QST

Latest Joint Satellite Project

RUDAK-2 is a digital transponder designed to fly aboard, and operate in parallel with, the RS-14 analog spacecraft, which is expected to be launched sometime this fall. The transponder features four receivers and a transmitter that covers FM and various digital modes. RS-14 is a combined effort of AMSAT-U-ORBITA in White Russia, the Adventure Club in Moscow and AMSAT-DL/RUDAK in West Germany (see Amateur Satellite Communications, *QST*, Sep 90, p 71).

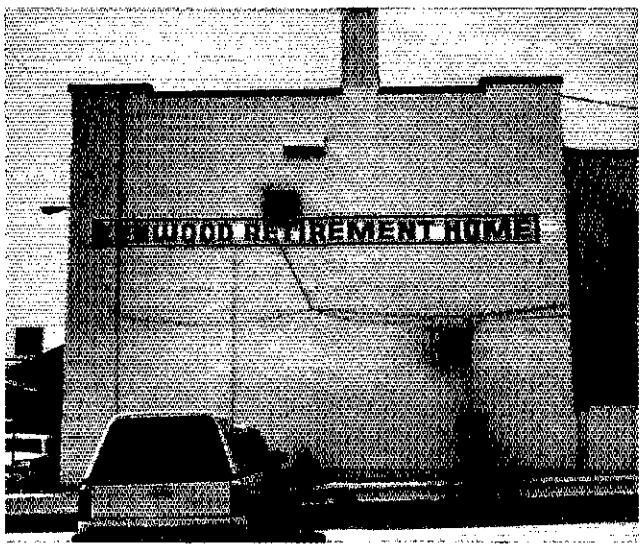


Smoke test: RUDAK-2 in its flight configuration getting an "EEG" on the bench. *(DK1YQ photos)*



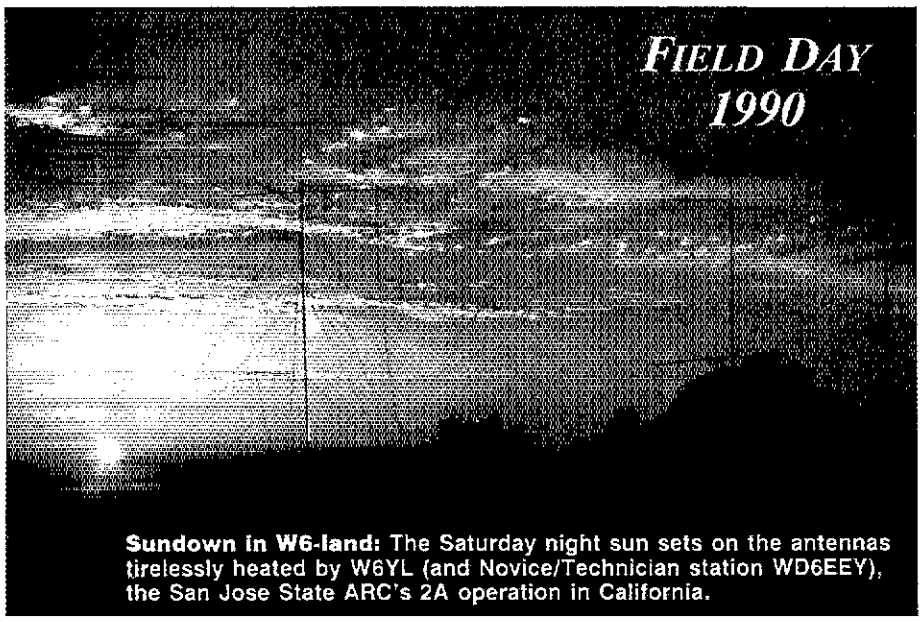
Baroque launch vehicle? RUDAK-2 tests were conducted in this water tower in Ismaning, near Munich, using the call sign DBØIQ.

Wireless pioneer: Leon A. Faber, W7EH, displays his coveted 70-Year ARRL Member plaque presented by Jim Swafford, W7FF, ARRL Arizona Section Manager. Born in Illinois on February 2, 1900, Faber built his first spark transmitter in 1913 and was first licensed as 9EH in 1917. *(photo courtesy of W7FF)*



Florida rest home: The Sunshine State ranks second in the US with more than 28,000 hams. How many rigs "go south" to spend their "final" years? This haven is on US 1 in West Palm Beach. *(NY2E photo; thanks to W1YL/4)*

PINS wins pins: PINS—your *P*articipation *I*n *N*ovember *S*weepstakes—can earn you one of these handsome mementos. Make at least 100 contacts and you qualify for one of these collector's items. There are separate pins for phone and CW. For more information, see October '90 *QST*, p 93. *(pin shown actual size)*

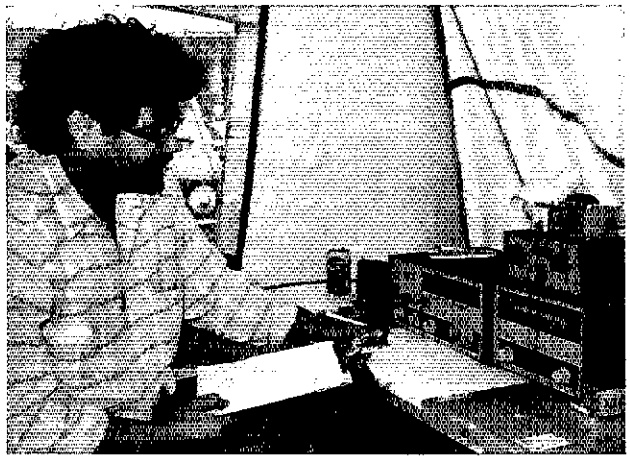


Sundown in W6-land: The Saturday night sun sets on the antennas tirelessly heated by W6YL (and Novice/Technician station WD6EEY), the San Jose State ARC's 2A operation in California.

Lucky it's "Sun-day!" Tracking old Sol in South Dakota are (l-r) Lee, WØHOJ; Jesse, WØEDV; and Phil, KAØFUL. They made 29 contacts from Vermont to Southern California using solar power.

"What are all these wires for?" Stewart Lake ARC members at WD7X in Oregon assemble their two-element quad for 10 and 15 meters.

More than 30,000 US and Canadian hams made 1.35 million contacts from 1828 stations set up in less than 24 hours. About 80% of the stations were run by sources other than commercial ac power. Digital and satellite communication greatly augmented traditional CW and phone, demonstrating that Amateur Radio emergency preparedness can be a lot of fun! Read the story elsewhere in this issue.

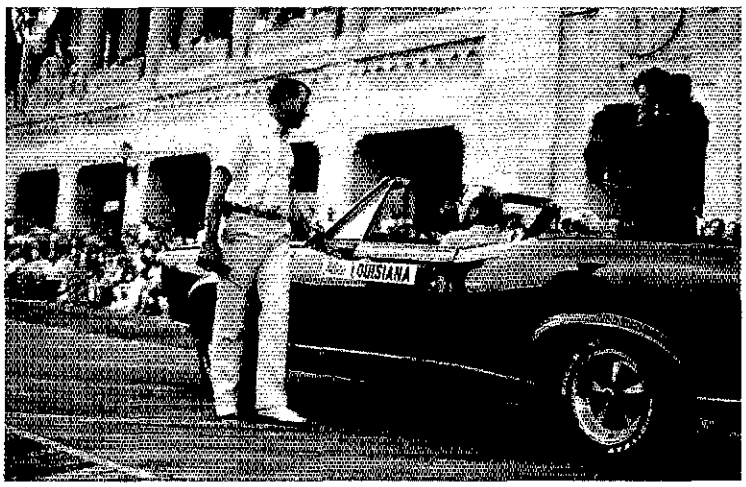


Field Day madness: Dave, N6YVC, works 40 CW from the Novice station at the Mad Scientists ARC 2A setup at AA6DE in the San Francisco Bay area.

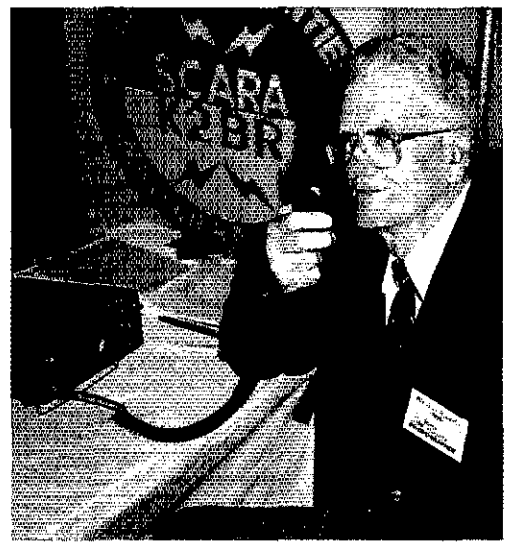
Artistic license: John Paolucci, KJ6ZF, who played a part in the combined Electronics Museum ARC and the Foothill ARS operation, stands by his hand-painted Field Day sign, based on 1940s-style *QST* artwork. Paolucci studied at the Art Center College of Design in Pasadena, California. *(KT6W photo)*

Ham Radio Hand-in-Hand with Miss America

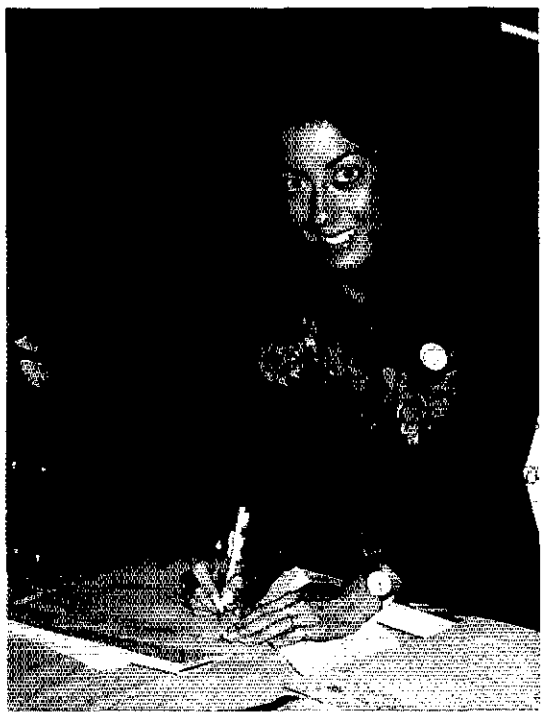
Amateur Radio and the Miss America Pageant have been together for two decades. The Southern Counties Amateur Radio Association (SCARA) furnishes communications for the Friday evening parade down the famed Atlantic City Boardwalk. SCARA also operates a behind-the-scenes special-event station, K2BR, where contestants send "pageantgrams" home via the ARRL National Traffic System. The station made almost a thousand contacts this year. *(story and photos by ARRL Field Services Manager Rick Palm, K1CE)*



Parade patrol: Rich Maxwell, WB2SFH, monitors progress in front of the famous Atlantic City Convention Hall on the Boardwalk.



Never one to "miss" the event: Min Bouchard, K2MB, sends a "pageantgram" on its way. Min has been associated with the special-event station since its beginning 20 years ago and as an annual tradition, operates during the pageant's Saturday night show, closing down at midnight.



Maine attraction: At the SCARA station, Miss Maine, Ann Rowe, visits K2BR to send a "pageantgram" to a friend back home.

"There she is..." Miss America 1991, Marjorie Vincent (Miss Illinois), holds court in the press room immediately after her midnight crowning.

League Lines

Draft US proposals for the 1992 World Administrative Radio Conference (WARC-92) have been made public. An FCC Second Notice of Inquiry (NOI) in Docket 89-554 was released at press time, October 1. The FCC proposes extensive expansion of the HF broadcasting bands, none at the expense of the Amateur Radio Service.

The proposals include realignment of the 40-meter amateur band and the 41-meter broadcasting band to avoid the present overlap. The amateur band worldwide would be 6900-7200 kHz, with broadcasting above 7200 kHz. If adopted at WARC-92, implementation would be more than 15 years away.

At higher frequencies, the news is less encouraging. The comment deadline on the FCC's NOI is December 3. See the article on page 42 of this issue.

In September, ARRL President Larry Price, W4RA, sent a four-page letter to League members explaining our WARC-92 preparations and requesting your financial support to help underwrite the extraordinary expenses the League will be incurring over the next two years. ***If you have already responded, thank you!*** Thousands of members have, and will be receiving acknowledgment certificates as soon as they can be processed. ***If not, there's still time to make your contribution count.***

The FCC has released a new Form 610, dated February 1990, with an expiration date of December 31, 1992. The FCC will continue to accept any previous versions of Form 610 that provide for three VE signatures (Form 610s dated June 1984 or later).

The FCC dismissed an ARRL request for ***more time for people to comment*** on the Notice of Proposed Rule Making in PR Docket 90-356, the proceeding to make higher classes of amateur license more accessible to the severely disabled.

ARRL filed comments on time. The comments point out that the subject of this proceeding is the same as that of Docket 78-250, which was dismissed without action in 1982, and that, while no one should be denied full access to Amateur Radio solely on account of a disability, the number of persons for whom flexible administration of a code exam is not an adequate solution is much smaller than the Commission suggests. Comments from two individuals with expertise in the medical and rehabilitation field are quoted to support that point. Noting that the Commission, in Docket 78-250, was unwilling to assume the burden of assessing the eligibility for a code waiver for itself, the League argues that the Commission should not now pass on this responsibility to others (except, perhaps, to a panel of Commission-appointed experts, to review applications from the limited number of individuals who might be qualified for a narrowly drawn exemption). Finally, the ARRL notes that there are well-established procedures for the granting of waivers by the Commission, and no rule making is required for the Commission to exercise them—in fact, the Commission has an affirmative duty to do so.

On September 7, ***the ARRL submitted reply comments in PR Docket 90-55, the FCC proposal for the establishment of a codeless license on 220 MHz and above.*** The League reiterated its view that such a license must be an additional point of entry into Amateur Radio and should not replace the Novice and Technician licenses.

W1AW will run a one-week test on the 30-meter band, November 26 to December 2. CW and RTTY transmissions using 100 watts will be made on 10.109 MHz and 10.136 MHz, respectively. See page 85 for the time of transmissions. Send signal reports and observations on how well you can copy W1AW on 30 meters in your area at different times to Eddy Pollock, W6LC, Manager, W1AW, 225 Main St, Newington, CT 06111

A bill adding prohibitions against willful or malicious interference to the Communications Act of 1934 is now law. The FCC Authorization Bill (Public Law 101-394) completes work initiated by Barry Goldwater, K7UGA, before he retired.

The Public Service Advisory Committee proposes to update the criteria for the Public Service Honor Roll. For the committee to have a recommendation ready for the 1991 Annual Meeting of the Board, it will need your input no later than November 15 (see page 69).

As you read this, **The 1991 ARRL Handbook** ***should be off the press.*** The 1232-page 68th edition features 39 chapters with more than 1200 tables, figures, charts and an extended index. Although written primarily for amateurs, the *Handbook* has developed a prestigious reputation among engineers and other communications professionals. See pages 168-170.

Send in your nomination for the 1990 International Humanitarian Award. This annual citation honors hams who, through Amateur Radio, promote the welfare of mankind by assisting people in need throughout the world. A group or person is also eligible based on extraordinary service during a crisis or disaster. Send nominations by December 31 to Rick Palm, K1CE, Field Services Manager, at ARRL HQ.

It's time to vote for your favorite Amateur Radio volunteer instructors and professional teachers. The ARRL gives Instructor of the Year awards to individuals who teach classes outside the school system and aren't compensated above and beyond their expenses, and to those who show outstanding qualities in teaching Amateur Radio in school. Thank an instructor or teacher for their dedication to the future of Amateur Radio by sending nominations to your Section Manager (see p 8) by January 31, 1991.

If you like amateur television and want to share the fascination with young people in school, contact the ARRL Educational Activities Department for an outline on how to participate. Get your foot in the school's door so it will be opened again for you when space shuttle mission STS-37 flies with SSTV equipment aboard.

Maritime Mobile with NP2AZ

Amateur Radio is the perfect companion for this adventurous couple as they sail into the sunset in a modern-day voyage on the Spanish Main.

By Marijane Evans, NP2AZ
PO Box 228
Ceiba, PR 00635

March of 1986 was a milestone in our lives. My husband, Vince Sipple, N6JIB, and I had sold our home on St Thomas, in the US Virgin Islands, and were preparing to move aboard our 32-foot sailboat, *Centaurea*. We were elated at finally realizing our long-time dream of being able to cruise full time...and frustrated as we tried to limit the possessions we could take aboard our relatively small boat.

There was no arguing over one item, however. Our Kenwood TS-430S had been carefully selected for the occasion. While I struggled to fit a rectangular bottom sheet over the pie-shaped V-berth where we would sleep, Vince managed to install the Kenwood and the antenna tuner into a small cabinet next to the navigation table. There, it would be readily accessible and, with the door closed, safe from salt water spray.

We avoided the expense of using an insulated backstay for an antenna by converting our 20-meter dipole to a 33-foot "long wire" that roughly paralleled the backstay to the mast. The setup works well for us on all frequencies from 10 through 40 meters. For a ground, we used 3-inch-wide copper foil to bond together a "dynaplate" to the engine and antenna tuner.

We received the inspiration and the courage to make this major change in our lifestyle from the many cruising sailors we met through the Virgin Islands Amateur Radio Club, as well as boaters taking their Amateur Radio exams on St Thomas and St Croix.

I had misgivings about sailing off to explore faraway places, leaving behind friends and family, giving up the comforts of life ashore (hot showers, TV and refrigerators), and it was hard to sell or give away so many favorite things that had no place on a sailboat.

In retrospect, I'd say the best thing we did to prepare for the cruising life was to get our Amateur Radio licenses. Through our ham contacts we've met many wonderful people in the countries we have visited, not to mention other cruising hams who cross our path. If I am feeling lonely in a remote and isolated anchorage, I can simply turn on the rig and find a friendly voice, happy to bring me up-to-date on the latest world news or exchange reports on the weather. It is reassuring to know that our family or friends can reach us in case of an emergency, no matter how far we are from telephones and post offices.

Since moving aboard, we usually start the day by listening to the Caribbean Maritime Mobile Net (from 1100 to 1200 UTC) on 7.237 MHz while we have our coffee in the cockpit. Lou Bean, KV4JC, the net controller, is a shining example to hams everywhere with his courteous behavior, no matter how trying the situation. Lou lives ashore on St Croix, which is especially useful to boaters because he can be contacted by telephone if a nonham needs to reach a member of the net. I can attest to this: Two years ago, I was able to catch a flight to Colorado from the Virgin Islands within 24 hours after receiving an emergency message from my family.

Ocean cruising has its risks and it certainly adds a measure of security to boaters who check into the maritime net to give a daily position report on a long passage, get on-the-spot weather reports from other boaters or current updates on conditions at their destination. We also benefit from the expertise of a variety of talented people,

Centaurea approaches Bonaire, in the Netherlands Antilles, with author Marijane, NP2AZ, and husband, Vince, N6JIB, at the helm.

and that makes cruising safer and more pleasurable.

Jeanne Kuich, NP2AJ, who has sailed around the world aboard her boat *Stargazer* and writes a column on astronomy for *Caribbean Boating*, has converted most of the net regulars into amateur astronomers with her tips on what to look for, when and where. Her reports on the lunar eclipse of August 16, 1989, inspired many boaters to get together to witness the event...and keep each other awake past the sailor's usual early bedtime.

Emergency!

Florence "Tootie" Larkin, WP2ABG, is a registered nurse who surely must have been the role model for the spirited Nellie in the movie *South Pacific*. Tootie can always be counted on, whether the situation calls for consolation or practical advice.

I'll never forget a particularly rough crossing from Culebra, Puerto Rico, to St Thomas a few years ago when a rogue wave threw Vince across the cockpit of our boat, delivering a nasty head wound that left him dazed and bleeding profusely. Unable to stop the bleeding, I called Tootie on the St Thomas 2-meter repeater. While doing her best to calm me down, she gave me instructions on how to help Vince and organized a rescue team of local hams to intercept our boat.

When we finally sailed into the harbor, Tootie gave me directions on the 2-meter net to a mooring they had found for us, and Tootie and her husband were waiting there in their dinghy, holding the mooring lines. They rushed us to the hospital, where Tootie whisked us right past the admittance desk and into the emergency room. When they started to clean Vince's wound for stitches, I bolted from the area, knowing he was in good hands with Tootie there to supervise!

Tootie and Jim built their 50-foot boat *Allons* (French for "Let's Go!") in the sugar cane fields of Louisiana and have cruised and lived aboard her since 1976. No ham function on St Thomas would be complete without Tootie's big pot of creole jambalaya.

In September 1989, when it became apparent that Hurricane Hugo would not miss St Thomas, Drew Johnson, NP2E, and his wife Christine, WP2AGQ, persuaded Tootie and Jim to leave *Allons* and take shelter ashore. When the two couples returned to the harbor following the storm, both *Allons* and the Johnsons' boat, *Quest*, were gone without a trace, along with all of their personal possessions. Without complaining about her loss, Tootie spent the next two weeks helping Drew pass hundreds of health-and-welfare messages on the radio. Everyone on the Caribbean Maritime Mobile Net will be cheering when Tootie and Jim find another boat and we hear "This is WP2ABG, Tootie, in St Thomas," back on the air.

Marijane at the controls of *Centaurea*'s diminutive ham station.

Bruce Goble, WP4EDC, who runs the net on Wednesdays and Sundays from the island of Culebra, Puerto Rico, managed to salvage his boat, *Katrina*, which was washed ashore during Hugo. Bruce, a computer expert, has produced the *Caribbean Maritime Mobile Net Directory*, which not only lists net members and their call signs, but has such useful information as the 2-meter repeater frequencies for the islands and information on how to get a reciprocal license or permit on the various Caribbean islands.

Reciprocal Licenses

For most seagoing hams, once they reach port and have checked in with customs and immigration, the next question is: "Where do I get my reciprocal license?"

Not only does Bruce stress the importance of this in his directory, but so does Ginny Osterholt, KA5YLM, who served as editor of the Seven Seas Cruising Association *Commodores' Bulletin* for almost 14 years (before succumbing to the call of the sea herself). The SSCA takes its motto to "Leave a Clean Wake," seriously, and members who knowingly break the laws of a host country may be dropped from the membership. Ginny has reminded members that these high standards of conduct include compliance with FCC regulations and the rules of the country they are visiting.

Maritime operators need to plan in advance to make sure they have information on reciprocal operating agreements and third-party traffic agreements by checking with the Caribbean Maritime Mobile Net, or sending an SASE to the SSCA or the ARRL with a request for information on the countries they plan to visit.

We have found that procedures, cost, and the time involved to get a reciprocal license or permit varies greatly. In Road Town, Tortola, British Virgin Islands, it's a short walk to the Office of Telecommunications from the Customs Office, but the $20 fee ($40 for both of us) puts a real dent in our cruising budget, so we sometimes exercise the right to remain silent. On Grenada, there is no fee and it's simply a matter of taking a copy of your license to Mr Gorman, J37AQ, at Grenada Yacht Services and signing the "guest log" for visiting hams. In Venezuela, we travel to Caracas, where our reciprocal licenses are processed in one day. The fee is 105 bolivars, less than $3 US.

Invariably, we've found that Amateur Radio operators in foreign countries are eager to help and are good sources of local information. Chuck Roswell, PJ4CR, who has lived on the Netherlands Antilles island of Bonaire for 23 years, has taken the trouble to make up an information sheet for visiting hams. In it, Chuck points out that third-party traffic is prohibited with the Netherlands Antilles and that visiting yachts must go outside the three-mile limit to operate under the license of their home country. Because these requirements differ from country to country, boaters need to check on the rules that apply to each area they plan to visit.

In Venezuela, maritime operators can count on the friendly assistance of Mauricio Black, YV5LIH, and John Tomasik, K8HIR, both avid sailors and ham operators. They have a marine store, MYS, in Puerto La Cruz, where John specializes in marine electronics, including

Vince, N6JIB, hoists the jib aboard *Centaurea*.

the sale and repair of ham equipment.

MYS became a gathering place for boaters in Puerto La Cruz last September, who, fortunate to be south of the hurricane zone, were seeking information on the fate of their friends caught in Hugo's destructive path. Those without amateur rigs on their boats listened to firsthand reports of the storm on the transceiver at MYS. This included a dramatic account from Judy Ludwig, KP2Q, as the eye of the hurricane passed over the Puerto Rican island of Vieques, where Judy and her husband Herman, NP2BU, had their boat *Rolling Home* tucked back in the mangroves.

During that tense week, as we anxiously listened to our ham radio for reports from or about our friends in the Virgin Islands and Puerto Rico, one bright spot came when Ken Coffer, N6MKS, aboard the yacht *Antoinette* asked if we could give his wife Toni and their teenage son, Derek, their Novice exams. Nothing is quite as infectious as the enthusiasm of someone just getting started in Amateur Radio, and we were delighted when Toni and Derek passed their code and written exams with flying colors.

Aspiring hams cruising outside the United States often find it difficult to find someone to administer Novice exams. We find it rewarding to help them get their start. We feel a real sense of pride when we later hear them on the air after they have upgraded.

One of the idiosyncrasies of Amateur Radio that we find amusing is that so many close friendships are formed by people whose only contact has been through ham radio. This was particularly amazing to me, as I considered the hobby a great way to keep in touch with friends we had made through the Virgin Islands Amateur Radio Club, but found it quite awkward to try to carry on a conversation with a total stranger.

A Phone Patch

While anchored in St George's Harbor, Grenada, in October of 1987, I was monitoring the InterAmerican Traffic Net when a Colorado Springs operator offered to do a phone patch for someone in South America. Curious, I followed them off frequency.

I had just been in Colorado Springs the month before to be with my family after my nephew was in a serious accident. Although he was out of intensive care, he was still in the hospital and I was anxious to learn how he was doing.

I waited while Mory Wunderlich, WAØYNP, handled the patch for the South American station, and when he was finished, I asked if he would call my sister, Gini. Mory briefed my sister on procedures, but he should have briefed me instead. I was the nervous one, and kept forgetting to say "over" at the end of my transmissions.

Vince and Marijane at Indunave Marina in the Morrocoy National Park, Venezuela.

From then on, Mory became an important link between me and my family. During our family crisis, we felt like we'd found a saint to bring us together in spite of the distance separating us.

When Gini returned to her job and phone patches were no longer convenient, I could still rely on Mory to give me progress reports on my nephew and to let my family know where and how we were.

Last year, when we sailed from Venezuela to Puerto Rico, Mory got a chart of the Caribbean and we kept a daily schedule so I could give him our coordinates and let him know how we were faring. Although Gini wasn't home, Mory would dial her telephone number and at the "beep," I'd say, "Hi! This is Marijane, and we are at 13° North, 66° West and having a rough sail...but at least it isn't snowing here."

After her initial surprise, Gini couldn't wait to get home from work to check her answering machine, and being a landlubber, was especially relieved to hear of our safe arrival.

The next time I get back to Colorado to visit my family, I will include a get-together with WAØYNP and his wife!

Friends

Our chances of meeting other hams who we hear on the radio are definitely enhanced if they are also cruising in the Caribbean, or so we thought. In October 1989, sailing through the offshore islands of Venezuela, we heard via the Caribbean Maritime Mobile Net that Frank, KP2BP, and Debby, KP2BQ, Lambert, aboard *Deborah*, would also be stopping at the island of Tortuga.

We looked forward to seeing these two with great anticipation; Debby sounded like such a nice person, and Frank is highly entertaining on the radio with his fish stories, poems to fit any occasion, and his frequent attempts to give away or get rid of Walker, their ship's cat.

After anchoring at Punta Delagado, on the northeast tip of Tortuga, we eagerly awaited the arrival of *Deborah*. Anticipation turned to concern as darkness fell and their boat was nowhere in sight.

We got up early the next morning to fix coffee and listen to the 0600 Voice of America news about the Friday the 13th stock market crash and to speculate on what had happened to *Deborah*. At 0700, we tuned to the Caribbean Maritime Mobile Net on 7.237 MHz. Frank was the first person to check in. When I answered his call for NP2AZ, Frank said:

"I've just one thing to ask you,
From this side the Spanish Main;
A question Caribbean,
Begs an answer not in vain!
While markets are a-tremble,
Fears shake Prudential-Bache,
All I want to know is,
What *is* your QTH?
Or, Where the devil are you, Marijane?"

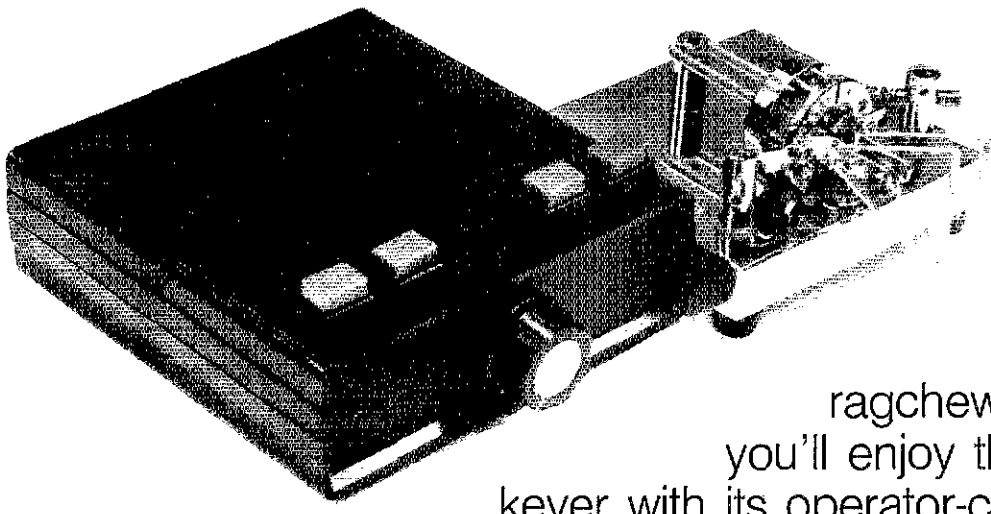
Relieved to learn that they had anchored at the *northwest* end of Tortuga, we promised to stay at Punta Delagado until they arrived. We were not disappointed. Debby and Frank were charming, outgoing and humorous. True to form, as we left their boat that night, Frank tried to talk us into taking Walker the Cat.... QST

Strays

"DOWN EAST" NTS NET NEEDS YOU

The Maine Slow-Speed Net is actively looking for more participants. MSSN meets every Tuesday, Thursday and Sunday at 6 PM Eastern time on 3725 kHz. CW speed ranges from 5-13 WPM (the average is about 10 WPM). New hams are particularly encouraged to join in to learn CW traffic net procedures, get code practice, meet new friends and enjoy Morse code. NM and NCS is Carl Ellis, K1UNQ, of Rumford, Maine. Other NCSs include Bill Mann, W1KX, of Pittsfield, Maine, and Michelle Noel, KA1VHI, of Harrison, Maine.

The CMOS Super Keyer II



Whether you're a ragchewer or a contester, you'll enjoy this feature-packed keyer with its operator-controlled flexibility!

By Jeff Russell, KCØQ
2125 Linmar Dr NE
Cedar Rapids, IA 52402

and Bud Southard, NØII
2519 Meadowbrook Dr SE
Cedar Rapids, IA 52403

The original CMOS Super Keyer appeared in October 1981 *QST*[1] and several editions of *The ARRL Handbook*. It proved to be very popular and, almost a decade later, requests for kits continue to arrive! Now, the CMOS Super Keyer II—a worthy successor—is here. As you'll see, modern technology allows much more to be done with a minimal amount of hardware, a smaller PC board and simplified construction.[2]

A glance at the photos of the completed CMOS Super Keyer II is all it takes to realize that the keyer doesn't need a keypad or a myriad of switches and knobs to control it. But don't conclude from this that it's just a bare-bones memory keyer! In fact, this keyer will satisfy the needs of casual ragchewers as well as avid DXers and contest operators. Because there are so few controls necessary to operate this keyer, handicapped amateurs will find it easy to manage. As an aid to the handicapped, a manual-on-disk is available—see note 2.

Features

Peek inside the Super Keyer II (see Fig 1) and you'll see that the small (1.4 × 2.4-inch) PC board contains only one IC, a couple of transistors and a few other components. It's the program in the IC that really makes this keyer remarkable. It provides:

- An iambic keyer with dot and dash memories.
- Four 48-character messages.
- Character and Real-Time messages.
- Timed pauses within messages.
- Messages that can call other messages and contain operational commands.
- Message-loop capability for continuous play.
- Message break-in to allow for paddle-inserted text.
- Input queue to store multiple message activation.
- Contest serial numbering (000-9999).
- Digital and linear analog speed control (6-60 WPM).
- Adjustable weighting (dot/dash ratio) of 25-75%.
- A built-in 700-Hz sidetone monitor.
- A transmitter key-down (tune) function.
- Hand-key mode.
- Compensation for transmitter-induced keying distortion.
- Selectable automatic character spacing.
- Keyer-status inquiry functions.
- Ultra-low power consumption for battery operation.

How does the Super Keyer II provide all this flexibility without a keypad or a bunch of switches and knobs? Simple: Commands are sent to the keyer in Morse code—using the paddles!

A detailed explanation of the operational features of the keyer will be given later. First, let's have a look at the schematic and find out how easy it is to build your own Super Keyer II.

Circuit Description

The keyer schematic is shown in Fig 2. The main component is the Motorola

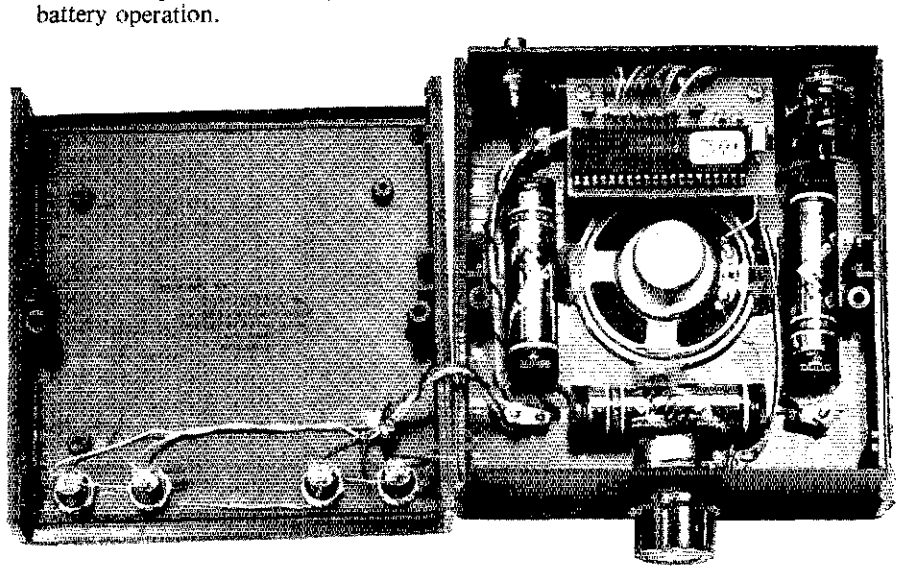


Fig 1—An inside view of the CMOS Super Keyer II. Around the speaker, three AA, single-cell holders are glued to the box bottom. A pair of ¾-inch spacers support the PC board at the rear of the cabinet. The analog speed control (R13) is center-mounted on the front panel. On the back panel are the paddle and key-line jacks. As shown in the title photo, the four push-button switches are mounted on the top half of the cabinet, two on each side of R13.

[1]Notes appear on p 21.

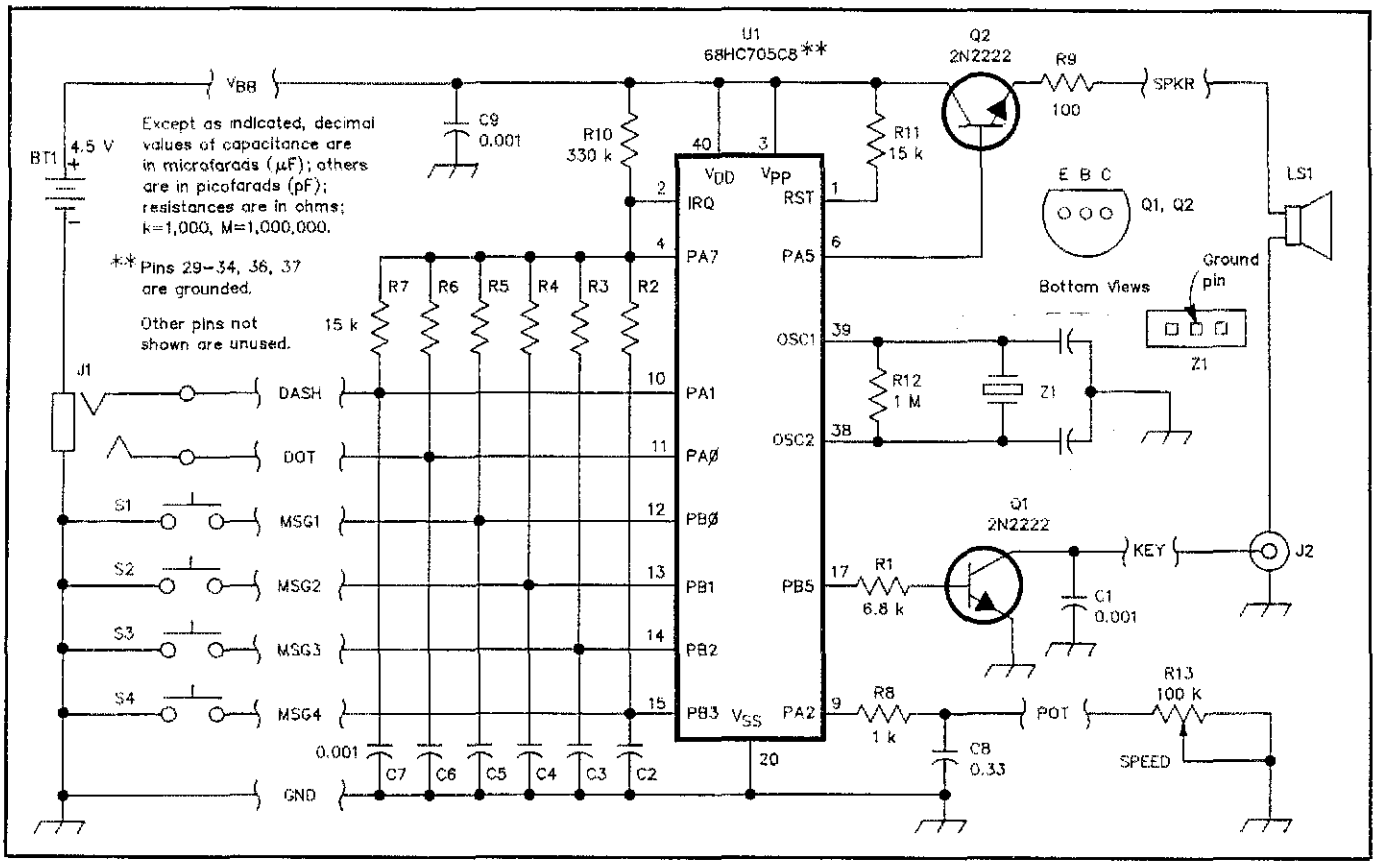


Fig 2—Schematic diagram of the keyer. All capacitors are 25-V disc ceramic units. Resistors are ¼-W carbon-composition or metal-film units. RS part numbers in parentheses are Radio Shack®.

BT1—Three 1.5-V AA alkaline cells (RS 23-552) wired in series; NiCd cells can also be used—see text.
J1—¼-inch, three-circuit key jack (RS 274-312).
J2—Phono jack (RS 274-346).
LS1—2-inch diam, 8-Ω speaker (RS 40-245).
Q1,Q2— 2N2222 or similar NPN (RS 276-2009).
R13—100-kΩ pot, linear taper (RS 271-092).
S1-S4—SPST push-button switch (RS 275-1566).
U1— Motorola 68HC705C8 (see note 2).
Z1—2-MHz resonator with built-in capacitors (Digi-Key part no. PX200; available from Digi-Key® Corp, 701 Brooks Ave S, Thief River Falls, MN 56701, tel 800-344-4539).

Miscellaneous

Enclosure—Pac-Tec™ CM5-125 used for prototype shown here. (Pac-Tec boxes are available from Electronic Precepts of Florida, 7401 114th Ave N, Suite 502A, Largo, FL 34643, tel 800-367-4649. The CM5-125 case comes in four colors: black, gray, tan and PC bone (an off-white). Price: $13.09 plus shipping and handling in quantities of 1 to 39. (The ARRL and *QST* in no way warrant this offer.)
Two ¼-inch standoffs
Three single-cell battery holders (RS 270-401)
Knob (RS 274-416)

68HC705C8 CMOS microcomputer (U1). This IC contains an 8-bit central-processing unit, timer, bidirectional I/O lines, 304 bytes of RAM, and nearly 8 kbytes of PROM. A 2-MHz clock is employed, with the frequency set by a ceramic resonator (Z1).

Dot, dash, and message-input lines are pulled up by R2-R7 and momentarily grounded by paddle or push-button closures. Analog speed is controlled by a software analog-to-digital converter (ADC) in conjunction with R8, C8, and R13. C8 is charged quickly through R8 with PA2 configured as an output. PA2 is then made an input, and the discharge time through R13 is measured.

A software-generated 700-Hz sidetone is selectively output on PA5. Q2 is a voltage follower that provides speaker drive through R9. Transmitter keying is done by Q1, which will handle low-voltage, positive-key-line rigs only. Take care not to exceed any of the maximum ratings of the 2N2222 transistor used at Q1 (V_{CEO} = 30, I_C = 800 mA, P_D = 1.2 W). If your transceiver has a negative key line or one that exceeds Q1's limits (likely if you own an older transceiver with a vacuum-tube final amplifier), use an interface circuit between the keyer and the transceiver. Some suitable circuits were recently described in *QST*.[3]

The CMOS Super Keyer II is designed for low power consumption. When idle, the microcomputer "sleeps"—not even the clock runs—yielding a current drain of under 10 μA! Thus, there's no need for an on/off switch. While the keyer is active, its current consumption rises to about 5 mA (with the sidetone monitor turned off), but after two seconds of inactivity, the keyer automatically goes back to sleep. The monitor is the major power consumer, requiring peak currents of about 40 mA. So, to extend battery life, the monitor should normally be turned off, and the rig's sidetone used to monitor sending.

The keyer works with any supply voltage in the range of 3 to 5.5. Three series-connected, AA alkaline cells provide a nominal 4.5 V and will yield many months of service under normal operating conditions. You could also use four series-connected, rechargeable NiCd cells to supply 4.8 V, an approach similar to that taken with the original Super Keyer.

Build Your Own

The PC board and associated components are available as a partial kit (see note 2). A part-placement guide is shown in Fig 3. Chassis-mounted parts, as used in the unit shown here, are all available from Radio Shack®. Similar components are also stocked by mail-order electronics parts suppliers.[4]

A 1.5 × 5.08 × 5.25-inch plastic enclosure obtained at a local hamfest houses the keyer shown in the accompanying photos. With miniature switches and connectors and tighter packaging, a considerably smaller box would suffice. If you so desire, you can use remotely-located message buttons instead of (or in parallel with) the chassis-mounted switches.

Though housed in a plastic box, the keyer

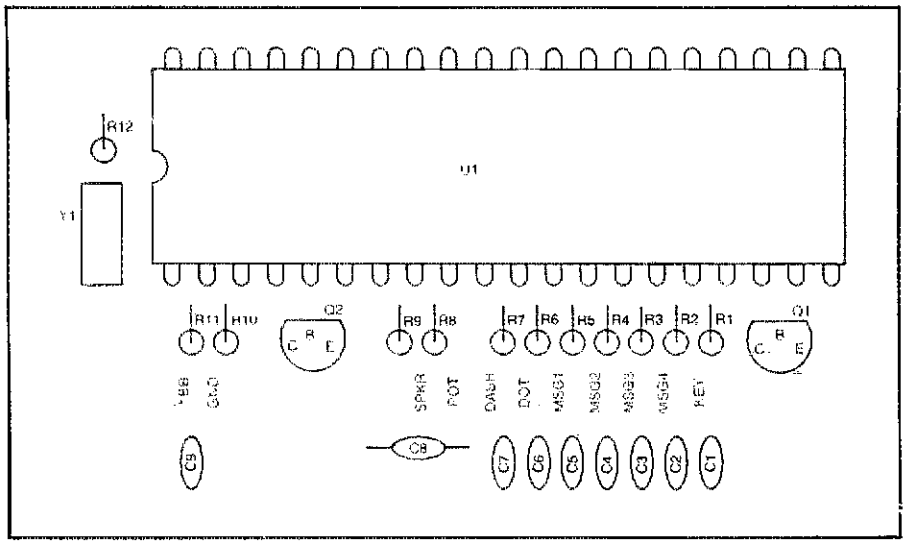


Fig 3—Part-placement guide for the CMOS Super Keyer II. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

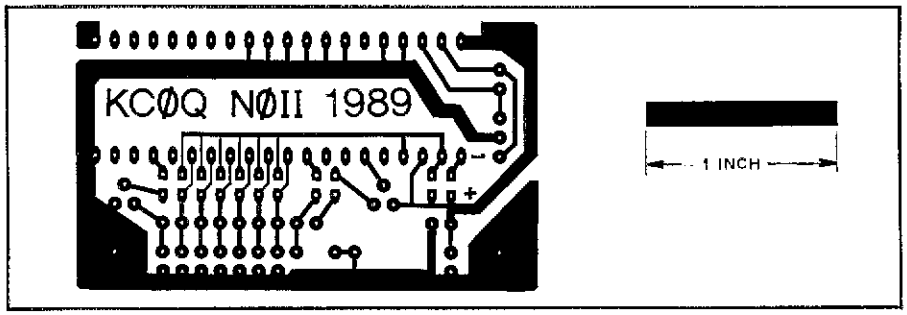


Fig 4—Circuit-board etching pattern for the CMOS Super Keyer II. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil. Ready-made PC boards are available; see note 2.

has not shown any allergic reactions to RF even when it was used adjacent to a kilowatt amplifier driving coax-fed antennas. But if your shack (or Field Day site) is hot with RF, consider the use of a metal enclosure and shielded cables.

The keyer can be built without the manual speed control, R13. If you opt to do this, also use a 100-kΩ resistor for R8 and install a jumper wire in place of C8. Then, only digital speed control is available, so you might find this procedure useful: Program messages 1 and 2 with /SU2 and /SD2, respectively, so simple button pushes provide convenient up/down speed control in 2-WPM steps. (The /SU and /SD commands are described later.)

Operational Description

When power is first applied to the keyer, it responds by sending OK in Morse code. The initialization state of the keyer is:

- Speed: 20 WPM (at the current knob position).
- Weighting: 50%.
- Monitor: on.
- Auto-space: off.
- Messages: empty.
- Load mode: Character.
- Input queue: on.
- Serial number: 001.
- Number option: 0.
- Function speed: 20 WPM.

Speed Control

Speed range, determined by the software, is 6 to 60 WPM. The analog control (R13) varies the speed over a 3-to-1 range. Software compensation allows the speed to vary *linearly* with knob rotation—this rare feature makes speed adjustment easy. As you might expect, operating speed can also be set digitally. When speed is set digitally, it is assigned to the current knob position. This allows you to tailor the absolute speed range of the analog control to suit your operating needs. For example, at KCØQ, the fully-counterclockwise position of the knob is programmed to be 13 WPM. Speed then increases linearly with clockwise rotation to a maximum of about 39 WPM.

To make function control easy, another—independent—speed can be programmed for use when entering commands. For example, even if you're operating at 35 WPM, function-controlling commands can be entered at 20 WPM or any other speed you choose. Alternatively, the command-entry speed can be made to default to the current operating speed. (See the explanation of the Reset mode under *Button Functions*.)

Keyer Commands

All paddle-entered keyer commands are sent in Morse code. If you enter an invalid command, or an incorrect parameter for a command, the keyer emits a burst of rapid dots. (*Which most definitely sounds like an electronic raspberry!*—Ed.) Multiple commands cannot be entered at one time. That is, each command must be entered separately and preceded by the simultaneous press of buttons 1 and 2. The presence of one or more *d*s represents the need for a digit(s) as part of the command.

Function Commands

Most function commands are employed only once to customize the keyer to your preferences. The keyer's functions are controlled using the push-button switches and the paddles. From left to right, (see the title-page photo) the buttons are designated as 1, 2, 3 and 4. To alert the keyer that a command is to be entered, momentarily and simultaneously press buttons 1 and 2. The keyer automatically disables transmitter keying, enables the sidetone, switches to the current command-entry speed, and acknowledges your request by sending K. Then, key in the desired command characters. For example, entering S25 sets the operating speed to 25 WPM. When the command is completed (the keyer knows when this occurs; no other action is necessary), the transmitter key line is again enabled and the speed and sidetone return to their previous state.

The *Kdd* command is included to compensate for keying distortion that may be introduced by your transmitter or amplifier. As is shown clearly in some *QST* product reviews, semi-break-in and full-break-in (QSK) operation can significantly shorten the keying on-time. This is caused by internal sequencing delays when changing between receive and transmit. The result is a light or choppy CW envelope. Although increasing the duty cycle with the weight command (*Wdd*) helps, it is correct for only one speed. However, keying compensation (*Kdd*) corrects the problem for all speeds by increasing the on-time of the keyer output, and commensurately decreasing the off-time, by a period of up to 25 milliseconds.

The *Zd* command selects various treatments for zeros when playing the contest serial number. Leading zeros may be inhibited or replaced by an *O* or *T*. Independently, an *O* or *T* can also replace any other zeros, and an *N* can be substituted for the number *9*.

Inquiry Commands

In addition to the commands that change settings and modes, there is a full set of keyer inquiry commands you can use. Inquiry commands allow you to determine the current state of the keyer. State information is sent to you in Morse code with the monitor auto-

matically enabled (even if it was disabled) and keying output disabled. Inquiries are initiated by momentarily and simultaneously pressing buttons 1 and 2. After receiving the F reply from the keyer, enter the desired inquiry with a leading question mark. For example, ?S asks what the current operating speed is; the keyer responds by sending two digits. Other inquiries evoke responses of ON, OFF, or other meaningful characters as appropriate. The complete set of inquiries is: ?A, ?F, ?K, ?L, ?N, ?Q, ?S, ?W, ?Z, ?1, ?2, ?3, and ?4. The last four are message inquiries that play the contents of message buffers 1 through 4, respectively. None of the inquiry responses key the transmitter.

Embedded Commands

Character-mode messages (described later) can contain embedded commands. To distinguish the commands from normal text, the command strings are prefixed by a slash bar (/) and entered as a separate word. When encountered during a message playback, the desired function is executed.

Break (/B) suspends the message for paddle entry and then automatically resumes the message when an exaggerated word space is detected. It makes constructing contest message loops a breeze!

Gap (/G*d*) allows spacing to be modified when emphasis is desirable. Expanded gaps can be used, for example, in call signs like WØEJ and WØIZ, to make the E or I easier to copy. It can also be used to shorten or lengthen the space between words.

Relative speed changes (/SU*d*, /SD*d*) can very useful. For example, the message /SU5 QRZ TEST DE WØIZ /SD5 is played at increased speed, but leaves the normal operating speed unchanged.

Messages

Four message buffers are provided. Each can hold 48 bytes (384 bits), which is generous enough, for example, to store *the quick brown fox jumped over the lazy dogs back.* The message buffers are volatile: If power is removed from the keyer, the messages will be erased.

A message-editing feature is included. If you make a mistake while entering a message, send a stream of seven or more dots. This tells the keyer to locate the last word and erase it. The keyer then plays back the previous word (if any) so you know where you left off. You can erase as many words as necessary. When you've reached the desired position, simply continue with the entry.

Loading a message is easy. Just press and hold one of the four buttons. After two seconds, the sidetone is enabled and the keyer emits a tone to signify that transmitter keying is inhibited. The keyer then sends an R or C to tell you if it's in Real-Time or Character mode, then message loading may begin. Enter the message text via the paddles. When you're done, terminate the message by simply tapping the same button again. If the message-buffer capacity is exceeded in either mode, the message is terminated automatically.

A message is played by tapping one of the four push-button switches. If the input-queue feature is enabled, the keyer will remember as many as eight button closures and play the messages in turn. Or, with the queue disabled, a button closure cancels any ongoing message and immediately starts the new one. Messages are aborted whenever a paddle is closed, allowing instant interruption for manual sending.

Real-Time Mode

The Real-Time mode works like it does in the original CMOS Super Keyer: What goes in is what comes out. You determine the spacing, so it will be as perfectly timed, compressed, or exaggerated as you make it.

In this mode, pauses are stored as spaces. It's important to know this because those spaces consume memory. After you've asked the keyer to accept a message, you don't have to rush the first entry because the keyer won't start storing pause-spaces until the first paddle closure is made. Once message entry begins, however, the keyer loads continuously: any pauses introduced are stored as spaces in the message. The elapsed time between the end of the last character entered to message termination is stored as a space at the end of the message. Real-Time mode does *not* permit the use of embedded function commands.

Character Mode

In the Character mode, complete character encodings are stored (rather than just bits to represent dots, dashes, and spaces). The software sanitizes your sending and produces perfectly timed Morse code when the message is played. Also, there is no need to worry about word spacing. Just stop sending after every word—the keyer will prompt you by sending an I (this doesn't appear as output) and wait for you to send the next word. Unlike Real-Time mode, there is no limit to the elapsed time between words, so there's no need to rush your entry.

Messages entered using the Character mode can contain embedded function commands for greater operating flexibility. These commands include those for speed changes, playing and incrementing the serial number, decrementing the serial number for repeats, and more.

A message can call any other message, allowing the messages to be linked, if desired. If a message calls itself, directly or via another called message, a continuous loop results.

Loops are useful for beacons, calling CQ, moonbounce and meteor-scatter operation, and in contesting. Loops are even more useful with the embedded Pause and Break functions. Speed-independent pauses in multiples of 0.1 second can be inserted anywhere, and the message resumes automatically after the time expires. A message Break allows you to insert one or more words manually. The message then resumes after a pause that exceeds a normal word space.

Button Functions

As mentioned earlier, single-button closures activate messages, and the 1-2 combination readies the keyer to accept paddle-entry functions. For added convenience, certain keyer function commands are duplicated by other double-button closures. The 2-3 combination is acknowledged by the keyer sending D, and decrements the serial number. Pressing 2-4 enables the Xmit (tune) function and is acknowledged by an X from the keyer. Similarly, pressing 1-3 sets the hand-key mode (preferred by some operators when tuning up their rigs), and is acknowledged by the keyer sending an H. The 3-4 button pair is for inquiry, and waits for paddle entry after acknowledging with ?. Finally, pressing buttons 1 and 4 simultaneously is acknowledged by the keyer as RV and causes a reversal in paddle sense (swapping the dot and dash sides of the paddle).

One four-button combination is recognized: 1-2-3-4. It's a Reset mode. It comes in handy, for instance, if you've mistakenly set the command-entry speed so high that you find you can't make further entries! If such a mistake occurs, don't panic or pull the batteries. Just press all four buttons simultaneously. The operating speed is reset to 20 WPM at the current knob position and the function-entry speed defaults to follow the knob setting. You can then decrease the speed to a comfortable value.

Summary and Acknowledgments

The CMOS Super Keyer II is versatile, simple and affordable. It has the advantage of battery operation and can serve your needs from a basic iambic keyer to a powerful contest machine.

Designs such as this are never done in a vacuum. We gratefully acknowledge the assistance, suggestions, and encouragement offered by Bob, W9KNI; Joe, NØBB; Dale, WØIZ; Barry, WAØRJT, and Jim, WØSR.

Notes

[1]J. Russell and C. Southard, "The CMOS Super Keyer," *QST*, Oct 1981, pp 11-17.

[2]A detailed operating manual and parts kit for the PC-board-mounted parts (programmed CPU IC, IC socket, ceramic resonator, transistors, resistors, capacitors, and etched PC board) are available from Idiom Press, Box 583, Deerfield, IL 60015. Price: $45 (subject to change without notice). Please add $3 shipping and handling in the US, $5 for surface-mail foreign orders. Credit cards are not accepted. (The ARRL and *QST* in no way warrant this offer.) As a service to the visually impaired, an operating manual is available on disk free of charge. To obtain the manual-on-disk, please send a PC- or MS-DOS®-formatted, 3½ or 5¼-inch floppy disk and self-addressed stamped mailer to Idiom Press. When corresponding with the authors or Idiom Press, include a business-size, self-addressed, envelope with one unit of First Class postage.

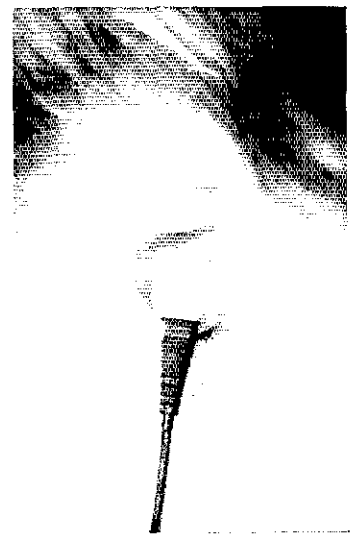
[3]See J. Galm, "Cheap and Easy Control-Signal Level Converters," *QST*, Feb 1990, pp 24-27, for a means of interfacing this keyer with negative-key-line transmitters—*Ed.*

[4]Mouser Electronics, 2401 Hwy 287 N, Mansfield, TX 76063, tel 800-346-6873.

Jeff Russell was first licensed as KCØQ in 1980, and has been chasing CW DX ever since. He holds BSEE, MSEE, and PhDEE degrees from the University of Wisconsin. Jeff manages processor development engineering at Rockwell International.

Bud Southard, NØII, was first licensed in 1953 as W9ZPU. He earned a BSEE degree from Marquette University, and is a software engineer at Rockwell International. A high-speed CW enthusiast, Bud can often be spotted touring on his Harley "hog."

An Intraural Microphone System for Mobile Operation



(NU1N photo)

Operating a hand-held transceiver while riding a bicycle or motorcycle can be challenging at best, and life-threatening at worst—and hefting a hand mike while driving a standard-shift car can be a hassle, too. The best place for that mike may be in your ear![1]

Bryan P. Bergeron, NU1N
30 Gardner Rd, Apt 1G
Brookline, MA 02146

As an avid cyclist, I am constantly searching for better ways of bringing my hand-held 2-meter transceiver along on group day trips. Having a ready communications system can be a indispensable asset in the event that someone in the pack has an accident or otherwise is unable to ride, especially when the nearest town is several miles away. Since it is simply too dangerous to hold a hand-held transceiver when moving at a good pace in a bicycle pack, in the past I have relied on a headset microphone/earphone assembly, with the rig—an ICOM IC-2AT—strapped to the handlebar for easy access to the power, volume, and frequency controls. VOX-based interfaces for the IC-2AT and other hand-helds have been described in the amateur literature,[2] but the wind noise and need to occasionally shout to companion riders makes PTT (with the PTT switch mounted on the handlebar, within easy reach of one thumb) the only reasonable operating mode for me.

Although a PTT-activated headset microphone greatly simplifies mobile operation of a hand-held, the bulk and weight of the headset present problems to cyclists. Not only is it difficult to fit a headset under a helmet, but the added weight (albeit only a few ounces) and constant whistling of the microphone boom become very annoying after five or six hours in the saddle. Because of its construction, the intraural (in-ear) microphone promises to avoid these and other limitations of headset mounted microphones, while retaining all of the benefits.

An intraural microphone is a compact, lightweight device that is positioned within the external auditory canal during use (see Figs 1 and 2). It is therefore easily used under a bicycle or motorcycle helmet, out of sight and the influence of the wind. In spite of these advantages, however, my initial reluctance to use an intraural microphone for Amateur Radio communication stemmed from the relatively narrow frequency-response characteristics of the design. Unlike conventional microphones, which are placed in front of, or at least in line with, the mouth, intraural microphones rely on bone conduction for the receipt of audio vibrations. The result is that, compared to conventional headset, boom, or hand-held microphones, higher-frequency, unvoiced sounds are poorly reproduced in an intraural system.

Although the differences between the response characteristics of intraural and

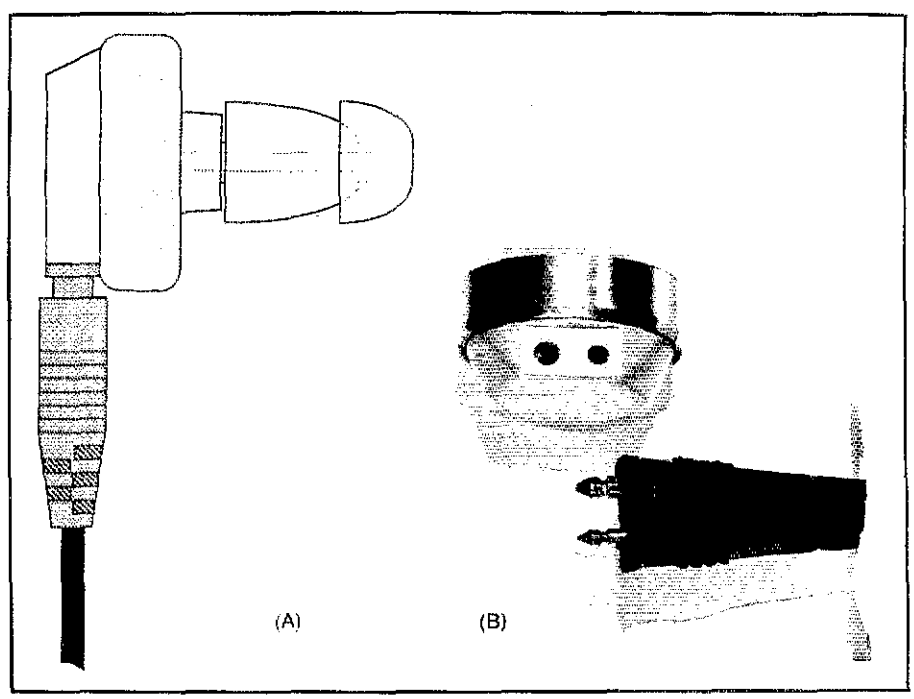


Fig 1—Intraural microphones permit hands-free operation of communications equipment in moderate- to high-noise environments. Except for their soft, removable, elongated tips, they resemble common monaural earphones (A). The removable tips are available in two diameters, allowing selection of a tip that more closely approximates the diameter of the user's external auditory canal. B details an intraural microphone's cable connector and socket. Although the two connector pins differ in size, the microphone is not polarized.

[1]Notes appear on p 24.

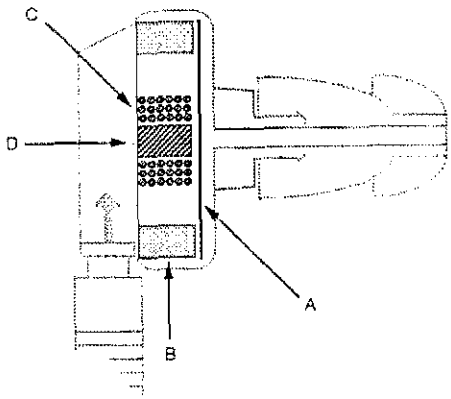


Fig 2—Intraural microphones transform acoustic vibrations induced in a thin, flexible metallic disc (A) into electrical signals. Functionally, these units resemble permanent-magnet dynamic speakers, with a permanent magnet (B), coil (C), and fixed central iron core (D). Dynamic earphones are also based on this design.

Speech in Mobile Communication

Most mobile Amateur Radio operation is speech-based. Speech, often supplemented with facial gestures and posturing, has evolved throughout the millennia to become the standard medium for interpersonal communications. Despite this, modern science has yet to fully understand the underlying neurological and psychological principles involved in the acquisition, synthesis, and understanding of speech. Yet, the physical phenomena of speech are easily described. On a mechanical level, speech can be considered to consist of two types of sounds, voiced and unvoiced. Voiced sounds, such as the *a* in *bat*, are the result of air being actively forced past the vocal cords. Unvoiced sounds, in comparison, are generated by the tongue, cheeks, teeth and lips, and are represented by the *s* in *swim* and the initial *t* in *tooth*. The spectral content of unvoiced sounds generally lies above 1.5 kHz,† whereas voiced sounds can encompass the entire range of human speech. In addition to the interpersonal differences in the intensity and spectral content of speech, there are significant sex-dependent differences as well. For example, women tend to have higher-pitched voices than men. While the range of human speech that is most important for understanding extends from about 600 to 4000 Hz,‡ speech-based communications systems commonly rely on signals in the 300- to 3000-Hz range.—*NU1N*

†K. Kleinschmidt, Ed., *The ARRL Handbook for the Radio Amateur*, 1990 ed (Newington: ARRL, 1989), Chapter 7.

‡R. Newman and S. Gelfand, "Characteristics of Sound," Belove, Hopkins, Nelson, Rosenstein and Shinners, Eds, *Handbook of Modern Electronics and Electrical Engineering* (New York: John Wiley & Sons, 1986).

conventional microphones are best appreciated aurally, the sonograms and pressure tracings in Figs 3 and 4 provide concrete evidence of the amplitude and spectral-response differences between intraural and conventional mikes. The tracings were created by simultaneously recording the spoken word *November* with a headset-boom (Fig 3) and intraural (Fig 4) microphone. The headset unit used for this comparison was a Shure SM10A directional dynamic microphone, and the intraural unit was a Maxon 508-021-A microphone.[3] Since the intraural mike's output was considerably less than that of the headset microphone, I used a low-noise, laboratory-grade audio preamplifier to bring its level up to that of the headset microphone. The sound power level of background (white) noise in the test environment was measured at 60 dB according to the equation

$$\text{Sound power level} = 10 \log (p \div 0.0002 \text{ dyne/cm}^2) \text{ dB} \qquad \text{(Eq 1)}$$

where p is the power level of the measured noise (0.0002 dyne/cm^2 is equivalent to 10 to 16 W/cm^2). The sound power level of the speech, measured at the location of the headset microphone element (at the corner of the mouth and approximately ½ inch away) was 90 dB.

Note the differences between the pressure tracings and the sonograms associated with each microphone. For example, while the peak amplitudes shown in the pressure tracings are equal, the peaks and valleys occur at different times during the utterance. Also note that the speech energy picked up by the intraural microphone is generally confined to the frequency band below 2 kHz, as shown in Fig 4A. In com-

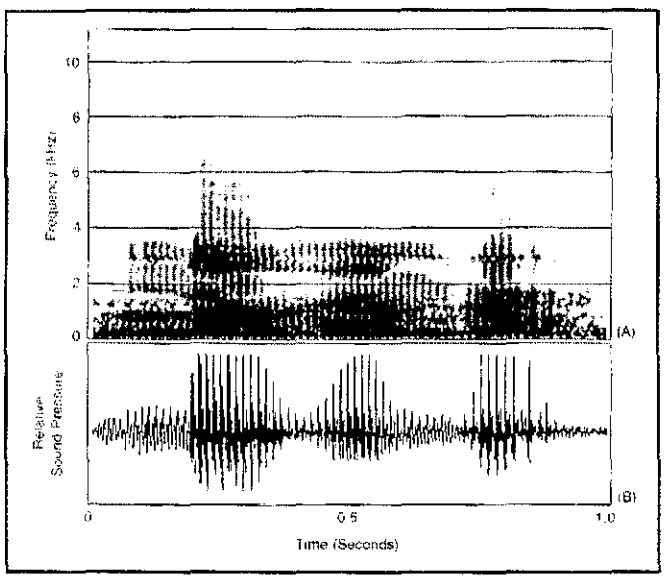


Fig 3— Sonogram (A) and sound pressure oscillogram (B) of the world *November* as measured by a Shure SM10A directional dynamic microphone headset. The sonogram axes indicate frequency (vertical) and time (horizontal), with the darker areas representing higher relative strength. Note the density above 2 kHz. The pressure-oscillogram axes indicate relative pressure (sound amplitude) and time.

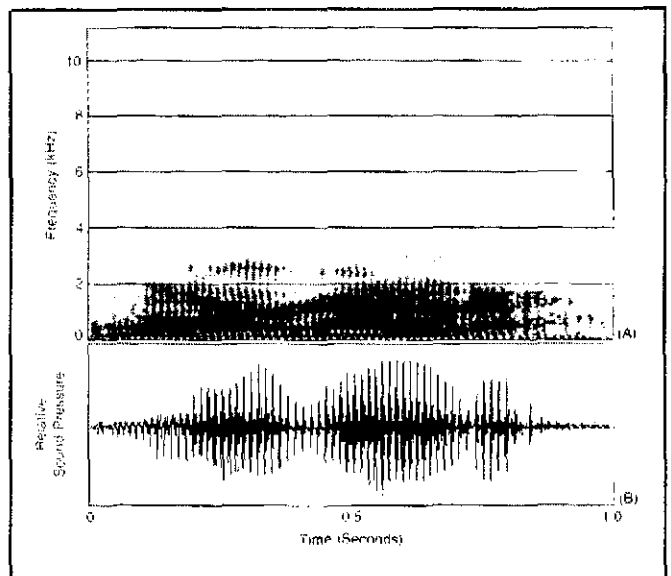


Fig 4—Sonogram (A) and sound-pressure oscillogram (bottom) of the word *November* as transduced by a Maxon 508-021-A intraural microphone. Note the differences between the sound-pressure oscillogram and sonogram in this figure with those in Fig 3.

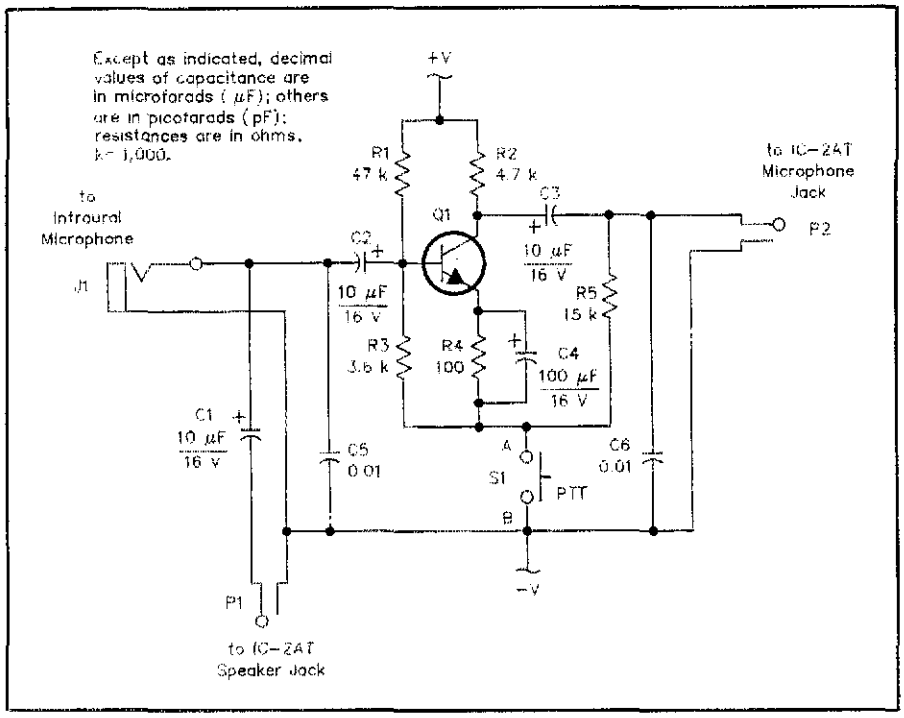


Fig 5—Schematic diagram of the ICOM IC-2AT intraural microphone interface. During receive, speaker output from plug P1 is directed to the intraural microphone, which also acts as an earphone, through C1 and jack J1. Q1 amplifies the mike signal when momentary push-to-talk switch S1, PTT, is closed. C5 and C6 are bypass capacitors. Power for the circuit is supplied by a 9-V alkaline battery.

Q1 is a general-purpose switching transistor. Electrolytic capacitors rated at 16 to 50 V are suitable at C1-C4. All resistors are ¼-W, 5% tolerance. If you install a remote PTT switch, connect it to the circuit via shielded microphone cable and connect a 0.01-μF bypass capacitor between points A and B.

parison, the sonogram illustrated in Fig 3 shows that the headset microphone picks up considerable speech energy in the 2- to 4-kHz range.

These relative differences in spectral response were expected, given that an intraural pickup device is poorly positioned to capture unvoiced speech sounds. But the sonograms also suggested that an intraural microphone should perform adequately over the relatively narrow audio bandwidth necessary for successful Amateur Radio voice communication.

A Practical Intraural Mike for Amateur Radio Use

To gain some on-the-air experience with the Maxon intraural microphone, I developed a simple interface system for my IC-2AT. As shown in Fig 5, the interface consists of little more than a low-noise preamplifier and PTT switch. During receive, the preamplifier is disabled, and audio from the IC-2AT speaker-output jack is fed to the intraural microphone/earphone (from plug P1, through capacitor C1 and jack J1). When the PTT switch (S1) is closed, R5, a 15-kΩ resistor, is placed across the IC-2AT microphone input, switching the transceiver into transmit mode. In addition, closing the PTT switch applies power (9 V dc at 25 mA) to the microphone preamplifier circuit, which amplifies the intraural microphone's output to a level comparable to that of a conventional mike. Bypass capacitors C5 and C6, though not strictly necessary, reduce the preamplifier's susceptibility to RF interference.

With the components in hand, the interface can be assembled on perf board (Radio Shack® no. 276-148 Dual Mini-Board is suitable) in about an hour. Alternatively, a template and a part-placement-guide for a custom PC board are available from ARRL HQ.[4]

Keep the leads between the microphone interface and the IC-2AT as short as possible—4 to 6 inches, maximum. Since the cable between the interface and the intraural microphone must be about 36 inches long to provide adequate operator mobility, use balanced, shielded microphone cable (available at Radio Shack) for this run. Unless you manage to come by a surplus transceiver system from Maxon or Radio Shack, you'll have to purchase a separate Maxon intraural microphone (see note 2), which does not include the necessary two-pin male microphone connector. Two short (¼-inch-long) pieces of solid copper wire, one no. 12 and one no. 18, inserted into the two sockets on the microphone jack, and held together by a dab of silicone sealant, can serve as a simple and effective weatherproof connector. Carefully solder the microphone cable to the wires, insert the wires about 1/8 inch into the microphone housing, and apply the silicone sealant.

Yes, But Does it Work?

On the air, the intraural microphone/IC-2AT combination has proven to be a complete success. Audio-quality reports are consistently excellent, and the lightweight and inconspicuous microphone is comfortable under a snug-fitting helmet even on rides several hours long. Now, my headset stays at home with my base-station MF/HF transceiver!

Using the Intraural Microphone with Other Hand-Helds

Although the intraural microphone and interface described in this article *were developed for use with an* ICOM IC-2AT, making them work with other hand-helds should require few, if any, alterations to the PTT portion of the intraural mike's interface circuit. For example, Yaesu hand-helds use the same type of PTT detection as the IC-2AT, so the interface will work as is. Kenwood hand-helds use a slightly different PTT-detection circuit, requiring minor rewiring of the interconnecting cables. See your radio's user manual for details. Happy mobiling!—*NU1N*

Notes

[1]Some states and municipalities may limit or prohibit the wearing of earphones or headsets while operating a vehicle. Be sure to check the applicable statutes before you ride or drive with a headset or intraural microphone.

[2]T. Warfel, "VOX for HTs," *73*, Dec 1989, pp 9-10, 12.

[3]Available, excluding cable, as a replacement part *for $9.50, plus $2.50 shipping and handling*, from Maxon Systems, Inc, 10828 NW AirWorld Dr, Kansas City, MO 64153, tel 816-891-1093.

[4]Address your request to Intraural Microphone Interface, ARRL Technical Department Secretary, 225 Main St, Newington, CT 06111. Please include an SASE with one First-Class stamp.

Strays

***QST* congratulates...**

☐ David P. Clements, KA1MRZ, of West Paris, Maine, on being selected recipient of The New Delmarva Hamfest Association's 1990 educational scholarship. Clements resides in Elkton, Maryland, while working *toward his PhD in physics at the University* of Delaware Graduate School. He was awarded the scholarship based on merit, activity in Amateur Radio and outstanding scholastic criteria.

☐ John Smertneck, KA3SFK, of Williamsport, Pennsylvania, on becoming an Eagle Scout. John has been licensed for three years and holds a General class ticket. His father is John Smertneck, W3KDK.

Circuit Improvements for the Heath SB-220 Amplifier—*Part 1*

The venerable SB-220 is one of the most popular Amateur Radio amplifiers ever made—and for good reason. But it isn't perfect. Here's how to make it better.

By Richard L. Measures, AG6K
6455 La Cumbre Rd
Somis, CA 93066

The Heath® SB-220/221 amplifier[1] made a notable impact on the world of Amateur Radio. It was the first reasonably priced *and* intelligently designed HF SSB/CW amplifier sold to the Amateur Radio community. Unfortunately, this amplifier is no longer manufactured. The SB-220 (and its successor, the HL-2200) has some excellent design features and a few easily corrected design weaknesses. In this two-part article, I'll discuss both topics, and some cures for the amplifier's weaknesses.

The High-Voltage Power Supply

Before the arrival of the SB-220, there was a popular notion that legal-limit SSB amplifiers needed heavy-duty power supplies that required two grown men to move them. Heath engineers knew that this idea was based more on folklore than on sound engineering principles.[2] They also knew that the average duty cycle of a human voice is only about 15%. Why build a 100% duty cycle "lock-to-talk" power supply when one wasn't required? So, they designed a power supply that would do the job at hand. That resulted in considerable size, weight and cost savings, which Heath passed along to SB-220 buyers.

At first, some people in the ham community had negative comments about the SB-220's "wimpy-looking" power supply. With time, it became apparent that the power supply did the job well. It had a low failure rate and no detectable ripple. This was no accident. Heath engineers wisely chose an HV-transformer design with an exceptionally low secondary resistance (only about 12.2 Ω). This minimizes the voltage drop under full load in the supply's full-wave voltage-doubling rectifier circuit. Such circuits have an extremely high peak-to-average output-current ratio, so minimizing the transformer-winding resistance is essential for good voltage regulation and reducing I^2R (heat) losses in the transformer's windings.

The voltage-doubling rectifier circuit has some advantages over the traditional full-wave-bridge rectifier circuit, including:

- Low ripple voltage. As one capacitor bank is charging, the other capacitor bank is simultaneously discharging, canceling the other's out-of-phase sawtooth waveform.

There is no safe substitute for pulling the electric-mains plug before putting your fingers inside any amplifier.

- Half as many transformer secondary wire turns as a comparable non-doubling supply, which yields a more efficient transformer design. Here's why: One layer of insulating paper is required between each layer of wires, so fewer turns means fewer layers of paper. The result is a transformer that has a high ratio of copper to paper, and thus a relatively high power-to-weight ratio.
- Excellent voltage regulation during current transients—exactly what's needed for CW and SSB operation—because no swinging-inductance filter choke is needed.

Cooling

Because about half of the power consumed by a linear amplifier is converted into heat, another important amplifier-design consideration is cooling. Most of the heat that a 3-500Z (or any other internal-anode tube) dissipates is carried away by heat radiation from its anode.

Here's how it works: During normal operation, the anode gets so hot that it glows a bright orange color. The surrounding objects are relatively much cooler, so the anode loses most of its heat to its surroundings by radiation, and a lesser amount by conduction through the anode stem and pins. Unfortunately, some of the components to which the anode loses heat are heat-sensitive parts of the 3-500Z, such as the tube's critical glass-to-metal seals and the solder used at the pins in the tube's base. These heat-sensitive parts must be cooled by forced air.

Heath's engineers came up with a deceptively simple method of effectively cooling the 3-500Zs. They realized that the expensive Eimac® air-system socket/glass-chimney cooling system had some serious trade-offs, such as: the difficulty of forcing enough air through the airflow restrictions in the system to adequately cool the filament pins and seals; inefficient anode-cap cooling (the horizontal fins on the standard anode-cap coolers were obviously not designed to be cooled by the vertical airflow through the Eimac air-system chimney); and those airflow restrictions require the use of a high-pressure centrifugal blower (and all high-pressure blowers are noisy). Heath needed a cooling system that would quietly move high-velocity air past the 3-500Z's hot filament pins,[3] filament and anode seals, and glass envelopes.

The Heath engineers knew that when horizontal air flows across vertical cylinders, such as a 3-500Z envelope and its pins, the air follows the curves of the cylinders, providing fairly uniform cooling to all areas of the cylinders (minimizing hot spots). They concluded that, with horizontal airflow, the cooling air has a direct path to the heat-sensitive parts of the tube, and allows the anode cooler's fins to take maximum advantage of the flow of cooling air. Because the filament pins are below the chassis and the filament and anode seals are above the chassis, the Heath engineers used

[1]Notes appear on p 29.

an open-ended chassis equipped with a single, 6-inch-diameter fan blade that could simultaneously blow cooling air above and below the chassis.

To position the four hot filament pins optimally in the under-chassis airflow, the pair of tube sockets was mounted with the two pairs of filament pins facing each other. This optimally positions the hottest parts in front of the tips of the fan blades.

The cooling-system design is brilliantly simple. It's relatively quiet and works well. Reports of tube-pin solder melting in SB-220 amplifiers are very rare (with the exception of cases where the fan-motor bearings seized because they were never oiled!). On the other hand, I have heard of many 3-500Z-pin solder-melting episodes in other amplifiers that used centrifugal blowers and air-system-chimney cooling.

One weakness in the SB-220's cooling system is that the infrared radiation (heat) reflected back into the tubes from the bright aluminum surfaces adjacent and parallel to the anodes shortens tube life. This deficiency is easily corrected: After removing the tubes, apply black liquid shoe polish to the vertical aluminum surfaces near the tubes.

Fan Oiling

An oversight in early SB-220s was the failure to provide oil holes for the fan-motor bearings. This problem can be corrected by drilling a small hole, no more than ¼ inch deep, above the front and rear bearings. It's not necessary to remove the fan motor to do this. The fan should be lubricated at least annually with a thin, *non-gumming* oil such as Hoppe's no. 1003.[4,5] Insert a drop or two of such oil into each hole. What isn't absorbed by the felt wicks that surround the bearings simply dribbles out. *More oil is not better, just messier.* The easiest way to get the desired amount of oil in the holes is to apply the oil with a disposable insulin syringe (available at most drug stores); each unit on such a syringe is equivalent to approximately one drop of oil.

Premature Filter-Capacitor Failure

Aluminum-electrolytic filter capacitors are very sensitive to heat. For every 10-°C increase above room temperature, capacitor life expectancy is approximately *halved.* The electrolytic filter capacitors in the SB-220 are subjected to high heat during normal operation, mostly because of their proximity to their eight associated 30-kΩ voltage-equalizing/bleeder resistors. During transmit, another (minor) source of capacitor heating is the 60-Hz ripple current flowing through each capacitor.

The capacitor-heating problem is compounded because cooling air does not reach the capacitors. In some cases, the heat present partially melts the ends of the capacitor holders that are nearest to the 30-kΩ resistors!

Heat dissipated by these resistors can be reduced by about 70% by replacing them with 100-kΩ, 2- or 3-W, 5%-tolerance film resistors. Other resistance values may be used, up to roughly 150 kΩ, provided that the resistors are rated to withstand the voltage applied to them and the resistor values are within 5% of each other. I do not recommend using ancient 2-W carbon-composition resistors for this application. They don't stay within their rated tolerance as they age. This simple modification greatly prolongs the life of the electrolytic filter capacitors.

Note: Increasing the equalizing-resistor values also increases the capacitor bleed-down time after the amplifier is shut off. Because this amplifier has a shorting HV interlock that grounds the HV-positive lead when the cover is removed, it's advisable to wait until the front-panel voltmeter indicates nearly 0 V before allowing the interlock to short the HV line to the chassis. Here's why: When the HV positive is shorted to ground, the energy stored in the filter capacitors is applied *directly* to the grid-current-meter shunt resistor, R3 (0.82 Ω), which is the only HV-negative path to chassis. The peak discharge current can be substantial, and damage to the meter shunt and movement can occur.

For example, if the filter-capacitors are at the 100-V level when the interlock shorts, the peak current through R3 is 100 V/ 0.82 Ω = *>100 A.* If a substantial voltage exists in the filter capacitors when the interlock shorts, R3 can be literally *blown away* by the discharge-current pulse! If the multimeter happens to be in the grid-current position, the meter can also be crispy-crittered. Meter damage can be avoided by parallel-reverse-connecting two ordinary 1-A (any PIV) silicon rectifiers across the terminals on each meter (see Fig 1).

For this reason, I removed the interlocks from both of my Heath amplifiers. Although this isn't necessarily a good thing for you to do, it isn't as unsafe as it sounds: the interlock protects you from residual charge in the HV filter capacitors, but it *does not* prevent operator contact with the potentially fatal voltage from the electric mains when the amplifier is plugged in and switched off. In other words, the safety interlock does not make the amplifier *safe.*

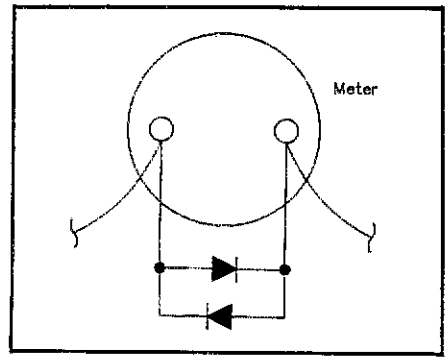


Fig 1—Meter damage caused by application of stored capacitor charge can be avoided by placing a pair of diodes across each meter movement.

For me, a major advantage of removing the interlock is that it allows the perforated cover to be removed for optimization of the tuned-input circuits (covered in Part 2). *There is no safe substitute for pulling the electric-mains plug before putting your fingers inside any amplifier.*

Intermittent Meter Readings

At least two problems can cause intermittent meter readings in the SB-220. If only the voltmeter exhibits this problem, the most likely cause is the three 4.7-MΩ, 1-W voltmeter-multiplier resistors (R6-R8). These resistors, which are rated at 350 V maximum per unit, are subjected to about *1 kV per unit* in the Heath circuit.[6] This can cause resistor deterioration, which leads to fluctuation and/or inaccuracy in the 0- to 3500-V meter indication. The abused resistors can simply be replaced with modern, 2-W flameproof spiral-film resistors designed to handle this voltage.

The other source of trouble lies inside the meters. Here's why: Different metals are used for the various parts of the meter. These parts, which conduct current to the meter armature, are fastened together with screws. Over time, moisture in the air causes electrolysis to take place at the junctions of the dissimilar metals. This increases the resistance at the junctions, causing intermittent meter indications.

This problem can be corrected by prying off the meter face, carefully removing the meter scale, and applying small dabs of conductive paint to all of the dissimilar metal junctions that carry current to the armature. (The conductive paint can be thinned with acetone to facilitate penetration into the narrow areas between the parts. As with any organic solvent, use extreme care when handling acetone—use it in a well ventilated area, don't get it on your skin or in your eyes, and don't breathe its vapors.) Allow conductive paint to dry for at least 15 minutes before replacing the plastic meter faces.

Transceiver-Relay-Contact Failure

During receive, the voltage across the **ANT RELAY** jack rises to about +115. A bypass capacitor, C52, is connected in parallel with this jack, so the capacitor charges to 115 V during receive. During transmit, the transceiver's relay (if one is used) places a short circuit across this jack—and the fully charged C52. The SB-220 relay-coil current is only about 25 mA, but the peak discharge current produced by placing a direct short on the charged capacitor can be surprisingly large. This action is like that of an electric spot welder. Over time, the contacts in the transceiver relay can become pitted and fail to make contact, or become welded together, causing the amplifier to go key-down continuously.

This problem can be corrected by placing a 100- to 200-Ω, ½-W current-limiting resistor in series with the center pin (blue wire)

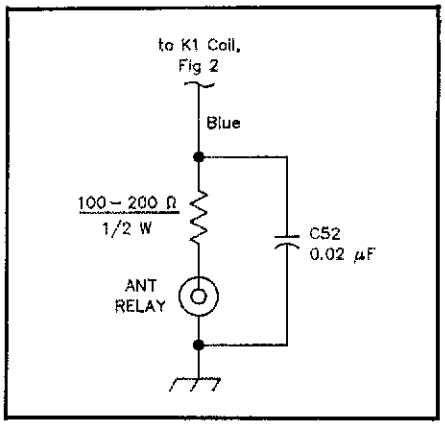


Fig 2—Transceiver-relay-contact pitting and eventual failure can result from use with the TR switching circuit in the SB-220. Adding a 100- to 200-Ω, ½-W resistor to the circuit as shown eliminates this trouble spot. All part numbers are those used by Heath.

on the antenna-relay jack. C52 must be connected to the blue-wire end of the resistor. See Fig 2. The drop across this resistor will be only about 5 V, which is insignificant to the 110-V relay coil.

The Filament Circuit

The most popular published modification for the SB-220 has been filament-inrush-current limiting. A large number of 3-500Zs in SB-220s suffered from filament to-grid shorts, so some people began to theorize that excessive filament-inrush current was the villain. Another theory was that the filament-to-grid shorts were caused by a manufacturing defect. Neither theory turned out to be true.

Curiously, none of the authors who wrote the SB-220 inrush-current-limiting articles published measured filament-inrush current. So, I decided to measure it with my HP 1706A oscilloscope. (After all, my name is Measures, so why not?)

Here's what I found: The maximum inrush current through the 3-500Z filaments in an SB-220 is only 60% of what Eimac allows. Heath accomplished this esoteric feat by the use of a special current-limiting core in the SB-220's filament transformer. The core is similar to those used in current-limiting neon-sign transformers. Externally, this core appears to be substantially different than the core used in the HV transformer.

The cause of virtually all grid-to-filament shorts in the 3-500Zs was later discovered to be a very brief, and usually very noisy, parasitic oscillation at roughly 110 MHz.[7] As will be discussed later, the large grid-current pulse that accompanies this oscillation creates a large electromagnetic pulse inside the 3-500Zs, pulling the hot filament wires off center, causing them to touch the grid cage.

Another interesting feature concerning the SB-220 filament circuit is that it normally operates near the low end of the recommended 3-500Z filament-voltage range; typically about 4.85 V (the recommended range is 4.75 to 5.25 V). This may not seem important, but according to Eimac, each 3% reduction in filament voltage (with no drop in PEP output) *doubles* the life expectancy of a 3-500Z. Thus, all other things being equal, the tubes in an SB-220 can be expected to last at least four times longer than the tubes in some other 3-500Z amplifiers.

For example, another (much more expensive)[8] 2 × 3-500Z amplifier that is considered by some to be a better designed, higher-output and more rugged amplifier than the SB-220 has a filament potential of more than 5.90 V at an ac-line supply of 240 V. This clearly exceeds the 3-500Z's maximum-filament-voltage rating, and reduces the useful emission life of the two 3-500Zs to only a few percent of what could have been realized if the tubes had been operated near the low end of the recommended filament-voltage range.

Although the filament circuit in the SB-220 needs no step-start circuit to protect the tubes from high filament-inrush current, there is another good reason to add such a circuit to the SB-220. If the amplifier is turned on in the SSB mode, when powered by stiff, 240-V ac mains, the inrush current through the power switch and other components is considerable. A step-start circuit will eliminate this potential source of trouble. (If an SB-220 is *always* started up in the **CW/TUNE** mode, and then switched to **SSB**, the inrush current is lower, and a step-start circuit is probably not needed.)

An easy-to-build step-start circuit is shown in Fig 3. In this circuit, the step-start relay can close only when the filter capacitors in the +110-V and HV power supplies have reached about ⅔ of their normal operating voltages of R1. If the step-start relay closes before the HV reaches ⅔ of its operating potential, increase the resistance of R1. If the relay closes unreliably, decrease the resistance (this will increase the current through the relay coil). If the circuit is functioning properly, the step-start relay will close about 1 second after turn-on, as the voltmeter indication passes the 2-kV level. The amplifier may be operated at "full throttle" 1 second after the relay closes.

The two 20- to 25-Ω, 10-W resistors and the step-start relay can be glued directly to the bottom of the chassis, directly under the filter-capacitor bank, using silicone-rubber adhesive.[9] The resistors should be held away from the chassis by a few millimeters by the silicone rubber. (This mounting method is appropriate because drilling mounting holes in this area could harm the filter capacitors.)

Because the step-start relay adds to the current burden on the +110-V power supply, it is a good idea to replace the stock, half-wave rectifier (D16) with a full-wave-bridge rectifier. If you do this, unground the grounded red wire on the transformer's 80-V-RMS winding and connect it to the input of the full-wave-bridge rectifier.

Adding a Standby Switch

Another popular modification for the SB-220 is the addition of a standby switch. A standby switch is really not necessary in this amplifier because the SB-220 uses "instant-on" tubes (3-500Zs use directly heated cathodes, which require only a very brief pre-use warmup period) and a current-limiting filament transformer. Because this transformer is very gentle to the filaments, the amplifier can be switched

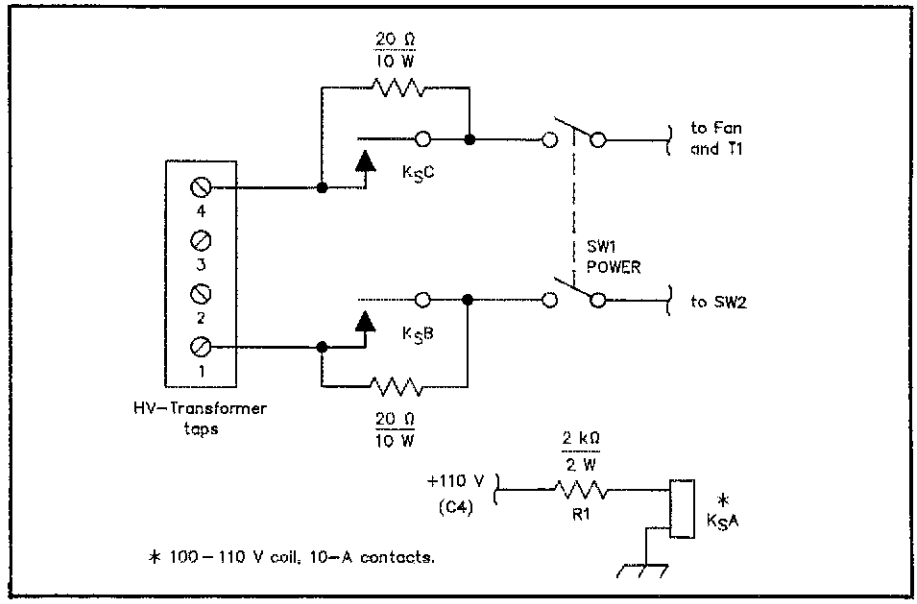


Fig 3—Adding a step-start circuit to the SB-220 minimizes power-on component stress. A 12-V-coil relay can be used in place of the 100- to 110-V unit; if you do so, connect the coil through R1 to the 5-V filament winding via a full-wave voltage doubler, and decrease R1 to about 20 Ω.

on or off as often as you like with no problem—with one exception: If you have just made a long RTTY or FM transmission, the glass-to-metal seals in the 3-500Zs should be allowed to cool for about 1 minute before you switch the amplifier off.

HV-Rectifier Protection

In the early 1960s, silicon-rectifier manufacturing technology was hit and miss. There was considerable variation between individual rectifiers of the same type. This variation led designers to use resistor-capacitor equalizer circuits in parallel with each rectifier. Today, silicon-rectifier manufacturing technology has improved considerably; rectifiers of the same type have very uniform parameters. Strings of identical, modern silicon rectifiers do not need to be equalized.[10] Unfortunately, old habits die a slow death, and many hams are still using outdated design methods. Much has been written about adding equalizing resistor-capacitor protection networks across the rectifiers in the SB-220's HV power supply. Unfortunately, these "protection" circuits not only *do not* perform as advocated, but they can lead to premature rectifier failure.

Here's why: The ½-W resistors typically used for voltage equalization are rated at 250 V maximum. How can a 250-V-rated resistor be trusted across a 600- or 1000-V rectifier? If anything breaks down in a series-rectifier circuit, it's like dominoes falling. One resistor failure can wipe out the remaining good parts in a series circuit.

The most frequent cause of failure in HV power-supply rectifiers is excessive reverse current. This problem can be eliminated if the total peak-inverse-voltage capability of the series-connected rectifiers substantially exceeds the peak voltage encountered in the circuit. In any series circuit, the current in all of the elements is exactly equal. The rectifiers are all in series, so, the reverse-current burden is exactly the same for each rectifier. How is it that things that are exactly equal need to be equalized?

During the half-cycle application of reverse voltage, it is important that all of the rectifiers in a series leg have similar junction capacitances. If they don't, then the reverse voltage across the lower-capacitance rectifiers will be greater than the voltage across the higher-capacitance rectifiers. Here's why: In a series circuit, smaller capacitors charge faster—and to a higher voltage—than larger capacitors.

Approximately 0.01 μF of bypass capacitance across each rectifier is probably a good idea if, for example, 1-A rectifiers are placed in series with 6-A rectifiers, because of the wide difference in junction capacitances between 1- and 6-A rectifiers. If all of the rectifiers in a series leg are similar, they will all have similar junction capacitances, so no external capacitors or resistors are needed.

Long ago, before they knew better, some commercial high-voltage silicon-rectifier-stack manufacturers used internal RC equalizing networks. These manufacturers stopped using these networks for the same reasons that were previously outlined. I don't know of any commercial HV-rectifier manufacturer who has not abandoned this malpractice.

Rectifier Failure

When a silicon rectifier fails from excessive reverse-current, the rectifier will short-circuit. This failure mode is very rare in SB-220s because the per-leg total rectifier PIV rating (more than 4.2 kV) is more than 1 kV higher than the actual PIV (3.1 kV) in the circuit. This is a conservative design; during a voltage surge, the chain of eight electrolytic filter capacitors, which is rated at 3.6 kV max, would likely fail before a 4200-PIV rectifier string.

A much more common type of rectifier failure in early production SB-220s is rectifier opening. This is caused by a defective spot weld inside the silicon rectifier. Eventually the weld breaks and the rectifier opens. The forward voltage jumps the gap at the open weld. When this happens, the heat generated by the arc blows a hole in the rectifier and a 60-Hz arc can usually be heard from inside the amplifier when current is being drawn from the HV supply. It is important to switch off the amplifier *immediately* when this noise is heard. Here's why: In a full-wave, voltage-doubler rectifier circuit, there are two series-connected filter capacitors.[11] One capacitor charges during the positive half of the cycle; the other charges during the negative half of the cycle. The two capacitors discharge in series. If one of the filter capacitors is not being fully charged by its rectifiers, when current is being drawn from the supply, the capacitor that is being charged may force reverse current through the capacitor that is not being fully charged. If unchecked, reverse current will cause electrolytic capacitors to discharge their corrosive electrolyte through their safety vents. In other words, reverse current will destroy polarized electrolytic capacitors in short order. Here's another measure of protection against this cause of capacitor failure: Place a reverse-biased rectifier diode across each capacitor. This allows reverse current to flow through the diodes, not the capacitors.

The Antenna and Bias Relay

A single three-pole relay switches the amplifier in and out of the coaxial line during operation, and handles tube-bias switching as well. A few improvements are in order in this area. See Fig 4.

- Add a diode across the relay coil to absorb the reverse-voltage spike that occurs when current stops flowing in the coil. This prolongs relay-coil-insulation life and quenches the magnetic pulse generated by the coil when it's switched off. If the magnetic pulse is unchecked, it can trigger the transceiver's VOX circuit and cause other problems.
- In the stock wiring configuration, +110 V is connected to a terminal of the relay. During receive, the relay connects this voltage to the center tap of the filament transformer, which is the dc cathode-current path to the 3-500Z filaments. The positive cathode voltage causes the tubes to cut off during receive by pulling the grids 110 V more negative than the cathodes.

A sticky problem arises if one of the tubes develops a filament-to-grid short (which, as mentioned earlier, is frequently the result of VHF parasitic oscillation). Because each grid is grounded for dc, a shorted tube also short-circuits the +110-V antenna-relay power supply, which is derived from the *unfused* filament transformer. Thus, if a filament-to-grid short occurs and the amplifier is not switched off *promptly*, the filament transformer will literally *melt down and short out*, and the black tar that comes out of the overheated transformer makes an unpleasant mess inside the amplifier. There are more pleasant ways to spend a Saturday morning than changing a smoked filament transformer!

This potential source of grief can be eliminated if the relay is rewired as shown in Fig 4. This circuit uses resistor-cutoff bias, using the existing 100-kΩ resistor (R27), which is rewired to another relay terminal. The current through this resistor during receive is usually less than 0.25 mA (R27 dissipates less than 7 mW), so its ½-W rating is more than adequate.

- The antenna relay is mounted on a rubber grommet. This was intended to reduce the vibration that the relay transmits to the chassis, which would otherwise act as a sounding board. Over time, the grommet hardens, increasing the acoustic noise generated by relay operation. This problem can be corrected by removing the mounting screw and the grommet from the top of the chassis and applying a small dab of silicone-rubber adhesive through the hole.

After the silicone rubber cures, an additional noise reduction can be gained by installing U-shaped strips of thin, flexible copper ribbon near the relay in series with the stiff wires soldered to relay terminals 4, 6, 7 and 9. The stiff wires should be shortened by about ¼ inch before the U links are soldered in. The flexible U links act as shock absorbers, and keep the stiff copper wires from transmitting vibration from the relay to the chassis. This simple modification results in a substantial noise reduction.

- During "barefoot" operation on 10 meters, when the amplifier is switched off, the SWR presented to the rig by the amplifier is less than wonderful. This is due to the inductive reactance in the amplifier's TR relay. The relay's inductive reactance can be canceled by adding capacitive reactance between a relay terminal and chassis ground (see Fig 4). The required capacitor

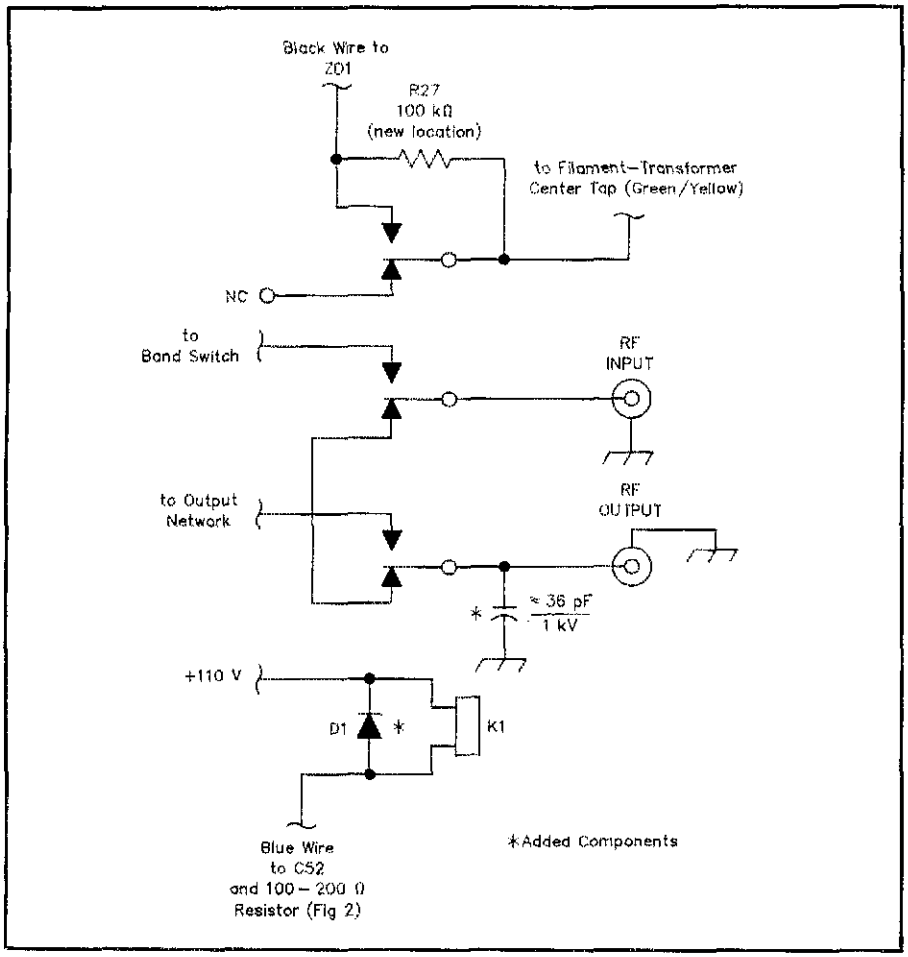


Fig 4—TR- and bias-switching-circuit modifications for the SB-220.

is usually about 36 pF (plus or minus a few standard 5% values) and should have at least a 1-kV rating. If you use a ceramic capacitor for this, the NP0 type is best.

Parasitic Oscillations

The most serious design weakness in the SB-220 is its tendency to support an intermittent VHF parasitic oscillation at roughly 110 MHz. This problem is far from being unique to the SB-220. I know of no model of commercial HF or MF/HF, ham-band, grounded-grid amplifier that has not occasionally had a VHF parasitic oscillation.

Briefly, the heart of the SB-220's VHF-parasitics problem lies in the use of high-VHF-Q copper conductors between the tuning capacitor and the anode connections (plate caps) on the 3-500Zs. The high-VHF-Q parts include the factory-stock parasitic suppressors!

This problem can be easily corrected by constructing low-VHF-Q parasitic suppressors with VHF-lossy nichrome, or even lossier nickel-chromium-iron alloy wire, and replacing the copper braid between the dc-blocking capacitor and the top of the HV RF choke with a pair of unequal-length nichrome wires.[12,13]

During the production life of the SB-220 and its successors, Heath made two changes in the amplifier's design that were related to the parasitic-oscillation problem. One change was to increase the voltage rating of the tuning capacitor, and the other was to decrease the values of the grid-to-ground capacitors from 200 pF to 115 pF. Three of these capacitors are used on each 3-500Z. The more-reactive 115-pF units canceled some of the internal grid inductance in the 3-500Zs, increasing the grid's VHF self-resonant frequency, making the amplifier slightly more stable. Unfortunately, this was not a sure cure.

Judging from numerous on-the-air and telephone conversations I've had with SB-220 users, Heath received many complaints from SB-220 owners who reported arcing at the tuning capacitor. In response to these complaints, Heath used a higher-voltage-rated capacitor in later amplifiers. That turned out to be a serious mistake.

Here's why: The original tuning capacitor already had a substantial breakdown-voltage safety factor, considering that the maximum peak (HF) RF anode potential in the SB-220 is less than 2.6 kV. The arcing was not being caused by normal HF RF voltage peaks: It was being caused by intermittent VHF parasitic-oscillation voltage. Increasing the voltage rating of this capacitor did stop the arcing at the capacitor, but it shifted the parasitic arcing to the output band switch as the parasitic voltage sought out the path of least resistance. If the band switch's contact spacing was increased to stop the band-switch arcing, the new, wide-spaced tuning capacitor would probably begin arcing.

Pitting on the plates of an air-dielectric variable capacitor can be cleaned up with a file, and the capacitor will be as good as new. Arcing on the fragile contacts of a band switch, however, is frequently fatal to the band switch. Heath didn't make a good trade in this case, but they didn't know what was causing the arcing at the time. Now that we understand parasitic oscillations in MF/HF amplifiers—and the cures for them—we can easily fix this problem.

The SB-220 is a well-designed amplifier. The fixes described here, and those covered in Part 2, considerably improve the SB-220's performance and life span.

Notes

[1]The SB-220 and the later SB-221 (like the SB-220, except that operation on the 10-meter band was not enabled at the factory) are considered to be identical for the purposes of this article. All part numbers referenced in this article are those used in Heath's SB-220 construction/operation manual.

[2]Unless specified otherwise, my statements about the SB-220's design are based on reverse-engineering and discussions with Heath's engineering staff.

[3]The filament pins receive a considerable amount of heat through conduction from the filament. The amount of heat present requires that continuous forced-air cooling be directed at the filament pins, even on standby.

[4]WD-40®, LPS and similar products are *not* nongumming.

[5]This oil can be purchased in stores that sell fishing reels and/or firearms. Ordinary 10 or 20 SG-grade motor oil can also be used.

[6]When the SB-220 is powered from 120 or 240 V, the no-load HV is very close to 3 kV.

[7]R. Measures, "Parasitics Revisited—*Part 1*," *QST*, Sep 1990, pp 15-18; and R. Measures, "Parasitics Revisited—*Part 2*," *QST*, Oct 1990, pp 32-35.

[8]Just because something is more expensive doesn't necessarily mean it's better. For an extensive treatment of this subject, see "The Emperor's New Clothes" by Hans Christian Andersen.

[9]The areas to be bonded should first be degreased. After the step-start parts are in place, do not disturb the amplifier for at least 24 hours while the silicone-rubber adhesive cures.

[10]This subject is discussed in detail in S. Katz, "Diode Failure," Technical Correspondence, *QST*, Apr 1988, pp 46-47.

[11]In the SB-220, each of these two capacitors is made from four 200-μF, 450-V capacitors in series. Thus, the four capacitors in each leg act as a single 50-μF, 1.8-kV capacitor.

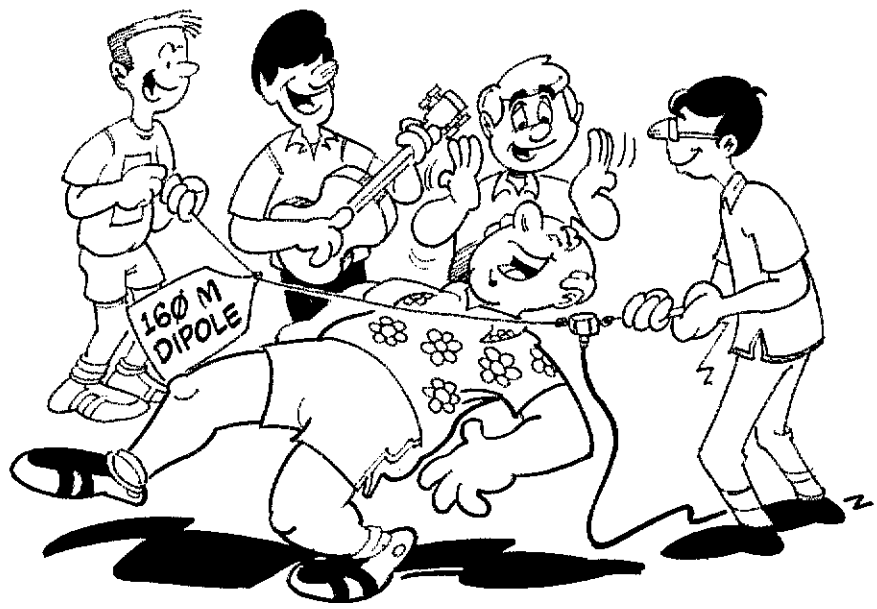
[12]If you would like to receive a 2-page information package and price list for improved parasitic-suppressor retrofit kits, send me a postcard or a QSL with your address.

[13]See note 7.

The 160-Meter Antenna Dilemma

If you're not getting the top-band results you expected, you'll find these antenna tips of use.

By Doug DeMaw, W1FB
ARRL Contributing Editor
PO Box 250
Luther, MI 49656



HOW LOW CAN YOU GO?

It is always a pleasure to welcome newcomers to the "gentlemen's band," as 160 meters has been called for many years. But few have signals that rattle the walls in my shack. In fact, they are often barely readable, or at best an S unit or so above the noise threshold.

When first-timers give me a call to ask for a signal check, I always inquire about their antenna. "I'm using my 35-foot-high 75-meter dipole with a Transmatch" is one common response. Another is, "Antenna here is a 100-foot, end-fed wire about 15 feet above ground." When I hear 160-meter antenna descriptions of this type I say "ouch!" The majority of these newcomers are using barefoot transceivers, which at times must look into high values of SWR.

There seems to be a misconception that leads some to believe that good antennas, at a suitable height, aren't necessary on 160 meters. In fact, the opposite is true! This is because 160 meters is generally a noisy band—more so than the 3.5-MHz and higher bands. This is a result of the vigorous atmospheric noise we must deal with, along with greater man-made noise. You can add to this hodgepodge the presence of TV "birdies" (15.75-kHz horizontal-oscillator harmonic radiation) that can virtually wipe out reception if the other station is weak. (TV birdies are seldom a problem above 3.5 MHz.) It is prudent to locate your 160-meter antenna as far from your TV antenna as possible. A brute-force ac-line filter on your TV receiver helps keep TV-birdie harmonics from radiating via the ac line in your home, and via those conductors outside your house.

The Matter of Height

We hams tend to think of height in terms of physical feet or meters, rather than with regard to wavelengths or fractions thereof above earth ground. Whereas a height of 50-60 feet may seem high above ground, it's very low in terms of wavelength at the lower frequencies. An ideal horizontal

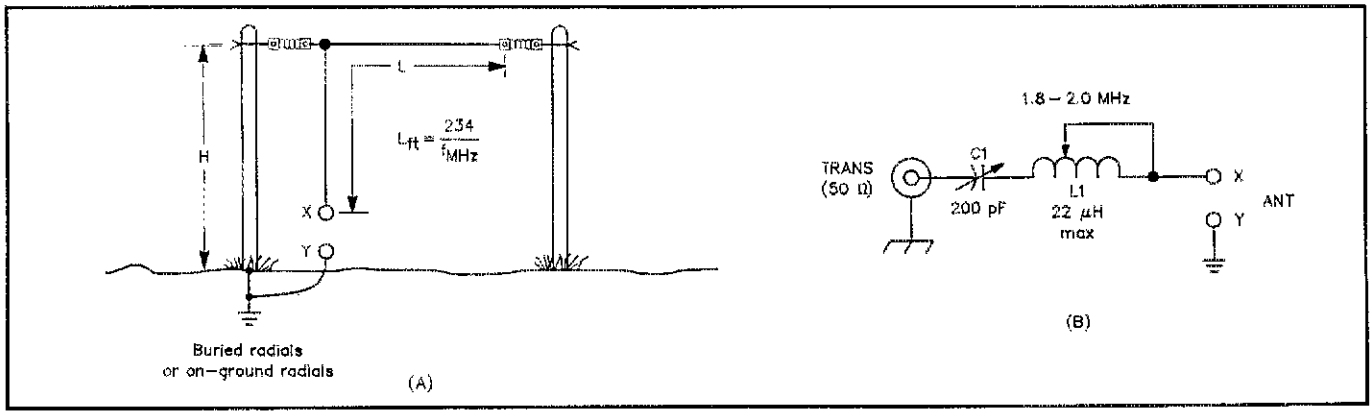


Fig 1—Example of a ¼-λ inverted-L antenna. Dimension H should be as high as practicable for best performance. The support poles may be metal or wood, or they can be trees. Illustration B shows a simple matching network that works very well with inverted-L antennas. The capacitor can be motor-driven from the ham shack to provide a 1:1 SWR across the band. A single value of inductance normally permits full band coverage with C1. Once the tap is selected, no further adjustments are required for full 160-meter coverage.

antenna height for working distant stations is ½ λ or greater above ground. This is relatively easy to achieve on, say, 20 meters (35 feet). But, for 3.5 MHz it is 141 feet, and at 1.8 MHz we need to have this ideal antenna 273 feet above ground! Not practical for most of us.

By way of example, a 160-meter dipole that is 35 feet above ground is equivalent, in terms of wavelength height, to a 10-meter dipole at about 2 feet above ground. None of us would consider erecting a 10-meter beam at 2 feet above ground!

What Happens at Low Height?

We can expect dreadful antenna efficiency when we use a 160-meter horizontal antenna at typical ham-antenna heights. Ground losses become high and the antenna has no directivity. In fact, the radiation is pretty much straight up, in the shape of a sphere. This can actually be very good for short-range QSOs at night, out to some 600 miles. Inverted-**V** antennas do somewhat better because they have a vertically polarized component (if the enclosed angle is between 90 and 110 degrees). They also have an omnidirectional radiation pattern. I prefer a 160-meter inverted **V** to a horizontal dipole at heights less than 100 feet. The feed impedance of a dipole at low height will be affected; a matching network at the antenna feed point may be required if you use coaxial cable for your transmission line. A dipole that is ½ λ high has a characteristic feed impedance of 75 ohms. This isn't so at other heights (for details, see *The ARRL Antenna Book*[1]).

An Answer for the Urban Dweller

Most hams who live in metropolitan areas do not have sufficient property to erect a full-size 160-meter horizontal dipole. In fact, the urbanite may have difficulty accommodating a 160-meter inverted **V**. An old expression is, "If you can't go out, go up." Vertical antennas for top band are popular and practical. A full-size ¼-λ vertical for 1.9 MHz is 123 feet high. Not many hams are willing to go to that extreme, especially in the city! You can, however, erect a short vertical antenna with some form of top loading (coil and capacitance hat near the upper end). If you have a tower, you may elect to shunt feed it (with your HF beam antenna in place) and add some top loading. *WIFB's Antenna Notebook* and *The ARRL Antenna Book* describe methods for doing this.[2]

A popular and effective antenna for 160 meters is the inverted **L**. It works well for local and DX communications if a ground-radial system is used with it. In fact, all ¼-λ antennas fed against ground require a radial system if losses are to be kept low. A couple of metal rods driven into the soil will *not* take the place of a radial system. Beware of this approach to an antenna ground. If the rods are at least 8 feet long and driven into the soil, however, the rods *will* provide a dc ground for your antenna and station.

An inverted-**L** antenna consists of ¼ λ of wire, shaped like an upside-down **L** (Fig 1). The greater the length of the vertical portion of the wire, the better the antenna will perform. The horizontal portion carries less current and does less radiating. So, the antenna radiation is predominantly vertical in polarization. This antenna has a fairly low radiation angle (typically 20-35°), which makes it useful for all-around communications. A number of hams have earned their 160-meter DXCC while using simple inverted-**L** antennas.

The major trade-off with verticals is that they pick up far more noise than do horizontal antennas. This is because most man-made noise is vertically polarized. Also, you may find that you have a "dead zone" with your vertical antenna. There will be times when signals out to a couple of hundred miles are very weak. Your signal will also be weak at the other ham's location, since it is skipping over his area. This does not always happen; it depends on propagation conditions at a given time.

Short verticals (30 feet long or greater) can be effective, too. You may want to make one from aluminum tubing or a telescoping steel mast. The shorter the vertical, the lower the antenna efficiency—unless you add many more radials to your ground system. Likewise as you add more inductive loading. But a short loaded vertical is often more effective for working distant stations than a full-size horizontal antenna near ground. I had good luck when I lived in Detroit during the 1950s while using a 16-foot helically wound vertical antenna on 160 meters. It was wound uniformly with ½ λ of no. 14 insulated wire. A 16-foot wooden hand rail from the lumberyard served as the coil form after I applied two coats of spar varnish. An aluminum pie plate was used at the tip of the helix to provide top capacitance and to prevent corona discharge (resulting from the extremely high voltage at the antenna's end) during transmit periods. One-half λ of wire results in ¼-λ resonance (approximately) when winding helical antennas of this type.

The Ground System

Some amateurs rebel at the thought of deploying a ground-radial system. Sure, it takes a bit of time and effort, but the reward is well worth the hours you invest in the project. You may hear that it is necessary to use 120 radials that are each ¼ λ long. Although such a ground system would be nice to have, it's not mandatory. You can do quite well with 15 or 20 radial wires. They need not be extended linearly away from the feed point of your vertical. If your house is in the way of your work, simply route the radials around the house. If there is not enough space for ¼-λ radials, make them as long as you can. I used a 55-foot top-loaded vertical when I lived in Connecticut. I had 20 in-ground radials of mixed wire gauge. Some were only 40 feet long, while others were greater than 100 feet long. I worked all 50 states on 160 meters and confirmed 72 countries with this system while running 100 watts on CW.

Don't worry about ruining your lawn with buried radials. A lawn-edging tool can be used to cut the slits for the wire. The

[1]Notes appear on page 32.

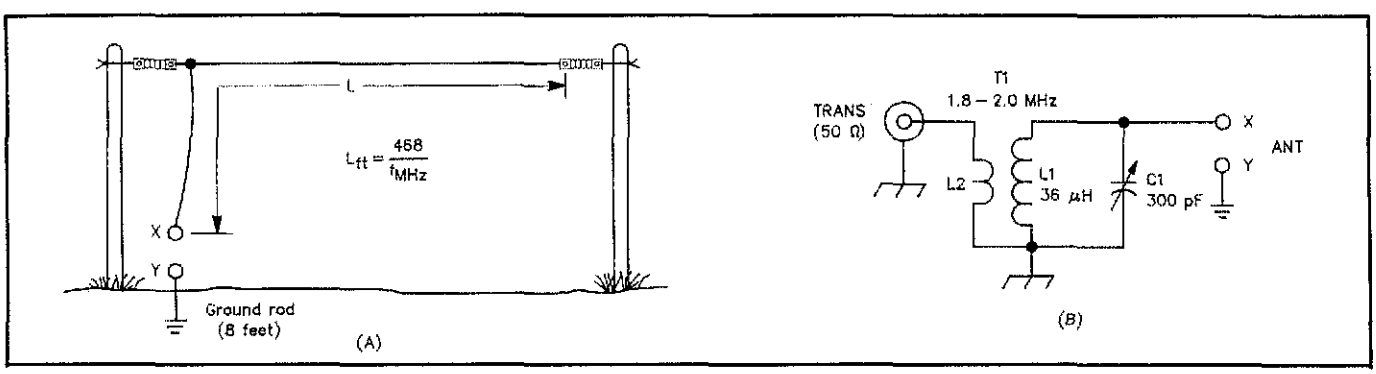


Fig 2—A ½-λ version of the antenna in Fig 1. This antenna is similar to one used at W4ZCB. L1 may have a relay-selected tap to permit operation on 80 meters as well. L1 and C1 are outside the house at the antenna feed point in a weatherproof box. C1 is motor driven and should have wide spacing or be a vacuum variable capacitor. Illustration B shows a suitable matching network.

lawn will heal in a month or two, and no one will know about the copper screen you have under the grass!

Other 160-Meter Antennas

Some amateurs obtain good performance with end-fed ½-λ wire antennas. Results depend on the height of the wire above ground. An antenna erected over poor ground (deep shale, granite or desert sand) may appear to be many feet higher over ground than it is. W4ZCB is situated on a small mountain in North Carolina. His end-fed wire for 160 meters (Fig 2) is only 50-60 feet above the surface of the earth. His signal in Michigan is always very loud. I expect that there's a lot of rock below his property. His antenna is tuned remotely and works equally well on 75 meters (1 λ overall).

I use a full-λ horizontal loop for 1.9 MHz. The corners are only 50 feet above ground, but I live over very dry, sandy soil. I suspect that the virtual (or effective) antenna height is considerably greater than 50 feet. I feed this loop at one corner with 450-ohm ladder line. It works exceptionally well on all of the bands from 160 through 10 meters with the help of a 4:1 balun transformer and my Transmatch. Loops are inherently quiet receiving antennas. My noise level is often S0 to S1, whereas the reading was generally S3 to S6 when I was using an inverted L. Lee, K8CLI, in Loveland, Ohio also uses a full-λ horizontal 160-meter loop at approximately 50 feet. His signal is always among the loudest I hear on 1.9 MHz.

Summary Remarks

I can't stress strongly enough that we need to take our 160-meter antennas seriously if we are to enjoy the benefits of this wonderful band. A hunk of wire a few feet above ground will surely deprive you of the fun that awaits you on 160 meters. If the other guy has to struggle to copy your signal he may choose to sign off with you. A little thought and effort are required when you erect your first top-band antenna. Don't settle for mediocrity—it's better to apply the same tender loving care you do when erecting an antenna for 40 or 20 meters. Although I do not advocate using amplifiers when they aren't needed, I suggest that you consider acquiring one for your 160-meter work if you intend to chase DX and have a consistently good signal. Amplifiers provide those extra decibels that are often needed to break through the noise. They are a definite asset when band conditions are poor, which is not atypical on 160 meters.

Finally, every decibel is important. I urge you to make an effort to match your feed line to your 160-meter antenna and to match your end-fed wire to the transmitter.

Notes

[1] *The ARRL Antenna Book* is available from ARRL HQ for $18 plus $2.50 shipping and handling ($3.50 for UPS), or from your local dealer.

[2] *W1FB's Antenna Notebook* is available from ARRL HQ for $8 plus $2.50 shipping and handling ($3.50 for UPS), or from your local dealer.

New Products

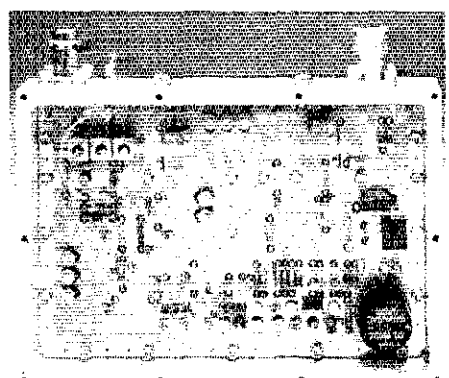
QUORUM COMMUNICATIONS DOWNCONVERTERS

Two new 1691-MHz to 137.5/141-MHz downconverters, models SDC-1691B and SDC-1691BWP, from Quorum Communications, Inc, are designed for reception of WEFAX and other services available from the US GOES, European Meteosat or Japan's GMS geostationary weather satellites. Except for weatherproofing, the two units are identical. The suffixes denote the difference between the two converter models; for ready-to-go outdoor use, the BWP model is installed in a weatherproof, mast-mountable case. Because the B-only-suffix unit is *not* weatherproof, it must be used indoors or housed in a weatherproof enclosure if used outdoors. (An optional weatherproof housing/mast-mountable case is available to upgrade the B-only-suffix version.)

The converter consists of a low-noise (typically 1-dB noise figure) RF amplifier, a bandpass image-rejection filter and a high-stability local oscillator (LO). To enhance frequency stability, the LO crystal is contained in an oven that maintains the crystal temperature at 75 °C. The LO circuit is also temperature compensated. As a result, the converter's output frequency remains within ±2 kHz with ambient temperature variations from −20 to +50 °C. Because of its low noise figure, the SDC-1691B requires no external preamplifier. The converter has a conversion gain of 30 to 33 dB.

Because the converter uses a wideband IF, no crystal switching or swapping is necessary to receive the existing geostationary weather satellites. For European Meteosat reception, the IF output is at 141 MHz with the supplied crystal. An LO-crystal option for Meteosat reception, providing an IF output of 137.5 MHz, is available at no additional cost.

Converter power requirements are +12 to 14 V at 500 mA. (Average current drain is 250 mA; power-up current drain is approximately 500 mA because of crystal-oven cycling.) Power is fed to the converter via a feedthrough capacitor or through the IF-output cable. A milled-aluminum case houses the electronics (see the photo). A female N connector is used for the 1691-MHz RF-input port, and the IF-output connector is a female BNC.



An illustrated installation and operation manual tells you how to integrate the converter into your weather-satellite receiving system. The manual includes an appendix with a wealth of information on receiving WEFAX transmissions (antenna recommendations, gain figures, system trade-offs, etc).

Price class: 1691B, $449; 1691BWP, $498; weatherproof housing/mast-mount case, $49. To order or obtain more information, contact Quorum Communications, Inc, 1020 S Main St, Suite A, Grapevine, TX 76051. Tel 817-488-4861; fax 817-481-8983. Quorum also operates a BBS (817-421-0228) that provides weather-satellite-picture files and other software. On the BBS, you can also find the latest version of the software used with Quorum's scan-converter card.—*Paul Pagel, N1FB*

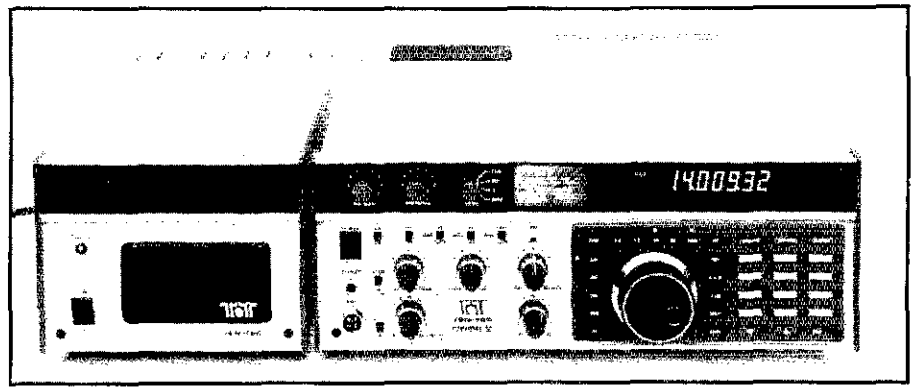
The ARRL and QST *in no way warrant products described under the New Products banner.*

Product Review

Conducted By James W. Healy, NJ2L
Assistant Technical Editor

Ten-Tec Omni V Model 562 160-10 Meter Transceiver

Reviewed by Kirk Kleinschmidt, NT0Z



According to early Omni V advertising, Ten-Tec designed this rig to provide optimized ham-bands-only transceive performance, especially for contesters and DXers. The Omni V strongly resembles its established general-coverage-receive sibling, the Paragon. The 100-watt-output Omni V covers all amateur bands from 1.8 to 29.7 MHz, and transmits and receives CW, LSB, USB, FM (optional), FSK and AFSK. Its many features include two "VFOs" (actually tunable memories); a digital multifunction display; 25 memories that store frequency, mode and IF-filter selection; a broadband, no-tune transmitter; a speech processor; passband tuning; and full-break-in CW with two TR-turnaround speed choices. In addition, the Omni V includes some not-so-standard features: a 24-hour clock (that beeps at 16 minutes past each hour to alert you to the impending WWV propagation-forecast broadcast sent 18 minutes after each hour), and receive-audio filtering.

Technicalities

The Omni V's signal-generation scheme is based on a phase-locked-loop (PLL)-based frequency synthesizer that tunes from 198.8 to 221.2 MHz in 400-Hz steps. Dividing this signal by 40 produces 4.97- to 5.53-MHz output in 10-Hz steps. This signal is mixed with the output of a crystal oscillator for final conversion to the operating frequency. Ten-Tec adopted this hybrid approach to minimize local-oscillator phase noise, and ARRL Lab testing confirms the wisdom of this approach: In terms of composite transmitted noise (which consists largely of phase noise), the Omni V is among the very cleanest of all the current MF/HF Amateur Radio transceivers we've tested.

The Omni V incorporates a double/triple-conversion receiver (first IF, 9.0 MHz; second IF, 6.3 MHz; third IF [for FM reception only], 455 kHz). The Omni V comes with a 2.4-kHz-wide IF filter as standard. On all modes, the Omni V generates its transmitted signal at 9 MHz.

The Omni V includes a 3-V lithium cell to maintain its clock/calendar and microprocessor status registers when power is removed; the frequency/mode/filter memory information, stored in nonvolatile RAM, does not depend on this cell for survival.

Physically, the Omni V embodies Ten-Tec's hallmark modular construction. There's plenty of room "under the hood" and weekend mechanics should have little trouble figuring out what's what.

Front Panel

The Omni V's front panel includes a large tuning knob, the multifunction display, five pairs of concentric rotary controls (**MIC** gain/**RF PWR**; **AF** gain/**TONE**; **FADE/BP** [these adjust the Omni V's receive-audio-filtering circuits]; **PassBand Tuning/NOTCH**; **RF** gain/**SQueLch**; seven push-on/push-off push buttons (speech **PROCessor** on/off; **ATTN** (selects a 20-dB RF attenuator on receive); **N.oise B.lanker** on/off; **PTT/VOX**; **QSK FAST/SLOW**; **AGC ON/OFF**; and **AGC FAST/SLOW**); a main **POWER** switch; and 35 momentary push buttons. Many of the push buttons trigger an annunciator beep.

Clustered around the main-tuning knob are the mode and IF-filter keys, and the VFO and memory-select keys. Of note among these are the **REVerse** key (allows listening on the transmitting frequency during split-frequency operation), and the **SPLIT** key (allows the Omni V to transmit on one of its two VFOs and receive on the other); as discussed later, this function is used in lieu of a separate RIT (receiver incremental tuning—sometimes also called receiver offset tuning or clarifier) control.

To the right are the Omni V's band-select keys and additional VFO-control keys (**VFO → M**, **M → VFO**), **CLeaR/CLocK** (selects and sets the 24-hour clock); ↑ and ↓ (fast-tuning keys during normal operation, these also set time and date); and **Voice Calendar Enable** (selects calendar-display mode and/or the optional voice readout). Even though it holds many controls, the Omni V's front panel is open and "airy."

The Omni V's multifunction fluorescent display shows the rig's carrier frequency (with 10-Hz resolution) in ½-inch-tall, blue-green digits, and has annunciators that show which VFO is selected, when split operation is enabled, and when all memories are full. Instead of the annunciators common on the multifunction displays of most other transceivers, the Omni V has LEDs that indicate the status of the functions controlled by the **ATTN**, **PROC**, **TUNE**, **MT**, and the mode- and filter-selection buttons.

A **RESET** switch, accessed through a hole on the right side of the rig, restores proper microprocessor function if the Omni V's microprocessor locks up—a condition in which the tuning knob or other microprocessor-related controls fail to function properly. The review rig locked up once at turn-on (the front-panel tuning and keypad controls had no effect) and had to be reset.

Rear-Panel Connections

Rear-panel connectors of note (in addition to antenna, key and external-speaker jacks, etc) include a 4-conductor **POWER** connector that carries dc and enables ac-line input to the matching Model 961 power supply; a DB25 **RS232 INTERFACE** connector; **RX ANTENNA** (for connecting a separate receiving antenna); **TX OUT** and **TX EN** (normally jumpered together, these allow the Omni V to control specific external RF amplifiers, such as Ten-Tec's Titan); **AUX +13.8V** (sources 13.8 V, unfused, at up to 2 A); **AUDIO OUT** (a fixed, "line-level" audio output intended to drive a modem or tape recorder); **AUDIO INput** (up to 500 mV; mixes with mike-channel audio); **XVRT EN** (selects the Omni V's transverter-interface functions, which include disabling the Omni V's final RF power amplifier and switching a low-level transmit signal [approximately 0 dBm, or 224 mV RMS, with a 50-Ω load] to the Omni V's **XVRT OUT** jack.) Except for the **50 OHM ANTENNA**, **POWER**, **EXT. SPEAKER**, **GND** and **RS232 INTERFACE** connectors, all the rear-panel connections are made via phono jacks.

The Omni V's rear panel also includes eight controls: **RX/TRX** (connects the Omni V's receiver input to either the **50 OHM ANTENNA** [SO-239] or **RX ANTENNA** jacks); **SIDETONE PITCH**; **SIDETONE LEVEL**; **MONITOR LEVEL** (allows monitoring transmitted audio [SSB, AFSK, SSTV, etc]; controls how much, if any, transmit audio is fed to the Omni V's audio-output amplifier during transmission); **BEEP/VOICE** (sets key-

Table 1

Ten-Tec Omni V 160-10 Meter Transceiver, Serial no. 23A10499

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: 1.47-2.03, 3.47-4.03, 6.97-7.53, 9.97-10.53, 13.97-14.53, 17.97-18.53, 20.97-21.53, 24.47-25.03, and 27.97-30.03 MHz.	As specified.
Modes of operation: USB, LSB, CW, FSK and AFSK RTTY, FM (optional).	As specified.
Power requirement: 13.8 V dc. Receive, 1.5 A; transmit, 20 A max.	*13.8 V, 17 A at 92 W output.*
Transmitter	*Transmitter Dynamic Testing*
Transmitter power: At 14 V, 200 W max input on SSB, CW and FM for 20 minutes (continuous with forced-air cooling of heat sink).	Output power: 92-96 W (output varies slightly from band to band).
Spurious-signal and harmonic suppression: >45 dB below peak power output.	As specified. See Fig 1.
Third-order intermodulation distortion products: Not specified.	See Fig 2.
CW-keying waveform: Not specified.	See Fig 3.
Transmit-receive turnaround time (PTT release to 90% audio output): Not specified.	S1 signal, 18 ms; S9 signal, 18 ms.
Composite transmitted noise: Not specified.	See Fig 4.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: SSB, CW and RTTY *(2.4-kHz filter): 0.15 μV (−123 dBm)* for 10-dB S/N.	Minimum discernible signal (noise *floor) with optional 250-Hz filter:* 3.5 MHz, −135 dBm; 14 MHz, −136 dBm.
FM (15-kHz filter): 0.30 μV (−117 dBm) for 12 dB SINAD.	Not tested (optional FM unit not installed).
Receiver dynamic range: 97 dB typ (signal spacing not specified).	Blocking dynamic range†: 3.5 MHz, 135 dB; 14 MHz, 135 dB.
	Two-tone, third-order intermodulation distortion dynamic range†: 3.5 MHz, 95 dB; 14 MHz, 97 dB.
Third-order input intercept: 12 dBm.	3.5 MHz, 6.5 dBm; 14 MHz, 9.5 dBm.
S-meter sensitivity (for S9 reading): 50 μV.	168 μV at 14 MHz.
SSB Squelch sensitivity: <0.6 μV.	As specified.
Notch filter attenuation: 50 dB typ.	More than 30 dB.††
Receiver audio output: 1.5 W at 2% distortion with an 8-Ω load.	As specified. 2.1 W at 10% total harmonic distortion (THD) with an 8-Ω load.
Receiver IF/audio response: Not specified.	377-2289 Hz at −6 dB.
Size (height, width, depth): 5.75 × 14.75 × 17 inches; weight, 16 lb.	

†Blocking dynamic range and third-order IMD dynamic range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.

††Test-equipment limitations inhibit ARRL Lab notch-filter-attenuation measurements of notches deeper than about 30 dB.

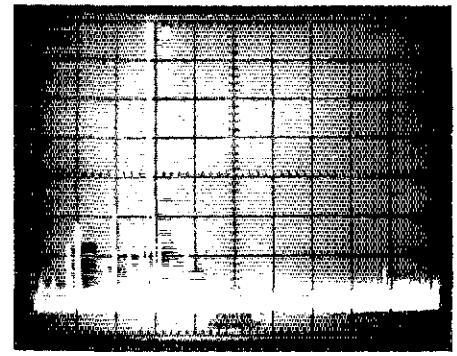


Fig 1—Worst-case spectral display of the Ten-Tec Omni V. Horizontal divisions are each 10 MHz; vertical divisions are each 10 dB. Output power is approximately 96 W at 28 MHz. All harmonics and spurious emissions are at least 48 dB below peak fundamental output. The Omni V complies with current FCC specifications for spectral purity for equipment in this power-output class and frequency range.

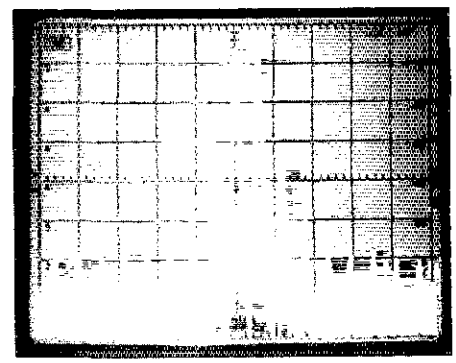


Fig 2—Spectral display of the Omni V during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 30 dB below PEP output, and fifth-order products are approximately 45 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at 100 W PEP output on 3.8 MHz.

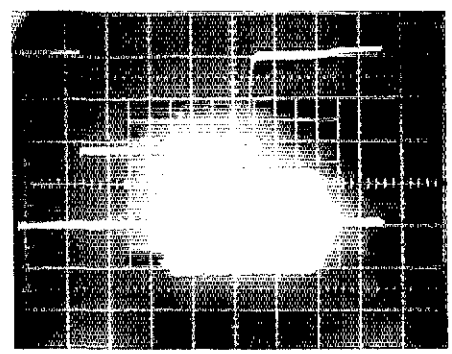


Fig 3—CW-keying waveforms for the Omni V in the full-break-in mode. The lower trace is the RF envelope; the upper trace is the actual key closure. Each horizontal division is 5 ms. The transceiver was being operated at 100 W output on 14.2 MHz. The Omni V's CW keying is very good.

annunciator-beep/voice-readout level); and VOX **DELAY**, **GAIN** and **ANTI**-trip.

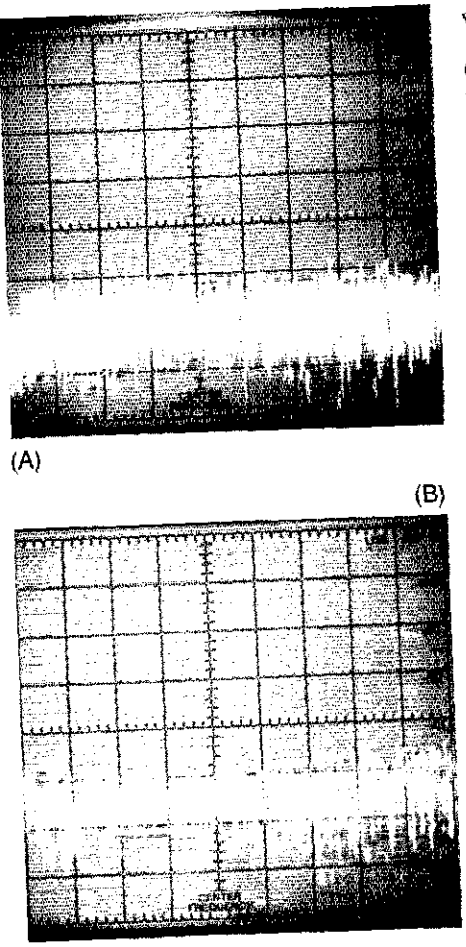
Frequency Control

Frequency control of the Omni V is straightforward and intuitive. The large main-tuning knob changes the frequency in 10-Hz steps in CW/USB/LSB/FSK (100 Hz in FM) when turned slowly; spinning the knob rapidly increases ("shifts") these steps to 50 Hz in CW/USB/LSB/FSK (500 Hz *in FM). Pressing* **FAST** *changes the tuning* steps to 50 Hz unshifted, 100 Hz shifted (CW/USB/LSB/FSK) and 500 Hz, regardless of how fast the knob is turned, in FM.

Quick in-band frequency excursions are easy with the ↑ and ↓ keys. Pressing either of them shifts the Omni V's operating frequency 10 kHz (30 kHz if **FAST** has been pressed) in the selected direction; holding either of these keys down repeats the function until the key is released.

Changing bands is easy. Simply press one of the band keys and you're there. When changing bands, the Omni V changes only the megahertz portion of the frequency. If, for example, you're at 21022.06 kHz and hit the **20** key, the Omni V jumps to 14022.06 kHz.

Like the readouts of most other current MF/HF transceivers that include numeric frequency displays, the Omni V's frequency readout is not frequency-counter based; it displays what it is commanded to by the



(A)

(B)

Fig 4—Spectral display of the Ten-Tec Omni V's transmitter output during composite-noise testing. Power output is 100 W at 3.5 MHz (A) and 100 W at 14 MHz (B). Each vertical division is 10 dB; each horizontal division is 2 kHz. The scale on the spectrum analyzer on which these photos were taken is calibrated so that the log reference level (the top horizontal line on the scale in the photos) represents −60 dBc/Hz and the baseline is −140 dBc/Hz. Composite-noise levels between −60 and −140 dBc/Hz may be read directly from the photographs. The carrier is 2 kHz off the left edge of the photographs. These photographs show composite transmitted noise at frequencies 2 to 20 kHz offset from the carrier. The Omni V has very good composite-transmitted-noise performance.

Omni V's microprocessor. As a result, the display's accuracy, stated as ±100 Hz at 25 °C, depends on how accurately the Omni V's oscillators are calibrated—and this calibration may drift somewhat with crystal aging, and as the Omni V warms up. Used at room temperature on 30 meters, for instance, the product review Omni V typically exhibited a frequency-readout error of +40 Hz at cold start and +110 Hz an hour later. Internal trimmer capacitors allow recalibration and compensation for the effects of crystal aging.

The Omni V does not have an RIT control. As mentioned earlier, Ten-Tec intends that Omni V users operate split in situations where offset tuning is necessary.

In addition to its 25 memories, the Omni V includes a "scratch-pad" memory that can be used to store a single, temporary frequency/mode/filter selection without affecting the main memory channels. For instance, the scratch pad can retain the location of a pileup or a contest station while you're tuning up or down the band. Pressing the **VFO →M** key once saves the current frequency, mode and filter settings to the scratch pad; pressing the **M →VFO** key once—with the memory tune (MT) function off—recalls the scratch-pad information.

Pressing the **VFO →M** key twice in rapid succession stores the current frequency, mode and filter settings in one of the Omni V's 25 main memories—the next available memory location, in ascending order. If this operation fills the last available memory, the right-most decimal point in the display lights, and the keypad-annunciator beep sounds at a lower-than-usual pitch. If all memories are already full, the current frequency/mode/filter settings are not saved, and the annunciator beep sounds at its lower-than-usual pitch. At this point, one or more memories must be cleared before more settings can be stored.

Selecting between the Omni V's 25 main memories involves pushing the **MT** key and tuning bidirectionally through the memories with the main-tuning knob. This displays each memory's stored frequency (but not filter and mode settings) *without changing the frequency/filter/mode settings currently in effect.* When you find a memory channel you'd like to use or clear, press **M →VFO** to load that memory's settings into the current VFO, or **CLR/CLK** to clear that memory. All the memories can be cleared at once by pressing the **CLR/CLK** key while turning on the rig's **POWER** switch.

If you're used to the memory systems found in current imported transceivers, the Omni V's memory system takes some getting used to. The Omni V's memories aren't tunable, and are identifiable only by their stored frequency. Once mastered, however, the Omni V's memory system is a powerful operating aid.

On the Air with the Omni V

Receiving

With the 6.3- and 9-MHz, 500-Hz-wide filters selected (**.50** and **NAR** pressed), the **BP** and **PBT** controls adjusted to coincide with the received-signal pitch, **FADE** turned all the way to the right (that is, fully selecting the Omni V's audio filtering, with no wideband audio mixed in) and **TONE** adjusted for maximum high cut, the Omni V provides *top-notch* CW reception. The Omni V's CW offset, fixed at 600 Hz, is, to my ears, more pleasant to copy than the 700- to 800-Hz CW receive pitch engineered into many MF/HF-transceivers. The Omni V also does a good job receiving SSB.

The Omni V's AGC "feel" is excellent regardless of whether **FAST** or **SLOW** AGC decay is selected—no popping here! The AGC returns the receiver to full gain after about 0.2 seconds in **FAST** and after 2 seconds in **SLOW**.

As shown in Table 1, the Omni V's receiver performance is excellent. The review rig was used for casual operation and CW and SSB contesting, and the receiver held up very well in these operating environments—including wall-to-wall contest sessions.

The Omni V's complement of QRM-fighting controls is varied and effective. In narrow CW reception, the **PBT** control functions like the **IF SHIFT** controls on most other transceivers; on SSB, it functions as a variable-IF-bandwidth control. The audio **NOTCH** filter cuts single-frequency heterodynes by more than 30 dB. Critically valuable for CW reception, the **BP** control adjusts the center frequency of the Omni V's band-pass audio filter from 220 to 1700 Hz.[1] Also of critical value in CW reception, the **FADE** control adjusts the mix of wideband and band-pass-filtered audio from all wideband, no band-pass (**FADE** all the way to the left) to all band-pass, no wideband (**FADE** all the way to the right). The Omni V's band-pass audio filter is a pleasure to use. It usefully sharpens the rig's audio response on CW without ringing significantly. Audio output from the Omni V is plentiful, and the rig's audio-power-amplifier chip is acceptably quiet.

The Omni V's noise blanker is effective on a wide variety of noise sources, from ignition noise to power-line noise to the over-the-horizon backscatter radar (the "woodpecker").

Transmitting

As shown in Table 1, the Omni V's transmitter specs compare favorably with those of other contemporary radios. Ten-Tec rates the Omni V's transmitter for up to 200 watts *input* in all modes, with a key-down limit of 20 minutes; no cooling fan is required. The rated key-down time is unlimited if you use an external cooling fan to force air through the fins of the rear-panel heat sink. An external fan is probably a good idea even if you don't intend to push the Omni V's 200-watt-input limit; the Omni V runs quite warm during extended RTTY operation at the 40-watt-output level.

QRPers and amplifier owners alike can take advantage of the Omni V's adjustable power output. The review rig puts out as little as 3.5 watts with **RF PWR** set to minimum. Its adjustable RF output makes the Omni V compatible with modern linear amplifiers that require only 30 to 50 watts of drive. Although the Omni V does not include an ALC output for connection to external amplifiers, this is not a serious

[1]Ten-Tec states that the −6-dB bandwidth of this filter is 35% of its center frequency; this equates to 77 Hz at a center frequency of 220 Hz, and 595 Hz at a center frequency of 1700 Hz. At the Omni V's 600-Hz-CW-offset receiving pitch, the band-pass filter therefore should be roughly 210 Hz wide at −6 dB.

omission because ALC is a second-rate solution to the problem of amplifier overdrive.[2]

Tuning up the Omni V is easy. First, set the **METER** switch to **FWD**, press the **TUNE** key and adjust **RF PWR** control for the desired output power. That's all there is to CW tune-up. For LSB or USB operation, speak into the mike in a normal voice and advance the **MIC** control until the **ALC** LED just lights on voice peaks.

Using the Omni V's speech processor involves adjusting the **MIC** and **RF PWR** controls as above, pushing the **PROC** switch and advancing the **PROCESSOR** control until the multifunction meter's needle centers in the black area of the **PROC** scale on voice peaks. (You may also need to reduce the mike gain so the **ALC** LED lights only on voice peaks.) The **MIC** and **PROCESSOR** controls interact a fair amount, and the correct settings vary by band. The effects of the processor can be heard via the built-in speech monitor circuit; the monitor makes proper processor adjustment easy. I used a moderate amount of processing in all of my SSB work with the Omni V, and I received favorable audio-quality reports.

Full-break-in CW operation is standard on the Omni V, with receiver recovery speed adjustable to **FAST** or **SLOW** via the **QSK** push button. The Omni V's fast QSK sounds thumpier than the QSK in other Ten-Tec radios I've used, but is still superior to most other current rigs. The **SLOW** QSK setting smooths everything out and is usable for most operating conditions. The Omni V's break-in works equally well in single-frequency and split operation.

Because QSK is the Omni V's only CW TR-switching mode, the PTT line is disabled during CW operation. This means that the transmitter *cannot* be hard keyed (held in the transmit mode). This is usually no trouble (once you've used Ten-Tec QSK, would you go back to anything else?) but is a problem when using unconventional accessories or external transverters.

The Omni V's mandatory QSK also disallows keying only the sidetone oscillator for zero-beating or keyer adjustment. Ten-Tec's service department can, however, provide information on a simple modification that allows you to hard-key the rig on CW.

By means of relay contacts accessible via the rear-panel **RELAY** jack, the Omni V can control external power amplifiers that do not feature QSK operation. The control-relay dropout delay is set via an internal control. In such an arrangement, the Omni V operates QSK, but the external amplifier is *switched in and out as in semi-break-in* operation. The relay, which is a bit noisier than I'd like, controlled my 3CX800A7 amplifier well. The Omni V is compatible with the TR-switching requirements of all current MF/HF digital modes.

Most current Amateur Radio transceivers include circuitry that reduces RF output power in response to rising SWR. The Omni V doesn't. Instead, it includes circuitry that limits the final-amplifier collector current to 20 amperes, maximum. If you can't achieve full power output with your Omni—the **ALC** LED comes on when current limiting occurs—it's likely that your antenna system does not look like a 50-Ω resistive load to the transceiver.

The Operator's Manual

The Omni V's 150+-page manual contains detailed descriptions and schematics of every circuit board in the rig. Ten-Tec engineers designed the Omni V to be field serviceable—unlike many modern "do-everything" radios—down to the board level. They succeeded admirably. The manual's operating-instruction section is not as strong as its technical pages, however, providing *little* more than enough information to get a user up and running. Certain features, such as the finer points of split-frequency operation (especially text describing how to use the dual VFOs in place of an RIT function), passband tuning, and the functions of available options, are sketchily explained. This rough edge is smoothed with an information packet entitled *Omni V, Model 562 Supplementary Data*, which is now incorporated into the operator's manual. If you own an Omni V that didn't come with this document, contact Ten-Tec for a copy.

Accessories

The Omni V has easy-to-install optional filters. For the 6.3-MHz IF, filters of 1.8, 0.5 and 0.25 kHz bandwidth are available. For the 9-MHz IF, filters of 0.25, 0.5, or 1.8 kHz can be installed (one at a time). The 6.3-MHz-IF filters plug into the passband-tuning board, and the narrow filter plugs into the 9-MHz IF board. The review radio was equipped with 2.4, 0.5 and 0.25-kHz filters in the 6.3-MHz IF and a 0.5-kHz filter in the 9-MHz IF. Filter selection is independent of operating mode. Any filter (or cascaded combination) can be selected on any mode. This is especially useful when operating RTTY.

Also available are the Model 256 FM board, the Model 257 voice-readout board (announces the displayed frequency), the Model 301 remote tuning encoder (an outboard knob in a case attached to a 6-foot-long cord that plugs into the rig's **RS232 INTERFACE** jack and functions in parallel with the main-tuning knob), the Model 259 ALC annunciator (useful for visually impaired operators, the annunciator beeps when the Omni V's front-panel **ALC** light comes on), and various microphones and keyers.

The Omni V is "plug-and-play" with the Hercules, Ten-Tec's compact solid-state amplifier. Used together, the two can provide 500 W of no-tune, full-break-in RF.

Service

Ten-Tec has repeatedly earned its reputation for service that's second to *none*. We had a couple of occasions to test this reputation with the review rig.

The optional 9-MHz-IF, 500-Hz filter we ordered and installed in the review rig was defective. A single phone call to Ten-Tec brought a replacement filter, shipped the same day, and a request that we ship them the defective filter upon receiving the new unit. The replacement filter, which works fine, came a few days later. Bravo, Ten-Tec!

Out of the box, the Omni V's display produced a high-pitched whine that was clearly audible to most people with reasonably sensitive hearing. Ten-Tec solved this problem by modifying the display-multiplexing circuitry in rigs made after the fall of 1989. Anyone with an affected radio can return it to Ten-Tec for a no-charge modification (less the cost of shipping the rig to the factory).

One truly odd problem with the Omni V turned up during lab testing. In one segment of the 10-meter band, the radio had high-level close-in spurs on transmit. Turning the tuning knob while transmitting made the spurs go away. This time, Ten-Tec needed a couple of weeks to fix the problem. Two traces on a circuit board were shorted by a hairline copper fragment. Ten-Tec's repair folks called us with regular progress reports during the trouble-shooting process, and they were always patient and willing to answer all of our questions. It's their judgment that this problem was a fluke occurrence with the review rig.

Rough Edges

As discussed in the manufacturer's *Omni V, Model 562 Supplementary Data*, the Omni V has an unusually large number of receiver spurs: "By actual count, 56...can be heard within the allocated ham bands, without an antenna. All but 13 of these birdies are S-1 or less and disappear when an antenna is connected and there is signal propagation. Nine of these, that can be heard at S-3 or so, are spread throughout the ten meter band. The other 4 are at 3.6, 3.999, 21.332 and 21.363 MHz."

In the review rig, I counted 83 spurs on the 10-meter band alone, with a few in the S3 to S7 range. As Ten-Tec states, however, most are so weak that they disappear into the noise when an antenna is connected. Realizing that few hams operate without an antenna, I don't consider the Omni V's quantity of receiver-spurs to be a fatal rough edge.

During SSB or wide-IF-bandwidth CW reception (with the **TONE** control adjusted for minimal high cut and **BP** turned all the way to the left), the review Omni V showed an undesirable trait: wideband IF noise that "bursted" with AGC onset. Annoying with hi-fi headphones, this effect could be

[2] See R. Measures, "Amplifier-Driver Compatibility," *QST*, Apr 1989, pp 17, 18 and 21.

minimized by adjusting the TONE control for maximum high cut, and all but eliminated by configuring the receiver for maximum-selectivity CW reception (as described in On the Air with the Omni V). Ten-Tec found that this noise resulted from an undesirably high-level inaudible spur at the input of the rig's IF amplifier. Their fix for this includes changing three components, and has been incorporated in production units since the spring of 1990 (contact Ten-Tec for more information if you have an Omni V made before then). This fix entirely eliminates the problem, as confirmed in the ARRL Lab.

The Model 961 power supply/speaker introduces significant 120-Hz hum into the Omni V's audio circuits when placed near the radio (especially on the left side). The supply must be placed as far from the rig as is practical to minimize this problem.

Although the Omni V has an RS-232-C interface and can be computer controlled, the operator's manual documentation of this function is sparse. (Most manufacturers of current MF/HF transceivers don't document their products' computer controllability any better.—*Ed.*) Diagrams show how to connect the Omni V to IBM® PC, Apple® Macintosh®, Commodore 64™ and 128, and Apple //c and //e computers; text and diagrams detail the Omni V's RS-232-C connector board; and a table lists command codes for the Omni V's computer-controllable functions. "For further information," says the manual, "refer to the programming information supplied with your software package."

Druthers

A rig's rough edges are one thing; its users' druthers are another. With Ten-Tec's stated Omni V design goals in mind, the reviewers proposed this Omni V "wish list":

NTØZ:

- Add a direct-frequency-entry keypad.
- Modify the AF-gain-control circuit to distribute its control range over more degrees of arc.
- Move the MONITOR LEVEL control to the front panel.
- Consider adding AM transmission and reception.

WJ1Z:

- Add a means of indicating memory channel number.
- Adjustable display intensity would be a help in low-light situations.
- Adjustable tuning-dial drag, and/or a dial-lock circuit, would help fumblers like me make better use of the Omni V's ultra-smooth, low-torque tuning feel.

NJ2L:

- Variable CW offset (and sidetone pitch that tracks it), an *IF* notch filter and variable IF bandwidth during narrow CW reception would go a long way toward making the Omni V *the* radio of choice among contesters.
- Adjustable transverter-output level would make life easier for VHF/UHF weak-signal enthusiasts and contesters.

The Bottom Line

Does the Omni V hit its target of providing superlative ham-bands-only performance for DXers and contesters? In my opinion, the answer is: DXers, the edge of the bull's-eye; contesters, *approaching* the bull's-eye.

In terms of phase noise (or, as we measure it, *composite noise*, which is a combination of phase noise, broadband amplifier noise and close-in spurs)—the Omni V is one of the best transceivers you can currently buy.

In the area of basic radio performance, the Omni V shines. This isn't a backhanded complement: You can pay close to a kilobuck for one radio that comes with, for example, distorted weak-signal CW audio as standard, or another that has receiver-audio that rolls off well below 2 kHz. *Good basic radio performance* is, amazingly, something you usually have to buy more than a basic radio to get!

Where the Omni V falls short of hitting the bull's-eye for DXers and contesters is in value-added features long termed *bells and whistles* but now considered by competitive contesters and DXers as necessities. Memories—callable, handlable and identifiable *by channel number*, and preferably tunable—are one such necessity; RIT—not just in function, but in fact—is another. Another is variable CW offset (and sidetone pitch that tracks it). Solitary hunt-and-pounce DXing is fading somewhat; networked, computer-aided, frequency-agile, PacketCluster™-assisted DXing is rising. This goes double in contesting, in which a rig (and its operator) must be able to be everywhere at once or sit on one frequency and comb a kilohertz or two for callers—with equal facility.

Many hams who demand excellent hambands-only radio performance, but who find the space-shuttle-cockpit aspect of other high-end transceivers intimidating, will find the Omni V to be their cup of tea.

Manufacturer's suggested retail price: Omni V, $2245; Model 961 power supply/speaker, $230; Model 256 FM module, $65; Model 257 voice synthesizer, $89; Model 259 ALC annunciator, $39; optional crystal filters (6.3- and 9-MHz IFs), $74 each; Model 301 remote frequency control, $75; Model 705 desk microphone, $83.

Acknowledgment

Dave Newkirk, WJ1Z, and Steve Powlishen, K1FO, contributed to this review.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from Amateur Radio dealers. ARRL receives no remuneration from anyone involved with the sale or manufacture of items presented in the Product Review or New Products columns. —*Ed.*]

The ARRL-purchased Product Review equipment listed below is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and are discounted from the purchase prices.

Yaesu FT-470 hand-held VHF/UHF FM transceiver with technical supplement (see Product Review, Sep 1990 *QST*). Minimum bid: $318.

AEA AT-300 antenna tuner (see Product Review, Aug 1990 *QST*). Minimum bid: $144.

AEA MM-3 keyer (see Product Review, Jul 1990 *QST*). Minimum bid: $137.

ICOM IC-725 160-10 meter transceiver with optional 500-Hz CW filter (see Product Review, Mar 1990 *QST*). Sold as a package only. Minimum bid: $653.

Sealed bids must be submitted by mail and must be postmarked on or before November 27, 1990. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

In your bid, please clearly identify the item you are bidding on, using the manufacturer's name, model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by the successful bidder, FOB Newington. The successful bidder will be advised by mail. No other notifications will be made, and no information will be given to anyone regarding final price or identity of the successful bidder.

Please send bids to Bob Boucher, Product Review Bids, ARRL, 225 Main St, Newington, CT 06111.

CLARIFICATION: GARANT ENTERPRISES GD-8 PRODUCT REVIEW

September *QST* carried a review of the Garant Enterprises GD-8 Antenna. The review should have made clear that only the 500-watt version of the product (Model number GD-8/500) was reviewed. The comments contained in the review do not necessarily pertain to the 2000-watt version of the product.

The $17.19 collected by the US Postal Service upon delivery of the package consisted of $13.94 customs duty and a $3.25 handling charge for collecting the duty.

The manufacturer states that his product is the same as that described in the Appendix on pages 33-34 of August 1990 *QST*. Readers may wish to review that Appendix, and the article it accompanies, for further information on this general type of antenna. The manufacturer also notes that he expressly does not recommend the use of RG-58/U coaxial cable.

Hints and Kinks

Conducted By David Newkirk, WJ1Z
Assistant Technical Editor

TEAMING THE W6OWP KEYING INTERFACE WITH THE HEATHKIT HW-101 TRANSCEIVER

☐ In April 1987 *QST*,[1] F. A. Bartlett, W6OWP, described a circuit capable of eliminating first-character distortion (shortening) that occurs during semi-break-in (keyed VOX) CW operation with some transceivers. Teaming the circuit with my Heathkit® HW-101 involved a few modifications that may be of interest to others who intend to use the interface with older, tube-based transceivers. Here's how I modified the two to work together.

Fig 1 shows the additional circuitry necessary to connect the interface's PTT-control line to V12B, the HW-101's TR-relay driver. U2D, unused in the original interface circuit, is put to work here.

The original interface was designed to be powered from a 13.5-V dc source in its associated transceiver. Such a supply is unavailable in the HW-101, so I used the circuit shown in Fig 1B, deleting the 9.1-V Zener diode, 200-Ω resistor, and 0.1- and 200-μF capacitors that provide 9.1-V dc from 13.5 V in the original design.

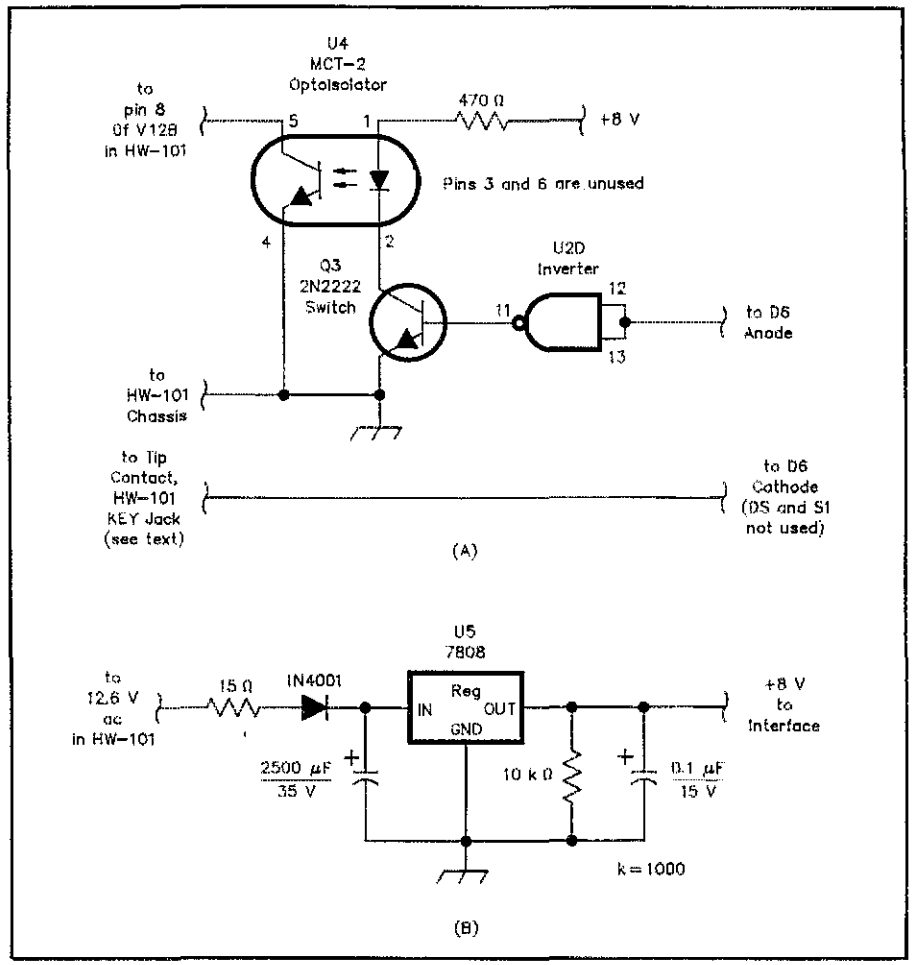


Fig 1—Jim Zvolanek modified F. A. Bartlett's CW keying interface for compatibility with a Heathkit HW-101 transceiver as shown at A. New power-supply circuitry (B), powered by the HW-101's 12.6-V ac heater supply, was necessary, too. Resistors are ¼-W, carbon-film units. See text.

Construction and Installation

I decided to build the interface into the transceiver on a Radio Shack® 276-150 Multipurpose Board. This board has ample room to accommodate the original interface circuitry (including the **MARK** and **SPACE** pots) and the additional parts called for in Fig 1A.

I mounted the interface board on the HW-101's main chassis, 3/4 inch to the right of the cage containing the rig's 6146 amplifier tubes and over the 5/8-inch-diameter access hole, which also allows wiring to the underchassis circuits. An aluminum bracket, 3 × 2 inches in size with a 1/4-inch flange, supports the board. Position the board on the bracket so the **MARK** and **SPACE** pots are accessible for easy adjustment.

I built the power supply underneath the chassis on the vertical partition that supports the coil compartment. A bolt suitable for mounting the 7808 regulator is available 3-1/2 inches from the rear of the chassis. Other power-supply parts are wired to a terminal strip mounted over the grounding lug for the socket of RL2 (one of the HW-101's TR relays).

The HW-101's **KEY**-jack wiring must be modified because the interface unit's keying transistor (Q2, an MPSA42; see the article cited in note 1) must operate grounded-collector, with its emitter connected to the HW-101's keying line. Lift the black/white wire at the tip terminal of the HW-101's **KEY** jack and connect this wire to Q2's emitter. Then run a wire from the HW-101's **KEY**-jack tip terminal to the cathode of D6 in the interface circuit. This completes the modification.

Follow the adjustment procedures described in the original article, and you're ready to operate.—*Jim Zvolanek, W9AG, 3827 W 83rd Pl, Chicago, IL 60652*

[1]F. Bartlett, "A CW Keying Interface," *QST*, Apr 1987, pp 51-53.

MAKE YOUR OWN QRP CARRY-ALL

☐ One of the great things about QRP is that it really opens up the possibility of go-anywhere operation. Recently, I've been taking my gear with me in style in my QRP Carry-All bag (Fig 2). Besides holding my gear, it's a great way to "fly the flag" because it displays the League diamond and a Michigan QRP Club patch. The Carry-All makes a home construction project that requires absolutely no debugging and no test equipment!

An uncle in England gave me a British school bag—similar to an American canvas knapsack—that was just the right size for my W7EL transceiver, battery box and assorted portable-operation-materials kit that I've assembled for my QRP ramblings. I based the QRP Carry-All on this bag. The assembly instructions? Simply dress it up with a couple of patches!

You don't even need to sew. Acquire a suitable bag or day pack. Then, using iron-on adhesive (intended for hemming garments, and available at fabric stores and variety-store notions counters), apply ham-radio-related patches to the bag. Such patches are available from many sources; ARRL sells an eye-catching ARRL-flag patch, as well as ARRL-diamond patches of two different sizes. The Society of Wireless Pioneers and other organizations also offer beautiful patches.

When not toting a portable station, the QRP Carry-All is also great for holding small hamfest purchases. Carried during air travel, the bag invariably attracts the attention of other traveling hams, who stop by

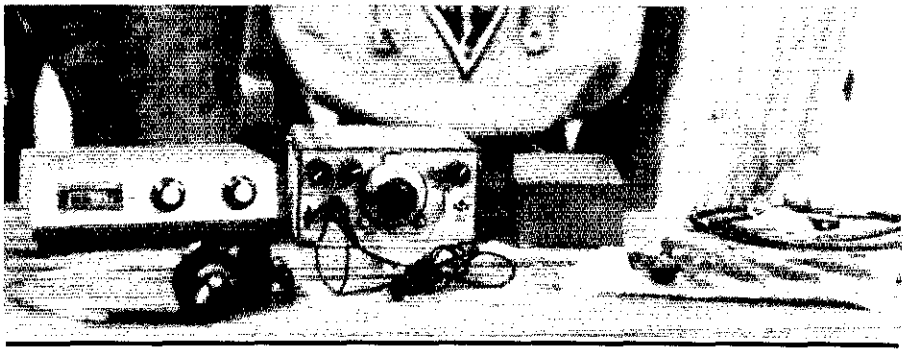


Fig 2—Doug Stivison's QRP Carry-All (left) is just the thing for toting a compact, battery-powered QRP station (below) into the sticks. Those ham-radio-related patches aren't just for show: Especially on air trips, their "Amateur Radio Spoken Here" message lets other traveling hams know that another of their own is near.

for conversation. Combined with my windbreaker, which sports Society of Wireless Pioneers patches, the QRP Carry-All has sparked many impromptu meetings. *—Doug Stivison, NR1A, 45 Norman Rd, Upper Montclair, NJ 07043-1933*

AAA NiCds IN AN AA CHARGER

☐ My 2-meter hand-held uses AAA NiCds, but my charger only takes AA cells. Although adapters are available, I found a cheap and easy way to fit AAA cells into my AA charger.

Remove a piece of the outer jacket—a section slightly longer than an AAA cell—from a length of scrap RG-8 cable. Slit the piece lengthwise and slip it over the cell to be charged. The jacket acts as an expander and allows the AAA cell to fit snugly in an AA charging well. As necessary, adjust the expander's length (perhaps with the addition of a metal spacer between the negative end of the cell and its corresponding charger electrode), to assure solid contact between the cell and the charger electrodes.

This technique can also be used to install AAA cells in AA-cell battery cases. *—Fred Devenish, G5UP/VE7BBD (SK)*

Once you've successfully fitted AAA cells into an AA-cell charger, the next thing to ensure is that the AAA cells charge at a rate appropriate for their capacity.—*Ed.*

LONGER LIFE FOR YOUR QUAD ANTENNA

☐ Having kept a quad antenna up and working for approximately 25 years, I'm sometimes asked how it's done. Sad experience has been my teacher! My first quad was a W2AU design. It worked very well, but its 20-meter element, and sometimes its 15-meter element, required periodic patching because of ice- and wind-related flexing. Typically, element-wire breakage occurred at the element corners—where they're supported by the quad's spreaders. Adding a two-wire strengthener (see Fig 3A) at each element corner solved this problem.

Teflon®-insulated wire is a better choice than stranded bare wire. Oxidization of the quad's original stranded copper wire was the reason for this: Ten or so years ago, I noticed that the quad's elements had turned green, and I took this as a sign that weather was taking its toll. (The quad's electrical performance was not affected.) Discovering that Teflon-insulated wire was available in odd lots at flea markets, I bought some. (It helped that I wasn't fussy about insulation color!)

The stock quad's spreaders were tied together (Fig 3B) with 50-pound monofilament (nylon) fishing line, which deteriorates in sunlight because of ultraviolet bombardment. I replaced it with more-durable cord.[2]

My quad uses tapped-coil inductive reflector tuning. I replaced its Miniductor coils with home-made, 1-inch-ID coils wound of no. 12 tinned bus wire. (I wound each coil on a 1-inch-diameter temporary form, removed it from the form and slipped it into position on its respective quad insulator.) Feeling that tapped coils—whether their unused turns are shorted or left open—introduce loss, I tuned the quad reflectors by adjusting the tuning coils' turn spacing as necessary.

I haven't had to repair my quad since I performed these modifications almost 15 years ago.—*Paul T. Atkins, K2OZ, 56 Ormsay St, Park Ridge, NJ 07656*

[2]*Nylon* cord, especially that treated to improve its resistance to ultraviolet light, is much better than monofilament fishing line for outdoor use; *Dacron* cord is even better. Because it deteriorates rapidly in ultraviolet light, avoid using *polypropylene* lines in sunlit locations.—*Ed.*

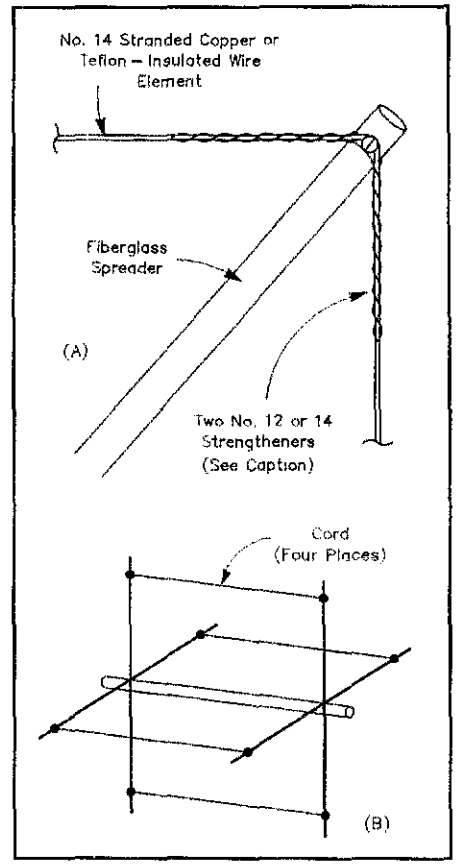


Fig 3—With its elements constructed as shown at A, Paul Atkins's quad has survived for over a decade without being kayoed by the weather. Although bare no. 14 stranded copper wire is shown for the elements, *Teflon-insulated* no. 14 stranded copper is better choice because of its greater strength and weatherproofing. (If you use insulated wire, take care not to nick the wire's strands when removing its insulation for soldering. If possible, use a thermal stripper to do this.)

Each corner strengthener consists of two pieces of no. 12 or 14 bus wire 14 to 16 inches long. After cleaning the element wire until it's bright and solderable, twist on one strengthener wire. Twist on the second strengthener wire *in the other direction*. Using rosin-core solder and a soldering iron hot enough to heat the work thoroughly, solder the three wires together. Complete the job by cleaning the joint to remove whatever rosin remains. The finished strengthener can be wrapped with tape as required.

B shows the spreader-to-spreader lines Paul replaced with cord. See text and note 2. QST

Technical Correspondence

Conducted By Paul Pagel, N1FB
Associate Technical Editor

AN IMPROVED INPUT CIRCUIT FOR PARALLEL-TUBE VHF POWER AMPLIFIERS

☐ A current trend in the construction of multiple-tube VHF power amplifiers is to use parallel rather than push-pull connection. Over the years, a number of articles have appeared describing the use of two (and even three) 4CX250s in parallel as replacements for the venerable W1HDQ "plumber's delight" push-pull pair on 144 and 432 MHz.[1-4] The primary advantage of the parallel-tube circuit is that it greatly reduces the effects of tube and plate-circuit imbalance, which can lead to nonlinearities in push-pull operation.

In the input circuit of a typical parallel-tube amplifier, the grids of both tubes are connected in parallel and matched to 50 ohms with a double-tuned, link-coupled circuit (see Fig 1). This circuit has virtually no latitude for balancing drive between tubes, thus eliminating one of the main advantages of parallel connection. A similar situation exists for amplifiers using cathode-driven tubes such as the 8874 or 3CX800A7. Parallel connection of tube cathodes is okay at MF/HF, but can lead to problems at VHF and above. An additional problem encountered when cathodes are connected in parallel is increased difficulty in metering the individual tube currents—a must when tubes are so expensive.

An input circuit that we recently tried with a parallel-connected pair of 3CX800A7s for 144 MHz is shown in Fig 2. Each tube cathode is matched to 50 ohms using a network that also provides a series input capacitor for dc blocking.[5] The two 50-ohm ports are fed in phase using a lumped-element Wilkinson power divider. The divider also provides up to 30 dB of port-to-port isolation, eliminating any possibility of push-pull modes between the tubes. A transmission-line Wilkinson divider or transmission-line ring hybrid would also work here.[6] Grid- and plate-current meters are provided for each tube, to allow monitoring the power split between the tubes.

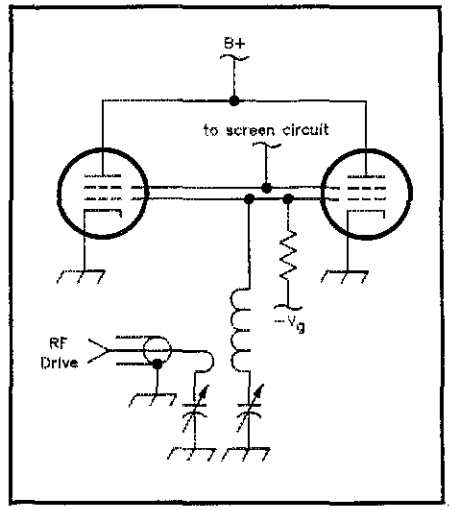


Fig 1—This input circuit offers no consistently reliable method for balancing the drive between the two parallel-connected tubes.

During initial tune-up, SWR meters are inserted into each cathode port and the input circuits are tuned for best match and balance between the tubes. If the tube gains are badly mismatched, 50-ohm attenuation can be inserted at the input port of the higher-gain tube. The completely separate cathode dc circuits also allow balancing the resting current of each tube by using different-value Zener diodes for D1 and D2, should this be necessary. D3 and D4 keep the plate meters from shorting the grid-meter circuit.

There's no reason that this concept can't be extended to use three or even four tubes in parallel provided that the proper multiport power divider is used.

After struggling for years with various push-pull and parallel schemes on 2 meters, we've found this approach to be a breeze. Amplifier balance and stability are excellent, and the extra dissipation provided by two tubes gives plenty of performance

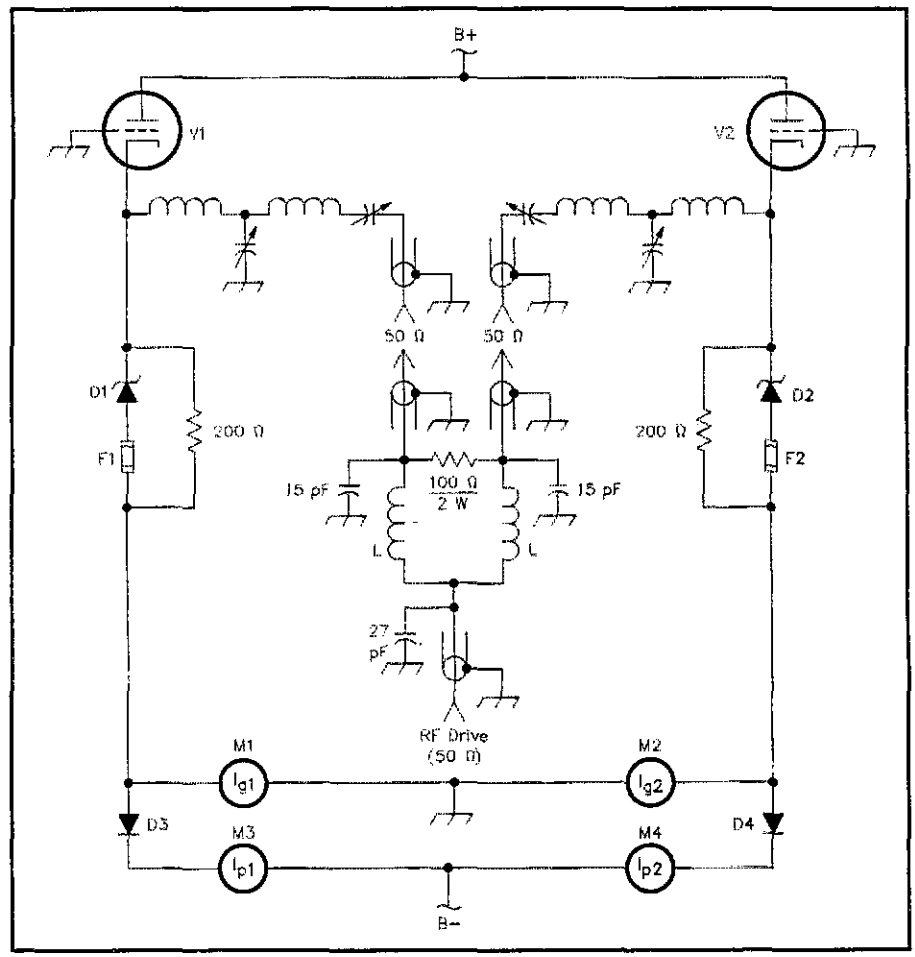


Fig 2—With this input circuit, drive balance is achieved easily. For 144 MHz, the two inductors labeled L each consist of 4 turns of no. 20 enameled wire, 1/8 inch diam, 1/2 inch long with a total winding length of 5/8 inch.

[1]E. Tilton, "A High-Efficiency 2-Meter Kilowatt," *QST*, Feb 1960, pp 30-33.
[2]R. Knadle, "A Strip-Line Kilowatt for 432 MHz," *QST*, Apr 1972, pp 49-55 (see Feedback, Jul 1972, p 47).
[3]S. Gross, "A Parallel 4CX250B Amplifier for 144 MHz," *QST*, May 1975, pp 11-14.
[4]D. Dobricic, "A Three-Tube 4CX250B Linear Amplifier," *ham radio*, Apr 1987, pp 63-72.
[5]D. Meacham, "A High-Power 2-Meter Amplifier Using the New 3CX800A7," *QST*, Apr 1984, pp 11-15.
[6]T. Pettis, "HY-brid HI-power," *QEX*, Jan 1990, pp 13-14.

margin even for contest and EME operation.—*Dave McGee, N3AHF, and Bob Evans, KS2D, c/o David Sarnoff Research Center, CN5300, Princeton, NJ 08525*

SPACE ENVIRONMENT LABORATORY PUBLIC COMPUTER BBS

☐ The Space Environment Laboratory in Boulder, Colorado offers a free public computer bulletin board service that makes solar- and radio-propagation-related information available on a 24-hour/day, 7-day/week basis. Since my article describing this service was first published,[7] some improvements have been made. *(See the New Books item below.*—Ed.*)*

The board's host computer has been upgraded to a faster, multitasking machine. The telephone interface has been expanded from one line to four, and the maximum data rate supported has been increased from 1200 to 2400 bauds. All of this equates to faster, more efficient on-line performance.

This board features HF radio propagation reports and forecasts based on actual operational experience during the previous several hours. It also provides regular solar reports containing more extensive data than in the Geophysical Alert Broadcasts as well as maximum usable frequency (MUF) predictions based on user-supplied geographical coordinates and SESC-supplied sunspot numbers. Recent archival solar and geomagnetic activity data are also available.

To access this free service, call 303-497-5000. Communications parameters are: 300, 1200, or 2400 bauds, 8 data bits, one stop bit and no parity. The board is completely menu-driven and there is an extensive help section.

This board uses the Bell Standard for its data communications. Many modems outside the US use other standards, so equipment operating instructions should be consulted before attempting to contact this bulletin board from outside the US. —*David A. Rosenthal, N6TST, 840 East Springer Ave, Ridgecrest, CA 93555*

SAFETY FIRST!

☐ During construction of a miniature QRP transmitter, I had to work without my glasses so I could focus while doing some close-up work. When unsoldering a connection, I was struck on my lower eyelid by a small piece of solder. Because I normally wear glasses while soldering and don't usually do such close-up work anyhow, I'd grown complacent to the potential danger.

If you normally don't wear glasses, you should wear some sort of eye protection when soldering or doing other work in the shop. Hardware and discount stores sell inexpensive plastic safety goggles. The consequences of damage to your eyes outweighs the discomfort and inconvenience of wearing protective equipment.—*Michael A. Czuhajewski, WA8MCQ, Box 232, Jessup, MD 20794*

[Even if you wear glasses, unless they're specifically designated as safety glasses, you should also wear safety goggles in the workshop. —*Ed.*]

Note: All correspondence addressed to this column should bear the name, call sign and complete address of the sender. Please include your daytime telephone number.

[7]D. Rosenthal, "NOAA's Space Environment Laboratory Public Computer Bulletin Board Service," *QST*, Aug 1989, pp 15-18.

New Books

RADIO FREQUENCY USER'S GUIDE TO THE SPACE ENVIRONMENT SERVICES CENTER GEOPHYSICAL ALERT BROADCASTS

By David A. Rosenthal and Joseph W. Hirman. Published by the National Oceanic and Atmospheric Administration Environmental Research Laboratories, Space Environment Services Center NOAA/ERL/SEL-R/E/SE, 325 Broadway, Boulder, CO 80303. 1990 edition. Softcover, 8½ × 11 inches, 19 pages. Available free of charge.

Reviewed by Paul Pagel, N1FB

Amateurs who regularly monitor the hourly Geophysical Alert Broadcasts transmitted via US Government radio stations WWV and WWVH will be glad to hear about this new publication. Recently released by the National Oceanic and Atmospheric Administration (NOAA), it's a user's guide to the WWV/WWVH 45-second bulletins. The *Guide* provides just about everything you need to extract the surprisingly large amount of information the bulletins contain. The data is broadcast at 18 and 45 minutes past the hour, and can prove especially useful to radio amateurs interested in tracking events in the near-earth space environment that affect the quality of HF radio propagation.

First released in March 1989 as *A User's Guide to the Space Environment Services Center Geophysical Alert Broadcasts*,[1] supplies of that free 20-page booklet were exhausted within a week. The new *Guide* reflects recent changes made in the Geophysical Alert Broadcasts and focuses on some of their radio-related aspects.

The organization responsible for the Geophysical Alert Broadcasts is the Space Environment Services Center (SESC), a part of NOAA's Space Environment Laboratory in Boulder, Colorado. The SESC is the hub of a worldwide data-collection network that constantly monitors events on the sun and their effects on the earth. Literally thousands of inputs from sensor arrays—on earth and in space—are combined with optical and radio observations to provide a continuous picture of conditions in what is known as the solar-terrestrial environment. Trained forecasters at the SESC examine this up-to-the-moment data and correlate it with longer-term knowledge to provide the information in the Geophysical Alert Broadcasts.

David A. Rosenthal, N6TST, holds an Advanced Class license. Dave co-authored the first edition of the *Guide*. He also wrote a *QST* article that provides step-by-step instructions on how to use its information to relate solar-terrestrial data to HF radio propagation conditions.[2] (Also, see "Space Environment Laboratory Public Computer BBS," this page.) Co-author Joseph W. Hirman, Chief Forecaster for the SESC, drew on his own background and the collected experience of the scientists and RF propagation specialists with the Space Environment Laboratory at Boulder.

This new publication is *free*. Get your copy by contacting the Space Environment Services Center at the address given in the heading. Request *NOAA Technical Memorandum ERL SEL-80.*

[1]P. Pagel, "A User's Guide to the Space Environment Services Center Geophysical Alert Broadcasts," *QST*, Aug 1989, p 60.

[2]D. Rosenthal, "NOAA's Space Environment Laboratory Public Computer Bulletin Board Service," *QST*, Aug 1989, pp 15-18.

WARC-92 Draft US Proposals Released

The FCC seeks comments on recommended allocations proposals: 7 MHz looks good, but 420 and 2390 MHz are under attack.

By David Sumner, K1ZZ
Executive Vice President, ARRL

The Federal Communications Commission has released the 150-page text of its Second Notice of Inquiry (NOI) in General Docket 89-554. The Commission opened this proceeding late last year to provide a forum for public input on the issues likely to arise at the World Administrative Radio Conference (WARC) scheduled to open in Spain on February 3, 1992. The agenda for this conference is limited in scope, but still could affect a number of important frequency allocations to the Amateur Service as high-frequency broadcasters and a number of terrestrial and satellite services seek new allocations.

The Second NOI includes specific draft recommendations for proposals to be made by the United States at WARC-92. No new FCC rules will result directly from this proceeding; rather, it is a part of the process by which the FCC is determining how the future needs of users (other than the Federal government) of radio spectrum in the United States can best be represented at the conference. The FCC also is receiving input from an Industry Advisory Committee on which ARRL is represented. The needs of non-government interests as defined through this process must be blended with those of the Federal government as defined through a parallel, non-public process being conducted by the National Telecommunications and Information Administration (NTIA). The third player in the development of US proposals for WARC-92 is the Department of State, which will forward the coordinated proposals to Geneva around June 1991 so they can be translated and distributed to the administrations of the member-countries of the International Telecommunication Union (ITU) for study prior to the conference.

In response to the considerable time pressure that exists, the FCC and the NTIA already have coordinated their recommendations on the majority of WARC-92 issues. These coordinated recommendations are reflected in the Second NOI. Coordination on a particular issue does not mean that the US proposal is cast in concrete; public input can and, on some issues, undoubtedly will result in changes being made. Neither does coordination mean that the position of Federal government users may not change before adoption of the final US proposals.

Responding to the Second NOI is the best opportunity for the general public to participate in the development of US WARC-92 proposals. The deadline is December 3, 1990. Here is an overview of the major issues identified in the NOI that may directly affect amateur allocations.

HF Broadcasting and 40 Meters

The draft proposals call for an expansion of the high-frequency broadcasting bands by 1325 kHz in Region 2 (1125 kHz in Regions 1 and 3). The difference in the amount of proposed expansion between the regions arises from a proposal to resolve the decades-old incompatibility between the Amateur Service in Region 2 and the Broadcasting Service in Regions 1 and 3.

Historically, the Amateur Service was allocated a 300-kHz band, worldwide, at 7000-7300 kHz. The increase in propaganda broadcasting on the eve of the Second World War led to the introduction of European broadcasting into the top part of the band in the late 1930s. This move was never accepted in Region 2, where the band continued to be available only to the Amateur Service in recognition of our continuing requirement for 300 kHz of spectrum around these frequencies. As recently as 1979, during the World Administrative Radio Conference held that year, broadcasters tried to make 7100-7300 kHz a worldwide broadcasting allocation without providing any compensation to the Amateur Service in Region 2. They failed because amateurs were able to retain the support of *every* Region 2 administration; not a single one broke ranks.

In its WARC-79 proposals, the US had suggested that the incompatibility at 7100-7300 kHz be resolved by shifting the amateur allocation down by 50 kHz, to 6950-7250 kHz, and expanding broadcasting allocations up by 150 kHz, making each band exclusive, worldwide. This proposal was not accepted by the conference because it was felt that it would have too great an impact on the fixed service (the present occupant of the bands immediately above and below the 40-meter band).

Preliminary US proposals contained in the Second NOI once again call for the creation of separate worldwide bands, this time by a 100-kHz downward shift of the amateur allocation to 6900-7200 kHz, and a 100-kHz upward shift of the broadcasting allocation to 7200-7400 kHz, with an additional broadcasting allocation of 7400-7525 kHz. The fixed service would be reaccommodated elsewhere; the existing secondary allocation to land mobile of 6900-7000 kHz would be retained, giving us a sharing partner in this 100-kHz segment that would be more compatible than the broadcasting presence in the 200-kHz segment that we have now.

Will this proposal fare better with other administrations than its 1979 counterpart? That's the big question. Broadcasters say their needs are greatest in the bands below 10 MHz, but this is precisely where congestion is also the biggest problem for the other services and where, therefore, broadcasting expansion would cause the most problems. While there's not much use made of HF fixed services in North America and western Europe, the same is not true everywhere. Some administrations have already let it be known that they're not enthusiastic about surrendering fixed service spectrum.

In addition to 7200-7525 kHz, the other new HF BC allocations proposed in the preliminary US proposals are:
5900-5950 kHz
9350-9500 kHz
11,550-11,650 kHz
13,800-13,900 kHz
15,600-15,700 kHz
17,450-17,550 kHz
18,900-19,300 kHz

These are expansions of existing bands except for 18,900-19,300 kHz, which would be a new band. In all cases, the fixed ser-

vice would be giving up spectrum in favor of broadcasting.

A feature of the preliminary US proposals for HF broadcasting is that the use of *reduced-carrier single-sideband emission would be required* after July 1, 2007, which is also the date proposed for implementation of the expansion bands (and for the 40-meter realignment). By going to SSB with a carrier level 12 dB below peak envelope power output, each broadcasting signal would occupy just half the spectrum of a conventional double-sideband AM emission; however, a new generation of receivers with synchronous detection and good filtering will be required. Manufacturers would have 15 years to develop and market such receivers at a price consumers would be willing to pay. A number of private US broadcasters are concerned that at least some of their listening audience, for economic or political reasons, would not have access to new receivers.

420 MHz

WARC-92 will consider two issues that may affect the 420-450 MHz band.

One item that barely made it onto the WARC-92 agenda is consideration of a possible allocation below 1 GHz of up to 5 MHz to low-earth-orbit (LEO) mobile satellites "on the basis of appropriate sharing criteria." To most WARC observers, this language conveys that the allocation is to be made only if the proponents of the new system can show they can successfully share with existing users.

The FCC has departed somewhat from this philosophy, proposing that the stated need for a new mobile-satellite LEO allocation be met in part by a 1-MHz uplink at 930-931 MHz and a downlink at 420-421 MHz. The irony of this particular proposal is that the feasibility of LEO satellite technology was demonstrated in the Amateur-Satellite Service! Shared, secondary allocations of 148.0-149.9 MHz (uplink) and 137.0-138.0 MHz (downlink) are also proposed for this service; the uplink is uncomfortably close to our most overused VHF band, so this also bears watching.

The second 420-MHz issue for WARC-92 will not come before the conference as an allocations issue, exactly. Interest in wind profiler radars is building, but when they operate near 404 MHz they cause interference to satellite systems in the 406.0-406.1 MHz band. So, another place must be found for them—perhaps several places, near 50 MHz, 400 MHz and 1 GHz, because different frequencies are better at spotting different atmospheric characteristics. The draft US proposals include a resolution urging that the matter of appropriate allocations be taken up at the next competent WARC following WARC-92, based on CCIR technical studies, and that frequency assignments to wind profiler radars be avoided in the 402-406 MHz band. Also proposed is a recommendation suggesting a specific frequency (not identified in the draft recommendation, but quite possibly 441 MHz) for interim implementation of wind profiler radars.

If the interim recommendation does turn out to be for a frequency in the 420-450 MHz band, this is not necessarily bad news for amateurs. Studies will need to be made of the compatibility of present and future amateur operations with the wind profiler radars. Because they are designed to radiate upward and to detect signals being reflected downward, it may turn out that the only problem is in the immediate vicinity of the radar. More sharing of spectrum is bound to be one of the results of WARC-92 and subsequent allocations conferences; finding compatible sharing partners helps ward off the loss of allocations.

2390 MHz

The amateur 13-cm band extends from 2300 to 2450 MHz. In the US, the use of 2310-2390 MHz by aeronautical flight-test telemetry has caused this segment to be withdrawn from amateur use. Microwave ovens and other industrial, scientific, and medical (ISM) devices use 2450 MHz, ±50 MHz, and we must accept any interference they may cause. The NOI makes it clear that this is not the end of the challenges in this part of the spectrum.

NOI Text Available

An extract of the portions of the FCC Second Notice of Inquiry in General Docket 89-554 that relate to the Amateur Service is available from ARRL Headquarters. Send $2 for postage, duplication and handling.

Interest in allocations for future generations of land mobile systems, using digital technology and "microcells" to permit intensive frequency re-use, is focused on 1700-2500 MHz. While there is a general preference for the lower part of the band (now used primarily by government and private fixed microwave systems), the amateur band may feel the pressure from land mobile either directly or indirectly (through reaccommodation of services displaced from their present bands by land mobile).

An even greater and more immediate threat has developed from digital audio broadcasting, both satellite and terrestrial. The Second NOI discusses three possible options for the delivery of CD-quality sound:

1) The use of 728-788 MHz, now used by UHF television broadcasting in this country, on a shared basis.

2) The use of 1493-1525 MHz, now used for aeronautical flight-test telemetry. The present occupants would be shifted to 2390-2420 MHz, and ISM would be confined to within 30 MHz of the 2450-MHz center frequency.

3) The use of 2390-2450 MHz. With narrowing of the ISM band and a possible slight shift upward in its frequency, it is thought that perhaps enough spectrum could be freed up here to accommodate the desired service. (Still, putting a consumer service in a band where microwave ovens presently operate, and are likely to operate until they break, is a bit mind-boggling.)

Even that isn't the end of our problems at 2390-2450 MHz. If the band is unsuitable for either flight-test telemetry or digital audio broadcasting, the FCC says it might be used as a mobile-satellite uplink band....

What Now?

Clearly, as radio amateurs we have our work cut out for us. While the draft proposals for HF are encouraging, we're not home free; we have to retain the domestic support we've been able to develop while building support overseas for an acceptable solution to the 7-MHz compatibility problem.

At 148 MHz, we have to make sure the LEO proposal for 148-149.9 MHz doesn't slip any farther south.

At 420-421 MHz, we have to marshal our arguments for retention of the band. Questioning the need or the desirability of the LEO service proposed for this band is fair play.

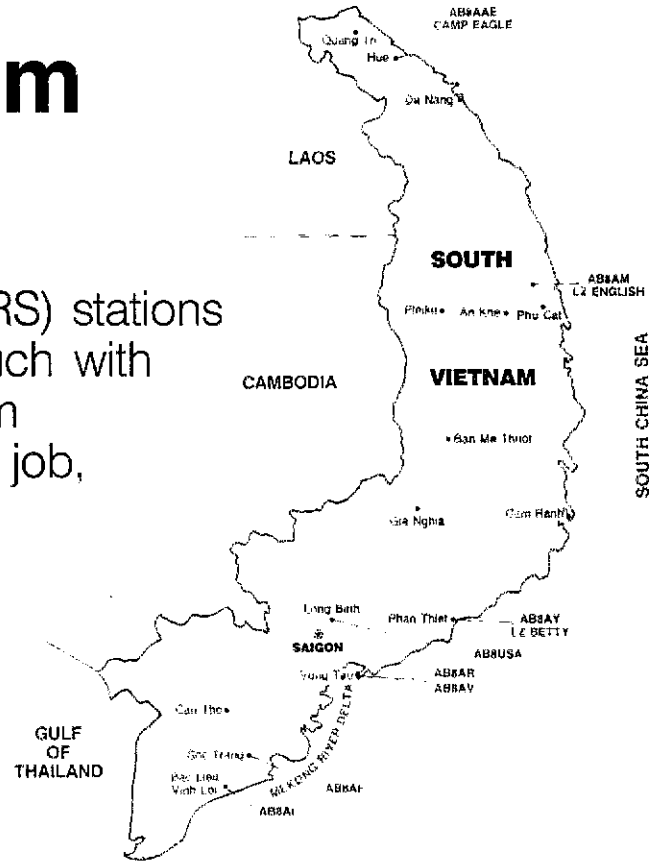
We must study the implications of wind profiler radars, not only in the 420-450 MHz band but possibly in the 50-54 MHz and 902-928 MHz bands as well.

We must build the strongest possible case for the retention of the 2300-2450 MHz band, and particularly for 2390-2450 MHz. Plans for the future of the amateur satellite program rely heavily on the 2400-2450 MHz band, and especially on the lower portion (as far as possible from microwave ovens). We just gained that band for amateur satellites at WARC-79; did we earn the band only to lose it little more than a decade later?

Finally, we can't be complacent about the HF bands below 22 MHz or the bands between 500 MHz and 3 GHz that haven't been targeted in the Second NOI. Just because there are no specific proposals for 902-928 or 1240-1300 MHz, or for the amateur HF bands other than 7 MHz, on the table at the present time does not mean they couldn't eventually find their way into proposals from the US or some other administration.

By giving the public until December 3 to comment, the FCC has given us more time to respond than many thought we would have. Now it's up to us to make the most of it.

Calling Home from Vietnam—*Part 1*



Military Affiliate Radio System (MARS) stations helped keep our servicemen in touch with their loved ones during the Vietnam War—but it wasn't always an easy job, especially on "the other end of the circuit."

By Dennis R. Vernacchia, N6KI
8993 Covina St
San Diego, CA 92126

I'd been a ham for about three years when I graduated from high school in 1965, and Vietnam was on my mind. After three semesters of college and a job with New Jersey Bell, I was drafted by the Army in September of 1967.

I was assigned to Radiotelephone Operators school because of where my name fell in the alphabet, not because I was a ham. Because I already was proficient at copying Morse code and operating radios, I was appointed an assistant instructor.

Our class of 200 graduated in April of 1968, and all but two of us received orders for Vietnam. We were initially assigned to Long Binh Replacement Depot, near Tan Son Nhut Airbase, to await assignments. I'd been asking questions about getting assigned to a MARS station, the facilities for handling message traffic and phone patches back to the US.[1]

When the last 15 of our original 198 radio operators got orders for the 101st Airborne Infantry Division, we protested mightily, to no avail, of course. After a fortnight of jungle training, I barely missed being shipped to the Demilitarized Zone in the north; instead, four of us were assigned to Headquarters Co 3/506 Infantry Battalion. We were heavily mortared the first night.

After a few days of sandbagging bunkers in the sweltering heat, I decided to get a wider view of the camp, known as Landing Zone (LZ) Betty. We were on a 200-foot bluff overlooking the South China Sea, about 100 miles northeast of Saigon.

The 3000-foot runway was defined by a dozen US units scattered along each side. This camp was home to a thousand men, half of whom were in the field at any one time. The perimeter was an uncomfortable 300 feet from the west side of the runway.

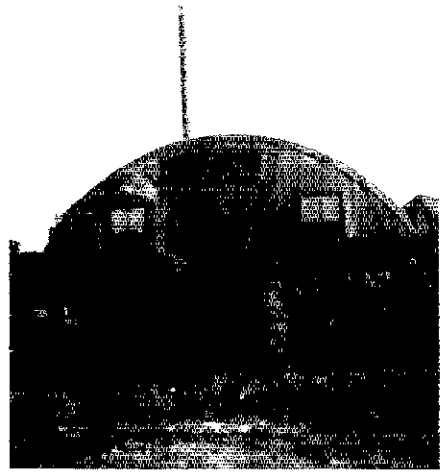
As I walked across the north end of the runway toward the perimeter, I noticed a fenced-in compound with two prefabricated metal buildings and antennas. Toward the rear of the compound I could see a small sandbagged bunker and next to it, a telephone pole with a two-element cubical quad antenna. I saw a Collins KWM-2A and 30L1 linear amplifier in the bunker. I hoped this was a MARS station.

One of the men in the bunker, Pat Yunker, was assigned to the US Army Stratcom communications unit manning the compound and was the chief operator of the MARS station. I explained to Pat how I got shanghaied into the 101st Infantry unit and demonstrated my ability to operate the Collins equipment. Pat convinced my sergeant-major to let me operate the MARS station for 30 days, until the 101st decided what to do with me.

My platoon sergeant had already informed me that no 101st trooper was going to get a "candy" assignment and that he was going to get me "properly" assigned in my infantry unit. It would take some fancy footwork to avoid losing my MARS position.

With Pat Yunker leaving and no replacement available, the station had to be moved outside the compound for security reasons. Because the MARS station was required to be operational 24 hours a day, I had my work cut out for me.

I contacted Jack Winning, WA6WDB, a civilian working on the base. Jack's pre-



"The most beautiful sight." The author's MARS station, AB8AY, in a Quonset hut with a Hy-Gain log-periodic antenna on a 37-foot pole.

[1]The Military Affiliate Radio System (MARS), while not strictly Amateur Radio, includes many licensed amateurs among its members. Since World War II, MARS nets operating just above and below several amateur bands have relayed messages to and from US military personnel stationed overseas, often in countries that do not permit third-party traffic by Amateur Radio.

A Christmas to Remember

By Paul A. Scipione, AA2AV

I spent Christmas Day, 1969, in Vietnam—in the ward at 326 Med, Camp Eagle, the base camp for the 101st Airborne Division—waiting to go over to the hospital ship *USS Repose* for surgery to repair a deviated septum.

At dawn the next day, several of my ward mates and I were choppered out to the *Repose*, anchored five miles offshore in the South China Sea. When I came out of the anesthesia, the doc told me that the surgery had gone "A-Okay."

After breakfast, two Navy doctors and a stern-faced Navy commander strode into the ward to announce that there had just been a major firefight near Quang Tri. We would be shipped out to make room for the latest wave of GI casualties; by early afternoon we were back in the ward at 326 Med.

"Okay, guys, this is the plan," whispered the lanky Spec 4 from Texas, drawing four of us into a tight circle to shield our conspiracy. "It's time to call home. As soon as the nurse leaves, we'll stuff pillows under our blankets an' duck out the back door an' down the hill to the MARS station."

The plan sounded fine, except that two of the guys were in casts and on crutches, the Texan was bent over from surgery to remove shrapnel from his intestines, and I could barely see around the bandages on my face. We headed for AB8AAE, the MARS station operated by the 501st Signal Battalion. Between the four of us, we had the equivalent of one working body.

AB8AAE wasn't particularly impressive from the outside: just a typical plywood-and-screen hooch, up on stilts a few feet, with a tin roof.

"How long a wait will we have?" I inquired of the PFC in charge.

"Can't estimate that exactly," a buck sergeant hollered out from behind a crude wooden table covered with Collins transmitters, receivers and linear amplifiers. "Propagation ain't so hot."

As the four of us from 326 Med took our places along the inside walls of the radio hooch, an amazing thing happened. One by one, other Screaming Eagles began giving up their places. "We can always come back tomorrow night. Looks like you guys need a call home more'n we do. Merry Christmas."

We were grateful for the generosity of our fellow GIs. After a two-hour wait, I was behind the Texan and a fellow from Indiana. As I entered the "phone booth," a makeshift plywood enclosure with an Army telephone on a plywood shelf and an old stool to sit on, I wondered if my wife and I would be able to recognize each other's voices over the 10,000-mile shortwave connection.

"Okay, Sarge, the usual time limit is three minutes, but you guys from the hospital get five. Here goes."

I was heartbroken when there was no answer from my wife. We then phoned my parents' house and I recognized my Dad's voice on the other end, hollering for my mother to crowd around the phone.

"Dad, how are you and Mom? Did you have a nice Christmas? Over."

"What's t-h-a-t, I can't quite make out who's talking on the other end. Can this really be Paul calling all the way from Vietnam? Over."

"Yes, Dad, it's really me, calling from Vietnam. Merry Christmas from the land of monsoons and rice paddies. Over."

"I'm still kinda confused at this end," I heard my Dad say in frustration. "This is your father, Alfred Scipione, of Lewiston, New York, talking. Over."

When my Dad heard my laugh from 10,000 miles away he knew it was really me and we were soon conversing like pros, as the two MARS operators threw their send and receive switches.

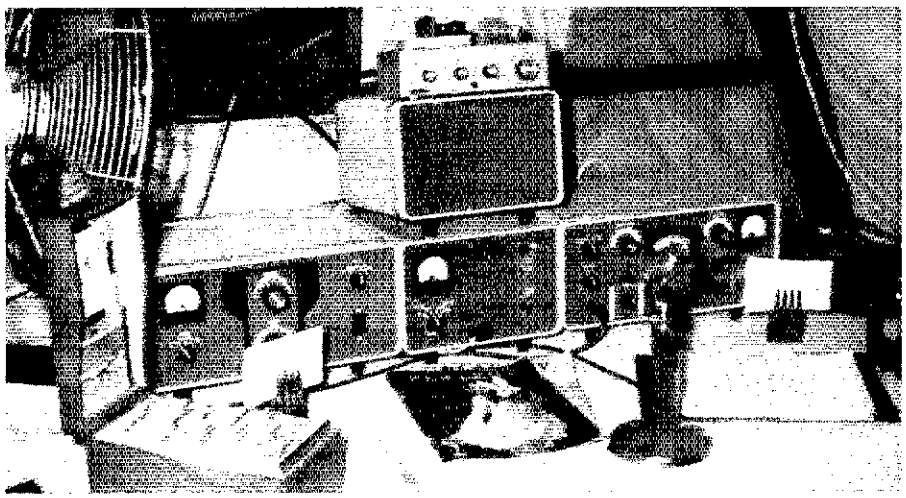
After I talked to my mother and hung up, tears filled my eyes, out of loneliness and because some wonderful hams had volunteered their time and stations to give us a touch of home. I stood in line another two hours, this time reaching Linda. "Hi, Babes. Love ya', Babes." The 10,000 miles disappeared.

Around two in the morning, our foursome stumbled out of AB8AAE and down the "road," back up the hill to the medical ward and our cold bunks. I smiled with joy thinking of my two miraculous Christmas calls home.

Twenty years later, on Christmas Day, 1989, I tuned the bands and listened to some GI phone patches home from Germany, Panama and the Indian Ocean. The men and women of MARS are still going full tilt.

I hope today's MARS operators—Army, Navy/Marine and Air Force—read this, because it's a belated "Christmas card" from me to them. I love and admire you, one and all.

Paul Scipione is active in the Piscataway (New Jersey) ARC. He holds a PhD in psychology, practicing from a study that doubles as his ham shack. He and his wife Linda have a 10-year-old daughter, Leigh.

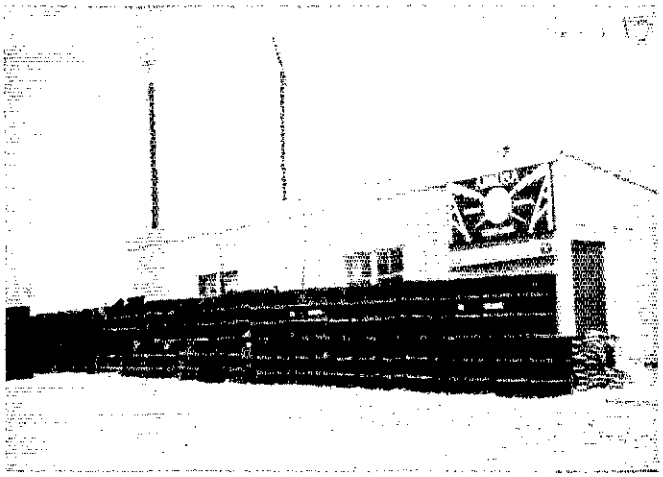


The author's operating position, including an M-14 ammunition clip to hold index cards and appropriate reading material. The "air conditioner" is on the left.

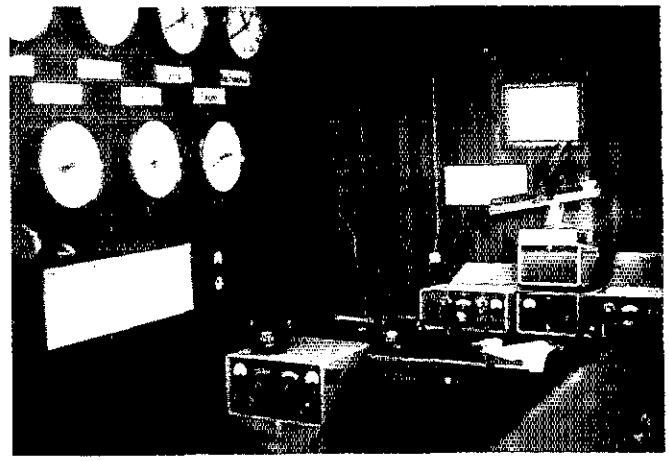
vious attempts to keep the MARS station on the air had fallen on deaf ears, but when he learned I was a fellow ham, he decided to help by getting me permanently assigned as chief operator. The colonel in charge of the base camp had never been given the opportunity of calling home, so I told him that the probability of calling his wife on a regular basis increased with his support of the MARS station.

I got the job.

While Jack worked on getting a new location authorized for the MARS station, I tried to keep AB8AY (Station Yankee) on the air as much as possible. I was supposed to check into Net No. 5 on the hour, 24 hours a day, but couldn't because I was the only operator for Yankee and had to sleep sometime. Another net member, AB8AV, covered for me.



AB8USA, the command-control station for Army MARS Vietnam, at Long Binh.



Inside the luxurious AB8USA, featuring a Collins 30S1 linear amplifier, paneling, world-time clocks for effect, "real" telephones and (not seen) an air conditioner.

Aside from phone patches, our traffic included operating instructions (MARSgrams) between stations, by voice or RTTY. Written messages were passed on in-country nets and ultimately sent out on RTTY to AB6USA, in Hawaii, who would screen all RTTY traffic before sending it to continental US (CONUS) stations.

The 6 × 6 × 6-foot metal shipping container that housed AB8AY was cramped, and the linear amp and transceiver were tired from the environment and use. We ate, slept and lived in the dirt and dust kicked up by the choppers and by the fan we used for cooling in the stifling heat.

The quad mounted on the 35-foot telephone pole above the bunker had high SWR on 20 and 15 meters from the many repairs that had been performed on it and the metal shrapnel embedded in the wooden spreaders and 2 × 4s that made up the boom.

I had a few phone connections around the camp. I could patch calls through to most headquarters offices, but there was no convenient way to get to most of the

The author inside the new "shipping-container" AB8AY.

troops. They had to come to my bunker and sit next to me, using the mike during the patch.

There was also the problem of the mike picking up the sounds of explosions, because the perimeter wasn't far away and our artillery firebase to the south was constantly lobbing harassment and interdiction rounds just outside our perimeter. We had no soundproof calling booths.

Another problem was having propagation to CONUS on only one frequency at a time every other day. On even-numbered days we had three frequencies.

We seldom had enough CONUS stations to run our patches and the few times we actually did, there weren't enough frequencies to run patches one-on-one with them. In desperation, our net stations would sometimes slide a few kHz from their assigned spots. Another trick was to select a frequency away from our assigned slot and monitor it 24 hours a day for a week—if nothing was heard, we'd run patches on it for a while.

This worked for about a month, when AB8AI was suddenly called on the carpet by AB8USA. The unusually clear 15-meter frequency "India" had chosen turned out to be an HF backup frequency for the Apollo space program! So much for that trick.

(continued next month....)

Strays

SMALL WORLD

The doorbell rang and there stood the neighborhood grouch. I thought to myself that it couldn't be TVI, so what was the problem *this* time? Instead of the usual frown, the lady had a big smile on her face. She said she had come to thank me "for writing that article in the magazine" ("Friends are Great People," Aug 1990 *QST*, p 15).

Seems she had a childhood sweetheart who had been asking her to come back east and visit him for years, but she'd never been able to go. She had finally decided, "Why not?" and was in the process of looking up the phone number when her phone rang—guess who? Seems the gentleman is a ham. He was reading *QST* and noticed that my address was close to hers, so he thought of calling her one more time to convince her to come for a visit. Now she's going and she's ecstatic.—*Joan Ash, WD6BNH, Atascadero, California*

I would like to get in touch with...

☐ anyone who has a maintenance, operation and calibration manual for a US Navy surplus 30-600 MHz ME-11B/U wattmeter manufactured by Decitron Electronics of Brooklyn, New York. Bob Mauney, WB4RPM, Rt 4, Box 4601, Jeffereson, GA 30549.

☐ anyone who has a wiring diagram for a Sinclair ZX-81 computer. Adolfo B. Pineda, XE1APJ, Calle Provincia, Guadalajara jal, Mexico.

☐ anyone who learned Morse code in 1923-24 when announcer Karl Stefan gave code practice over WJAG in Norfolk, Nebraska. Clarence E. Filley, W7KE, 1109 S 2nd St, Hamilton, MT 59840.

☐ anyone acquainted with the workings of a photo densitometer. Fred Tucker, W8YBS, 6114 E Pierson Rd, Flint, MI 48506.

☐ anyone who has a schematic or service info for an HBS-800C control panel for a Model 952-A Lectric Leopard automobile made by US Electricar Corp of Athol, Massachusetts. John Wittman, WK8X, 535 E Fulton St, Grand Rapids, MI 49503.

QST **Profile:**

Dick Ehrhorn, W4ETO— The Man from Alpha

An acclaimed "home-brewer" who's never satisfied with compromise, this ham is a hero to thousands worldwide.

By James D. Cain, K1TN
ARRL Associate Editor

Dick Ehrhorn with ETO's latest 20-kW MRI amplifier and to his left, an Alpha 86 amp. Visible in the pull-out drawer is the MRI's RF deck with its final, a modified Eimac 3CX15000B7. A solid-state 300-watt exciter drives a 3CX800 that drives the big tube. The power supply is below the RF deck.

In a hectic world, it's reassuring to run across something *logical*. *Star Trek*'s Mr Spock would appreciate how Dick Ehrhorn, W4ETO, came to build RF power amplifiers.

Born during the Depression, Ehrhorn went to college in the early 1950s. Ehrhorn was perfectly positioned in time. A freshman engineering student when the transistor was in its infancy, within five years he was designing radar systems for guided missiles, two technologies born only a few years before he became a ham. Ten years later, Ehrhorn Technological Operations (ETO) opened for business.

His parents were professional educators; the principal of Ehrhorn's high school was Dick's father. The "plan" was Harvard and young Richard would be a lawyer. Lucky for us, Ehrhorn ended up at the University of Minnesota, getting a BSEE, and then a Masters degree from the California Institute of Technology. During his freshman year, in 1952, he passed the brand-new Amateur Extra Class exam, one of the first 50 or so hams to do so. Harvard's loss and, later, the Vietnam War, led directly to the founding of ETO.

Beginnings

"Wired" telegraphy was a common means of introducing youngsters to Morse code in the 1930s and '40s. "Miss Terhune showed our fourth-grade class how to make a nail and bell-wire telegraph set, so I built one and set it up to a neighbor's house," says Ehrhorn.

Building a one-tube regenerative receiver out of Alfred Morgan's *First Radio Book for Boys*, Ehrhorn substituted a no. 27 cathode type tube for the specified no. 30 so he could use an old battery eliminator that put out ac for the filament—his first design project.

Ehrhorn bought the 1946 *ARRL Handbook* and discovered Amateur Radio. "The first station I ever saw was WØFNF, Grant Jensen's gorgeous setup just three blocks from home."

His family moved to Arlington Heights, Illinois, and at age 13, Ehrhorn passed the FCC Class B exam (today's General class) and became W9AOA. There was no Novice license in those days. A vivid memory from that year is Field Day with W9IT, the Northwest ARC.

"So all the great vices," Ehrhorn figures, "were planted in my mind by eighth grade: DX, CW and contests, as well as hot receivers, beams and beautiful home-brew amplifiers."

W9AOA's first rig, a 117L7GT crystal oscillator-rectifier, put out about a watt on 40-meter CW, directly feeding a wire to a tree across the street. The DX bug bit when Ehrhorn worked Cuba. Chicago's "Surplus Row" overflowed with WWII military gear in those days, and *QST* overflowed with articles on converting the wartime sets to amateur use. Among the war's leftovers,

he found a BC-348Q receiver and a BC-453, which he converted into the popular "Q-5er."

"I built a 6L6 audio amp on a cake pan, to drive the headphones louder, which no doubt explains why one ear now rolls off 8 dB at 2 kHz," Ehrhorn remembers.

The family moved again, this time to Rochester, Minnesota, and Ehrhorn became WØFID in the fall of '47. He built a heterodyne VFO exciter using a "modern" 2E26 beam-power tetrode to drive an 813 amplifier. "I spent every available minute reading the *Handbook*, building, chasing parasitics and working DX and Sweepstakes contests."

He added a third 813 to his home-brew final amplifier, learning "it's hard to put *three* parallel 813s on 10 meters." The pattern was emerging.

Designs on Design

Following his graduate work at Cal Tech, Ehrhorn (then K6CTV) stayed in California to work for General Dynamics, but his job didn't directly involve RF or high power. His interest in amateur power amplifiers continued to be driven by competitive Amateur Radio: contests and DX.

Ehrhorn obtained a Central Electronics 100V transmitter in the late 1950s and "I loved it," he says. This innovative rig featured bandpass tuning, a small oscilloscope and full CW break-in. A decade later, Ehrhorn would be instrumental in the development of another pioneering rig: the Signal/One CX7.

California cemented another love, too: mountains. Ehrhorn built a shack at 6300 feet on the "Rim of the World" in the San Bernardino Mountains. His neighbor was Don Stoner, W6TNS, then Novice Editor of *CQ* magazine. Today, Dick and his wife Marilyn, married 30 years, have a log home fondly called "2MI HI," at 10,650 feet in the Colorado Rockies.

Ehrhorn left General Dynamics in 1960 for the Jet Propulsion Laboratory at Pasadena, to be present at the creation of the Deep Space Communications Net, used for the lunar soft-landing Surveyor and the manned Apollo spacecraft programs.

Ehrhorn, who became WA4NGO and then W4ETO, joined Electronics Communications Inc (ECI) in St Petersburg in 1963, "to finally get involved with hardware development." He led a group designing VHF/UHF communications equipment for ships and planes, working on leading-edge projects such as digital counters for frequency synthesizers. Keep in mind, this was 25 years ago.

Let's Build a Rig

Not one to sit still for long, Ehrhorn admits to "getting bored again." In 1968, he persuaded ECI to "make an amateur transceiver more state-of-the-art than anything in existence." The result was the landmark Signal/One CX7 transceiver.

When the Navy cancelled ECI's biggest Vietnam-era contract, the Signal/One division, not yet profitable, was eliminated. Some 350 CX7s had been delivered and Ehrhorn's part in Signal/One was finished.

But the CX7 wouldn't die. A California firm built 350 more as the Model CX7A. The Signal/One lives on after being resurrected again in the early 1980s (as the CX-11), its current iteration being the $10,000 Milspec 1030.

The Founding of ETO

Ehrhorn left ECI in December of 1969 to found ETO in two office trailers. He'd played "musical amplifiers" for years, using the Johnson Desk Kilowatt, National NCL-2000, Hallicrafters HT-33, Collins KWS-1 and a Henry 4K. Of these venerable companies, only Henry Radio is still building amateur RF power amplifiers.

"I never was quite satisfied," says Ehrhorn, "and always ended up preferring my home-brew amps. Believing that other serious hams must think likewise, I incorporated ETO to develop the world's best linear amplifier for hams."

The original Alpha 70 was inspired partly by Jack Quinn's "Stanley Steamer" article in *QST* and partly by the work done by ECI engineer Harold Johnson, W4ZCB, with compact and lightweight power transformers. Johnson, now retired, joined ETO in 1970 and designed every Alpha Hipersil® transformer until about two years ago.

ETO shipped about 125 vapor-cooled Alpha 70s in 1970-71. The Alpha 77, using the new, more reliable Eimac 8877 tube, first saw light in early 1972. In 1974, ETO turned its first profit. Other Alphas were developed over the years, but the original Alpha 70 concept remained the company's workhorse.

Over the years, Alpha advertising has been entertaining and informative. In one of the wackiest, a human skeleton held down a key while an Alpha continued to put out the power. "I always look for help wherever I can get it," says Ehrhorn, "but ever since 1969 at Signal/One, I've pretty much conceived and written all our ads." The "skeleton key" ad drew little comment, although one reader complained about "making fun of death."

A New Field

The Alpha reputation led to a major commercial contract for ETO in 1983. The late Jim Lawson, W2PV, who died in 1982, had a dozen Alpha amps in his Schenectady, New York, superstation and a bunch of (highly modified) Signal/Ones.

In a classic case of ham networking, Lawson connected ETO with an engineer working on the first magnetic-resonance imaging (MRI) systems for the health-care industry. This engineer was instrumental in ETO's eventual domination of (what else?) power amplifiers for MRI units, including those made by GE, Phillips, Picker and Toshiba. This new business for ETO put development of Amateur Radio products on hold. "The Alpha 87 was long overdue," Ehrhorn admits.

ETO has built more than 1200 high-field MRI amplifiers, each delivering 15 kW of linear output from 1 milliwatt of drive. ETO's newest models include a fixed-frequency 20-kW amplifier using a version of the 3CX15000B7 output tube and broadband, all-solid-state amps at lesser power levels. It's likely that when you or someone you love has an MRI scan, W4ETO is playing a part in it. Harvard's loss has been our gain in more ways than one.

ETO, The Company

Ehrhorn Technological Operations is a private corporation with approximately 15 shareholders, mostly family friends and acquaintances. The company employs about a hundred people and occupies two buildings totalling 32,000 square feet at the foot of Pike's Peak in Colorado Springs; a long way from the two office trailers 20 years ago.

Ehrhorn estimates he's sold more than ten thousand Alpha amplifiers. "ETO is a different company now," he says, "with strong professional management and engineering—not just 'me.' We've finally been able to resume developing new ham products."

Marilyn and Dick Ehrhorn have two children. Lieutenant Commander Scott Ehrhorn is a graduate of the US Coast Guard Academy and an oceanic engineer. Daughter Kimberlee spent several months last year with a medical team in the Ecuadoran jungle. Last winter she surprised her father with a new ham call sign, KC6FJB, saying she got it to "find out what makes Dad tick."

The Ehrhorns spend most weekends at 2MI HI in Breckenridge, Colorado, where Dick keeps a personal computer and fax machine busy. He describes himself as a "fairly decent skier and a mediocre tennis player and photographer." In the fall of 1988, Ehrhorn spent two weekends on Aruba, not coincidentally including the record-setting P4ØV operation in the *CQ* WW DX Contest.

You get three guesses what kind of linear amplifiers P4ØV used, and the first two don't count. QST

DX from Tarawa

Sent to the exotic South Pacific, this YL turned a choice diplomatic posting into an exciting, extended DXpedition.

By Vicki Lee Hess, W6OAE
1211 Wilson Dr
Eau Claire, WI 54703

As a UN staff officer in Tarawa, Republic of Kiribati (formerly the Gilbert Islands) for some two years, I operated Amateur Radio station T30CH. Being on the air from this somewhat remote island was something I'll not soon forget.

Kiribati is in the southwest Pacific near the point where the International Date Line and Equator meet. It has 33 atolls, 16 of which are inhabited. Tarawa, the site of a fierce WWII battle, is its capital.

Most of the islanders are Polynesian, although Kiribati is part of Micronesia. They are moderate in stature and have straight or wavy black hair. The Gilbertese men are often bare to the waist and wear shorts or a *lava-lava* (loincloth). Women wear a brightly colored T-shirt and a *lava-lava*. There are 20,000 people on the island of Tarawa and more than 60,000 in all of Kiribati. The Europeans (*I-Matang*, as they are called) are mostly from Great Britain, Australia and New Zealand. About 10 hams lived in Kiribati when I was there. Three of us were expatriates: Alan, T30AT, and Doug, T30DB, from the UK, and me, an American.

It was exciting to be a DX station in Tarawa. When I fired up my Drake TR-4, I'd work mostly 20 meters. It didn't take long to fill up my logbook. I'd call CQ and a roaring wave of voices came back. Often, a helpful ham in South America would set up a small list operation for me. I'd call the stations he lined up and exchange names, QTHs and signal reports, then go on to the next station. It worked well, except when he could hear stations from his part of the world that I couldn't. Then it didn't work at all.

I once worked an American ham who was a veteran of the WWII Battle of Tarawa. His voice cracked with emotion when he discovered I was on that island. Among the abundant reminders of that battle is the bunker on Betio the Japanese so steadfastly held and later lost to the US Marines. Shell casings are still scattered about on the beaches.

My friends, Alan, T30AT; Ritite, a local Gilbertese, T30BY, who calls himself "Beautiful Yankee" or "Blue Yankee," depending on his mood; Steve, KH6SB, from Hawaii; and Raj, 3D2ER, from Fiji, helped me set up my equipment. If it hadn't been for them, I never would have been operational. It was the usual case of hams helping other hams.

On the beach at T30DB's house in Betio on Tarawa Island. Shown (l-r) are Doug Blythe, T30DB (now J6LDB); John Walton; Willie Maen, T30AC; Vicki Lee Hess, T30CH/W6OAE; Alan Taylor, T30AT; Ritite Neemia, T30BY; and three friends *(T30DB photo)*

The author outside her hut/shack at the capital of Kiribati.

My house was 100 yards from the ocean. The Butternut vertical we planted on the beach worked beautifully and gave me many 5-9 signal reports throughout the world.

Originally, I used my Drake barefoot. Later, my mother sent me an Ameritron AL-80 amplifier for my birthday. Actually, she sent the money to Steve, KH6SB, who bought the amp and gave it to a friend who worked for Aloha Airlines and came to Kiribati every two weeks. He gave it to me. Friends are invaluable when living on an isolated island!

Now that I'm back in the US, I've been going through hundreds of QSL cards. My uncle, Clare, W9SLT, was my QSL manager, so the cards went directly to him. I can see why some hams get the bug for DXing—just to receive a card and a stamp from another country is a thrill, let alone making a new ham friend.

My stay in Tarawa would not have been so rewarding if it hadn't been for ham radio. Being a DX station was a highlight of my 34 years as a ham. If you ever get a similar opportunity, don't pass it up—and if I can find a group or companion to travel with, I hope to return to Tarawa in March of 1991 to operate again as T30CH.

A New Look at *200 Meters & Down*

Taking a fresh look at this 1936 classic reveals timeless themes and raises thought-provoking questions about the future of Amateur Radio.

By Jim Nash, K4HMS
952 Echo Ln
Houston, TX 77024

I recently revisited an old friend, *200 Meters & Down*, by Clinton B. DeSoto, first published in 1936.[1] Don't let the date fool you: The book is interesting and relevant.

DeSoto is good at explaining the basics and tracing the technical development of radio. Also interesting is his treatment of the word *amateur* as it applies to our avocation. The term developed from a root word meaning "to love." This perspective makes the widespread use of the word in connection with Amateur Radio acceptable, even though today "amateur" is sometimes used to mean "unskilled."

The book also contains reams of fascinating background information on the "tidbits" of radio. For example, how many of us know about the great "auroral disturbances" of May 14, 1921? That was the night wire service from New York was knocked out (by a solar flare, we must assume, and not the aurora as such) and ARRL Founding President Hiram Percy Maxim acquired the AP news via CW for a Hartford, Connecticut, newspaper.

Although most early hams were electrical experimenters, a lot of them were also amateur telegraphers: That's right, in 1900 there were neighborhood telegraph lines in American cities and the amateur telegraphers who used them were (pardon the expression) electrified to discover that it was possible to send without wires. Thus, from the beginning, there were communicators. This became important later, as the traffic handlers took over from the experimenters. It also helps explain the steadfast popularity of CW today.

DeSoto's book is valuable today because he clearly identifies issues that have concerned us from the beginning and shaped Amateur Radio. There are notable examples.

Experimenters versus Communicators

DeSoto points out that early in the game, the communicators took over from the experimenters who were the early mainstays of Amateur Radio. Message handling came to dominate the airwaves and provide the first generation of hams with a serious purpose. Despite the early shift toward communicating, the radio magazines mostly featured construction projects, even up to the days of complex solid-state equipment. Today, experimenters are still vitally important, especially in antenna, space and repeater technology.

Message Handling versus DXing

A "DX craze" held sway for years, DeSoto points out, referring to the period in the 1920s after the first transatlantic communications. After the international bands were severely cut back in 1929, amateurs "turned back to a more solid form of internal communication, the backbone of the art" (p 119). Thus, DeSoto accepts the doctrine that message handling is the heart of the hobby, even going so far as to refer to DXing as "the unhealthy distance urge." DeSoto was apparently not a true-blue DXer and makes DXing sound like something bad. This is strange, because for years DeSoto conducted the IARU News column in *QST* and was its *de facto* DX editor. His views seem quaint today, when message handling has lost some of its earlier importance and long-distance communication under difficult circumstances is, for many of us, the apex of the radio art.

Technology and Economy versus the Number of Licensees

DeSoto shows that technological advances combined with the economic aspects of Amateur Radio, ie, equipment costs, produces waves of new hams and new uses for their equipment: The crystal receiver, the vacuum tube, the superhet and the cheap commercial radios of the 1930s (easily convertible to transmitters) helped swell the ranks. DeSoto's interesting review of the demographic history of ham radio reveals a tremendous spurt in licensed stations—from 16,829 in 1929 to 45,561 in 1935—during the depths of the depression. Although part of this growth was related to other factors such as increased spare time for the hordes of unemployed, the main cause was better equipment at lower prices. A station that would have cost $150 in 1929 could be acquired for $50 in the mid-'30s. The surge of growth after World War II was related to easy access to cheap war surplus gear and mass-produced commercial equipment from factories previously geared up for wartime production and therefore, able to produce high-quality equipment at reasonable prices. It seems that the availability of reasonably priced transceivers helps determine the number of new licensees attracted to the hobby.

The Battle for Spectrum

For 80 years, the battle for frequency allocations and the resulting need to use our frequencies productively have been vital to radio amateurs. This struggle goes back to the fight preceding passage of the Radio Act of 1912. Today, we're moving toward strategies such as limited codeless licensing and digital communications as possible ways to build our numbers and protect our VHF and UHF spectrum. DeSoto shows us that this is nothing new.

The Utility of Amateur Radio

Because RF spectrum space is in finite supply, the utility of Amateur Radio has always been—and continues to be—an important issue. DeSoto emphasizes this point, but in his day, the question was easily answered—Amateur Radio was a training ground for radio operators needed by the tens of thousands in time of war. Thus, the US military supported liberal frequency allocations for the amateur service. Hams served other valuable functions by handling routine and emergency traffic and by developing new technology.

Moving Toward the 21st Century

Today, the issues are a bit thornier. Amateurs are important in emergency situations, but the military no longer needs thousands of CW operators. With future advances in communications technology, Amateur Radio may become less important during emergencies. Low-cost long-distance telephone rates long ago reduced the utility of routine traffic handling. Where does this leave us? We'll know in future years.

The questions and answers were easier in 1936 than they are today. But at a time when we need to be charting a course for the next century, it's useful to look at our past. What we need now is a book covering 1936 to the present that's as good as DeSoto's. I hope today's top Amateur Radio writers are working on it.

[1] Clinton B. DeSoto, *200 Meters & Down: The Story of Amateur Radio* (ARRL, Newington, 1936, 1981).

A Visit to Headquarters

There's something for everyone (every ham . . .) at ARRL HQ. Thousands of people tour the administration building and W1AW every year—here are one visitor's impressions.

By Joe O'Brien, WG2C
Yonkers ARC
New York, NY

Newington's a mecca for ham radio, although not necessarily for hams. Situated a few miles south of Hartford, it's not the easiest place in the world to get to; but like Mecca, it's probably good for your (electronic) soul to go there at least once.

From the Cross-Bronx Expressway in the New York City area, it's a 94-mile trip via Interstate 95 (58 miles to Exit 48) and Interstate 91 N. Leave 91 N at Exit 17 and travel north on the Berlin Turnpike (Route 15). Take Junction 176 N (Main St, Newington) and go through the village. You can't miss the towering antenna array on the left at No. 225.

On the journey north, enjoy the beautiful stretch of scenery along the bay at New Haven. As you approach your destination, tune to 145.45 MHz FM to pick up the Newington 2-meter repeater.

The small brick building out front is home to W1AW, the Hiram Percy Maxim Memorial Station. Farther back on the sprawling lot is the two-story administration building that houses the 100-or-so League staffers.

If you can't make the 9- or 10-AM tours, wait until the afternoon sessions at 1, 2 or 3 PM. Newington's a small, sleepy hamlet that you would probably never hear about were it not for your association with Amateur Radio.

When you get there, you may well be the only person to be led around by one of the tour guides (only one visitor—a ham from Alaska—was with me on the tour), but then again, you may also be lost in the crush should a tour bus full of eager hams from New Jersey show up.

The first thing you'll notice, naturally, is the array of towers and antennas. My companion from the Far North was not overly impressed—with his wide-open spaces, I guess he was expecting rhombics. The main 120-foot tower rises above three 60-foot towers spaced around the front yard. All in all there are some 17 monoband Yagis for 40-6 meters, some fixed southwest for bulletin transmissions, some rotatable. There are also a couple of 80-meter dipoles and a 160-meter antenna is in the works.

Some of the antennas are used for the the code-practice transmissions and other W1AW bulletins; others, mostly the rotatable Yagis, are connected to the three guest operator studios.

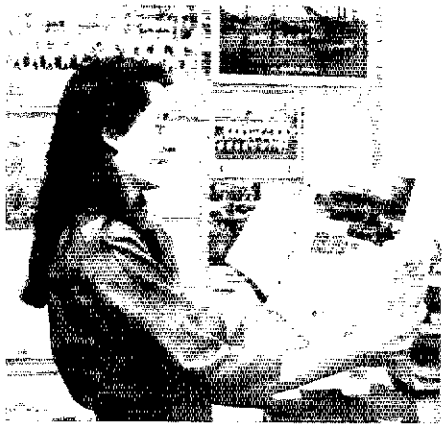
The reception area in the main building doubles as a radio museum: The tall, old wood-framed glass cases house relatively ancient exhibits depicting the history of Amateur Radio. Looking down on this scene from their row of photographic portraits are the faces of all ARRL presidents, starting with Hiram Percy Maxim (the only one in a high starched collar). Also on permanent view are the bronze plaques bearing the names of all past and present Division Directors.

You can have a leisurely time circling around the museum treasures, many dating from grandad's era, before requesting a formal tour of the rest of the facility. There is an early specimen (serial no. 41) of De Forest's Audion detector as well as an Armstrong regenerative receiver and several spark-gap transmitters that look as if they've been inherited from the laboratory of Dr Frankenstein. One "record-making" 1-kW spark job is contained in a 36 × 15 × 12-inch wooden box and described as portable (it only required four men to carry it!). Strewn about, also in their glass tombs, are scores of vacuum tubes, spark coils, crystal detectors (including De Forest's original RJ4 detector of 1909), loading coils, unwieldy code-practice machines, 1912-vintage dry-cell batteries that required the addition of water for activation, Leyden jars, loose couplers, some beautiful antique transmitting keys and impressive (all that thick shiny copper) oscillation transformers—all, for the most part, donated by amateur collectors.

If some of you old-timers have forgotten what a Harvey-Wells Bandmaster (the "dream rig of the early '50s") or a Depew Special looks like, they're waiting for you in their cases. But you'd have to be a nonagenarian, perhaps, to recall the "supreme receiver" of the early post-war days (World War 1, that is)—"the set that will get those European long-wave stations." It was the Kennedy Universal, according to the tag. Come to think of it, a few European broadcasters still ride the long waves—the superb programs of the

Whether in person or over the phone, the first person most HQ visitors meet is receptionist Penny Harts. With 21+ years on the job, Penny knows a lot about ARRL HQ! *(NT0Z photos)*

DXCC Data Entry Technician Hanan Al-Qaddumi enters a New Mixed DXCC application for Jan E. Collins, K6BZS, of Livermore, California.



If it's a *QST* ad, it's probably crossed the desk of Advertising Assistant Angela Beebe, KA1SER.

BBC's Radio 4 on 198 kHz and the highbrow Deutschlandfunk on 153 kHz—but who can or bothers to pick 'em up now?

And have you heard of the Elser-Mather Cup? It's a joke really—a 1928 woodcarving by Philippine natives done up as a trophy by a couple of imaginative hams and bearing the inscription:

ence library. It was interesting as well as nostalgic to thumb through the 40-year run of *Short-Wave* magazine and old scientific journals from Bell Labs. Various Proceedings are also on file: The National Electronics Conference (1949 on), IRE (1914-), IEE (1938-), ITU (1937-). Nostalgia will also be served by the old *RCA/Mullard Valve Handbooks*, *Jones' Radio Handbook* (1930s) and *Henney's Radio Engineering Handbook* (1940s). I was attracted by the odd title *Mathematical Quickies*, believing, incorrectly, that it might be a "marriage" manual for actuaries.

One of the most computerized sections of HQ is the Circulation Department, handling the daily torrent of member inquiries. The work of this and other departments is facilitated by an IBM System 38 computer and some 50 terminals throughout the building.

More interesting is the QSL Bureau, where thousands of cards are stacked in cubbyholes, sorted according to their call sign prefixes, waiting to be sent all over the globe on behalf of grateful hams (ask to see some of the more colorful and exotic samples).

The pace will probably pick up a bit as you work your way through the DXCC and Contest Branch areas, Field Services (support for ARRL-affiliated clubs, volunteers, etc), Graphics and Editorial (production of

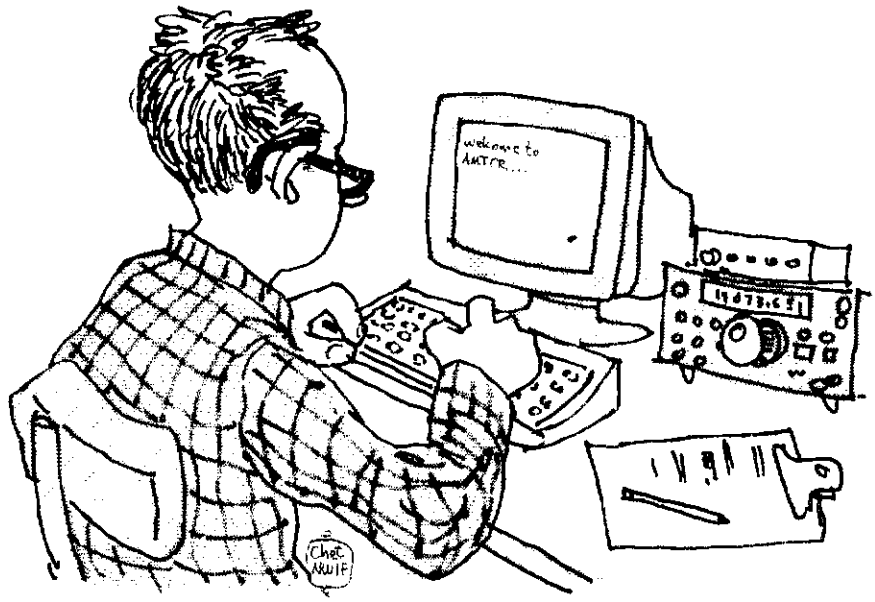
Although Joe Carcia, NJ1Q, now works in the VEC Department, he's sorted millions of QSL cards in his QSL Bureau days.

Your last treat will be a visit to Memorial Station W1AW (in service for more than 50 years). It's from here that the computer-generated code-practice sessions and voice and digital bulletins are sent out daily. Be sure to bring your license so you can work the world (in any of several modes) from

A Beginner's Tour to and Through AMTOR

If you've ever wanted to get on the air with AMTOR or APLINK, here's a step-by-step course that'll get you started on the right foot.

By Jim Mortensen, N2HOS
65 Holly Place
Briarcliff Manor, NY 10510



There is a rambling road that leads us from one aspect of Amateur Radio to another. Neither maps nor plans are of much value, but somehow, we just get there. Take AMTOR as an example. I had no interest in that mode when I purchased my TNC a couple of years ago. Far from it. Instead, I wanted to get out there with the digital crowd on VHF/UHF and master that exciting development called packet.

As soon as the TNC was unpacked, I read the first section of its very large manual, hooked up the computer, successfully completed the loop-back test and struggled into the night (building a cable by soldering five wires into a tiny plug that was never meant to be touched by human hands the size of mine!). There were false starts, profane comments and a ruined plug; but finally, believe it or not, my 2-meter transceiver was keyed and I was CONNECTED! My limited knowledge of commands deterred my attempts to conquer the world that night, but I was safely launched into the world of tomorrow.

But there was one problem—I looked at tomorrow, and didn't like it all that much. The idea of working like the devil to send a message to a friend a few miles away made the telephone look more attractive than ever. The bulletin boards, bless them for all their effort, were difficult to reach during prime time. And when connected, I wasn't quite sure what I wanted to do. For me, packet offered little excitement (DX PacketCluster® aside—a subsequent discovery) and no feeling of involvement or accomplishment. Dust began to settle on the TNC.

Just before I was about to put the TNC up for sale, I decided to try a little RTTY. There were some stumbles with the software, but I got the hang of it. And am I glad I did! RTTY became my favorite mode and I soon became acquainted with most of the "RTTY Regulars" scattered about the globe. In no time I felt like a veteran at the keyboard. DXing was a picnic and I worked several countries that I had never heard on phone.

Then, I had a contest QSO with Sanjeevi, VU2SJV, and my troubles began. Along with my QSL card, I sent a note volunteering my services as a QSL manager. I knew that he was having card problems because as QSL manager for VU2GI I was aware that the VU bureau wasn't functioning and that the mail was subject to "interruption."

Sanjeevi was enthusiastic about the idea, saying "Yes, I'd love to have you as QSL manager...and, by the way, I'll send my logs via APLINK...which has regular transfer facilities...to VAGE, then to WDRZ, WQWG or WURA." On the same day there was a message on my answering machine via NTS from WA1URA/9: "I have traffic for you from VU2SJV. Please call on 14071.5 mark frequency. That reads 14073.6 on my rig. All the best. Frank."

The letter and the message might as well have been in Chinese. Nonetheless, the always-challenging "new mode time" had arrived. That night, on my RTTY sked with Geoff, KB6WSQ, I asked him about APLINK. He hadn't heard of it, but promised to try to find out. He didn't know much about mark frequencies, either, but he did switch us to AMTOR and after a day or two of fumbling about, we had the basic QSO routines refined. On the subject of APLINK, however, we still drew a blank.

Several AMTOR QSOs, some with veterans of the strange-sounding mode, produced little or nothing. None of them seemed to use mailboxes. I kept calling WA1URA/9 from time to time on 14073.6 but could not connect. Magazines and handbooks had little hard information.

The breakthrough came from both coasts on the same day. Geoff discovered that APLINK stood for AMTOR-Packet-Link. The *RTTY JOURNAL* provided the clue as to the mark frequency (even though there were two quite different explanations on facing pages, both of which proved to be correct). Through a QSO with Peter, TJ1DL, I received a file containing most of the active mailbox stations, their frequencies, commands and hours of operation. It took about 30 minutes to download the file (with accuracy guaranteed by the nature of the error-correcting mode). Peter was most generous and I will always appreciate his patience. Cameroon had provided the last clue.

Full of confidence, I started to call away. But it was too late for the US station that

I wanted to reach. The band had shifted. Undeterred, I called G4GSA and connected with little difficulty. The screen menu was most helpful. I fumbled through the sign-on procedure and then took two very important steps. First, I downloaded the APLINK command file; then, I sent my first message to VU2SJV. The user-friendly menu tutored me all the way. My message was on its way to Sanjeevi via VK2AGE and I was on my way to becoming an APLINK fan.

The next morning, I called WA1URA/9; connected, left more messages—both domestic and DX—and picked up messages from near and far. Each day's routine now includes a stop at TG9VT (I have regularly linked with John's box with nothing more than a 54-inch antenna on the balcony railing of our Florida apartment, or with the vertical atop our motor home from all over the USA) and VK2AGE. Each day there are messages from friends on land and sea.

Table 1
Active APLINK Stations

Call	*SELCAL*	*SysOp*	*Location*	*Frequency (kHz)*
AH6D	AAHD	PAUL	HAWAII	14071.5*
DLØYB	DLYB	WERNER	GERMANY	14080.0
DU9BC	DUBC	FRED	PHILIPPINES	14072.0
G4SCA	GSCA	JOHN	ENGLAND	14070.0*
HL9TG	HLTG	GARY	KOREA	14073.5
K7BUC	KBUC	DEL	ARIZONA	14072.5*
KB1PJ/8	KBPJ	DAVID	OHIO	14070.5*
NØIA/7	NNIA	BUD	NEVADA	14070.5*
TG9VT	TGVT	JOHN	GUATEMALA	14074.0*
V51NH	VVNH	NICO	NAMIBIA	14070.0
VK2AGE	VAGE	GORDON	AUSTRALIA	14075.0*
VK2EHQ	VEHQ	PETER	AUSTRALIA	14070.5
VK6YM	VKYM	HERVE	AUSTRALIA	14081.0
WA1URA/9	WURA	FRANK	INDIANA	14071.5*
WA8DRZ/6	WDRZ	CRAIG	CALIFORNIA	14068.5*
WB7QWG/9	WQWG	BOB	INDIANA	14071.5*
ZF1GC	ZFGC	FRANK	CAYMAN IS	14070.5*
ZL1ACO	ZACO	NEILL	NEW ZEALAND	14072.5

*On multiple frequencies/bands.

Getting Started

Software/computer/TNC/transceiver combinations abound and there is no way to cover all the possible setups here. The system I used at the time this was written consisted of a TS-940S transceiver, a PK-232 multimode data controller, *PC-Pakratt* software and a Radio Shack® laptop (IBM compatible) computer—a fairly typical installation—at least in terms of the basic elements. I have since used two other transceivers and *Hal*, *Aries-II* and *Acuterm* software. The command structures vary somewhat but are equally simple if you focus on the few required commands covered in this article.

If you have difficulty getting your TNC and transceiver to communicate, or if you have software problems, call the manufacturer. They are especially helpful in solving tough start-up problems.

From here on out I'll assume you have a functional AMTOR station: a properly cabled rig; a multimode TNC and computer receiving AMTOR signals; and a correctly configured and entered SELCAL identifier (a four-letter call with no numbers: N2HOS becomes NHOS).

Remember two things about AMTOR: *Don't use your amplifier and don't send RYRYRYRY!* AMTOR is a remarkably effective and efficient mode and is almost always the "last signal on the band." A lot of power is not required to work stations on the other side of the globe, so don't overwhelm a small subband with a huge signal.

Don't tie up the frequency for 10 minutes repeating RYRY for four lines, my call sign six times and yours eight times before you tell me your name and QTH—and then go through multiple IDs as you pass the keys back to me. That sort of repetition has no place in AMTOR. *Don't use RYs—period.* This mode is a-c-c-u-r-a-t-e. Except under extremely poor conditions, every character is sent and its correct transmission confirmed before AMTOR moves on to the next character group. No other station should disturb the connection because stations in QSO are locked in a handshake, thus station ID is required at normal intervals only. QRM or QRN can reduce the effectiveness of an AMTOR link, but will usually not disrupt it. And even if the link breaks for some reason, the software will immediately react and start sending the SELCAL to relink.

Your First QSO

Okay, let's get on the air. Place your TNC in AMTOR standby mode. Tune around just below the Baudot portion of the band (14.070-14.080 MHz, for example) and listen for the distinctive, continuous sound of the FEC (Forward Error Correction) call. Although some ops communicate in that mode, it is normally used for calling CQ. Here's my CQ as it would appear on your screen (after the TNC begins decoding the FEC signal):

CQ CQ CQ CQ
CQ CQ CQ CQ
N2HOS N2HOS
N2HOS N2HOS
SELCAL
NHOS NHOS
PSE KKK

Press F2 (when using *PC-Pakratt* software) to bring up the ARQ Selective Calling menu, type in the SELCAL (NHOS) and hit ENTER (CR/LF). Your transceiver will now start sending my SELCAL. The QSO is now in your hands, so type in my call sign, your call sign, QTH, name and (+?) (Fn/End on the keyboard). As you connect, the tone will change and your transmitted copy will appear as highlighted text in the upper part of the computer screen. The menu will indicate that you have a handshake and are underway.

I will respond as soon as your (+?) appears on my screen. While reading my message to you, immediately start typing the next segment of your QSO. Anything you type will be stored until it's your turn to transmit. Respond to my copy or pull down the buffer that describes your rig, or whatever, but build up a backlog of copy before the (+?) appears at the end of my transmission. When that sign appears, your rig responds immediately and starts transmitting your copy. It does so at considerable speed if you have a good connection and a quiet band.

Use the (+?) character as the "over" signal until you are ready to break the link. Then, if you are the one to terminate the QSO, end your last transmission with station IDs and "Control/D." This breaks the link and puts your rig in standby mode, ready for the next QSO.

Remember that you call CQ in FEC and then automatically change to ARQ. You answer a CQ in ARQ, using the Selective Calling menu (F2). The only commands you *must* know are OVER (+?) and DROPLINK (Control/D). It's that easy. Run a few QSOs to get used to the sounds, commands and peculiarities of the mode, then review your TNC manuals (you'll be amazed at how much more sense they now make) before moving on to the next round.

APLINK

There are more than 100 mailbox facilities on the HF digital bands, but for now we'll focus only on APLINK stations and

cover the process from start to finish. (See Table 1 for a partial list—there are about 40 in all.) None of the APLINK stations send out a beacon inviting your call (a fortunate development considering the potential for QRM). Thus, the first step is to find the correct frequency by calculating the difference between the mark frequency of the APLINK station and the readout on your rig. The Kenwood TS-940S readout, for example, reads the "space" frequency, which is 170 Hz below the "mark." That means that the dial must show 14071.33 kHz to connect with a station operating on 14071.5 kHz. The IC-751 would read 14073.6 kHz for the same frequency, according to Frank, WA1URA/9. If you have a different rig, beg, borrow or steal an explanation about how it handles mark and space frequencies.

Tune to the selected frequency (14.074 MHz for the TG9VT mailbox, for example) and listen for a while to make sure that there is no traffic. Remember, there can be several stations operating on or scanning that frequency. If it is vacant, press F2 and type in the SELCAL on the Selective Calling menu and press RETURN (CR/LF). Your transmitter will start calling the station and if you are on the "mark," if conditions are right and if the station is not engaged with something else on another band or frequency, you will connect and the screen will display: DE TG9VT PLEASE STAND BY...(pause)...IF YOU NEED HELP, TYPE "HELP" (CR/LF), PLEASE LOG IN. Although you'll want to get the HELP file later, let's forge ahead. Because you are a new, unregistered user, the first step is to get on the list. So, type NEW N2HOS NHOS (CR/LF). (Remember, that's the ENTER key.) The screen will ask you to confirm your call sign, so when prompted, type YES (CR/LF).[1]

Table 2[2]
Selected APLINK Commands

Command or Sequence	*Effect*
NEW (CALL) (SELCALL)	REGISTERS A NEW USER
LOGIN (YOUR CALL)	LOGS IN WHEN REGISTERED
LH	LISTS ALL HELP FILES
LT	LISTS ALL MESSAGES TO YOU
LF	LISTS ALL MESSAGES FROM YOU
LB	LISTS ALL BULLETINS
RN	READS ALL MESSAGES TO YOU
R (NUMBER)	READS NUMBERED MESSAGE
SP (CALL)	SEND MESSAGE TO—END NNNN
T	TALK TO SYSOP
I	INFO ABOUT THE SYSTEM
LOGOUT	LOGS YOU OFF

The mailbox now asks GA+?, which prompts you to do something. Let's start with reading the bulletins on file. Type LB (CR/LF) to get a list of numbered subjects like ARRL bulletins, station notes, DX reports and size and date of each bulletin. (The VK2SG RTTY DX report on TG9VT and VK2AGE, available in the wee hours of Friday Zulu is a gem). Before calling up the list, it's a good idea to turn on your printer because you may want to refer to the list from time to time. When the list is complete, the GA+? prompt appears.

Let's assume that bulletin number 123 is a juicy DX bulletin. Type R 123 (CR/LF). Leave your printer on if you wish to save the information. The screen delivers the information to you and winds up, again, with GA+?. Type LOGOUT (CR/LF) and the station will drop the link.

If, for example, you'd like to send me a message via APLINK, compose the message and type it into a buffer or file before you connect.[3] Call the station that I use as a mailbox, log in as usual and when the screen says GA+?, type SP N2HOS (CR/LF). A message number is assigned and the GA+? prompt reappears.

Send the buffer and, to conclude the message, type NNNN on a new line and (CR/LF). After informing you that the message has been filed the screen will prompt with a GA+?. Type LOGOUT (CR/LF) and the station will drop the link.

Next time, log in as usual. If the prompt shows (YOUR CALL) DE TG9VT QTC 2/2....GA+?, you know that you have mail, two messages in this case. Type RN+? and the mail will be delivered to you automatically. If the prompt says (YOUR CALL) DE TG9VT QRU...GA+?, there is no mail, so go on to whatever interests you or log out.

To send a message to a DX station, you must know that he uses AMTOR and that he uses a specific APLINK station. Otherwise, the message will just clutter up the system for 21 days before it is automatically discarded.

Here's how to do it. If you can contact the specific APLINK station directly, the procedure is the same as for domestic log-ins—simply type SP (HIS CALL) (CR/LF). If your message must be forwarded to another mailbox, the procedure is somewhat different. First, compose the message and put it in a buffer or file.[4] Call up the APLINK station and sign in as usual. When prompted with the usual GA+?, type VU2SJV AT VK2AGE (CR/LF). (The word AT is very important and must be used.) The system repeats the address and asks for confirmation; type YES (CR/LF). A file number is assigned and the system asks for the message with the usual GA+? prompt. Transmit the buffer and watch the message being sent. As it's going out, start a new line and type NNNN (CR/LF). After confirming that the message has been filed, the station will give you the GA+? prompt. Sign off as usual.

Delivery times vary, but messages can arrive at their destinations within 12 to 24 hours, either direct or via an intermediate station. Faster delivery can be assumed if you connect directly to the mailbox used by the addressee. APLINK is a wonderful system and its accuracy normally assures delivery of the exact copy you sent. Links can be lost during forwarding, of course, but the addressee will be so informed.

There are other commands and shortcuts that you'll want to explore as you become more familiar with the system. (And there is the subject of local packet forwarding beyond the APLINK station, but that is the subject of another article.) But these are the basics that get you on and off APLINK and allow you to use the primary features. Get on the system and use all of the facilities. Sign on with several stations, get to know the ops, check to see who logs in (I have arranged several interesting DX skeds that way) and read the bulletins.

There are other types of mailboxes on the air as well, including some that I find very entertaining. Try ST2SA (STSA) on the 14.078-MHz mark frequency. Sid is in Khartoum and has a marvelous menu and programmed reactions to your information. He will even print out a QSL card on the spot (sorry, it doesn't count). Several others can be accessed via Baudot with easy-to-learn commands.

Whatever your interest, if you'd like to try the digital modes or are already into RTTY or packet, expand your horizons and give AMTOR and APLINK a try. Use this guide to help you explore this unusual mode and exceptional message-forwarding system.

You'll no doubt join me in thanking Vic Poor, W5SMM, for writing the great software (now past version 4.0) that is the backbone of the system and all of the APLINK operators around the globe who devote so much of their money, time and energy to the stations required to move our traffic.

Notes

[1]The next time you call you are entered in the station's register, simplifying the log-in procedure. When asked to log in, simply type LOGIN N2HOS (CR/LF), and you are underway.

[2]This condensed list is extracted from a typical APLINK help file. It is best to download and print the entire help file for your reference.

[3]Note that the first 25 characters form the subject of the message. Type something like "Hello Jim," hit (CR/LF) and start the message on the second line.

[4]The file procedure for *PC-Pakratt* is awkward but effective. From the main menu, type E. You will be asked to name the file. Keep it simple. Type JIM. Complete the message and hit ESC. Enter AMTOR mode and type Control/F3. Select File, 0, type JIM, then ESC. The file is now loaded. When you want to send the file, type ALT/0 (CR/LF) and the message will appear in the upper screen as it is transmitted. Nine other files can be loaded and sent the same way. QST

Happenings

Conducted By John C. Hennessee, KJ4KB
Regulatory Information Editor

Amateur Radio Aims for the Olympics

Spurred on by the success of the World RadioSport Team Championship (Oct *QST*, p 43), a plan to form a World RadioSport Federation (WRSF) to make Amateur Radio an Olympic event has been announced by an international group of amateurs.

The WRSF is targeting the 1996 Summer Olympics, which will be held in Atlanta, Georgia.

The International Olympic Committee (IOC) has four main ground rules which a sport must meet to be considered for the Games:

- The sport must be actively practiced in 50 countries by men and in 35 countries by women;
- There must be a sanctioning organization acceptable to the IOC;
- Periodic regional events must take place between Olympic Games;
- There should be a mechanism to establish a world championship.

The WRSF would meet these criteria by establishing an international consortium of radio societies, local radio clubs, individuals and corporate supporters. But beyond the immediate goal of the Olympics, the Federation would seek the general betterment of Amateur Radio around the world.

In their Proposal for Discussion, the organizers note Amateur Radio's recognized value as a pool of trained operators able to provide a variety of communications services and the continuing need for self-promotion of the amateur service.

The WRSF believes that radiosport events (such as the team championship in Seattle) and associated educational efforts can be used as a vehicle for promoting Amateur Radio and for recruiting new hams.

Radiosport events can demonstrate to government officials and the general public the purpose and value of Amateur Radio, the proposal says. The argument is bolstered by noting that recent international operating events (DX contests) attract upwards of 40,000 amateurs worldwide—a pool of potential WRSF members and ambassadors.

The not-for-profit WRSF would support the activities of the International Amateur Radio Union (IARU). "Activities and initiatives undertaken by the WRSF are intended to enhance accomplishment of IARU goals and objectives," the proposal says. The purposes and objectives of the WRSF are to:

- Encourage the growth of Amateur Radio by promoting and supporting operating activities that enable successful recruitment of new participants, especially young people;
- Enhance individual operator knowledge and skill in emergency communications techniques and procedures;
- Provide an international sanctioning organization for on-site and other radiosport events;
- Promote increased awareness and understanding of the Amateur Radio service among government officials and members of the general public.

WRSF membership would fall under four categories and the planners have estimated the following makeup: Voting Members (total of 15); Associate (50); Sustaining (1500); and Corporate Sponsors (10). A geographically diverse board of trustees would be elected by and from the voting membership, while a slate of corporate officers would be elected annually by the board. Six working committees would handle specific activities.

The promoters acknowledge that initially, members would come from the ranks of contest operators and DXers around the world. They anticipate support from "more traditional" hams over the long term.

The WRSF would be financially independent of all other Amateur Radio organizations. Funding would come from initiation fees, membership dues and corporate sponsors. The promoters see an eventual annual budget in the range $175,000 to $250,000.

The federation would assist local groups in conducting competitive activities—with the inherent spin-offs of public relations and education—by promoting the following kinds of events:

- *Mini HF Field Days:* Two-person teams would construct and operate stations under simulated emergency conditions. Local winners would qualify for national, regional or international on-site competitions that would be staged during international contests such as ARRL Field Day and the IARU HF World Championship. International on-site events would be held at least every four years, concurrent with the Olympic Games.
- *Amateur Radio Direction Finding (ARDF):* Long popular in Eastern Europe, the USSR and Asia, these events would pit contestants in various age groups in a test of physical stamina and radio technique. ARDF would permit amateurs not proficient in Morse code to be competitive.
- *Communications Accuracy Contest:* These traditional CW and voice pileup copying contests would be sanctioned for holding at hamfests and radio club meetings.

The WRSF would establish rules and guidelines for the events mentioned above, and help finance regional and international events.

The federation would maintain an international speakers bureau, to speak and to conduct workshops and seminars explaining and promoting Amateur Radio. In time, it would seek to establish a scholarship program and to maintain a fund to aid developing countries in conducting Amateur Radio events and demonstrations. Young people would especially be targeted, through such international groups as the Scouts and the YWCA and YMCA.

The WRSF promoters believe that neither national radio societies nor the IARU have the resources necessary to address, on a worldwide scale, the issues of recruitment of new amateurs and of communications training. The WRSF will seek "appropriate recognition and endorsement by the IARU," believing that "successful achievement of WRSF goals and objectives is closely tied to receipt of official recognition and moral support from the IARU and its member societies."

In the next few months, the organizers will tend to legal incorporation, election of an initial slate of trustees and officers, the establishment of committee chairmen and obtaining essential business equipment. Planning of a detailed agenda will begin following a worldwide teleconference of founders, according to John Crovelli, W2GD. Among the founders are Martti Laine, OH2BH; ARRL New England Division Director Tom Frenaye, K1KI; Northern California DX Foundation Trustee Rusty Epps, W6OAT; and Boris Stepanov, UW3AX, deputy editor of *Radio* magazine.

Persons interested in this ambitious endeavor may contact John Crovelli, W2GD, 200 Woolf Rd, Milford, NJ 08848, for a copy of the Proposal for Discussion. A large SASE with two units of First-Class postage would be appreciated.

FCC ACTS IN 20-METER DISPUTES

The Federal Communications Commission has issued at least three Notices of Apparent Liability to Monetary Forfeiture to radio amateurs involved in net operations on 20 meters. The FCC announced on September 7 that three amateurs may be lia-

ble for $1000 fines each for alleged violations of Part 97.

On August 27, the FCC sent letters to the following amateurs: Herbert Schoenbohm, KV4FZ, of Christiansted, US Virgin Islands; Richard K. Eastman, N5FX, of Springdale, Arkansas; and William Terrill, K2BFI, of New Hartford, New York.

All three were told, "You appear to be in willful violation of Section 97.101(d) of the FCC Rules and Regulations, in that you operated your Amateur Radio station in a manner that resulted in willful interference to radio communications of other radio amateur stations."

Shoenbohm and Eastman were cited for operations on July 16 and Terrill for FCC observations on August 17.

According to the FCC Public Notice issued September 10, the notices are for apparent liability to a monetary forfeiture of $1000. Schoenbohm, Eastman and Terrill had 30 days to respond to the letters. John Hudak of the FCC's Field Operations Bureau stated that the Commission is working on other cases for the same rule violation.

DIVISION DIRECTOR ELECTIONS

The ARRL Election Committee has completed its examination of nominating petitions filed by members in eight Divisions. Ballots have been mailed to Full Members in the five Divisions where there were more than one eligible candidate for an office, as follows:

Central Division

For Vice Director:

Kenneth A. Ebneter, K9EN
Mike Hoshiko, W9CJW
Howard S. Huntington, K9KM

Hudson Division

For Director:

Vincent James Biancomano, WB2EZG
Stephen A. Mendelsohn, WA2DHF

Northwestern Division

For Director:

Mary Lewis, W7QGP
William R. Shrader, W7QMU

Rocky Mountain Division

For Vice Director:

Lys J. Carey, KØPGM
Robert A. Scupp, WB5YYX

West Gulf Division

For Director:

Richard C. Albury, W5SOQ
Tom Comstock, N5TC

Any Full Member of record as of September 10 in these Divisions who does not receive a ballot by November 1 should request a duplicate from the Secretary, ARRL. Ballots will be counted November 20, and election results will appear in January 1991 *QST*. Terms of office are two years beginning January 1, 1990.

In addition, the Election Committee found the following candidates unopposed. Declared elected without balloting were:

Director, Central Division: Edmond A. Metzger, W9PRN

Vice Director, Hudson Division: Paul Vydareny, WB2VUK

Director, New England Division: Tom Frenaye, K1KI

Vice Director, New England Division: William Burden, WB1BRE

Vice Director, Northwestern Division: Mary Lou Brown, NM7N

Director, Roanoke Division: John C. Kanode, N4MM

Vice Director, Roanoke Division: James G. Walker, WD4HLZ

Director, Rocky Mountain Division: Marshall Quiat, AGØX

Director, Southwestern Division: Fried Heyn, WA6WZO

Vice Director, Southwestern Division: Wayne Overbeck, N6NB

Vice Director, West Gulf Division: Sam Sitton, KV5X

HARRISON MAY LOSE LICENSE

On September 18, 1990, Michael D. Harrison, WB2PTI, of Oceanside, New York, who pleaded guilty and was convicted on five counts of mail fraud earlier this year, was issued an Order to Show Cause why his FCC-issued Amateur Radio license should not be revoked. Harrison took out ads in several ham magazines (*not* including *QST*) fraudulently offering merchandise for sale. For more information, see p 56 of June *QST*.

GUS BROWNING, W4BPD, SK

Gus Browning, W4BPD, a member of the *CQ* DX Hall of Fame and one of our most prolific DXers, died August 21 in South Carolina after a long illness. He was 82.

Gus hit the DXpedition trail in the mid-1950s, an ever-present (warm) Coca-Cola in hand. His heaviest travel lasted until the early '60s. He went out again in the mid-'60s, to reactivate some of his earlier conquests for a whole new crop of DXers.

"Gus always kept his cool," says friend Stu Meyer, W2GHK, "no matter how wild the pileups got." Meyer remembers Gus as a great operator and a technician able to repair his radios in the most remote spots. W4BPD taught himself to write with his left hand, so he could operate two-handed on CW.

Browning, an ARRL Alternate Director in the early 1950's, was self-employed most of his life, operating a radio/television repair business and running a print shop. He printed QSL cards and for years edited and published *The DXers Magazine*.

Among his survivors is his wife, Peggy.

FCC WATCHES CABLE TV

Federal Communications Commission engineers conducted field tests of cable television around the country the week of August 20, according to a Commission release. The stated purpose of the checks was to assess and improve compliance with a new Cumulative Leakage Index (CLI) that went into effect July 1.

The CLI standard sets a leakage limit that cable operators must not exceed, to prevent harmful interference to aeronautical communications and navigation frequencies. FCC rules establishing leakage standards are

AMATEUR CALL SIGN UPDATE

The following is a list of the FCC's most recently issued call signs as of September 1.

District	Group "A" Extra	Group "B" Advanced	Group "C" Tech/Gen	Group "D" Novice
0	AAØBW	KFØMM	NØMKQ	KBØHLY
1	WJ1Q	KC1WU	N1IAA	KA1WIT
2	AA2BB	KE2VY	N2LFL	KB2LAX
3	WD3Z	KD3TR	N3IMS	KA3WUO
4	AB4YT	KN4OJ	**	KC4SSO
5	AA5UN	KI5IU	N5RGO	KB5NPM
6	AA6XU	KK6PA	**	KC6NMS
7	AA7FT	KG7HZ	N7PLR	KB7LOQ
8	AA8CC	KF8JD	N8MWQ	KB8KPK
9	WV9E	KE9YY	N9KCF	KB9FLB
Guam	KH2N	AH2CH	KH2EP	WH2AMR
Hawaii	**	AH6KN	NH6XM	WH6CIP
Alaska	**	AL7MJ	NL7UU	WL7BZI
USVI	NP2G	KP2BU	NP2DX	WP2AHD
PR	**	KP4QZ	WP4YU	WP4JIH

**All call signs for these groups have been assigned in these districts.*

Note: N-prefixed Group "C" calls for the fourth and sixth districts have been exhausted. The FCC will now assign Technicians and Generals Group "D" (2 x 3) call signs in these call areas.

in Sections 76.610 through 76.617. Cable systems found not in compliance will be ordered to shut down operations in the aviation bands 108-137 MHz and 225-400 MHz, the Commission said.

If a cable company's signal leaks out of the cable, amateur signals can leak in as well. Amateurs operating on the 2-meter band can be affected (most cable TV systems put Channel 18 in the 2-meter band), as are those operating on 220 MHz.

Cable system licensees are required to provide documentation of compliance to the FCC and all systems are subject to on-site evaluation by Commission personnel.

The study netted violators: According to a September 13 release, Multivision Cable TV in Hermosa Beach, California, was shut down when found in violation of the CLI criteria. Other system operators found to be in violation will be fined $2000 or more.

FCC ENFORCEMENT ACTIONS

Six thousand dollars' worth of illegal Citizens Band (CB) equipment was seized by US marshals and FCC personnel from Tabb CB Radio of Hanford, California, on August 16. Twenty-nine pieces of equipment seized included 27 linear amplifiers and two transceivers. The FCC stated that the marketing, manufacture and use of illegal radio equipment was a violation of Section 302(b) of the Communications Act of 1934, as amended, and that violators can face potential criminal penalties of up to $100,000 in fines and up to a year in prison. *(FCC Public Notice, August 31, 1990.)*

• The FCC's New York Office has shut down an unlicensed FM radio station operating in the FM broadcast band. The station operator, Joseph Sapanaro Jr, of Floral Park, New York, was fined $1500 for unlicensed operation. Unlicensed radio operation is a violation of Section 301 of the Communications Act of 1934, as amended. Sanctions may include administrative fines of up to $10,000 and/or criminal penalties of up to $100,000 and/or imprisonment for up to one year. *(FCC Public Notice, August 23, 1990)*

HAM WINS IN RFI LAWSUIT

The State of Arizona Court of Appeals upheld the decision of a lower court in a nuisance suit for RFI and TVI brought against Joseph Michaels III, W4DDV, of Tucson (Still v Michaels). On August 21, the Appeals Court agreed that Federal law (the Communications Act of 1934) preempted state law in the case. The complainants unsuccessfully argued otherwise.

The court found that "[previous cases] considering this issue agree that the FCC has exclusive Federal jurisdiction over the resolution of RFI matters." The complainants' recourse is appeal to the Arizona Supreme Court.

Michaels' neighbors had asked for an injunction against him by stating that his Amateur Radio transmissions were "disruptive."

DoD PULLS OUT OF DRILL

US involvement in the Middle East has forced a major Amateur Radio-government emergency exercise to be scaled back. The National Disaster Medical System (NDMS) steering committee, acting on a notice from the Department of Defense (DoD), has cancelled a full-scale drill scheduled for October 10-13 as mentioned in League Lines last month, but local drills still may be carried out as planned.

In a letter from Peter B. Collis MD, Deputy Assistant Secretary of Defense, the department advised that "Because of their respective commitments to Operation Desert Shield, DoD...found it increasingly difficult to provide the level of activity [the NDMS drill] deserves and is necessary to support its successful conclusion." The letter noted that the DoD has already "canceled or delayed a number of annual war games, open houses and community relations programs, in order to meet mission requirements in the Middle East."

FCC WON'T PROTECT UNLICENSED DEVICES AT 900 MHz

The FCC has issued a public notice regarding unlicensed devices transmitting in the 900-MHz range, particularly video transmission systems. These systems ordinarily use a wireless receiver and transmitter for remoting video devices such as VCRs, video cameras and games, and television pictures and audio. Such devices fall under "additional unlicensed use" of frequencies and as such have no protection from interference from amateurs or any other licensed service.

Companies that have received FCC grants of equipment authorization for their video transmission systems include: Gemini Industries, Recoton Corp, Star Tech Company, Video Technology Engineering and Wiso Electronics. Grants of equipment authorization issued by the FCC appear monthly in a Public Notice entitled *Certification/Notification Actions*. Customers experiencing RFI to such devices should contact the manufacturer.

FCC MOVES ATLANTA OFFICE

The FCC's Atlanta office has moved. The new address is: Atlanta Office, Federal Communications Commission, Koger Center-Gwinnett, Suite 320, 3575 Koger Blvd, Duluth, GA 30136; telephone 404-279-4620; 404-279-4621 (recorded information).

SECTION MANAGER ELECTION NOTICE

To all ARRL Members in the Arizona, Arkansas, Iowa, Kentucky, Montana, Mississippi, North Texas, Orange and Wyoming Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 8 of this issue.

A petition, to be valid, must contain the signatures of five or more Full ARRL Members residing in the Section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition*. It is advisable to have a few more than five signatures on each petition.

Petition forms (FSD-129) are available on request from ARRL Headquarters, but are not required. The following is suggested:

(Place and date)
Field Services Manager
ARRL
225 Main St
Newington, CT 06111

We, the undersigned Full Members of the...ARRL Section of the...Division, hereby nominate...as candidate for Section Manager for this Section for the next two-year term of office.

(Signature... Call... City... ZIP).

Any candidate for the office of SM must be a resident of the Section, a licensed amateur of Technician class or higher and a Full Member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination.

Petitions must be received at Headquarters on or before 4 PM Eastern Standard Time December 7, 1990. Whenever more than one Member is nominated in a single Section, ballots will be mailed from Headquarters to Full Members of record as of the nominations closing date (December 7) on or before January 2, 1991. Returns will be counted February 19, 1991. SMs elected as a result of the above procedure will take office April 1, 1991.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 1991.

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in April 1991 *QST*. An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by the Field Services Manager.

You are urged to take the initiative and file a nomination petition immediately.—*Richard K. Palm, K1CE, Field Services Manager*

How's DX?

Conducted By Ellen White, W1YL/4
19620 SW 234 St, Homestead, FL 33031

Digital DXing

In a letter, Bill Mullin, AA4M/6, reminds me of the excitement I felt when the DX bug first bit me (many moons ago!). If you're a bit "burned out" despite your high DX totals, you'll enjoy the following extracts from Bill's letter. Be careful, you just may get reinoculated, the digital way!

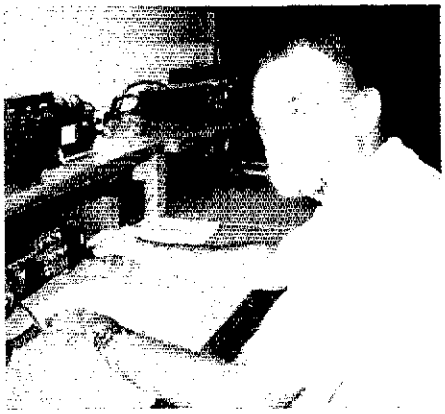
"As an active DX chaser for 15 years, my interest waned; I needed a new challenge. I still wanted to work DX, specifically DX that would count toward DXCC. RTTY and AMTOR offered an answer. I acquired a multimode controller to allow the flexibility of experimenting with different digital modes. Talk about fun—I haven't enjoyed hamming this much since I first got on CW! Within only three months of using the AEA PK-232MBX I worked my 100th digital country. I've got all states on RTTY and my WAZ total is 38/33. The digital operating has been after work and on weekends. From the great RTTY DX I've seen on the PacketCluster®, I've no doubt that I'd now have 160 countries or so if I'd been at home during work hours on weekdays.

"I have an ICOM IC-781, ETO Alpha 78, AEA PK-88 for 2-meter packet and a KT34A at 55 feet. The computer is an Everex 386/25 with all the goodies. My RTTY software is only a plain-jane modem communications program, but it does everything I need. Of course, an elaborate computer setup like this one isn't necessary—a 'dumb' terminal interfaced through the TNC will do the job.

"RTTY and AMTOR have revitalized my interest in ham radio in general and DXing in particular! I recommend anyone looking for a new interest give these digital modes a try; you won't regret it."—*Bill Mullin, AA4M/6, 3042 Larkin Pl, San Diego, CA 92123-3026*

XE2OK, a regular in the ARRL DX competition for years, is active again. Rafael prefers CW and is looking for old and new friends on 20 and 40. *(photo courtesy of K6TQ)*

Nils Arne Broberg, SM7ANB, has been in the ARRL's DX Century Club program since 1954 and is now on the Honor Roll. He runs 500 watts with a home-brew 813; Yagis on 10, 15, 20; slopers on 40 and 80; and a shunt-fed tower for top band. Now retired, he and K1TTY have plenty of time for DXing.



HSØAC, the club station of the Radio Amateur Society of Thailand, is active thanks to John Vajo, W2ZWW, of East Northport, New York. He urges you to let him, the operator, have the "last word" during the contact so he can go on cleanly to the next station. Confirm HSØAC, HSØB, HSØM and HSØSM via Ray Riker, NY2E, 433 Palo Alto Dr, Palm Springs, FL 33461.

CIRCUIT

☐ **Haiti:** The first week this month will find Larry Woolsey, NY5F, and San Hutson, K5YY, QRV 160-10 on SSB and CW with a variety of HH numerals.

☐ **W6AM:** A new book about the late, great Don Wallace will be available soon. See Strays, p 71, for more info.

☐ **Colvins:** Lloyd and Iris are off again, to 5HØKG and points beyond, hoping to visit Mozambique and Madagascar. The YASME Foundation is handling cards via Box 2025, Castro Valley, CA 94546 (see Apr 1990 *QST*, pp 50 and 59).

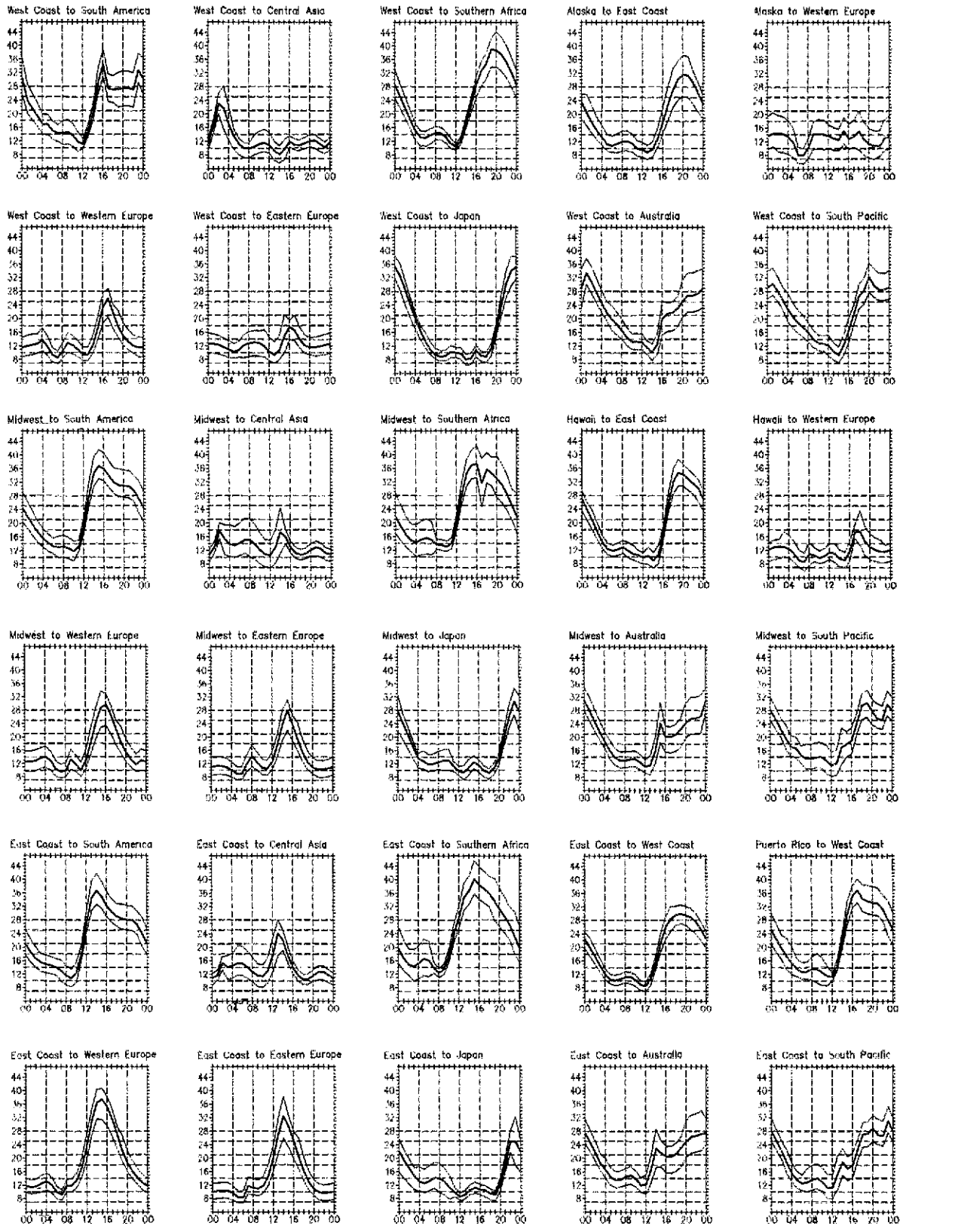
☐ **ZS Cards:** Non-South African Radio League members can't have their cards processed by SARL, report several "actives." It looks like a QSL "direct" situation would ensure delivery.

☐ **DX Convention:** The 2nd weekend in April will bring out the big guns in Visalia, California. The famous "bus" will make the round trip from the SF Bay area to Visalia Friday and return on Sunday, making it especially convenient for out-of-towners to get to mid-California. For details contact Ken Anderson, K6PU, Box 934, Los Gatos, CA 95031, tel 408-473-4342 (days) or 408-353-4466 (eves before 2100 local). Fare includes lunch and Napa Valley wines!

☐ **Awards:** The CX Telegraph Group offers the CXCW award, CW only, for proof of five code contacts (after 8/89) with CX stations (three with members of the group). Send your verified log with six IRCs (air return) to Alberico Lopez, CX4GL, 75001 Palmitas, Dp Soriano, Uruguay. (The club members include CX1s DX JM, CX2s DF DK ET, CX3s AN AW BH DD EU GR MA, CX4s AW CO CQ GL LO SB SS VA, CX5s AAI BBI BW CO, CX6s BM CV, CX7s BBB BBU BY, CX8s BBH DR and CX9s AU CJ.)

☐ **Volunteer:** AC3D is retired and would like to be a QSL manager for a DX station. Dick has been licensed since 1937 and was an unofficial XU6 in China in early 1946. Write Dick Gulatsi, AC3D, 288 Devonshire Rd, Devon, PA 19333.

☐ **Routings:** V31TU (Scott Rathjen, W7SW, op), QSLs via Aldo, IØIA. V31BB (Silent Key) cards are in the hands of Gordon Silverman, N3ADC, of Levittown, Pennsylvania (include an SASE). Thanks, *QRZ DX*. XU8DX, resident operator Sukhun, and Hiro, JA2EZD, QSL via Sin, JA1NUT (requires at least a business-size return envelope and two IRCs or equivalent). Sin is also looking for donations toward XU8DX station equipment. (Thanks, NB3T and VE6BSA.)



When are the bands open? These charts predict this month's average propagation predictions for high-frequency circuits between the US and various overseas points. One chart showing East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or HPF). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or MUF). On 90 percent of the days of the month, it will be at least as high as the lowest curve (optimum traffic frequency, or FOT). The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. See April 1983 *QST*, pp 63-64, for a more-detailed explanation. The 3rd edition of *The ARRL Operating Manual* contains similar charts for a range of sunspot numbers and times of the year. Sunspot data is derived from *Solar Indices Bulletin*, National Geophysical Data Center (E/GC2), Boulder, Colorado. Curves are generated using IONCAP. These predictions, for November 16 to December 15, 1990, assume a smoothed sunspot number of 130, which corresponds to a smoothed 2800-MHz solar flux of 173.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC Countries List. You may endorse your award in 25-country increments through 250, 10-country increments through 300 and 5-country increments above 300. The Satellite, 160 Meter, 80 Meter and 40 Meter DXCC awards are endorseable in 10-country increments through 200. Presently, there are a total of 323 countries on the official ARRL DXCC Countries List. The totals shown below are exact credits given to DXCC members from February 26 to March 30, 1990. An SASE will bring you the rules and application forms for participation in the DXCC program. Send $1 to request the ARRL DXCC Countries List.

NEW MEMBERS

Mixed

CT1ZQ/112
DF5LJ/101
DL5HCO/101
DL8LA/102
HP6AYV/207
I7ALE/245
IK1CPB/105
IK6LLJ/109
JF1EQA/212
JM1PTA/106
JF2RSF/110
JH2CLV/135
JR2KDN/307
JA3BSL/110
JA3NTE/326
JA3SMQ/124
JF4EQJ/107
JA5EXW/310
JA7JM/315
JH7AJD/227
JI7KEP/216
JE0FAM/122
LA9HF/226
OE3DHS/119
OK3KAW/197
OZ7AX/114
OZ7JQ/105
P40P/104
PA3FFJ/130
PY2NA/100
SM6IVV/119
SM7BZO/112
SM0MHC/102
SM0OHI/110
UQ2AP/202
VE2AWR/107
VE4AOZ/100
VK8TD/112
XE2KB/153
YU4ES/104
9V1XI/190
KA1HGY/115
KA1PIQ/106
NJ1V/102
W1PN/102
W1WEB/112
WA1SVF/100
KA2ELI/267
KA2VAE/107
KE2BO/126
W2HCA/118
W2KTF/225
W2QV/130
WB2YIP/142
WS2L/104
K3KAL/102
K3SW/206
KD3KW/104
W3DNA/189
WA3CAS/106
WB3IJM/103
A45YT/126
G4YJU/104
KC4BEM/102
KC4MDD/103
KD4MM/151
KD4WB/168
KK4TK/101
KM4TY/105
N4OLE/135
N4QCJ/113
N4RTE/112
N4VYZ/106
N6FBL/104
WA4GRW/121
WA4ITY/137
WB4JPM/103
K5AVH/104
K85DZY/198
KF5DE/100
N5MHP/114
N5PT/105
WA5UFH/102
AA6EW/102
AA6GK/105
K6BXI/105
KI6KV/105
KJ6LD/182
N6QLH/100
N6QMT/108
NT6G/105
WA6BXE/100
WJ6U/104
AA7AX/105
K7EHI/300
KB7TX/127
KL7RA/320
W7IUJ/105
WA7HRR/125
N8KEM/128
NZ8U/103
WA8JBG/290
WB8FIW/320
WD8MQY/287
K9UJU/144
KE9ET/152
N9AH/106
N9FSN/101
N9JR/100
NT9T/110
WA9NPM/127
WF9V/116
KB0UY/100
KB0ZQ/107
KO0D/122
N0FIK/106
N0HCH/106
N0IDR/132
NV0C/102
WD0CHW/290
WO0Y/102

Phone

CP1DM/127
DJ9JM/203
DL2FAI/118
DL8HBV/106
DL8RS/100
F6CQU/307
G4TQL/109
HK0EFU/111
HK0TCN/111
HP6AYV/207
I8XVP/233
IK1MTZ/105
IK8EFA/182
IS0VCY/122
IV3VCG/200
JQ1ALQ/109
JR2KDN/305
JA3NTE/323
JA5EXW/306
JH6WMJ/175
JA7JM/308
JH7AJD/160
JT1BV/108
OE6FSD/120
OK1DDS/309
OK3KAW/132
OZ5RM/100
PA0ZH/219
SM6IVV/111
SM7BZO/109
UQ2AP/174
XT2PS/115
YC7BBI/120
ZP5AA/115
ZP5YV/110
9V1XI/170
ND1S/106
NS1T/102
W1WEB/112
N2CYL/158
WA2UZI/257
KA3TWE/108
W3DNA/116
K4HXD/110
KA4TUM/101
KA4TYZ/112
N4LCQ/108
N4OLE/135
N4RJZ/103
N4VYZ/104
WA4GRW/121
WA4ITY/135
WS4L/300
K5EWJ/163
K5VEL/100
KB5AZN/102
KB5HPH/124
WB5KYK/160
AA6GK/104
K6AAL/203
KB8EDH/105
W8MCA/125
WA8JBG/266
WB8FIW/319
WD8MQY/286
KC9GG/134
KE9ET/152
N9EIP/106
W9TLU/290
KB0NN/105
KD0AF/302
N0IDR/130
N0JO/161
NV0C/102

CW

DJ8BD/110
DJ0BP/105
DL6NBE/109
EA3FAG/151
F1HR/114
G3BJD/100
HA7ML/102
I7ALE/228
JM1PTA/104
JH2CLV/134
JA3NTE/287
JF4EQJ/107
JH7AJD/167
JH8JBX/105
JA0MGR/143
LA9HF/209
OH3NLH/153
OK1CV/119
OK1DDS/290
OK1FWA/105
OK1HCD/169
OK2PGT/110
OK3KAW/158
OZ3ACO/104
PA3AMA/173
PY1AVZ/147
N1FNN/106
NS1I/151
KE2PF/146
NX2T/132
W2KTF/204
WB2YIP/127
W3DNA/111
K4KO/277
KB4SVP/121
KO4D/117
KP4P/283
N4RTE/106
N4XR/267
K5EWJ/113
N5MHP/110
K6KE/101
KA7WDM/129
NU7F/110
K8CS/113
WA8JBG/248
NI9O/123
NT9T/101
N0EVQ/110
NI0C/115

RTTY

DJ2YE/100
SM7CNA/110
VK3EBP/106
N2HOS/126
NT6V/105
W6CN/105
W6OTC/105
K7NN/104
NZ7D/103

Satellite

KA5DNP/101
VE6LQ/100
JA2ORW/101

160 Meters

CP8HD/104
SM6CTQ/102

80 Meters

UQ2AP/102
K1HDO/102
KM1R/121
K4AMC/106
KK4HD/101
AG9S/124

40 Meters

UQ2AP/100
YC5ODQ/107
ZP5ZR/104
W8UVZ/299
AG9S/165

10 Meters

JA1UTN/108
JH4UVU/146
JA6CBG/110
JH7AJD/108
TA2AU/152
UQ2AP/105
VE3OKK/108
VE6EJ/110
VE7EW/110
YC0MCA/141
K1HDO/168
N1HEJ/100
W1WAI/227
KB2BBG/151
KC3LM/105
NR3Y/124
KB4CSE/100
KB4RIU/103
W4LZW/116
WA4MME/140
WA4SFN/106
WV5K/112
K8ZR/152
WD8EOL/105
KB9COF/126
N9IWL/125
NB0Q/105

5BDXCC

LA8XM
KE7LU
LA1VFA
JR6CSY
W6MJP
UQ2AP
IK2BLA
HK3JJH
KE8CQ
UY5EG
CT1TM
WB2WOW
AI9U
KP4BJD
EA5BCX
PA0ZH
K3QIA

ENDORSEMENTS

Mixed

AL7HX/179
CU2AX/303
DF0AFZ/290
DJ7EE/205
DJ9HX/303
DJ0GN/191
DL2ZAE/270
DL4FBZ/285
DL5KAT/279
DL7XS/316
DL8VN/310
FM5CD/306
G3KLL/318
G3TXF/311
G4IUF/311
G4OBK/292
G4QK/201
HA5DA/294
HA5LV/301
HA0MM/285
HB9CSA/280
HK0HEU/307
I2HVE/256
I2QMU/310
I2RGV/266
IK2GXK/278
IK2IGX/214
JA1CZI/296
JA1KQX/291
JA1NGM/272
JH1OCC/227
JO1QUB/251
JR1ARK/256
JJ2RCJ/300
JJ3AFV/312
JH4ATX/152
JR5RPP/202
JA6HUG/317
JA6NQT/160
JA6TMU/266
JH6WMJ/175
JA7AOR/316
JA7HMZ/318
JA7ZP/320
JA8EJO/256
JA8RJE/252
JA0AZE/319
LA4BQ/177
LU6DHR/314
LZ1HA/310
OD5PL/145
OH2BOZ/319
OK1DDS/313
ON5SY/323
PY1AFL/207
PY2DBU/309
SM2EJE/314
SM5HYL/313
SM6BGG/313
SM6IF/303
SM7CNA/326
SM7JKY/127
SM7LOX/274
SM7PRF/202
SM7TV/325
SM0BSB/243
SP5DRH/309
TF3IM/179
UT5MD/314
VE3IR/325
VE3PG/294
VE6EJ/270
VE7AIW/290
VE7EIK/225
XE1L/318
XE1XRC/265
XE2GAT/151
YB3ASQ/257
YU1ZO/318
YU3QI/318
ZL1AH/344
ZS6ASW/275
ZS6AZQ/265
4X1FC/264
5B4TI/302
AA4GA/202
AD1C/301
AK1N/302
K1RH/315
KA1CSL/215
KA1EJ/280
KB1ER/284
KB1EW/177
KM1A/158
KM1R/287
KN1M/304
KT1H/200
KT1O/232
N1AJO/316
N1FNN/143
NA1N/250
ND1U/162
NX1L/290
W1CYB/301
W1DID/206
W1PEA/320
W1WAI/326
W1WW/332
W1YCO/175
WA1SPT/212
WA1WTP/313
WA1ZLD/316
WB1ATZ/244
WB1BQJ/125
WB1BVQ/290
AE2L/204
K2BRF/199
K2OVS/274
K2SD/268
K2VSP/228
KC2NB/312
KE2PF/224
KU2A/202
N2AC/316
N2HOS/225
N2JD/316
N2ZZ/235
NX2T/259
W2FB/313
W2OUM/150
W2TE/315
WA2AOG/314
WA2BOT/306
WA2CJO/225
WA2MZX/288
WA2UDT/250
WA2WYR/150
WB2PQG/205
WB2WOW/322
WE2L/306
K3YGU/294
KC3AJ/298
KT3H/251
N3CTB/174
NM3C/284
NR3Y/281
NS3K/270
W3BZN/310
W3IOP/315
W3KYN/204
WA3NHG/133
WA3YVN/175
WB3EFQ/285
WB3JRU/307
AA4R/309
AB4DU/227
AB4ON/241
AF4Y/308
AG4L/311
AK4N/312
K4AOH/236
K4AVC/310
K4DLI/313
K4EJQ/208
K4GFI/329
K4LR/318
K4PR/313
KA4LRM/278
KB4HBH/197
KC4MK/297
KC4QT/292
KF4AV/173
KM4IH/200
KV4F/316
KX4H/295
N4CRI/304
N4GDJ/257
N4GE/320
N4HOH/300
N4LZL/249
N4NPV/245
N4PYD/271
N4SZ/281
N4SZE/230
N4XO/348
N4XR/345
N4ZQ/245
NM4L/296
NX4B/229
W4EJH/320
W4FHI/269
W4FNS/330
W4FQT/260
W4ITD/229
W4JAT/277
W4MBD/288
W4QCU/321
W4VUL/301
W4WAW/228
W4XT/254
WA4BEC/317
WA4CCP/300
WA4CTA/299
WA4ICK/318
WA4QYK/203
WA4QYP/191
WA4UCI/237
WB4M/167
WB4UBS/148
WC4B/306
WD4AFY/250
WD4JDJ/224
WD4KMW/200
WF4I/277
WJ4T/310
WM4D/157
WN4H/153
WV4S/135
K5EWJ/204
K5GWN/320
K5XX/306
KF5MY/310
KG5EG/212
N5CB/300
N5EPA/271
N5GGO/305
N5PC/254
W5BKK/227
W5HFN/201
W5HT/264
W5LFK/333
W5OSH/293
WA5SKY/227
WS5E/301
WW5L/182
AJ6V/316
K6FM/321
KG6AM/293
KI6HT/172
N6IXX/271
N6VR/325
N6ZU/180
NC6A/154
W6ABT/315
W6MVW/200
W6NIZ/258
W6PBI/325
W6SPQ/309
W6UZ/301
W6YQ/313
WA6YFD/253
WB6HTC/199
WZ6P/256
K7AZG/203
K7HRW/297
K7LJ/301
K7TCL/235
K7XN/301
KB7VD/300
KO7V/231
KQ7H/232
KX7J/302
KY7M/300
W7DNY/320
W7GXC/324
W7KSA/330
W7MI/345
W7YS/261
WA7GCS/174
K8BL/228
K8CSG/326
K8ZTT/315
KB8ZW/305
KJ8M/311
KY8Y/200
N8BKF/314
N8MK/168
N8ZA/342
NB8B/301
W8BCL/307
W8BLA/168
W8FN/250
W8IQ/338
W8JCC/210
W8MFW/310
W8PBO/284
W8WEJ/150
WA8CZS/303
WA8HFN/323
WA8JOC/312
WA8NDL/309
WB8HIW/275
WB8QLA/162
WB8SFF/260
K8JPI/270
K9TI/309
KA9FCZ/200
KA9SMD/124
KD9QB/309
KZ9A/124
N9ALC/312
N9RD/301
NE9K/313
NF9Q/314
NI9O/131
NJ9R/176
NK9X/246
W9AA/288
W9CA/318
W9DDP/314
W9GMS/323
W9JEK/259
W9LJR/307
W9MCR/326
W9MP/300
W9MYG/316
W9OTE/157
W9TC/318
WB9Z/319
WB9ZNB/231
WI9H/309
AK0A/315
K0AW/328
K0AXU/270
K0CVD/315
K0IIR/278
KB0AUK/226
KC0D/280
KD0JL/293
KD0RT/176
KD0UE/151
KS0T/213
NB0Q/209
NI0C/182
NI0G/301
NN0M/133
W0FF/326
W0IZV/204
W0JLC/315
W0JRN/302
W0NAR/302
W0NB/320
WA0OZP/181
WB0AFZ/152

Phone

AL7HS/150
AL7HX/179
DF4PL/311
DJ3CP/316
DK2XX/320
DK6NP/320
DL2AW/321
DL5NAO/295
DL5SY/314
DL6NX/323
DL7GN/257
DL7MAE/312
EA3AEA/292
EA5FCO/275
F2CW/303
F6FWW/310
F8ZQ/179
G3KLL/317
G3VIE/323
HB9BGN/311
HC2RG/294
HK3JJH/264
HK8BUT/253
I1ZFT/331
I2MMH/263
I2QMU/309
I3ZSX/224
I4CSP/300
I4LX/308
I5JHW/310
I5KKW/321
IK2GXK/269
IK2IGX/214
JA1GTF/314
JA1GV/325
JA1KQX/161
JA1NGM/261
JA1OND/313
JA1PCY/317
JA1RWI/303
JA1SVP/317
JA1WSK/322
JH1OCC/221
JJ1DWT/317
JR1ARK/209
JA2DSY/325
JA2IVK/300
JA2KVD/319
JH2CJW/309
JJ2RCJ/276
JA3AFR/330
JA3ART/315
JA3BG/304
JA3CSZ/318
JA3FYC/303
JA3JOR/323
JA3LUK/319
JJ3AFV/309
JR3ANG/284
JA4DND/317
JH4ATX/152
JA5BLB/319
JA5FDJ/312
JA5THU/287
JE5IVW/323
JA6CNL/311
JA7AQR/314
JA7BJS/321
JA7FS/305
JA7HMZ/303
JA7PL/321
JA7ZP/312
JE7JZT/256
JH7FMJ/313
JA8AWH/305
JA8RJE/244
JA9CXA/300
JA0SC/278
LA2WR/162
LA4HW/318
LU1JDL/277
LZ1HA/304
OE1PC/326
OH2BOZ/316
OK1DDS/309
OK2DB/317
OK3JW/318
ON8AW/280
OZ1HPS/204
PP2ZDD/281
PY4OD/323
SM2EJE/307
SM3DXC/312
SM4EMO/307
SM5BRW/312
SM5CAK/326
SM5HYL/303
SM5JPG/161
SM6BGG/308
SM6CKU/321
SM6DYK/279
SM6IF/303
SM7LOX/273
SM0DJZ/318
TF6MM/164
TI2JJP/284
TR8SA/286
VE3PG/290
VE4AT/315
VE6EJ/248
VE6WQ/316
VE7AIW/289
VE7XO/226
VK2AGA/247
VK4ZM/281
XE1L/318
XE1XRC/265
YB3ASQ/238
YC1RED/204
YC2BAB/152
YC0MCA/193
ZL1ALE/320
ZL1WG/203
ZL4BO/332
4X6DK/251
5B4TI/302
AK1N/297
K1EFI/317
K1SE/315
K1SF/314
K1YR/300
KB1EW/177
KM1R/275
KN1M/275
N1AJO/315
N1CPC/180
N1FNN/128
N1TZ/314
NX1L/280
W1CYB/300
W1FAB/314
W1KKG/201
W1PEA/316
W1TSP/302
W1WLW/312
WA1WTP/312
WA1ZLD/296
WB1BVQ/288
AA2A/309
K2CM/330
K2LS/278
K2PWG/308
K2SD/255
KB2XP/290
KC2NB/311
KR2Q/308
N2HOS/210
N2KA/318
N2LM/320
N2ZZ/218
NN2Q/225
NX2T/238
W2BSI/129
W2FCR/324
W2HXF/318
W2IQB/308
W2MLH/177
W2NC/319
W2NJN/257
W2VO/333
WA2BOT/306
WA2MOE/314
WA2OAG/264
WA2UZI/257
WA2ZLK/230
WB2WOW/317
WE2L/306
K3WS/308
K3YGU/267
KC3KE/292
KJ3L/317
N3ED/317
N3JM/200
NB3T/299
W3ZN/318
WA3DMF/182
WB3KBZ/VP9/281
AA4KA/314
AF4Y/301
AG4L/304
AL7EL/W4/313
K4BVQ/341
K4DJ/329
K4DLI/311
K4GFI/329
K4KQ/275
K4KST/291
K4KUZ/303
K4LR/314
K4PR/306
K4PR/307
K4WMB/317
KB4SSS/250
KC4MK/261
KC4YX/170

KE4E/313
KE4YD/301
KF4M/309
KI4SR/287
KJ4JM/203
KK4HD/283
KK4OK/261
KM4IH/200
KV4F/316
N4AVV/317
N4BYU/311
N4CRI/301
N4MZL/241
N4ONI/300
N4PYD/271
N4QF/316
N4TB/332
N4XRE/129
N4ZQ/217
NF4U/317
NX4B/226
W4CVX/253
W4DOU/320
W4DQQ/172
W4JHE/309
W4JZ/317
W4LVM/316
W4MBD/262
W4ODE/153
W4UNP/316
W4UW/318
WA4BEC/316
WA4CTA/299
WA4DRU/325
WA4FHQ/317
WA4ICK/285
WA4LPM/229
WA4PLR/316
WA4PPS/299
WA4QYK/203
WA4TLI/325
WD4AFY/250
WD4JMC/270
WD4KXB/311
WF4G/312
WF4I/264
WJ4T/284
WM4D/137
WT4T/313
K5CTG/312
K5FM/318
K5GOT/339
K5RSG/307
KC5NO/279
KC5WJ/261
KE5PA/300
N5GGO/305
N5JR/316
N5PC/249
W5LDH/315
W5LFK/317
W5VVD/264
WA5HLQ/260
WA5SKY/226
AH6HY/270
K6MA/329
K6PZ/327
K6RK/317
KB6KTV/223
KB6SD/156
KB6ZY/235
KC6AWX/176
KC6H/294
KI6YE/183
KJ6GC/224
N6IXX/202
N6JV/269
N6MU/322
W6DU/283
W6FAH/290
W6HCU/207
W6IEG/251
W6NIZ/258
W6OMR/322
W6QON/260
W6TFO/315
W6ZZB/225
WA6TLA/276
WB6RSE/313
WB6UBR/300
WE6H/290
K7BCX/326
K7EG/290
K7EHI/300
K7LAY/317
K7RLS/312
K7TCL/232
KB7VD/300
KF7RU/201
KQ7H/231
KX7J/285
N7EF/317
NK7Y/290
W7DNY/318
W7GXC/323
W7KH/345
W7OTL/127
W7TE/321
W7UZA/315
W7ZR/312
WA7SIG/131
WA7UVO/320
AB6Y/315
K6BL/170
K6CSG/326
K6CX/310
K6GG/311
K6JRM/312
K6OHG/250
K6ONV/338
K8YVI/290
K8ZTT/306
KA8YSW/185
KB8ZW/302
KE8NU/249
KN8COQ/274
N8BKF/313
W8QNF/290
W8WOJ/320
WA8CZS/301
WA8HFN/319
WA8OSE/321
WA8PYL/325
WD8LVF/216
WD8NNP/146
WD8Y/318
K9BJ/318
K9BSL/199
K9EL/305
K9HQM/319
K9MFY/315
K9TI/301
K9ZO/317
KA9OTD/183
KB9I/296
KC9YX/300
KD9NA/283
KD9QB/309
N9ELY/230
NE9K/308
NJ9R/174
W9DDP/310
W9DE/319
W9HJ/327
W9LNQ/325
W9MMZ/333
W9NNE/311
W9TC/317
WA9EZY/255
WA9VGY/325
WC9N/288
WD9IIC/289
WI9H/300
K0IIR/212
K0WWX/330
KY0A/315
W0BL/311
W0FF/309
W0GKE/320
W0JLC/259
W0NB/292
W0YNZ/322
W0ZRA/277
WA0RVK/261
WB0CHS/201

CW

DJ2YA/250
DJ5JH/313
DK5PR/310
DK6NP/307
DL1FU/153
DL1KB/296
DL2AW/289
DL5KAT/219
DL6QW/303
DL7MAE/307
DL7SY/295
DL7WL/311
F2CW/289
F6BEE/286
G3TXF/281
G4OK/164
HB9ALO/312
I2QMU/289
I2XIP/308
I4EAT/294
I5SMX/202
JA1BN/310
JA1CZI/279
JA1GV/307
JA1HGY/305
JA1JWP/315
JA1KQX/255
JA1MDK/313
JA1MRM/310
JA1OND/279
JA1PCY/266
JA1QXY/309
JA1RWI/268
JA1SVP/295
JG1NBD/304
JJ1DWT/272
JA2AAQ/317
JA2APA/295
JA2IVK/261
JA2IVY/206
JA2JW/294
JA2JYP/273
JA2KVD/293
JH2CJW/308
JA3ART/233
JA3BG/303
JA3CMD/305
JA3JOR/292
JA3PIS/309
JE3LWB/302
JJ3AFV/304
JM3DDG/155
JR3ANG/206
JA4LXY/306
JA5AUC/259
JA5PUL/308
JA5THU/294
JA6CNU/282
JA6TMU/142
JF6TUU/129
JA7AO/277
JA7HMZ/304
JA7PL/304
JA8DNV/317
JA8EJO/239
JA8ZO/312
JA9AA/272
JA9CXA/175
JA0DAI/294
JF1KKV/306
JH1OJU/304
JH8CMZ/210
JR1ARK/158
LA8CE/234
OK2DB/295
PA3DBG/209
PT7WA/286
PY1AFL/186
PY4OD/292
SM3DXC/301
SM4CTT/277
SM4DHF/283
SM4EMO/272
SM5BRW/299
SM5CAK/274
SM8BGG/251
SM6DYK/313
SM8HCJ/177
SM0BSB/243
SM0DJZ/306
SP5DRH/234
SP5EWY/312
VE3HO/298
VE6EJ/221
VE6WQ/283
VE7AHA/293
VE7WO/305
YU1ZO/298
4X1FC/253
4X4FU/312
4Z4DX/305
AD1C/288
AI1N/253
K1JA/315
K1NTR/290
K1ST/309
K1VKO/307
KM1D/256
KT1O/192
N1TZ/255
W1AX/272
W1KSZ/307
W1TSP/277
W1WLW/311
W1YY/313
WA1ZLD/256
AA2A/236
K2AGJ/306
K2ENT/308
K2LS/268
K2SD/159
KD2KR/125
N2ZZ/129
W2FXA/302
WA2AOG/197
WA2ASQ/202
WA2MZX/164
N3ED/285
W3KYN/201
AA4DO/274
AA4EL/150
AA4KA/292
K2SHZ/295
K4CEF/306
K4CXY/303
K4FJ/309
K4PB/181
K4PR/284
K4XI/295
KE4E/275
KF4AV/169
KI4TF/228
KR4F/298
KU4J/311
N4BPP/311
N4CC/270
N4CRI/268
N4RR/296
N4ZQ/148
NE4A/287
NE4R/189
W4BFR/310
W4LVM/305
W4NUS/291
W4UW/156
WA4CTA/307
WA4SSI/205
WB4BMM/151
WF4G/292
WF4I/155
WT4T/256
K5NW/313
K5VNJ/172
KA5W/308
KC5M/304
W5AQ/212
W5BKK/179
W5MUG/208
W5VT/302
WD5DBV/292
K6DT/312
K6JAD/141
K6PZ/155
K6RK/301
K6WD/275
N6MU/297
N6VR/292
W6BJH/305
W6DN/291
W6DU/291
W6ISQ/311
W6JTI/260
W6MND/203
W6SN/276
W6YQ/280
WA6FIT/183
WZ6P/253
K7EG/265
K7LAY/184
K7NN/277
K7ZBV/291
K7ZR/309
KO7V/209
KX7J/253
N7EF/308
N7EPD/255
N7MC/294
N7US/296
N7UT/301
W7KSK/224
W7QN/225
W7TE/302
W7YS/252
AB8Y/300
K8BL/150
K8CX/278
K8IFF/306
K8PYD/315
K8ZTT/283
KA8HOK/152
KJ8M/266
KN8Z/297
N8GGI/125
N8MC/305
W8BE/285
W8CY/297
W8DA/297
W8FN/232
W8IO/216
W8JBI/306
W8PR/300
WA8OSE/156
WB8QLA/157
WB8RJX/305
AB9O/254
AK9Y/216
K9BG/312
K9BWQ/308
K9EL/284
K9TI/288
K9ZO/305
KR9O/296
NT9L/187
W9DDP/278
W9DE/270
W9LNQ/306
W9NNE/185
W9ROK/149
WB9NOV/253
WD9IIC/311
AB0X/294
K0CVD/310
KC0D/271
KC0Q/308
KU0S/277
KY0A/253
NI0G/273
W0JLC/304
W0NB/272

RTTY

DJ2YA/154
JA3MNP/226
JA6TMU/138
OK1MP/211
W1EW/175
K2ENT/225
KA2BHD/148
W2FCR/226
WB2CJL/249
W3DJZ/270
NE4R/123
K5KR/227
W5VT/235
W5ZPA/236
W7KS/180
W0LYM/249

Satellite

W4BE/132

160 Meters

DJ2YA/115
DJ8FW/141
HK0HEU/130
JA1GTF/173
JA3QNB/136
JA4LXY/115
JA7AO/122
4X4NJ/176
K1MM/196
K1ZM/215
W1ENE/112
W1JZ/175
W2FCR/153
W3GH/151
AA4V/180
W6AJJ/130
K9UWA/180

80 Meters

DL1PM/217
JA1GTF/208
JA2AAQ/273
JA8DNV/233
OK1MP/236
SM5AKT/191
SM6BGG/206
SM6CVX/232
SM6DYK/154
SM0DJZ/180
VE7AHA/194
VE7SV/229
VK6HD/265
K1MEM/276
K1MM/282
K1NTR/165
KM1D/120
W1YY/206
K2SHZ/181
K2TQC/269
W2HZ/173
W3GG/230
W3MFW/307
AA4V/190
K4DY/287
W4VQ/239
N6ET/162

40 Meters

DL1PM/300
JA1GTF/239
JA2BAY/322
JA3CSZ/306
JA5PUL/199
OK1MP/261
SM6BGG/225
SM6CVX/279
SM6DYK/182
SM0AJU/307
SM0DJZ/229
VE7AHA/263
VK6HD/311
K1MEM/306
K1MM/309
K1NTR/226
KM1D/127
W1KSZ/211
W1WAI/262
W1YY/271
K2SHZ/235
K2TQC/311
K3UA/261
AA4DO/196
AA4V/251
K4DY/314
K4KUZ/231
NE4A/170
W4DR/334
W4VQ/299
K6MA/185
N6ET/200
N6JV/244
N7US/194

10 Meters

DK6NP/283
DL1PM/302
JA1GTF/252
JG1NBD/308
JA3CMD/275
JA5PUL/259
OH2BOZ/300
OK1MP/288
SM3DXC/234
SM5AKT/252
SM6BGG/195
SM6CVX/284
SM6DYK/161
SM6IF/262
SM0AJU/308
SM0DJZ/274
SV1ADG/321
VE6WQ/268
VE7AHA/203
4Z4DX/289
K1MEM/295
K1MM/297
K1NTR/206
K1YDG/183
W1KSZ/260
W1YY/284
WA1HHN/140
AE2U/163
K2ARO/310
K2EEK/206
K2OVS/223
K2TQC/308
WA2FUZ/125
WE2U/142
K3UA/275
W3GG/275
WA3DMF/178
AA4DO/178
AA4V/272
K4CXY/184
K4DY/317
KK4HD/148
N4VZ/295
N4ZQ/145
NE4A/193
NX4B/129
W4DR/325
W4VQ/298
W5LLU/257
K6EMN/262
K6MA/228
K6YRA/302
N6ET/202
N6IXX/130
N7US/203
K8BL/160
KB8CUS/156
K9ALP/210
KA9ULN/152
N9ISL/175
N9IWT/123

DXCC Honor Roll

Administered By Don Search, W3AZD

The DXCC Honor Roll is comprised of those amateurs who have been credited with at least 314 of the 323 current countries on the DXCC list. Total DXCC credits earned, including deleted countries, are shown after each call sign. The large, boldface numbers indicate total DXCC credits, excluding deleted countries.

MIXED

323

DJ1XP/344
DJ2BW/365
DJ5AI/339
DL1JW/360
DL1PM/351
DL3RK/365
DL3ZI/356
DL6EN/363
DL7HU/357
DL9OH/359
F3AT/359
F9RM/357
G3AAE/367
G3FXB/365
G3KMA/351
GW3AHN/367
I2KMG/348
IT9ZGY/363
JA1BK/355
JA1MIN/345
JA4ZA/349
LA9CE/343
LU6DJX/372
OH2QQ/360
OH4NS/349
OK1MP/353
ON4DM/364
PT7YS/358
SM7ANB/358
SM0AJU/360
SP7HT/345
YV5AIP/357
4X4DK/366
4X4JU/363
K1DRN/346
W1AX/370
W1FZ/366
W1GKI/374
W1HX/368
W1JR/364
W1OO/347
K2BS/349
K2FL/364
K2LWR/362
K2MUB/346
K2TQC/355
W2AGW/372
W2BOK/364
W2BXA/372
W2GW/366
W2JVU/369
W2NC/348
W2OKM/366
W2SSC/364
W2UE/363
W2YY/356
WA2DIG/357
W3GH/363
K4CEB/342
K4GJD/332
K4ID/350
K4IKR/346
K4KQ/366
K4LNM/362
K4PDV/365
K4RPK/356
K4XO/341
K4YYL/348
N4SU/369
W4AIT/371
W4BFR/356
W4DR/364
W4IF/359
W4MGN/356
W4VQ/352
K5AAD/351
K5KR/348
K5YY/347
W5GJ/355
W5IO/366
W5QK/359
K6EV/354
K6OJ/370
K6RF/356
K6RN/356
K6RQ/359
K6WR/353
K6ZO/372
N6AV/349
W6CF/349
W6EL/353
W6ET/360
W6EUF/347
W6ISQ/355
W6KNH/343
W6KTE/350
W6ONZ/359
W6ONM/357
W6RJ/351
W6RT/365
W6YA/353
WA6OET/348
NS7J/352
W7CG/364
W7CMO/358
W7DX/356
W7GN/364
W7MB/372
W7QK/361
K8DYZ/348
W8BKP/361
W8JBI/366
W8KPL/364
W8LKH/367
W8PHZ/363
W8RSW/349
W8RT/366
K9AB/361
K9RJ/345
W9CH/355
W9DWQ/361
W9DY/360
W9ZM/371
W9BW/367
W9CM/365
W9MLY/369

322

DJ1YA/352
DJ7CY/347
DL1BO/363
DL1KB/367
DL6QW/343
DL8NU/343
F8RU/341
G3FKM/364
HB9MX/357
HB9PL/356
I8AA/345
JA1BN/353
JA1BWA/348
JA1MJ/345
JA2JW/357
JA2XW/347
JA3DY/355
JA8ADQ/345
JA8ZO/343
OH2QV/352
OH3SR/341
PY2PE/348
PY4OD/357
SM3CXS/342
SM6CVX/340
VE3HD/350
VE7IG/342
VE7SV/348
VE7WO/358
ZL1AV/348
ZL1HY/371
4X4FQ/354
K1RM/342
W1AXA/363
W1BIH/370
W1CKA/357
W1DGJ/352
W1UU/353
K2FB/354
W2AG/367
W2FXA/359
W2HZ/343
W2MJ/357
W2QHH/367
W2QM/362
W3AP/338
W3CWG/363
W3DJZ/353
W3VT/367
K4CIA/347
K4DJ/344
K4DY/343
K4FJ/349
K4MQG/351
K4MZU/348
K4YR/363
W4BAA/363
W4FX/358
W4GTS/341
W4NL/342
W4NNH/360
WA4WIP/346
K5UC/368
W5EJT/352
K6JG/347
K6MA/351
K6YRA/347
KI6T/361
N6FX/354
W6BSY/363
W6BZE/367
W6GR/345
W6HYG/359
W6KH/360
W6REH/353
W6ZM/357
W6ZQ/368
K7ABV/345
K7KG/344
W7KH/370
K8EJ/348
K8ONV/355
W8EVZ/349
W8OK/358
W8PR/349
W8QFR/341
W8ZCQ/360
W8ZD/353
K9AR/340
K9MM/341
K9RA/338
W9DC/344
W9KNI/353
W9KQD/345
W9NA/357
W9YSX/360
W0ZV/356

321

DJ4PI/340

DJ8FW/331
DJ8UJ/334
DK3FD/332
DL8FL/338
G3HTA/342
G3LQP/338
G4CP/367
GM3BQA/344
HB9AFI/331
HB9DX/354
I1ZL/358
I4MKN/339
IT9ZGY/361
JA1BLC/342
JA1BRK/349
JA1HGY/337
JA2AAQ/341
JA7MA/340
JA8JL/342
JA8MS/337
OH2BC/348
OH2BH/348
OH2BZ/347
OH2NB/368
OH6RA/348
OK1ADM/351
OK3JW/332
ON5KL/338
OZ3Y/360
OZ7YY/333
PAØLOU/358
SM5API/343
SM5BBC/341
SM5CAK/342
SM5DQC/336
SM7EXE/338
SMØBFJ/337
SM5CZY/349
SP6RT/342
U5WF/360
VE1AL/330
VE3WT/349
VE3WW/343
YU1HA/348
ZL1AAS/336
ZL4BO/354
4X4NJ/340
4Z4DX/329
W1JBW/344
W1JZ/340
W1NU/360
W1OT/338
W1SD/352
W1SP/355
K2BK/360
K2BZT/363
K2OEA/359
K2PXX/350
K2SHZ/357
W2AYJ/364
W2FG/343
W2FP/340
W2GW/364
W2LPE/363
W2LV/365
W2PPG/341
W2RS/334
W2TQC/359
W2VUF/344
W3EVW/366
AE4X/358
K4AIM/356
K4BVQ/354
K4EZ/362
K4ISV/344
N4CC/335
N4KG/341
N4UH/343
W4BRE/344
W4EX/370
W4JVU/344
W4OO/356
W4UG/348
W4ZD/356
K5FJ/358
K5UR/340
W5AQ/359
WA5IEV/340
WF5E/352
K6CCY/350
K6DC/364
K6EXO/345
K6GA/354
K6PU/348
W6ERS/351
W6FSJ/362
W6KG/357
W6KUT/365
W6PN/349
W6RKP/361
W6SN/359
W6TZD/366
W6YO/344
WA6GFE/345
K7NNJ/337
W7CB/340
W7DY/345
W7OF/363

K8DR/357
K8LJG/333
K8MFO/343
W8CT/349
W8DCH/343
W8ILC/343
K9ECE/355
K9IW/317
N9AB/338
W9AQ/346
W9FKC/365
W9JUV/364
W9RCJ/358
NAØY/357
W8CJZ/349
WØELA/369

320

DJ5JH/340
DJ5LA/343
DK1YK/332
DL7FT/346
DL7HZ/351
EA1BC/355
F6BWJ/326
G3RUX/336
GM3ITN/353
HB9AHL/330
IØAMU/363
JA1AAT/340
JA1ELY/332
JA1FHK/341
JA1GV/343
JA1HYF/336
JA1IFP/340
JA1UQP/338
JA2BL/343
JA3BG/344
JA3BQE/335
JA3MNP/332
JA6BSM/335
JA7AD/356
JA8EAT/332
LU4DMG/360
OH2KI/335
OH2LA/357
OH2LU/336
OK3MM/360
OZ1LO/342
OZ6MI/339
PY1APS/341
PY1HQ/360
PY1HX/358
PY7ZZ/332
SM5AQB/343
SM5BCO/352
SM6CKS/341
SP6BZ/338
SV1ADG/324
UA1CK/350
UA3CT/354
VE1KG/340
VE1YX/328
VE3GMT/339
VE7BD/334
VK5WO/349
VK6DH/339
XE1AE/354
YU1AB/329
YV5CWO/332
ZS6LW/358
K1JO/336
K1NA/344
N1XX/345
W1DK/363
W1GL/334
W1HH/356
W1KG/331
W1MU/352
KM2V/335
W2HTI/361
W2PN/346
W2VJN/348
WB2YQH/337
K3AV/351
N3II/332
W3MP/367
AA4S/335
K4BBF/339
K4KC/346
K4RA/334
KE4I/337
N4MM/341
N4ZC/342
NE4R/328
W4AUH/339
W4BQY/367
W4OWJ/350
W4SSU/352
W4YJ/365
WA4FFW/338
K5GH/334
K5OS/337
N5UR/332
W5TO/344
W5YU/343
K6DT/347
K6IR/334

K6KII/357
K6LGF/357
N6MU/335
W6BS/362
W6BVM/359
W6FW/350
W6GMF/353
W6MUR/357
W6PHF/350
W6PT/362
W6QL/343
W6SQP/361
W6TC/334
W6TWZ/352
W6YK/362
W6ZKM/341
N7RO/335
W7BGH/354
W7IR/364
W7TE/333
K8FF/350
K8IFF/339
K8KAE/339
K8NN/329
K8RA/333
W8AH/361
W8DA/354
W8JQ/345
W8NGO/361
W8OY/358
W8RCM/340
WB8EUN/337
K9CJK/345
K9KAE/339
K9QVB/326
W9DE/335
W9GU/355
W9HJ/354
W9TKV/360
KØBUR/341
KØGVB/338
WØAIH/360

319

DJ2YA/349
DJ5DA/345
DJ6TK/337
DJ7ZG/345
DJ8CR/339
DK5PR/332
DL1RB/327
DL3BK/356
DL8UP/329
EA4MY/329
F2BS/346
F5LQ/334
F9IE/340
G3NSY/333
G3RCA/325
G3UML/342
G3ZAY/332
HB9AMO/332
HB9AQW/332
HB9MO/357
HB9TL/360
I2ZGC/326
I3EVK/341
IV3PRK/338
I5ARS/349
I5FLN/335
I7HH/335
I7ZPB/350
JA1ADN/350
JA1FNA/332
JA1GTF/335
JA1JAN/337
JR1AIB/326
JA2AH/337
JA2APA/327
JA3AQ/337
JA3ART/336
JA3EMU/332
JA3FYC/330
JA3GM/332
JA4AFT/336
JA7FS/336
JA8DNZ/328
JA8IXM/328
JA9AA/349
LA5HE/355
LU5DO/358
OE1ER/366
OE3WWB/334
ON4UN/340
ON5NT/332
OZ3PZ/332
OZ5EV/328
OZ8SS/355
PAØTAU/346
RT5UN/335
SM1CXE/345
SM3BIZ/361
SM3EVR/326
SM4CTT/327
SM5CZY/347
SM6AOU/348
SM6CAS/340
SM6VR/344

SM7ASN/339
SM7DMN/329
SM7QY/361
SP9PT/337
UA2AO/347
UB5WE/332
VE3BX/342
VE3NE/341
VK3YL/355
YU2YM/329
ZL1AMO/340
K1BW/334
K1CC/331
K1KI/332
K1ST/326
W1AFF/350
W1FJ/347
W1GDQ/335
W1HZ/362
W1UN/336
W1WLW/343
W1YRC/338
K2AGJ/335
K2CM/337
K2JMY/346
K2LE/344
KY2Q/344
N2KA/327
W2AX/359
W2BHM/357
W2GC/358
W2GKZ/346
W2IRV/359
W2LL/351
W2SAW/360
W2SM/331
W2SUA/339
AF3E/332
K3FN/326
K3GL/362
K3UA/327
K3ZR/335
N3UN/325
W3GG/336
W3XM/343
W3YT/331
AA4MM/339
K4CEF/337
K4MPE/343
K4PI/328
K4XG/338
K4XH/334
K4XI/331
K4XP/326
KR4M/333
N4KE/331
N4OM/326
N4XO/351
W4AVY/355
W4CPZ/338
W4DHZ/354
W4DRK/349
W4EEE/360
W4FPW/336
W4LVM/329
W4NKI/342
W4OTX/337
W4QM/351
W4RIM/335
W4YV/338
WB4NDX/329
WB4QNP/333
K5AQ/339
K5JM/330
K5KLA/329
K5KR/328
K5LIL/341
K5VT/329
N5AR/347
W5GEL/359
W5KGX/360
W5RDA/350
W5SJ/339
K6JR/339
K6LM/324
K6LQA/336
K6QH/344
N6EA/356
N6ET/338
N6UC/337
W6BA/363
W6BJH/333
W6DN/334
W6EE/365
W6GC/334
W6JRY/334
W6LQC/335
W6OMR/336
W6XP/335
WA6WZO/326
K7RLS/330
N7EB/356
W7AQB/356
W7JFO/338
W7LFA/338
W7OM/340
W7RV/341
K8CH/337

K8IP/341
K8PYD/335
K8ZR/329
KN8Z/337
W8BE/342
W8CNL/338
W8GKM/337
W8YA/336
W8ZCK/347
W8ZET/350
AB9O/319
K9AJ/330
K9BG/327
K9JF/336
K9KA/338
K9SM/348
N9AF/340
N9ZN/350
W9FD/357
W9GIL/361
W9GRF/351
W9RF/337
W9VA/329
W9WY/336
KØIEA/334
NØRR/332
WØBL/339
WØCD/337
WØIZ/336

318

CX4CR/329
DJ6RX/339
DJ8NK/332
DK6NP/325
DL2AW/326
DL7EN/359
DL7WL/322
DL8CM/351
F2VX/332
F5II/338
F5VU/333
F6BEE/325
G3SJH/329
HB9AHA/339
HB9MQ/360
HB9RX/335
I1RBJ/339
I2PJA/328
I7WL/337
JA1DM/357
JA1JRK/336
JA1MDK/328
JH1GZE/329
JA2IVY/325
JA2JSF/329
JA3APL/337
JA3BG/342
JA3BQE/333
JA3HZT/330
JE3LWB/321
JH3CXL/324
JR3ANG/322
JA4LXY/328
JA5AUC/324
JA5EN/335
JA5PUL/325
JA7ARD/328
JA7PL/328
JA7ZF/331
JA8CDT/330
JA9XJF/327
JA9BJ/337
JAØGZZ/327
KH6CD/365
LA9GV/322
OE1FT/353
OH2EE/322
OH2VB/338
OK2DB/330
ON6HE/322
PY1DH/351
PY2ELV/336
PY2TM/327
PY5ATL/333
SM3DXC/326
SM5FQQ/322
SM6CST/333
SM6DHU/337
SM7BIP/335
SMØDJZ/325
UQ2MU/325
VE3DR/323
VE4OX/346
VE4SK/335
VK6HD/337
YU1EXY/335
ZL1ARY/343
ZL2HP/352
ZS6RM/355
K1CMI/328
K1DFC/338
K1HZ/326
K1MEM/330
K1RAW/329
K1TN/330
K1YZW/341
W1AA/356

W1AB/348
W1GX/340
W1KGH/340
W1NG/335
W1RLQ/350
K2CL/338
K2ON/322
K2UO/325
K2UR/343
KB2ZP/323
KR2Q/336
N2DT/324
W2GK/344
W2HAZ/335
W2HI/349
W2JB/329
W2LZX/326
W2MIG/329
W2TA/329
WA2JUN/322
K3MO/356
W3BTX/331
W3EYF/349
WA3HUP/338
AA4AR/323
AB4D/337
K4RD/328
K4SM/361
K4ZYU/333
KA4S/326
N4OL/331
N4VZ/327
N4WB/332
N4WJ/333
N4WW/339
W4CZU/326
W4OEL/340
W4PZV/337
WA4VDE/323
WB4TDH/326
K5BLV/325
K5DX/359
K5JW/337
K5NW/329
N5UD/329
W5DJ/341
W5IZ/342
W5KFN/330
W5LVD/341
W5MUG/339
W5NUT/356
W5XJ/335
W5ZPA/324
K6CBL/328
K6JAD/330
K6LEB/346
K6PZ/335
K6RK/330
K6SVL/333
KD6PY/330
N6AHU/323
N6DX/349
N6JV/329
N6MG/330
W6HT/332
W6MI/343
W6TPJ/350
W6YB/344
WA6AHF/336
WA6FIT/327
WA6TLA/328
K7OXB/330
N7NG/341
W7EKM/332
W7IUV/324
W7UZA/334
AC8K/331
K8NW/324
KJ8G/326
W8BF/364
W8CFG/335
W8MPW/361
W8QWI/340
K9BWQ/331
K9EL/323
K9FD/325
K9HMB/326
K9NB/326
W9AMM/335
W9FR/332
W9LNQ/343
W9NGA/329
W9SFR/358
W9SS/332
W9TKD/352
W9XX/323
W9ZR/335
WA9NUQ/340
KØWWX/335
KYØA/331
NØAT/324
WØHBH/331
WØLYI/337
WØUD/339
WØYK/324

317

CU2AK/336

DJ5MC/325
DJ9RQ/326
DK3FS/327
DL1HH/351
DL6KG/338
DL7CW/341
DL7NB/330
DL7SY/323
EA3NA/333
F6CKH/328
F6EXV/322
G3IOR/351
G3JEC/339
G3MCS/333
GI3IVJ/356
HB9AAA/336
HB9BGN/322
HB9IK/345
HB9QR/348
I1APQ/332
I2DEZ/336
I2VGU/328
I2XIP/321
I8KDB/355
JA1JWP/324
JA1OYY/326
JA1PCY/327
JA1QXY/330
JA1SVP/326
JA1WSK/328
JF1PJK/329
JH1IFS/330
JA2BHG/337
JA2IVK/325
JA2KVD/326
JA3LUK/328
JA3PIS/320
JA4CQS/327
JA5FDJ/324
JA6CNL/331
JA6VA/334
JA6WW/325
JA7IL/326
JA7JH/332
JA8BIO/331
JA9CXA/330
JE5IVW/329
KH6CF/326
LA8LF/345
OE1LO/346
OE8RT/337
OH2BGD/333
OH2XF/348
OH5UQ/342
OK1MG/343
ON4IZ/347
OZ3PO/343
OZ7OP/335
PP5UG/339
PT2BW/332
PY5WD/325
SM2EKM/332
SM4BOI/320
SM4EAC/335
SM5BFC/325
SM5BHW/339
SM6AFH/337
SM6CTQ/328
SM6DYK/323
SP2AJO/332
SP5BAK/325
SP5EWY/326
T77C/321
TG9NX/323
UA6JW/336
UB5UT/323
VE1AST/325
VE3GS/336
VE3HO/325
VE3LGQ/347
VE3MJ/340
VE3SR/359
VE3ST/350
VE3XN/336
VE5RU/354
VE6WQ/324
VE7AHA/325
YO3AC/335
YS1RRD/329
YU1AM/332
ZL3IS/355
K1BV/335
K1HMO/322
K1JA/329
K1MM/327
K1NJE/334
K1VKO/322
KA1QY/355
NR1R/325
W1GME/352
W1HSB/321
W1IKB/336
W1LQQ/338
W1OHA/344
W1QJR/351
W1WY/354
WA1EOT/325
WB1DQC/321

K2LQ/327
K2VV/331
KM2P/334
N2AP/331
N2KW/324
N2LM/338
N2OO/326
W2BMK/353
W2CP/347
W2FZY/355
W2IOT/340
W2IQB/325
W2SY/335
W2VYX/341
W2XN/356
WA2MOE/321
K3II/356
K3SGE/335
K3TUP/333
W3ACE/326
W3LB/334
W3ZN/333
WA3IKK/336
AA4V/329
K4HJE/336
K4JC/347
K4KFH/321
K4MG/331
K4UTE/335
K4ZKZ/341
KN4B/325
N4AVB/321
N4RR/326
N4SA/332
W4HR/353
W4QQN/343
W4XJ/345
WA4DRU/333
WA4JTI/326
WB4LFM/329
WF4G/322
K5LP/329
K5PP/322
K5RC/339
K5YCP/331
KB5GL/321
N5FW/326
N5JR/322
N5OK/328
W5HTY/339
W5OB/352
W5VT/334
K6OZL/335
K6UD/327
KJ6V/341
NS6B/321
W6GO/329
W6MJP/336
K7EG/324
K7UT/329
K7ZBV/321
N7MC/325
W7CSW/348
W7DQ/326
W7OEV/340
W7ZR/325
AB8Y/322
K8DB/319
K8DR/353
K8JRM/317
K8RWL/334
KD8VM/329
KN8COQ/320
W8CUT/349
W8CY/322
W8DMD/363
W8GT/365
W8KR/339
W8SEY/344
W8UVZ/329
W8YGR/346
WD8Y/322
KW9K/322
W9AZP/347
W9HK/352
W9RXJ/331
W9RY/330
W9WM/347
KØALL/329
KØBS/334
KØWWX/334
KØKTP/325
KK0U/321
WØJMZ/328
WØLWG/353
WØPAH/338
WØQGI/358
WØSR/328
WAØOAH/336

316

DJ2TI/328
DJ6NI/330
DJ0KQ/342
DK3KD/323
DK9FB/330
DL7AA/362
DL7AP/354

DL7UX/322
F6BKI/324
G2FSP/353
G3GIQ/342
G3HCT/352
G3JAG/336
G3KDB/332
G3MXJ/334
G3YJI/324
HB9LL/333
IN3DEI/321
I8RFD/320
I8YRK/338
IT9TAI/357
JA1EOD/335
JA1MCU/337
JA1RWI/324
JK1OPL/329
JR1FYS/323
JA2BAY/325
JA3CSZ/323
JA3RWJ/325
JA4DND/326
JA5BLB/323
JA5ELM/321
JA6GXP/325
JA7GLB/326
JR7TEQ/322
JA8AWH/327
KH6IJ/360
KV4FZ/335
LA3XI/330
LA8CJ/324
OE6MKG/327
OH2BAD/335
OH2BCV/330
OK1TA/335
ON4QJ/344
ON6BC/323
OZ8BZ/333
PT7WA/324
PY2BKO/341
SM3RL/332
SM4DHF/330
SM5BRW/329
SM6AEK/340
SM6CWK/338
SMØKV/356
SP6AEG/320
SP9AI/330
UP1BZZ/323
VE7GI/364
VK4QM/364
YS1GMV/324
ZL1AJU/348
K1SA/321
W1BL/326
W1DQH/340
W1GG/339
W1JJ/322
AB2N/321
K2SB/335
K2UFM/330
K2YLM/341
N2SS/334
W2CC/329
W2TP/350
W2UI/341
WA2IZN/321
WB2BNJ/327
WB2CEI/320
AD3Z/326
K3KG/330
K3KP/341
K3ND/328
K3NL/334
K3NN/328
N3ED/334
N3US/324
W3AFM/354
W3GRS/353
W3LPL/335
W3UM/322
W3VRT/326
AA4CJ/329
AA4KA/321
AA4KT/321
AA4VK/322
AB4H/331
K4IR/335
K4KG/344
K4LTA/338
K4NYV/320
K4SE/322
K4UEE/329
K4WMB/332
K4XR/323
KB4FQ/320
KB4IL/318
KU4J/320
N4AVV/320
N4BPP/320
N4DW/331
N4EA/337
N4NO/335
N4QF/321
N4SR/329
N4WF/335

NF4U/324
W4BBP/347
W4DXI/337
W4EEU/342
W4FLA/330
W4GD/361
W4JD/332
W4OM/362
W4RJC/331
W4WD/338
W4WV/352
W4XQ/335
W4XR/334
W4YN/343
WA4TLI/328
WB4OSS/334
K5BZU/329
K5VNJ/323
KA5W/320
N5DX/339
N5EA/332
N5GM/328
N5RR/335
W5AL/360
W5CKT/346
W5HE/342
W5JG/321
W5LCI/351
W5UN/355
WD5K/334
KW6N/321
N6AR/345
N6CW/338
N6GM/342
N6RJ/330
N6ST/324
W6RGG/341
W6US/329
W6XI/334
W6YMV/346
WB6RSE/321
K7ZR/334
N7EF/321
W7KSG/334
W7ORH/333
AB8K/326
K8FL/342
K8GG/322
K8TL/337
KA8T/320
KB8DB/320
KG8V/332
N8AA/337
N8MC/321
NE8Z/330
W8OBI/331
WB8FIW/320
WB8RJX/320
K9GM/334
KM9J/320
W9BM/352
W9BW/345
W9DH/344
W9FID/355
W9IU/355
WA9WJE/332
WB9OQU/320
KØCS/323
WØAX/362
WØDU/363
WØGKE/331
WØGKL/352
WØHZ/345
WØRI/343

315

DF1DB/320
DJ2AA/347
DJ7CX/341
DK2XX/322
DL1CF/344
DL1DC/352
DL3IE/336
DL3OH/336
DL6MK/345
DL7MAE/315
DL9NC/332
EA3NC/335
F2CW/315
F6BFH/327
F6DHB/320
F9GL/347
G3ALI/333
G3RTE/316
G3VIE/328
G5RP/341
G5VT/359
I2BVG/325
I2LAG/333
I2MQP/329
I2VDX/324
I2ZZZ/329
IT9AUA/331
I8DUD/322
I8JX/334
JA1IBX/339
JA1OCA/333
JA1OND/326

JA1VN/326
JA1WTI/328
JE1MGE/324
JF1KKV/320
JH1HLQ/325
JH1OJU/322
JH1QOJ/327
JR1EBE/321
JA2ADH/335
JA2AN/334
JA2DSY/329
JA2HNP/334
JA2THS/319
JA2VPO/320
JH2CJW/320
JA3JOR/325
JA3NTE/326
JA4VAD/320
JA5IU/326
JE5IVW/327
JA6BEE/335
JA7AQO/326
JH7DNO/319
JA9YBA/327
JA0CWZ/322
JA0DAI/319
JA0SGC/324
KP4RK/350
LA1KI/339
LA5UF/331
OE2EGL/336
OH2BBF/322
OH2BDP/329
ON4TX/343
ON5FU/323
ON8XA/335
PP5YC/325
SM4EMO/322
SM5AKT/322

SM5FC/333
SM6CMU/326
SM6EOC/331
SM7CRW/328
SM8CCE/354
SM8CCM/323
TG9NX/321
VE6VM/325
VE7DX/321
YU2DX/335
YU2TW/325
YU3AW/322
YU3EY/333
YV5ANF/345
Z24JS/337
ZS6YQ/349
9Y4VU/325
K1EFI/329
K1SF/319
W1DA/328
W1XS/319
W1YY/329
WA1URV/319
K2AGZ/336
K2BT/334
K2JLA/322
K2LS/321
K2UU/328
K2XA/328
KB2HZ/317
N2JV/319
W2AZX/346
W2CR/357
W2HN/331
W2MZV/340
W2NJN/319
W2PSU/328
W2ZZ/335
WA2OHD/319

WA2VUY/319
K3HPG/333
KJ3L/319
W3AC/341
W3NF/322
W3YX/328
WA3CGE/324
AA4M/321
AE4Z/325
AL7EL/W4/330
K4AUL/335
K4CXY/322
K4IBP/320
K4KUZ/320
K4RZ/326
KC4DY/316
N4AH/328
N4AXR/320
N4DAZ/317
N4HH/323
N4JJ/325
N4PN/326
N4RA/330
NE4A/328
W4AXR/354
W4EO/354
W4FDA/336
W4OHZ/321
W4WG/332
WA4CXZ/323
WA4QBX/330
WB4HOK/320
WR4K/329
K5FA/330
K5GO/331
K5JUC/320
K5RSG/321
KC5M/318
N5DC/328

W5DU/351
W5GO/353
W5MMK/361
W5QKR/330
W5RA/333
W5UP/331
WB5SSD/320
K6EC/354
K6GAK/334
K6OJO/330
K6WD/327
K6ZM/346
KM6B/325
N6AW/332
W6HFL/345
W6MZ/333
W6TXL/346
W6UY/330
WA6OGW/324
WB6APX/330
WX6M/319
AA7A/321
K7LAY/323
N7UT/321
W7DQM/335
W7IYW/328
W7JYZ/348
W7LR/327
W7XA/329
WA7BEV/333
K8BTH/319
K8CX/322
K8NA/324
W8AD/332
W8ARH/343
W8QBG/331
W8TA/332
WA8PYL/329
WB8VPA/319

WD8PKF/319
K9AWK/337
K9FN/328
K9PPY/332
K9RHY/320
K9VAL/320
K9XJJ/328
K9ZO/323
KB9I/318
KR9O/319
W9EQP/326
W9HB/354
W9HLY/347
W9IT/335
W9LT/347
W9NNE/324
W9RKP/356
W9ZRX/333
WA9EKA/321
WA9VGY/330
WB9NOV/319
WD9IIC/319
AJ0X/336
K0CD/349
KF0H/324
KW0A/331
W0EDI/351
W0TRF/325
W0VX/323
W0YNZ/324
WA0IDK/320
WB0NHD/320

314

OE3GN/323
DJ3NW/324
DK3PO/333
DL3ZA/337

DL7BK/348
F2GL/325
F6BLP/317
G2DMR/335
G2FYT/349
G4DYO/320
G4FEU/317
HB9AFM/336
HB9AZO/317
HB9GZA/315
HK3DDD/320
I2RFJ/316
I3OBO/318
I4EAT/321
IT9JLA/323
IT9TGO/319
JA1MRM/321
JA1NRH/321
JG1NBD/316
JH1ARJ/326
JH1EDB/323
JJ1DWT/319
JA2AIR/335
JA2JYP/317
JA3HTL/327
JA4FWM/324
JA5THU/317
JA6GIJ/319
JH7FMJ/319
JA8FKO/321
JA0DXG/324
KP4BJD/323
LA1K/346
LZ2DF/315
OH2BN/319
OK1ACT/332
OK1VK/328
OK2RZ/332

OZ4RT/346
OZ7JZ/331
PY2BW/330
PY5EG/320
RB5WA/317
SM7BYP/320
SV1IW/318
TF3SV/333
UB4WZA/320
UB5UAT/320
UT5MD/314
VE3GVZ/326
VE3ICR/319
VE3IPR/318
YO3JU/334
YS1O/353
YU7BB/330
YU7BCD/342
9H4G/326
AA1K/321
K1AR/322
K1EM/319
K1IU/322
K1UO/321
K1WJL/324
K1YR/323
N1TZ/319
W1AM/329
W1BR/332
W1ELR/350
W1EOA/332
W1NHJ/344
W1RED/326
W1TSP/321
W1ZE/332
AA2A/317
K2ENT/318
K2KGB/332

K2LGJ/337
K2PZ/318
KF2O/325
KN2N/317
KW2P/326
KZ2U/325
W2GA/329
W2GLF/352
W2JGR/322
W2PD/325
W2QXA/323
WA2CBB/335
WB2OHD/318
WB2P/318
WB2QMU/325
K3WS/325
W3PVZ/335
W3SO/331
WA3WIP/318
WB3DNA/318
K4EGI/330
K4II/340
K4JEX/320
K4RIG/318
K4SMX/327
KD4S/319
KE4E/319
KG4W/319
KR4F/318
N4IA/326
N4TB/333
W4HY/324
W4JFE/341
W4PTH/327
W4VPD/354
WA4DAN/318
WA4DPU/319
WB4RFZ/319

K5UKN/332
K5YCP/331
KB5GU/321
W5HTY/339
W5LZW/349
W5UYD/332
W5YU/340
K6CCY/346
K6LM/322
N6AHU/322
W6CCB/334
W6CN/323
W6GO/329
W6GTL/329
W6HXW/328
W6KON/333
W6YQ/324
WA6AHF/335
K7UT/329
K7ZBV/321
KE7LU/339
N7SU/328
W7DQ/328
W7EKM/331
K8NW/323
K8ZR/327
KC8CY/322
KD8VM/358
W8CUO/346
W8CY/322
W8GKM/335
K9IKP/326
N9AF/337
W9RXJ/331
W9TKD/341
W9XX/322
WA9NUQ/339
KØBS/334
KØGT/320
KØKTP/325
NØAT/320

316

CT1RM/326
CT1UE/332
DJ6NI/330
DJ6VM/332
DK2BL/333
DL6QW/327
EA8LD/320
F5JA/329
F6CKH/327
F6EXV/321
I1FNX/321
I1HAG/323
I1TBE/327
I2WTY/319
I3EVK/337
IN3DEI/321
I5MPN/321
I5TDJ/344
I8YRK/338
JA1AAT/336
JA1JRK/333
JA2BAY/325
JA7ARD/326
JA7DRM/326

JA7GLB/326
JA7JH/331
JA8EAT/328
JA8XJF/325
KH6OR/351
OE2GKL/330
ON6MY/321
PT2BW/329
SM4BOI/319
SM6VR/335
TI2CC/329
VE3BX/331
VE3HO/324
VE3XN/335
VE4BJ/326
VE7AHA/320
XE3EB/331
YS1GMV/324
ZL1AMN/329
K1MM/316
W1ICU/335
W1JFG/356
W1JJ/322
W1LQQ/331
W1SEB/335
WA1EOT/323
N2KW/321
NO2U/332
W2CC/329
W2IOT/339
W2LZX/322
W2RGU/332
W2TP/347
WB2BNJ/327
WB2CEI/320
WB2CVL/319
W3FDP/329
AA4KT/321
K4MG/330
K4PQV/332
N4WF/335
N4WW/333
W4BAA/334
W4PZV/335
W4TDW/344
WA4JTI/324
K5KR/325
KA5W/320
K5JW/336
N5AJW/321
W5AQ/339
W5DJ/333
W5JWM/351
W5LQN/322
WD5DBV/321
NS6B/320
W6AXH/328
W6YMV/345
WA6OET/336
WA6RTA/332
KB8DB/320
W8CFG/332
W8EVZ/342
W8JTD/336
W8JXM/336
W8KST/338
WB8JRX/320

K9HMB/323
K9IW/320
K9LKA/337
K9QVB/321
W9QO/328
W9SFR/347
W9ZR/331
WØGKL/351
WØJMZ/327
WØYK/321
WØYMH/331
WAØOAH/335

315

DF1DB/320
DJ5LA/340
DL1HH/339
DL4YAH/317
DL7FP/328
EA2HX/344
EA4JF/331
F6BFH/327
F6DLM/320
FF5OK/319
G3YJI/323
G3ZAY/328
G5VT/359
HB9AHA/334
IX1BGJ/331
I2IAU/300
I2JQ/315
I2LAG/333
I2LPA/330
I4BAC/328
I7KXG/316
IC8EGO/321
IØDUD/322
IØJX/334
JA1IPF/328
JA1JWP/320
JA1MDK/320
JA1RWE/328
JR1FYS/321
JA2ADH/335
JA3AQ/324
JA3DY/328
JA8BIO/329
JA8ZO/332
JA9AA/330
JH1OJU/321
KH6BB/338
LA8CJ/322
LU2AH/322
LU3AJW/322
OE2EGL/336
ON8XA/335
PAØLEG/319
PY2DSC/332
PY2PC/338
PY4VX/332
PY5PS/321
PY5WD/320
SM5BFC/323
SM5FC/333
SM7CRW/327
UA6JW/328
VK4LC/348

W6KTE/349
W6REH/349
W6ZM/352
W7CMO/349
KBCFU/354
W9DC/341
W9DWQ/350
W9NZM/351
W9RNX/352

321

DJ1XP/334
DJ2YA/346
DL1KB/356
DL7FT/347
EA4DO/342
F2MO/349
F9RM/355
G3TJW/337
GM3BQA/344
IT9GAI/342
JA4AZ/345
JA8ADO/340
LU4DMG/361
OH3SR/340
OK1MP/346
ON4DH/361
ON5KL/334
OZ3Y/353
PY2FR/339
SM5CZY/349
VE3MR/348
VE3WW/343
ZL3NS/346
K1FX/340
W1CKA/348
W1GKK/358
W1SP/354
K2BZT/356
K2TQC/333
W2HZ/342
W2LV/356
W2QWS/350
W3DJZ/351
K4AIM/356
K4MQG/346
K4PDV/349
K4XO/338
W4BRE/342
W4UG/347
W5IO/363
W5UAW/342
KI6T/353
W6BSY/357
W6ISQ/346
W6KUT/350
W6RKP/355
W7UPF/342
K8LJG/333
K9AB/343
K9ECE/354
W9YSX/359
NA0Y/351
WØMLY/360

320

DJØUJ/333

DK9KX/328
DL8FL/336
F6AOI/337
G3KMA/337
G3NLY/343
G3UML/343
G3ZBA/336
I2YBC/330
I6FLD/351
I8SAT/329
IØAMU/363
JA1BWA/337
JA2AAQ/340
JA2JW/345
JA2XW/337
JA7MA/339
OK1ADM/345
OZ3SK/350
PY3BXW/339
PY5GA/337
SM5BCO/352
SM5DQC/335
SM6CKS/341
SM6CVK/336
U5WF/343
UA1CK/350
VE1YX/328
VE3GMT/339
VE3WT/348
VE7WO/341
VK5WO/346
VK6RU/367
XE1AE/354
YV5CWO/332
ZL1VA/336
ZP5CF/361
ZS6LW/357
W1JR/350
W1SD/345
K2BS/346
W2FP/336
W2HTI/360
W2YYL/350
W3EVW/351
K4BBF/339
K4GJD/332
N4MM/339
W4DR/357
W4EX/367
W4JVU/343
W4UWC/347
W4YJ/362
W5RRK/339
WA5IEV/339
K6JG/342
K6YRA/345
N6UC/338
W6BAF/355
W6KPC/344
W6RKP/355
W6ZKM/341
W7MB/345
K8NN/329
W8GMF/349
K9MM/339
KØBUR/341
WØCSZ/348
WØYDB/336

319

CT1FL/338
DJ2YI/358
DJ9ZB/333
DL8NU/340
EA4JL/338
F2BS/344
F5JA/332
F9IE/339
HB9TL/359
I2ZGC/326
IV3PRK/338
I5FLN/335
I7HH/335
I8WOX/330
IT9ZGY/348
JA1BN/340
JA1BRK/341
JA2AH/334
JA3BQE/333
JA3CMD/327
JA4ZA/343
JA6BSM/333
LA3XI/330
OE3WWB/334
ON4UN/340
ON5NT/332
OZ3PZ/332
OZ5EV/328
PY1APS/338
SV1ADG/323
VE3NE/340
VK6HD/337
ZL3QN/336
W1AFF/350
K2JMY/346
KS2I/343
W2VO/333
K3BCG/330
W3AP/329
W3DHM/358
W3GG/334
W3JK/342
W3MP/344
AA4MM/339
K4KC/344
N4CC/331
N4KG/329
W4BFR/336
W4EEE/360
W4LMX/354
W4NKI/342
W4OTX/337
WB4NDX/329
K5HG/333
K5OS/336
K5OVC/337
K5UR/336
W5KGX/356
K6EV/348
K6JR/339
K6LGF/353
W6FW/348
W6KOE/337
W6LQC/335
W6XP/335
WA6WZO/326

K7NN/335
NS7J/327
W7JFO/338
W7LFA/338
W8ZET/350
AB9O/319
W9BEK/347
W9KOD/330
KØEPE/341
W9SFU/344
WBØHAD/321

318

DJ7ZG/344
DJ8NK/332
DL1JW/345
EA1QF/323
EA8JJ/335
F2VX/331
F5II/338
F6VU/333
F9MD/345
G3FKM/356
G3RCA/324
G3SJH/329
GW3CDP/323
I1AGC/331
I1RBJ/339
I2PJA/327
I4ZSQ/337
I5KKW/327
JA1ADN/342
JA1ELY/329
JA1JAN/334
JA1UQP/336
JR1AIB/325
JA2APA/326
JA3MNP/330
LA1ZI/332
LA9GV/322
LU1BR/331
OA4OS/337
PY2ED/336
PY2TM/322
PY7ZZ/325
W4VQ/331
SM3BIZ/359
SM4CTT/324
SM5FOO/322
VK5MS/362
VK6LK/334
VO1CU/328
YV1KZ/336
ZL1AV/334
ZL1BKX/334
ZS6RM/351
K1CMI/328
K1LHT/335
K1RAW/329
K1ST/323
W1AA/356
W1BIH/348
W1MMV/359
KM2V/332
W2FG/339
W2FXA/340
W2SUA/337

W3XM/342
AE4X/337
K4CEF/331
K4FJ/339
KE4I/334
W4DPS/337
W4EPZ/340
W4SKO/367
WA4MMO/330
WB4QNP/330
AA4AR/323
K5AQ/336
K5DX/354
W5SZ/341
K6DT/330
K6GA/337
K6IR/332
K6JAD/330
K6SVL/333
W6AXH/330
K7IRO/329
N7RO/332
W7QK/341
K8DR/341
K8IFF/337
K8PYD/333
KJ8G/325
KN8Z/336
W8BF/364
W8CNL/334
W8GZ/366
W8ILC/337
W8PR/336
WB8EUN/334
K9BWQ/331
K9KA/336
W9AMM/333
W9GU/335
W9JT/342
W9SS/332
NØRR/328
WØLYI/336

317

DJ6FN/327
DJ9RQ/326
DK2WH/320
DK3HL/327
DK8MZ/322
DK9KD/325
DL6KG/336
EA1IY/332
EA3AOC/322
EA3TT/324
EA7LQ/323
F3DJ/350
F8AJA/332
G3JEC/339
G3MCS/333
I1APQ/332
I2VGU/328
I8JN/330
I8KDB/355
I8KNT/322
IT9GAI/338
IT9ZGY/346
IØMPF/325

IØOLK/336
JA1FNA/329
JA1OYY/326
JH1GZE/328
JH1IFS/330
JA2JSF/326
JA3APL/335
JA4AFT/333
JA5PUL/324
JA7IL/326
JA8IXM/325
JA9BJ/335
JAØGZZ/324
LU9DAH/353
OE1LO/343
OH2BZ/335
OH2LU/323
ON4SZ/355
OZ7OP/335
PAØHBO/357
PP5UG/339
PY4TK/357
SM4EAC/335
SM5BHW/336
SM6CAS/337
TG9NX/323
UA2AO/343
UA3CT/334
UB5WE/330
VE2WY/346
VE3GS/336
VE3MJ/340
VE3QA/356
VE5RU/353
YS1RRD/329
ZL1AAS/332
ZL1ARY/336
K1MEM/325
NR1R/325
W1JWX/340
W1KSZ/321
W1ONK/357
WB1DQC/321
K2UO/324
KM2P/333
W2GK/342
W2MIG/328
W2MPK/332
WA2MNM/321
K3RX/326
K3SGE/334
N3UN/322
W3ACE/325
WA3IKK/336
K4HJE/336
K4JC/343
K4MEZ/330
K4PI/323
K4XG/332
K4XH/332
W4AVY/338
W4FRU/317
W4VQ/330
W4WMQ/324
WA4VDE/322
WB4LFM/327
K5GH/331

VK4QM/349
XE1J/329
YV5ANF/345
ZS6BBP/337
4Z4DX/322
K1JO/330
K1NJE/332
W1AX/347
W1DNZ/330
W1IJB/320
W1NG/327
W1TRC/324
WA1URV/319
K2GPL/329
K2HWE/320
K2JLA/322
K2UFM/329
N2SS/333
W2GKZ/341
W2SY/331
WA2JUN/319
WA2VUY/319
KB3PJ/328
WA3GCE/324
AA4AR/320
K4HEF/359
K4SE/321
KB4FQ/319
N4AVB/319
N4AXR/320
N4JA/325
N4JA/329
N4KE/327
NE4R/322
W4ELB/332
W4NYN/343
K5FJ/348
NY5F/347
W5AYZ/323
W5RRK/334
K6PU/332
K6RF/339
N6AHV/318
N6ET/332
W6BCQ/331
W6HFL/345
W6ORD/320
W6RGG/338
WX6M/319
K7ABV/322
K7OXB/325
W7DQM/336
W7EPA/341
W7JYZ/348
W7YR/323
K8BTH/319
K8SQE/327
W8BE/325
WB8FIW/319
WB8VPA/319
K9RO/319
W9SW/338
W9CZI/320
W9DMH/322
W9DNE/335
W9HPS/342
W9LA/335
W9RY/326
AJ0X/336
K0SE/316
W0GAA/343
W0IZ/321
W0QGI/346
W0SR/325
WB0NHD/320

314

CE3GN/323
DJ2TI/323
DJ2YL/333
DJ4PT/331
DK3HL/324
DK3SF/323
DL7NB/323
DL9DY/334
EA1OF/319
EA4LH/333
FE2WU/314
F6CYV/318
G4DYO/320
G5APA/331
GI3IVJ/351
HB9RG/321
HK3DDD/320
HK0HEU/316
I1GEA/329
I2PHN/332
I2PKF/318
IV3YRN/318
I4WZK/320
I5PAC/335
I8ACB/321
JA1EOD/333
JA1OCA/330
JE1MGE/323
JA2IVY/320
JA2JYP/317
JA2THS/318
JA3GM/324
JA3NTE/323
JA5IU/325
JA6BEE/330
JA7BJS/322
JA7ZF/326
JR7TEQ/320
KV4FZ/331
LA8LF/340
ON5FU/322
ON5HU/321
OZ3WK/327
PT7WA/322
PY5EG/320
VE3HD/339
VE3IPR/318
VE3MRS/319
VE4AS/326
VE7WJ/325
YO3JU/334
YV5ANQ/338
ZL1AMO/318
ZS6YO/347
6W1DY/332
9H4G/326
9Y4VU/324
K1UO/321
W1DO/333
W1VKQ/320
W1WXZ/321
K2AGJ/326
K2ENT/318
K2SGH/320
K2UU/327
KB2HZ/315
W2GBC/337
W2GLF/352
W2XN/349
WA2IZN/319
WB2P/318
K3UA/321
N3US/320
W3FWD/344
AA4V/327
AA4VK/320
AA4XT/324
K4CXY/321
K4EGI/330
K4RIG/318
KO4DY/315
KD4S/319
KQ4O/318
N4CRU/316
N4ZC/332
NE4A/322
W4BBL/335
W4OM/354
W4QAW/333
WA4CXZ/322
WB4RFZ/319
KC5M/316
N5FW/319
N5UD/325
ND5N/317
W5HE/337
W5MQ/332
W5VT/327
K6EXO/338
K6OJO/329
K6XJ/328
N6AR/337
N6AW/331
N6CR/322
NS6C/324
W6DN/318
W6PT/343
W6SN/319
W6VZZ/318
WA6SLO/314
N7US/325
W7BKR/325
W7OEV/333
W7OM/332
WA7KNK/321
K8DB/316
KB8MR/317
N8ATR/316
W8KKF/319
W8RT/345
WD8PKF/318
K9DXO/325
K9FN/326
K9FYZ/323
K9MGF/315
K9SM/337
K9VAL/319
KS9Z/318
W9DH/336
W9NGA/325
WA9EKA/319
WB9NOV/318
K0CD/331
K0IUC/323
K0WWX/331
W0CD/330

CW

319

DJ2BW/325
DL6EN/325
JA1ELY/325
JA3FYC/324
JA8EAT/324
ON5NT/324
K2TOC/323
K3FN/324
K4PI/325
W9KNI/327

318

DL1PM/322
I2KMG/319
OK3JW/322
SM0AJU/324
W2FP/323
K4XO/322
K5UR/324
WA6TLA/323
K8MFO/323
K9MM/324
K9QVB/322
N0RR/323

317

W9ZM/322
DL8AN/322
JA1BK/321
JH3CXL/321
OZ7BW/322
PY2TM/321
SM3EVR/323
K1MEM/321
K2UO/321
N4RJ/323
K5VT/322
K6GA/324
K8WW/321
K9AJ/322
W9DWQ/322
W9XX/321

316

F3AT/321
JA6BSM/322
PY7ZZ/318
W3AP/320
W4VQ/321
N5JR/320
WB6RSE/320
NS7J/318
K8DYZ/319
K8ZH/320
W8UVZ/320

315

JA1BWA/321
JA1IFP/319
JA3BQE/321
TG9NX/318
K1MM/319
W1JR/319
N2KW/319
K3UA/319
K5KLA/320
W5ZPA/318
W8AH/321

314

G3KMA/318
JA1GTF/320
JR1FYS/318
JA3GM/318
JA3MNP/318
JA8JL/319
OZ1LO/320
OZ3Y/319
PY5WD/319
SM5AKT/318
VE3CKF/318
W1FZ/318
AA4KT/318
N4VZ/318
N4WW/322
W6TC/320
W8RT/320
W9KQD/317
W9ZM/319
W0BW/318

313

EA4MY/318
I5XIM/317
JA1FNA/316
JA1UQP/318
JF1PJK/320
JH1IFS/316
JA3DY/318
OK1MP/316
SM6CST/317
W1GU/317
W2MIG/317
W2NC/318
N4KG/316
K5AQ/316
K6JG/318
W7LR/319
W8RSW/318
K9AB/318

312

DJ1XP/315
JA3CBZ/315
LA8CJ/315
PY2ELV/317
W1NG/316
W2LXZ/317
W2SM/315
W2YY/315
K4CEB/315
K4SE/316
KE4I/317
K5KR/315
W6PT/319
WB6ZUC/316
K8LJG/316
K8NW/318
K9IW/315
W9ZR/316
W0SR/317

311

DL9YX/314
JA1JWP/315
JE1JKL/316
JR1EBE/316
LA3XI/314
SM5DQC/311
SM6CVX/316
K1RH/314
AA4AR/313
N4MM/315
K5YY/314
K6CBL/316
K6LM/313
N6JV/315
W6GO/314
W7IUV/315
W0IZ/315
W0YK/314

310

OK1TA/315
SM5BHW/316
SM6DYK/313
AA1K/314
W1DA/316
K4KUZ/314
N4RJ/316
N5FW/314
AA6AA/312
W6TFO/312
W8ZCQ/314
W9TY/314
WA9EKA/313

Strays

GB2 SCIENCE MUSEUM

The Science Museum in London, England, celebrated its Amateur Radio station's 35th anniversary in August. The idea of a ham station at the Science Museum arose from a discussion between the late G. R. M. Garrat, G5CS, deputy keeper of the Department of Electrical Engineering and Communications, and the Radio Society of Great Britain (RSGB). The station was licensed with the special call sign GB2SM and went on the air in 1955 with a Pye transmitter, Eddystone Radio 680X and BRT 400 receivers and a trap dipole from KW Electronics, typical of many British ham stations of the day.

Today, GB2SM boasts a Rockwell Collins KWM 380 transceiver, 30L-1 linear amplifier, 312B-5 control unit, a Yaesu oscilloscope/monitor, Yaesu FT-980 HF transceiver (RTTY and SSTV on 10-40 meters), Yaesu FT-726 VHF/UHF transceiver for 6, 10 and 70 cm terrestrial and satellite operation, Hy-Gain TH6DXX triband Yagi, a two-element triband beam, dipoles for 30, 40 and 80 meters, a trap dipole, a multiband vertical, a 14-element Yagi for 2 meters and a collinear antenna for 70 cm. The antennas are mounted on the Museum roof, about 120 feet above street level.

There are also receivers for demonstrations of commercial radio, satellite and television operation including continuous weather information via Meteosat.

Guest operators join the Museum staff and volunteers to go on the air from three operating positions. Because the Museum attracts many nonham visitors, most QSOs are conducted on SSB with English-speaking stations, with the audio amplified through a speaker system for the visitors to hear demonstrations of Amateur Radio. In 1989, the station was visited by more than 190 hams from 30 nations. The station solicits contacts with the eastern US around 1200Z and the western US around 1630Z. All QSL cards received are answered via the bureau. GB2SM has achieved DXCC, WAS, WAZ and EDXC.

If you hear GS2SM calling CQ Stateside, give them an answer and help showcase ham radio for the benefit of interested museum-goers across the Atlantic.—*George Benbow, G3HB, Middlesex, England*

GB2SM's original chief operator Geoff Voller, G3JUL, of the British Science Museum staff, who retired in January 1990. *(photo courtesy of the Science Museum)*

The World Above 50 MHz

Conducted by Bill Tynan, W3XO*

A Computerized VHF Data Base?

Having just finished the not-so-trivial task of going through a large stack of 6-meter DX updates, I am reminded of an idea offered some months ago by WA6MXI. Al suggested the possibility of setting up a computer data base, accessible by telephone, to enable people to directly update their standings for the 6-meter DX and the other Standings Boxes. He offered to set the system up and run it, for a while, at least. There are a number of questions which must be answered before making such a move. First: How many of those who participate in the Boxes have computers and modems to make their own entries, and how best to handle those who are not so equipped? Second: How can it be assured that the entries are valid? The reason I insist that 6-meter DX updates include a complete list, showing one station for each country claimed—along with the date of each contact; is that some still claim countries that do not allow 6-meter operation and a few are not familiar with *The ARRL DXCC Countries List*. The most recent example of credit being claimed for contacts with countries not permitting 6-meter operation involves the Canary Islands, one which most of us thought was okay. However, the DXCC desk at Headquarters is currently not accepting 6-meter DXCC credit for any Spanish stations, including EA8. A lot of my time this go-around was spent in deleting credit for EA8 contacts previously counted. Many include contacts with countries which, until recently, have not allowed 6-meter operation. Germany is the one that shows up most frequently. Contacts must have taken place after 6-meter authorization was granted. As examples of lack of familiarity with *The ARRL DXCC Countries List*, some have listed Saba separate from Dutch St Maarten. A few have counted places like Newfoundland, Labrador, the Yukon and even Nova Scotia and Prince Edward Island as countries separate from Canada[1]. Some few have included in their totals countries worked crossband, along with their 6-meter two-ways. Is it any wonder that I can't accept submissions consisting only of statements like "I have XX countries worked with YY confirmed" and present a list that's meaningful? With everyone making their own updates, how can errors such as these be corrected?

For Boxes covering the other bands as well as the EME Annals, computer updating would be somewhat more straightforward now that I no longer request lists of stations worked for each state, etc.

Despite these concerns, WA6MXI's suggestion is intriguing. It would make it easier for those with the proper terminal equipment to update their standings. The data could also be available to anyone wishing to call in. Thus, they could see the latest standings without waiting for the appropriate column to come out. This seems even more important now that each Box is being presented only once per year. Nevertheless, is computer updating of the boxes a practical approach? I would very much like to hear your views on the matter.

[1]A copy of the latest *ARRL DXCC Countries List* is available from Headquarters for $1. The *List* (although not as updated) can also be found in *The ARRL Operating Manual*.

ON THE BANDS

As this is being written in early September, the 6-meter band is beginning to show signs of life and the 28.885-MHz liaison frequency is starting to become useful again—all signs of the approaching fall. September got off to an early start for a few observant 6-meter operators in the Southwest. One of these, who seems to miss few openings, is W5OZI, Junction, Texas, about 100 miles northwest of San Antonio. Pat reports a contact with PP5WL in Brazil at 0122Z September 1—a new country, and one not easily worked from this area. This was followed by QSOs with LU9AEA at 0127Z, LU8BF at 0134Z, LU6DAT, at 0153Z, XE2HWB at 0155Z, LU2DEK at 0211Z, CE3BFZ at 0242Z and OA8ABT at 0245Z. W5OZI notes that this opening came almost a year to the day after a similar session in 1989. That one took place August 29. The fact that a Mexican station was heard at the same time suggests the involvement of an E_S/TEP link-up. Several West Coast stations also report working South American stations that evening, including N6DX, who came up with OA8ABT at 0306Z and CE3BFZ at 0311Z; and AA6TT, who snagged a new country by working CE3BFZ.

TE openings began for CE3BFZ a few evenings earlier. Pedro writes that he had propagation beginning at 0130Z August 28—with PJ9EE and PJ2BR both audible. A marginal mid-afternoon opening occurred September 6 when LU1VK reported hearing the WB4OSN beacon. The 6th was more productive for others. N16E/KH6 QSOed some 200 Japanese stations beginning about 0010Z, and LU7DZ is reported to have worked TU2EJ about 2200Z. On Saturday, September 8, 9L1US reported working 14 European stations around 1720Z. Things are beginning to happen!

WZ8D reports on his Gridexpedition to various Canadian grids. His 500 W to a 3-element beam helped John complete some 850 QSOs, most of which resulted in new grids for those on the other end. He commented that it almost seemed that he heard WA5UUD "all the time." Other prominent stations included N4MM, for whom he provided 5 new grids, WD5K 7, AA5AM 7, W5OZI 7 and W5FF 6. Best success was from EO60, where he had 250 QSOs. EN69 netted 200 plus and EN70 about 200. Not bad for a family vacation!

K6QXY reports that N6AMG, N4LTA and he have pooled resources and sent a beacon to FO5DR. Currently on 50.050 MHz, it signs "VVV DE FO5DR/B" three times, then sends the grid, BH52. Power output is 50 W; several Yagis are used.

Reports on the Perseids meteor shower have been varied to say the least. Many have termed it "below normal." W5AL, Amarillo, Texas, however, reports success, and on 1¼ meters at that! Len completed 220-MHz contacts with VE5LY, DN70; NN9K, EN41, Illinois; WBØTEM, EN12, Iowa; W7RV, DM43, Arizona; KØTLM, EM29, Missouri; and K5UR, EM35, Arkansas. Len comments that his 1¼-meter grid total got another boost when K5IS traveled through the Texas Panhandle, activating grids as he went. Jerome's Microwave Modules transverter, Mirage amplifier and 13-element Yagi provided contacts in DM 96, 95, 94, 93, 83, 82, 81 and 82. W5AL has also joined the not-so-exclusive club of single-Yagi stations who have worked W5UN off the moon on 2 meters.

Another who gives this year's Perseids good marks is WA9O. Jerry and K9VGE took the "mobile" station, pictured on page 11 of September *QST*, to Cooper Harbor, Michigan (population 40), in EN67. Using 3.818 MHz to set up skeds (while not telling anyone in advance that they were mobile), they managed to complete 15 out of 21 skeds, even though it turned out that some attempts were not at optimum times. K5UR was worked in 55 seconds and N1BUG in 90 seconds. WA1OUB, New Hampshire, and K1LL/Ø, South Dakota, were worked on randoms with the beam pointed south. The junket was finished off with a few tropo contacts in northern Illinois on 2 meters and 70 cm, as well as a 23-cm QSO with WD9EGE, Green Bay, Wisconsin.

*Mail reports to Bill Tynan, W3XO, at HCR 5 Box 574-334, Tierra Linda Ranch, Kerrville, TX 78028, or phone 512-257-1296 to make a voice recording regarding late-breaking information or to send a fax.

50-MHz DX Standings

(see next page)

DXCC countries are based on information received as of September 8, 1990. Space limitations dictate that continental US and lower-tier Canadian stations with fewer than 15 countries, and others with fewer than 10 countries not be listed. Those not submitting a report within the past two years have been dropped from the list. They will be reinstated upon presentation of a written statement of their continued activity on the band. It is not necessary to work new countries to be reinstated.

Countries are those listed in the latest *ARRL DXCC Countries List*, but deleted countries worked prior to their deletion have been counted. Credit has not been granted for contacts with stations known not to have been authorized 6-meter operation at the time of the contact. Unless noted, totals are those worked by individual or club stations operating from a single location or multiple locations within a radius of 150 miles. See page 77 of March 1990 *QST* for publication schedules and submission dates for this and other Boxes.

Reports need not be on the special forms, but their use is helpful. They are available for an SASE to the column address. Whether reports use the forms, they must state each country, one station worked in that country, an indication as to whether the contact was two-way on 6 meters or crossband, the date of the contact and whether the contact has been confirmed by receipt of a QSL card. The first column shows the total countries claimed while the second lists those confirmed.

K5FF*(1)	114	114	WA1AYS	76	65	AE3T*	64	61	K9APW*	50	49	K6BEM	36	38	ZL3TY	25	12
W5FF*(2)	114	113	WA8LXJ*	76	65	W1AIM*	64	61	W3BWU	50	49	W4OWJ*	36	36	VK9LF[1]	25	—
JA4MBM*(4)	113	112	CX8BE*	76	57	WB4WTC*	63	60	ZS6WB	50	49	N1DJB	36	33	VK6RO	24	24
VE1YX*(3)	109	108	JA5TEW*	75	74	OH2TI*	63	49	K5LZO	50	45	AA2U	36	29	VK2EEC	24	21
W2CAP/1*	104	104	KA1A	74	74	K5ZMS*	62	61	K6JZK	49	49	WB8PAT*	35	35	5W1KT	24	—
K1TOL*	104	102	WA6PEV*	74	74	WB7OHF*	62	61	WA5LIG/6#	49	48	K8TGC	35	31	VK2KAY	23	21
LU3EX*	104	101	WB4RUA*	74	73	K6KLY	62	60	XE1GE	49	48	WA2FUZ	35	31	KK6C	23	17
K8WKZ*	103	102	JK1PEC*	74	72	KØTLM*	62	57	K1FJM/4*	49	46	WB4SLM	35	16	VK3AWY	22	22
W4CKD/8*#	103	100	K8GJX*	74	72	N6DX	62	49	WBØV*	49	46	YCØUVO	34	27	VK5LP	22	21
K5CM*	101	98	W2MPK*	74	72	9Y4VU	62	46	JF3QJR*	49	45	VP2MJ	34	26	K8EID	21	20
W3XO/5*#	101	96	KA1PE*	74	70	KA1CDZ	61	54	JA2TTO	48	48	K6PHE	33	33	VK2BNN	21	20
KH6IAA*	97	97	G4AHN*	74	64	TI2KD	61	51	K1SF	48	42	N9BJG	33	33	VK3AUI	21	17
WA1OUB	97	94	NI6E/KH6*	74	57	AA5AM*	60	56	WA8LLY/6	47	47	KI6BU	33	32	VK9XT	21	17
JA1VOK*	96	95	KN5S*	73	72	VK2QF	60	56	WD4FAB	47	47	N1ETT	33	31	WØDFK	21	14
W4OO*	96	95	GØJHC*	73	66	W3ZZ*	60	53	N7DB	47	42	N4VA#	33	27	VE6CX	20	20
N5KW*	96	93	W6BJJ*	72	71	K1LPS	60	46	KM5X*	47	6	VK4ZJB	32	32	VK4ALM	20	20
WW8M*	93	93	LU3DCA*	72	68	WB4MLE	59	58	WB5QBV*	46	45	KB1WW	32	23	K9LCR	20	19
N4EJW*#	93	84	ZD8TC*	71	71	VE3KKL	59	51	W5NZS*	46	43	WBØRJR*	32	23	VK7JG	20	18
W3JO*	92	92	K4KUZ*	71	70	VK2BA	58	55	W9JUV*	46	43	VE3EVW	32	22	VK4TL	19	19
K4CKS*	92	89	KS2T	71	68	W2RTW	58	55	KB6SL/CE3*	46	37	NA4I	32	21	GJ3RAX	19	—
W2IDZ*#	90	90	N6CA*	71	67	ZL2KT	58	54	WA1VRH	45	45	KØCS*	31	31	VK4ZAL	18	18
WA4OWC*	90	90	N4MM*	71	66	K1ICM*	57	57	GØIMG*	45	43	W7KNT	31	31	VK8HK	18	12
WA6BYA*	90	90	K2YOF	70	68	ZL1MQ	57	56	K2QWD*	45	41	WL7AZB/4	31	30	VK9LG	18	—
HC2FG*	90	83	W3EPJ/1	70	63	LU7DZ*	57	55	GM3WOJ	45	21	HK4EB	31	29	VK3AMK	17	17
W3WFM*	89	89	VK3OT	70	61	N9CEX*	57	54	WB8TGY*	44	52	W7JF*	31	—	VK3NM	17	16
WA5IYX*	86	69	W2CNS*	70	56	WA5HNK*	57	52	W1GXT	44	38	VK2BA	30	30	KL7IKV	17	13
K1GPJ*	87	85	K1EM*	69	63	K7ICW*	57	50	LU9MA*	44	28	GØING	30	28	VK2ZRU	16	15
W3IWU*#	86	84	K5GE*	68	67	ZD8MB*	57	47	ZL2ACI	44	21	VE3LNX	30	27	VK4ZSH	16	15
K2QIE*	86	82	WD5K*	68	65	W1DGA/3	57	25	WB4WXE	43	43	KU2A	30	24	FP/KA3B	15	15
WA2BPE*	85	83	W5HUQ/4*#	68	64	WA5UFH*	56	53	VE3DSS*	43	37	G4GLT	30	21	T20AA	15	15
WB4OSN*	85	82	W3OTC*	68	63	KA1DHO	56	51	VK8GB	42	42	VK2GF	29	27	W3TFA	15	15
K3QMX*	84	82	N6AMG*	68	51	WØJRP*	55	53	WA8RCN*	42	41	KH6JJK	29	20	WB4YLR	15	14
WB2WSV*	84	79	K1HTV/3	68	50	CE3BFZ*	55	48	KH6FLD	42	35	WAØGOZ	28	21	CO2KK	15	—
JA3EGE*	83	83	N5DDB*	67	67	LU8MBL*	55	48	KA9MGR*	42	31	NØAJU	28	18	VK9YT	14	12
PA0ERA*	83	81	WA2OCE	67	67	G4UPS	55	43	KG4SM	42	28	W6YLZ	28	—	VK3ZZX	13	12
W8CMS*	83	79	WA7EPU/5*#	67	67	NZ1D	55	40	W7HAH*	41	39	VK2VC	27	27	VK8ZLX	13	10
VE3ASO*	83	78	WB8YFE*	67	66	K4GOK	54	53	WB7SLY*	41	38	WA5OLT*	27	25	N6AMG/KH8	11	—
K6QXY*	82	81	W5OZI*	67	64	KB4CRT	54	52	N6VI	41	36	VK3AUI	27	19	VK4KHZ	10	10
W1JR*	82	80	N5JHV*	67	59	N4TL	53	50	ZS6BMS	40	40	KDØHE*	27	—	VK6OX	10	10
WB2CZB*	82	79	WA5JCN*	66	63	WB6BMB*	53	50	N4VC	40	38	VK2DDG	26	25			
WB8IGY*	81	81	JA2DDN*	65	65	K3ICH/4	53	45	VE5LY	40	35	WB6AAG	26	25			
N3AHI/4*#	78	75	JE1TGN*	65	64	K5UR	53	43	KØCJ*	40	30	N5EPA	26	24			
JA1RJU*	77	76	K8UNV*	65	63	K1SC/7*	53	41	KA6ING	39	39	VK3XQ	26	24			
NØLL*	77	75	KØUS*	65	57	WQ5S*	52	49	N4LTA	39	39	W7IDZ	26	24			
VE1BNN	77	74	CT1LN*	65	34	W1EJ*	51	50	V29OA*	39	39	J52US	26	20			
W5VY*	76	72	WA3DMF	64	63	K2OVS	50	49	ZL3ADT	39	37	AA6TT	26	18			
W4WHK	76	68	WA4UAS*	64	63	K4QXX	50	49	KY5N*	39	36	N8HNS	25	25			
									WA5QCP*	39	34	W9NAW	25	20			
									WA5VJB	38	35						
									ZP6XDW*	38	—						
									W8TN	37	31						

* = 6-meter two-ways claimed with all continents.
\# = Some contacts made from locations more than 150 miles apart.
(1-4) = Numbers show 6-Meter DXCC Award numbers.

[1]Combined effort of VK9LF, VK9LG and VK9ZLX

FM/RPT

Conducted By Brian Battles, WA1YUA
QST Copy Editor

CTCSS Debate

The comments in the FM/RPT column in September 1990 *QST* on CTCSS caught my eye. As of September 2, I've been operating FM mobile for 28 years. I've seen repeater systems come and go, from single-tone "whistle" systems (when all repeaters were on 146.76 or 146.94 MHz) to the elaborate multiple-voting receivers of today. I've installed amateur and commercial systems.

How do you lock a system with subaudible tone and still allow universal access? Two possibilities come to mind:

1) Because the output of a repeater tone detector keys the transmitter rather than unmuting audio, install a DTMF decoder that would enable the repeater for an autopatch call when a particular sequence is received. I suggest 9-1-1 or *-9-1-1 (many systems use *-9-1 to access the emergency autodial). Upon receipt of this sequence, the repeater could connect the caller to an emergency operator and enable the repeater for the duration of the call. This approach has the advantage of allowing the amateur without CTCSS to have emergency access to the system.

2) Install a dual-CTCSS decoder similar to those used in shared-repeater systems. The second subaudible tone would be one universally accepted for emergency access (I suggest 100.0 Hz [PL 1Z] as it's easy to remember).

I agree 100% with Williams on his remarks regarding "PL." It would be less confusing to use the generic "CTCSS."

I can see the reasoning behind the 28-MHz regional tone plan; I don't think such a plan is applicable to 144 MHz because propagation and repeater density are different—50 MHz, maybe.—*Joe Heumpheus, K6DXW, Santa Barbara, California*

In the September 1990 FM/RPT column, Dave Williams, N3FNW, mentioned the use of subaudible tone on the output of a repeater (W3EAG, 146.835 MHz in Eagleville, Pennsylvania). He stated that in times of band openings, a repeater broadcasting tone could be set to be the only one to be received by the operator. This is not a good idea.

A repeater user could be oblivious to QRM he may be causing. As he doesn't hear the other repeaters that may be in range, he has no reason to suspect he's running too much power, using too much antenna or that his activity may be more effectively conducted on a repeater closer to him.

By being able to hear everything happening on a frequency, the operator knows the effects his operation is having on other stations. Remove the tone-squelch CTCSS from repeaters!—*Steve Wolf, NO8M, North Olmstead, Ohio*

To reduce the potential problem Wolf mentions, whether using a CTCSS-encoded system or not, all operators should always use the minimum power required to maintain communications, as stated in FCC Rules Part 97.313(a), and *always* listen before transmitting on any frequency. Another way to reduce interference and allow emergency access to a repeater is to conduct contacts via simplex whenever possible.—*WA1YUA*

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Editor

BIOEFFECTS CLARIFICATION

☐ I wish to correct an erroneous interpretation of my October 1989 article[1] on the possible bioeffects of electromagnetic radiation and Amateur Radio operators, which appeared in the "Happenings" column in September, 1990.

Firstly, Dr Samuel Milham's article[2], which was most directed at Amateur Radio operators, appeared in the press in 1988, not a decade ago.

Nowhere in my 1989 article did I say that "no conclusions could be drawn from the study because...the sample was small and many of the amateurs also had been employed in potentially high-risk occupations." What I did indicate was that his research, as well as other work in the field "...must be considered significant enough to support further research into both the epidemiology and the biologic mechanisms involved in these effects."

While most of the recent public concerns have swirled around the effects of 60 Hz, electromagnetic fields from tension power lines and home appliances, still less work has emerged with regard to the effect of EMFs in the Amateur Radio frequency range. David Savitz's work in the 60 Hz areas has been well documented by other workers and is the basis for all the current interest in the lay press, including *The New Yorker* article by Paul Brodeur. Despite the lack of additional recent articles in the biologic literature about the specific biohazards of EMFs and Amateur Radio operators, to imply that Dr Milham's work should be of no concern to amateurs would be a gross misreading of the intent of my article.

The ARRL Bioeffects Committee has been engaged in a project designed to define the extent to which amateurs are subjected to EMFs during actual radio transmissions, and hopes to be able to report some definitive information in the near future. In the meantime, amateurs are strongly urged to follow the guidelines discussed in my 1989 article designed to reduce one's potential exposure to electromagnetic fields.—*Ivan Shulman, WC2S, Chairman, ARRL Bioeffects Committee*

[1]Shulman, I., "Is Amateur Radio Hazardous to Our Health?" *QST*, Oct 1989, pp 31-33, 38.
[2]Milham, S. B., "Increased Mortality in Amateur Radio Operators Due to Lymphatic and Hematopoetic Malignancies," *Am J Epidemiol* 1988, 127:50-54.

ONE SMALL STEP FOR A HAM, A GIANT LEAP FOR HAMKIND

☐ I'd like to thank you for *QST*'s recent publicity concerning the award I was given at the 1990 Dayton HamVention® ("Outstanding Amateurs Honored at Dayton," *QST*, Aug '90, p 27). It's an honor to have my efforts recognized by such a prestigious organization, but I believe the media reports have been a bit incomplete.

The reports, in general, made it seem that Microsat was an N4HY enterprise. Nothing could be further from the truth. Although I played an important, possibly crucial, role in the development, many others contributed time, expertise and invaluable resources to the project.

The Microsats are a testament to *all* the contributors at AMSAT, TAPR, the ARRL Lab, BRAMSAT, AMSAT-LU, Weber State University and many others. The Dayton award was based on my contributions to many Amateur Radio projects, one of which is Microsat. If the award would have been for Microsat alone, I would have refused it.

I feel uniquely blessed to have played a part in all of my Amateur Radio endeavors and I share my award with those who have worked with me on them. I'm proud of what we've accomplished and the work in making the complete facilities of these satellites available to amateurs continues. Why don't you join us? See you on the birds!—*Bob McGwier, N4HY, East Windsor, New Jersey*

LET MY PEOPLE PHONE

☐ There is controversy these days over the use of phone patches by those of us, including missionaries and anthropologists, who live in Latin American countries. Some hams have come to the incorrect conclusion that third-party traffic is illegal, but this is no excuse for the rude, obnoxious and generally arrogant behavior I was subjected to this morning.

I came on 15-meter SSB seeking help with a "two-way" into the US. I intended to run third-party traffic for my wife, who had not talked with her mother since January. Right after a ham offered to help, another ham came on asking me challenging questions and refusing to identify. His behavior was a repudiation of everything I know of Amateur Radio. My wife was upset that she was not able to talk to her mother.

Someone might ask why my wife did not use a telephone. Sadly, much of the world does not have convenient, inexpensive phone service like that of North America and Western Europe. Here in the Peruvian jungle, we do have access to a telephone half a mile away over a dirt road. It is available for international calls from 8 PM to 7 AM, provided someone in the main office in the city remembers to throw the proper switch at 8 PM. Because there are few trunks to this area, it can take up to an hour and a half to get a free circuit. If we can get a connection into the US, we may or may not be able to hear the person on the other end. For this "service," we pay between $8 and $10 a minute, with a minimum charge of three minutes for even a wrong number or no answer. Given the constraints of our budget, for we are missionaries, the telephone is not practical for the "Hello, how are you doing?" type of conversation my wife wanted to make.

In the situation that happened to me, a reasonable interpretation of FCC Part 97 would show that I intended nothing illegal, but the actions of the self-appointed "judge" were grossly in violation of the law.—*Barry Hovey, N2FSG/OA8ACD, Pucallpa, Peru*

"CONFRONTATION" CONFRONTS THE ISSUE

☐ I thought Dave Sumner's editorial "Confrontation" (It Seems to Us..., *QST*, Sep '90, p 9) was the most common-sense approach to the 20-meter fiasco I've seen. His suggestion to simply let the interferers cut their own throats and not confront them is good advice to all hams. It's too bad every ham doesn't read *QST*!

We have all trusted "the system" for our entire ham careers. Let's hope FCC Chairman Alfred Sikes won't let us down. —*Robert C. Ragain, WB4ETT, Littleton, Colorado*

JUST SIGN HERE

☐ I've noted the plight of HB9XY and others concerning responses to QSL cards. QSLing is indeed a lost art. I am an avid county hunter and I send out reply cards filled out complete with return address and postage. All that's necessary is to verify, sign and drop the card in a mailbox. I have only about a 50% rate of return. I don't know why more aren't returned, because they're worthless to anyone but me.—*Orville Otis, K8IU, Royersford, Pennsylvania*

THE GIFT THAT KEEPS ON GIVING

☐ I recently sent a gift subscription of *QST* to my local public library. It's my small way of helping to spread the word about the hobby I love. Maybe my gift will offer someone a window into a vast and glorious place where a sense of mystery and worldwide brotherhood are not strange bedfellows.

Think seriously about sending a gift of *QST* and other ARRL publications to a local public or school library. Perhaps this could be the topic of discussion at your next club meeting...perhaps your club could donate. Eighty cents a week is such a small investment to offer our people the gift of a sense of wonder about radio.—*Lou Janicek, N2CYY, Ramsey, New Jersey*

Public Service

Conducted By Luck Hurder, KY1T
Deputy Manager, Field Services Department, ARRL

Texas Amateurs Get On-The-Job Training in Chemical Explosion and Fire

By Douglas Rowlett, WB5IRI

On Friday, June 8, at 11:15 AM, a massive explosion and fire ripped through a chemical plant in Pearland, Texas, injuring two workers and spewing flames and smoke that could be seen 25 miles away. After the initial explosion, the fireworks continued for hours as 55-gallon drums of highly flammable chemicals rocketed into the air like a macabre Fourth of July celebration.

Although the blast and fire damage was confined to the plant's premises, the ugly black cloud of chemical-laden smoke wasn't. It slowly drifted over nearby residential neighborhoods and Jamison Middle School, where summer classes were in session. Ray Blalock Jr, WB5PJH, Pearland's emergency management coordinator, recommended immediate evacuation of a two-square-mile area surrounding the burning plant.

Ironically, just two days earlier, at its regular monthly meeting, the Pearland ARC had decided to hold training drills and establish a local emergency net to ensure we were ready for the beginning of the Gulf Coast hurricane season. Thus, when Glendon Baker Jr, KB5DWJ, came up on the club's 147.22-MHz repeater with an announcement that a state of emergency had been declared in the city, it appeared to be an unscheduled drill. But it was the real thing and local amateurs were asked to report to the police station for some on-the-job training.

Thirteen amateurs provided their volunteer services. Some manned telephones in the Civil Defense offices as the city's switchboards became clogged with calls from anxious residents, soon replaced by reporters calling from across the country as word of the explosion spread. Other operators were dispatched to the scene of the fire and to the emergency evacuation center where they handled numerous pieces of third-party emergency traffic, including 38 phone patches through the club's 446.2-MHz repeater.

Why all the hoopla? Why were amateurs even involved? After all, this situation didn't involve the loss of ordinary communications channels. The reason is one that crops up often in cities across the US. Pearland police, fire, ambulance and public service radios were all in working order and put to good use, but the fire department couldn't talk to the police, the EMS personnel manning the ambulances couldn't talk to the city and... you get the picture. Each department had its own radios and frequencies and couldn't talk to each other when the need arose. The phone lines were jammed with incoming calls and none of the departments seemed ever to have heard of an autopatch before (the dialtone coming out of my hand-held opened some eyes!).

The emergency was declared over at 4:45 PM and the evacuation shelter ordered closed—the last and most welcome piece of traffic handled that day. "If we ever have

Public Service Advisory Committee Roster

Atlantic—Bob Josuweit, WA3PZO, 9 Derwen Dr, Havertown, PA 19083

Central—Rich Regent, K9GDF, 5003 S 26th St, Milwaukee, WI 53221

Dakota—Ray Munger, KA0ARP, 2172 Pequaywan Lake Rd, Duluth, MN 55803

Delta—Dale Temple, W5RXU, 1620 Tarrytown Rd, Little Rock, AR 72207

Great Lakes—David L. Kersten, N8AUH, 2197 McKinley Ave, Lakewood, OH 44107

Hudson—Ronald A. Barbera, KA2LAD, 21 Triangle Dr, Setouket, NY 11733

Midwest—Larry Staples, WØAIB, Chairman, 425 W 49 Terrace, Kansas City, MO 64112

New England—Warren Rothberg, WB1HBB, 35 Drew Rd, Derry, NH 03038

Northwestern—John White, K7RUN, PO Box 13274, Portland, OR 97213

Pacific—David B. Tyler, N6DRT, PO Box 6017, Albany, CA 94700

Roanoke—Charles Moeller, N4FVU, 116 Willow Winds Dr, Columbia, SC 29210

Rocky Mountain—Joe Knight, W5PDY, 10408 Snow Heights Blvd NE, Albuquerque, NM 87112

Southeastern—Joel Kandel, KI4T, PO Box 523042, Miami, FL 33152

Southwestern—Jerry Boyd, KG6LF, 3726 Bonita Canyon Rd, Bonita, CA 92002

West Gulf—Tom Anderson, WW5L, 901 Forest Glen Dr, Bedford, TX 76021

Board liaison—George Race, WB8BGY, 3865 Gibbs Rd, Albion, MI 49224

Staff liaison—Luck Hurder, KY1T, ARRL 225 Main St, Newington, CT 06111

Third-Party Traffic Clarification

NTS International Assistance and Traffic Net Manager Geri Sweeney, N4GHI, reminds us that some US amateurs continue to refuse *all* traffic going to countries with whom we do not share third-party traffic agreements.

In the FCC Rules, Section 97.115 clarifies this point for US amateurs by noting that "No station shall transmit messages for a third party to any station within the jurisdiction of any foreign government whose administration has not made such an arrangement." But there's more. "This prohibition does not apply to a message for any third party who is eligible to be a control operator of the station."

Check *The FCC Rule Book* for further info on third-party traffic.

Public Service Honor Roll Revision: Your Input Needed Now

It is important that the League recognize those who give freely their skills, time and equipment for the advancement of Amateur Radio through public service. The monthly publication in *QST* of the Public Service Honor Roll (PSHR) gives recognition to members who perform such service.

For about six months, the ARRL Public Service Advisory Committee (PSAC) has wrestled with the development of a new set of qualifications for listing in the PSHR. To many committee members, the name of the award means that those who participate in all forms of public service activities should be able to gain this recognition.

Please consider the following set of proposed rules and let me have your comments, or, if you wish, contact the PSAC member in your Division:

1) Checking into emergency, ARES, RACES or National Traffic System (NTS) traffic nets, one point each, max 60.

2) NCS on an emergency, ARES, RACES or NTS traffic net, three points each, max 24.

3) Performing assigned liaison between emergency, ARES, RACES and/or NTS nets, three points each, max 24.

4) Origination of a third-party NTS or health-and-welfare message, one point each, max 30.

5) End delivery of a third-party NTS or health-and-welfare message, one point each, max 30.

6) Taking an active part in public relations activities or providing support communications during a public service event, 10 points each, no max.

7) Serving as an ARRL Field Organization appointee or Section Manager, 10 points, max 10.

8) Providing a BBS that handles NTS traffic, 10 points.

Monthly qualifying total points, 70.

The Board of Directors has asked that, at its January meeting, the PSAC recommend a new set of rules. Please give us the benefit of your thoughts so we can develop a set of rules that will give new meaning to the award and encourage more hams to get involved.—*Larry Staples, WØAIB*

another disaster," said Barry Lastik, city parks director and manager of the shelter, holding the door open for relieved residents to return to their homes, "I want one of those hams by my side at all times!" I couldn't have said it better myself.

Field Organization Reports August 1990

ARRL Section Emergency Coordinator Reports

There are currently 33,191 ARES members accounted for in SEC records. The following sections reported this month: ALA, EPA, GA, IA, IN, KS, KY, LAX, ME, MI, MN, MO, NE, NH, NM, NV, OH, OR, RI, SD, SDG, SFL, UT, VA, WWA, WNY, WPA, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	93	75.00	317	866
TCC Central	88	94.60	396	396
TCC Pacific	107	86.29	321	633
Summary	288	85.29	1034	1695
Cycle Three				
TCC Eastern				
Cycle Four				
TCC Eastern				
TCC Central				
TCC Pacific	110	88.71	492	961
Summary				

TCC Roster

Eastern Area Cycle 2: KW1U Director. K1EIC W1FYR KT1Q KW1U WA2FJJ W2FR NN2H WB2MNA W2MTA N2XJ N3DRM N3EDM NR3Q KQ3T AA4AT W4FRR N4GHI K4MTX WB4PNY N4SS KA8CPS WT8L W8PMJ KA8WNO WB8YDZ W8YP KB9LT VE3ORN.

Eastern Area, Cycle 3 & 4: KN1K Director.

Central Area, Cycle 2: N0FBW Director. WA4JDH W5CTZ AE5I NS5M W5QFU KG5TL K5UPN VE5KZ KE5ZV W0FE N0FBW

Central Area, Cycle 4: K5GM Director.

Pacific Area, Cycle 2: ND5T, Director. W5JOV K6UYK WF6O KI6ZH W7AMM VE7EIL KF7R W7TGU W7IGC N0IA WA0YNP.

Pacific Area, Cycle 4: K0DJ Director.

National Traffic System

1RN Packet Nodes QTC 918

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	29	592	20.41	20.41	66.4	
CAN	31	531	17.12	540	100.0	
PAN*	62	635	7.25	663	92.4	
Region Nets						
1RN	62	303	4.89	394	93.0	100.0
2RN	59	229	3.88	353	92.2	100.0
3RN	31	89	2.87	308	92.7	93.1
4RN	62	362	5.83	280	75.0	96.5
5RN	62	714	11.52	456	89.0	100.0
6RN	62	167	2.69	279		100.0
7RN	59	232	3.90	301	80.9	100.0
8RN	62	268	4.32	294	95.1	100.0
9RN						100.0
TEN	62	451	7.27	306	89.9	100.0
TWN						96.5
ECN						
Cycle Three						
Area Net						
EAN	31	135	4.35	336	80.6	
Region Net						
1RN						96.7
2RN	30	78	2.60	234	96.0	87.1
3RN						83.3
4RN						70.1
8RN						100.0
ECN						
Cycle Four						
Area Nets						
EAN	31	800	25.81	1.122	98.6	
CAN	31	713	23.00	1.150	100.0	
PAN	30	563	18.32	.778	98.9	
Region Nets						
1RN						100.0
2RN	48	133	2.77	.342	74.8	100.0
3RN						100.0
4RN	62	315	5.08	306	96.7	100.0
5RN	62	426	6.90	474	87.0	100.0
6RN	62	277	4.47	578	95.9	98.3
7RN	62	256	4.13	561	82.3	100.0
8RN	51	244	4.78	331	78.0	100.0
9RN	62	203	3.27	350	96.0	
TEN	62	272	4.39	453	54.0	
TWN	61	176	2.88	257	78.4	91.9
ECN						
ARN	31	107	3.45	071		93.5

*PAN operates Cycles one and two.

ARRL Section Traffic Managers reporting: AL, AK, AR, AZ, CT, EPA, EMA, GA, IA, IL, IN, ME, MI, MN, NC, NFL, NH, NNJ, NTX, NV, OH, OK, OR, ORG, SC, SCV, SD, SDG, SFL, SNJ, STX, SV, TN, VA, VT, WV, WWA, WMA, WNY, WTX.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from HQ. This certificate is a one-time award, ie, it is not issued more than once.

527
W8AKF

188
N2JAW

161
KF5BL

151
WT0G

149
WA2SPL

145
W2MTA

138
WB2UVB

122
N4GHI
N4KFU

121
KK4M

120
W7LRB

117
W7VSE
KA1EXJ

115
K4IWW
KA2GJV

112
N1CPX

110
WA9VND

109
KJ3E

108
K4FQU
K9CNP
WA1TBY

107
KI4YV
WA4PFK
K4ZK
WB2ZJF

106
AA4AT
W4JLS

105
WA4JDH
W2QNL
W2RRX
KI6ZH

104
W4PIM

103
KA1GWE

102
W4QAT
N4EXQ
WA4EIC
KD8HB

101
WB8SYA
WT8J
W0OYH
K2YAI

100
N2XJ

99
KT1Q
WB4DVZ

98
N4XFX
W9DM
WB4WII

97
K1EIC

96
W4CKS
W7GHT
WF6O
WD5GKH
KA7AID
N5PGZ
W1PEX
N2EIA

95
WD4LOO
NY8W
W1WCG
KD2WP

KA1GEP

94
K0ERM
K1ABO

93
WA4QXT

92
WS7U
N5KQZ/T
N5NAV

91
WB4KSG
N4JTG
W5YQZ
W1ALE
KA2QOO

90
N0FOO

89
WB4MMD
KT9I
N4WFU
KB7LX

88
K4MTX
WB4ZTR
W2MTD
K0BXF

87
W3YVQ
NR9K

86
WB8FSV
WB9LT
W2DMM
WT0E
NM3K
WA2ERT

85
KA0VQN

84
K0PIZ
WB8R
W5CTZ
W7EJZ

82
WA0TFC
WB7WVD
KB5BNU

81
WB4IDB
N7BGW
W7LNE
ND2S

80
WX4J
W7LBK
W2MTD

79
WB8DPZ
WA2PAC
AC5Z

78
KD0NH
N4SSX
K4FFM
NJ3V

77
WD0GUF
KA2INE
K2VX
AA7CU
KA1IFC

76
KC3Y
KA4FZI
W4ANK
W5SHN

75
KC4GCK
K7OVK
KA4HHE

74
W4TZC
KJ4EK
KC4FL
WB5YDD
N3DRM
N5KCL
KC4BHX

73
AA4XF
K0PIZ
W4DWN
WB4WQL
W0PE
KT6A

72
K3RXK
N7MAL

KC5NG

71
KM4JD
KC2HJ

70
W4IBU
K8JDI
N7LJF
WD5ERG/T
KA7WFW
WA2UKX
WA2FJJ

69
KJ9J
K1UXB

68
WB2FTX
N5ILI

67
KC4QJM
K4BGZ
KD6KU
WA1JVV
N7LVK

66
WA3YLO
KC4MTW
KA2ZNZ/T
WB2OEV

65
K0OBE
N1DHT

64
N0CYR
KD0YL
WA8DHB
KA8CPS
WA4GYR
W6RE
NZ2T
WA1FNM

63
WB0ZNY
AB4EZ
N8FPN
N2DXP/T
WB2QIX
KB1AF

62
KA4RZZ

WA4RUE
KA0UEQ
KA1S
N8FWA

61
K3GHH
W9UMH
N6CRV
N8INP
K2PBP/1
KB4CYC/T
W5FZH
W1TC

60
WA4RNP
WB0WNJ
N4JAQ
KA2CQX/T
WB0ZNY
N2EVG/T
W2FR

57
N2JRS/T

56
KA1VAX/T

54
N1GZQ/T

51
KB2IWN/T

50
KA8TND/T

47
KA8YWV/T

45
KB2CEV/T
N6FWG/T

44
KC4MWT/T

43
KA6HJK/T

42
KC4JGC/T
KA1HPO/T
W1YOL/T

40
N8JRV/T
N5JUU/T

The following stations qualified for PSHR during the month of June, but were not listed in the appropriate column: K1EIC 74, KA1GWE 101, W1WCG 99, W1YOL/T 42, W7VSE 120.

Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

The Brass Pounders League Medallion is available to individual operators who achieve BPL and are listed in the BPL column for the third time. This medallion is a one-time-only award, ie, it is not issued more than once. It is not necessary that the three months involved be consecutive. Any three months will qualify an operator. Stations that qualify for the BPL medallion, upon written notification of the qualifying months to the ARRL Public Service Branch, will be awarded the call sign-engraved BPL medallion.

Call	Orig	Rcvd	Sent	Dlvd	Total
W8AKF	433	2902	3014	503	6852
W3CUL	803	834	1396	69	3120
W1PEX	1	385	1057	12	1455
W3VR	420	361	497	56	1334
WB0YNS	0	641	641	0	1282
K6UYK	332	409	373	13	1127
WB0WNJ	230	85	780	6	1101
W3IWI	29	447	449	0	925
WA2SPL	6	480	347	48	881
N2GTE	6	413	419	2	840
KA1IFC	0	358	460	13	831
W1UD	125	225	361	21	752
W1FYR	35	343	339	6	723
WA4JDH	1	319	382	4	706
N2JAW	108	229	247	104	688
K1UGM	0	310	310	0	620
W0LVI	29	333	0	253	615
WA3DFU	—	—	—	—	588
N5DST	204	84	210	79	577
W7TGU	55	230	285	3	573
K9DCX	29	295	0	225	549
N4QO	0	273	272	0	545
KJ3E	6	214	264	50	534
WA3TSW	—	—	—	—	530
NM1K	110	181	210	4	505
WB0TAX	13	242	242	7	504

BPL for 100 or more originations plus deliveries:

WD4IIO	120
KA1VED	118
W0FIR	105

The following stations qualified for BPL during the month of July, but were not listed in last month's issue: K6UYK 861, (Jun) 771, (May) 581, (Mar) 596, (Jun) K1EIC 540, NM1K 116, KA1VED 125.

Independent Nets

Net Name	Sess	Tfc	Check-ins
Bears of Manchester	31	351	410
Central Gulf Coast Hurricane Net	31	78	3042
Clearing House Net	31	312	264
Empire Slow Speed Net	31	139	362
Golden Bear Amateur Radio Net	31	65	1289
Great Lakes Emergency & Traffic Net	31	49	967
Hit and Bounce Net	31	195	637
IMRA	27	612	1594
Mission Trail Net	31	222	879
NYSPTEN	31	72	445
Southwest Traffic Net	31	244	1368
West Coast Slow Speed Net	31	67	388
20-Meter ISSB Net	27	1021	301
7290	50	374	3371
75-Meter ISSB Net	31	147	947

Packet Perspective

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716-2702
CompuServe ID no. 70645,247

Winter Packet Projects

The frost is on the modem, so now's the time to line up packet radio projects for the approaching winter. If you're like me, you already have plenty of winter projects (packet radio or otherwise) in the queue. If you are one of the "lucky" ones with nothing to do this winter, I'll gladly share with you two entries from my winter packet radio project "wish list." Perhaps you'll tackle one of them. It'll keep you busy, relieve cabin fever, make it a better packet radio world and shorten *my* things-to-do list.

Local Lingo Interface

Remember your first TNC and the documentation that came with it? Remember trying to figure out what commands to use when and where? Imagine yourself in a non-English-speaking country. Take Poland, for example. Say you live in downtown Krakow. PPS (Polska Parcel Service) has just delivered your first TNC; the one you purchased through your cousin in Chicago. You open the box, pull out the documentation and take a deep breath.

Hooking up the TNC to your radio and terminal is not difficult because the documentation explains how to do it using the universal language called "schematics." After you power up the TNC, a short message appears on the terminal followed by "cmd:" and you start to wonder what you've gotten yourself into this time.

If you live in Krakow, Rio, or Ho Chi Minh City, *"cmd:" is as incomprehensible* as using a terminal and TNC set at incompatible data rates, character lengths and/or parities. To solve this international dilemma, a user interface is needed that can translate the nonsense spurting forth from a TNC into the operator's native tongue. A Polish *operator using such an interface would see "życzenie:"* (or perhaps *"życ:"*) displayed on his or her terminal instead of "cmd:"

This interface would have to work in both directions, ie, besides displaying commands in the native tongue, it also would accept commands typed in the local lingo and translate them into "TNC-speak." As a result, when I type *"łączyć SP1LOU" at* my downtown Krakow terminal, the TNC knows I want to connect to SP1LOU.

To make things easier for the new packet radio operator, the terminal could display a menu of the more common commands in the local lingo instead of just the "cmd:/*życzenie:*" prompt. Once the operator became familiar with these commands, he or she could simply shut the menu feature off, if desired.

So, here is a winter software project for you. Pick a non-English-speaking country where packet radio is used (almost any country will do) and write a local lingo interface for the packeteers of that country. It might not be a bad idea to write a similar interface for English-speaking hams as well; one that will translate TNC-speak into plain English ("Your next command, please?").

Go Fetch My Mail

Here's another software project I've had on the back-burner for years:

I usually check into my local PBBS every other day to pick up and deposit my mail. The problem is that I try to do this at the same time everyone else is trying to do same thing... between 6 and 10 PM. As a result, it doesn't always get done. So, I wait until the next day, hoping to find a time slot that will allow me to connect with the PBBS successfully before my outgoing mail piles up and clogs my hard disk and my incoming mail piles up and clogs the PBBS's hard disk.

When I make a prime-time connection, the throughput is slow. I might as well be communicating with a 45-baud RTTY mailbox as a 1200-baud PBBS! The traffic on frequency is slowing down communications between my station and the PBBS, and the PBBS and I are slowing down communications for everyone else.

The solution is a computer program that will send and receive mail to and from the PBBS at any time the user desires (preferably during less busy hours, say 2 AM or 2 PM). You pick the time and the computer program does your bidding.

The problem with this solution is that the time you choose may not be the optimum time. What if the PBBS is busy at the time you select? Perhaps the program could be written to accept one or two alternate times. Then, if the first time doesn't work out, it will try again at the second time and third *time, etc. A more sophisticated solution* would be for the software to monitor the frequency and select the optimum time (when the channel and PBBS were not busy) to make the connection.

As long as we're getting sophisticated, I might as well tack on another feature that would make the program get a list of all the new messages on the PBBS and allow you to pick the ones you would like retrieved the next time the program connected to the PBBS.

Results

If you tackle any of these projects, let me know how successful you are and if you're willing to share the fruits of your labor.

RECOMMENDED READING

The 9th Computer Networking Conference, jointly sponsored by the ARRL and the CRRL, was held on September 22 in London, Ontario, Canada. During the conference, excellent papers were presented on various packet radio topics and, as in the past, these works have been collected into a book. *Proceedings of the 9th Computer Networking Conference* is available from ARRL HQ for $12 plus $3.50 for UPS shipping and handling.

These papers are written by the movers and shakers in digital Amateur Radio communications from around the world, and they know what they're talking about. Topics covered in this year's proceedings include PACSAT, RUDAK II (see Up Front in *QST*, p 11), voice systems, TCP/IP, high-speed operation, bulletin distribution techniques, networking, new protocols, digital radios, error correction and HF data communications. This is *the book* to read if you want to learn more about where packet radio is heading.

Strays

NEW BOOK TELLS THE W6AM STORY

Don C. Wallace, W6AM by Jan D. Perkins, N6AW, is a 350-page hardcover volume that describes the 75-year history of Amateur Radio as experienced by the colorful "old-timer," Don C. Wallace, W6AM. Wallace was on the air in 1911, before the first radio regulations. In 1919, he served as radio operator for US President Woodrow Wilson aboard the *USS George Washington* at the Versailles Peace Conference. Wallace was a winner of the Hoover Cup for best home-built amateur station, earned one of the first WAS certificates and was a charter member of WAC in 1926.

Wallace is perhaps best-remembered for his *piece de resistance*, when he acquired 120 acres atop Palos Verdes Peninsula in 1945 and installed 16 massive rhombic antennas in Rolling Hills—at that time, the largest, most powerful amateur station in the world. The W6AM antenna farm was built from 61 80-foot telephone poles, 90 25-foot feeder poles, 108 relays, 17 miles of antenna wire and 52 miles of no. 8 Copperweld™ feed line (see "The W6AM Rhombic Antenna Farm Dismantled," by Jan D. Perkins, N6AW, Dec 1988 *QST*, p 62).

By 1957, Wallace had reached the top of the ARRL DX Century Club Honor Roll, a spot he held for most of the last 28 years of his life, and was inducted into the *CQ* DX Hall of Fame and the Quarter-Century Wireless Association Hall of Fame. An exciting 75-year Amateur Radio career came to an end when W6AM became a Silent Key on May 25, 1985.

Don C. Wallace, W6AM, will be available around January. Contact Wallace & Wallace, 11823 Slauson Ave, Suite 38, Santa Fe Springs, CA 90670.

Coming Conventions

SOUTH TEXAS SECTION CONVENTION

November 9-11, 1990, Houston

The South Texas Section Convention is sponsored by Houston Ham Conventions Inc and will be held at the Sheraton Crown Hotel and Conference Center, 15700 John F. Kennedy Blvd, near Houston Intercontinental Airport. Registration hours: Friday 3 PM-8 PM, Saturday 8 AM-5 PM, Sunday 9 AM-12 PM. Exhibit Hall hours: Saturday 9 AM-5 PM, Sunday 9 AM to closing. Features include Friday night auction at 7:30 PM, commercial exhibits Saturday and Sunday, swap fest, seminars, VE exams. Admission: $5 in advance, $7 at the door. Talk-in: 147.68/08 and 222.66/224.26 MHz. Write to Com-Vention '90, PO Box 742183, Houston, TX 77274-2183.

1993 National Convention: Call for Applications

The ARRL is now accepting applications for the 1993 National Convention. Contact ARRL Headquarters for application forms and information.

The Board of Directors may consider applications for the 1993 Convention as early as the 1991 Annual Meeting, so applicants should send completed forms to ARRL HQ by December 31, 1990—*Bernice Dunn, KA1KXQ, ARRL Convention Program Manager*

ARRL NATIONAL CONVENTIONS
August 23-25, 1991—Saginaw, MI
August 20-23, 1992—Los Angeles

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

Attention Hamfest and Convention Sponsors

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You are encouraged to register your event with HQ as far in advance as your planning permits. Note that the hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ does not constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your Division Director. For conventions, approval must be made by your Director and, additionally, by the Executive Committee. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, tel 203-666-1541, ext 283.

Hamfest Calendar

Administered By Bernice Dunn, KA1KXQ
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.

(Abbreviations used in this column: *TI:* = talk-in, *Spr:* = Sponsor, *Adm:* = Admission)

†**Alabama (Montgomery)—Nov 24**; set up 6 AM, public 8 AM-3 PM. *Spr:* Montgomery ARC. Garrett Coliseum at the Southern Alabama State Fairgrounds, Federal Dr. Free parking, flea mkt, VE sess (code testing begins at 8 AM, written exams at 9 AM, bring copy of current license, picture ID & $2). *TI:* 146.24/84, call W4AP; ragchew 146.32/92 (with phone patch, ' up/# down), 147.78/18 & 444.50/449.50. *Adm:* free. Write to Hamfest Committee, c/o 2141 Edinburgh Dr, Montgomery, AL 36116, or call Phil, 205-272-7980 (after 5 PM CST).

Connecticut (North Haven)—Nov 11; sellers 7 AM, public 9-3. *Spr:* South-Central CT ARA, North Haven Parks & Rec Center, 7 Linsley St. *TI:* 146.01/61. *Adm:* $3. *Tables:* adv $15, door $20 (reservations for tables must be received with check by Nov 1, no reservations by phone). Send SASE to SCARA Flea Market, PO Box 81, North Haven, CT 06473, or call Brad at 203-265-6478, 7 PM-9 PM.

†**Florida (Ft Lauderdale)—Dec 1-2**; Sat 9-5, Sun 9-4. *Spr:* Broward ARC. Broward Community College N Campus, Omni Auditorium, 1000 Coconut Creek Blvd, ¼-mi W of the FL Tpke at Pompano Beach, Exit 24. Refreshments, forums, VE sess (Sat 9 AM), free parking. *TI:* 146.31/91, 444.825. *Adm:* adv $5, door $6. *Tables:* $20 each (electricity is $5 per vendor). Ticket & table info 305-584-7822; booth info 305-742-9661.

†**Florida (Tampa)—Nov 17-18**; Sat 9-5, Sun 9-2. *Spr:* Florida Gulf Coast Amateur Radio Council.

†ARRL Hamfest

Indiana (Ft Wayne)—Nov 17-18; set up Fri 5:30-9:30 PM, Sat 5-7 AM; public Sat 8-5, Sun 8-3. *Spr:* Allen County Amateur Radio & Tech Society. Allen County War Memorial Coliseum Expo Center. Commercial vendors, flea mkt, forums (ARRL, packet, IRCC, NiCds), VE sess. *TI:* 146.28/88 & 443.80/448.80. *Adm:* adv $5, door $5.50. *Tables:* $30 premium, $15 regular, power $25 extra (reserve in adv). SASE to ACRATS, PO Box 10342, Ft Wayne, IN 46851; for tickets & tables 219-693-3766 eves.

Massachusetts (Billerica)—Nov 17, 10 AM. *Spr:* Bull HN 1200 Radio Club & Waltham Amateur Radio Assn. Bull HN plant, 300 Concord Rd, Exit 27 off Rte 3. Radio & electronics auction, refreshments, free parking. *TI:* 147.72/12, 146.04/64. *Adm:* free. Mike Rioux, NW1J, 132 Killam Hill Rd, Boxford, MA 01921.

Massachusetts (Framingham)—Nov 10, 1 PM. *Spr:* New England DXCC. Intersection of Mass Tpke (I-290), Exit 12 & Rte 9 (Worcester Rd). Forums, speakers, DX quiz, ARRL update, QSL verification for DXCC, WAZ, dinner 6 PM ($23 only by reservation). *Adm:* adv $5, door $7. Joe Green, K2VUI, 8 Wedgewood Rd, Wellesley, MA 02181, 617-536-0020 days, 617-239-1370 eves.

Michigan (Hazel Park)—Dec 2, 8 AM-2 PM. *Spr:* Hazel Park ARC. Hazel Park High School, 23400 Hughes St. *Adm:* adv $2, door $3. Ticket & table reservations by mail, HPARC, PO Box 368, Hazel Park, MI 48030.

Minnesota (Faribault)—Dec 1, 9 AM. *Spr:* Courage Center Handi-Hams. Eagles Club. Handi-Ham equipment auction, refreshments, programs. *TI:* 146.19/79. Don Franz, WØFIT, 1114 Frank Ave, Albert Lea, MN 56007.

†**New Jersey (Wall Township)—Nov 11**; sellers 6 AM, public 8-3. *Sprs:* Garden State ARC, Jersey Shore ARC, Neptune ARC, Ocean-Monmouth ARC. Allaire Expo Ctr, Allaire Airport (formerly Monmouth Co Airport), Rt 34, ¼-mi N of I-195. VE sess, tailgating $8, ham radio & computer demos. *TI:* 144.51/145.11, 146.52, Fly-in freq: 123.0 UNICOM. *Adm:* adv $4, door $5, under 12 & spouses free. *Tables:* $20. Al Jackson, NK2O, PO Box 635, Eatontown, NJ 07724, 201-922-8121.

New York (Selden)—Nov 11; set up 6:30 AM, public 9-4. *Spr:* Radio Central ARC. Suffolk Community College, LI Expwy (495), Exit 62 N (Nicolls Rd), 1 mi to college entrance. Free parking, refreshments, dealers, forums, guest speakers, seminars, mfrs, demos, VE sess (walk-ins accepted, sign in at 9:30; bring license, copy of license, photo ID, $4.75). *TI:* WA2UEC/R 144.55/145.15 (PL/CTCSS 4Z), 444.525/449.525 (PL/CTCSS 2A). *Adm:* $5, under 13 free. *Tables:* $20, advance reg required by Nov 1 to RCARC, PO Box 680, Miller Place, NY 11764. John Mark, KB2QQ, 516-689-6336; Ron Katz, WB2DVK, 516-689-3279; or Jo Ann Colletti, N2IME, 516-399-1877.

†**North Carolina (Concord)—Nov 11**, 9-3. *Spr:* Cabarrus ARS. New National Guard Armory on NC Hwy 49 S. VE sess, flea mkt, new equipment dealers. *TI:* 146.055/655. *Adm:* no adv, door $4. William Hickok, 704-788-5370 days, 704-788-2873 eves.

North Carolina (Greensboro)—Nov 24-25; Sat 9-5, Sunday 9 AM-3 PM. *Spr:* Greater Greensboro Hamfest, National Guard Armory, Franklin Blvd. VE sess, forums, outside paved tailgate & flea mkt area for price of ticket plus $2, for unlimited space. *TI:* 146.16/146.76, 144.65/145.25. *Adm:* adv $4, door $5. *Tables:* (inside) $12 per 6-foot table, good both days. GGH, PO Box 8252, Greensboro, NC 27419-0252, 919-852-9244 except Wed, for exams: TEARC, Jim Williamson, NQ4T, 3504 Stonehurst Place, High Point, NC 27265, 919-841-7576.

Ohio (Massillon)—Nov 11; set up 7 AM, public 8-5 PM. *Spr:* Massillon ARC. Massillon K of C Hall on Cherry Rd (W from US Rte 21). Refreshments, free parking, auction (11 AM). *TI:* 147.78/18. *Adm:* adv $3.50, door $4. *Tables:* $7 per 8-foot space. MARC, PO Box 73, Massillon, OH 44648; SASE, please.

†**Pennsylvania (Washington)—Nov 18**, 8-3. *Spr:* Washington Amateur Communications Inc. ½-mi from Exit 8, I-79 at the Meadows on Racetrack Rd. VE sess, refreshments, parking. *TI:* 144.89/145.49 W3CYO/R, 146.52. *Adm:* $1. Kevin Smith, N3HKQ, 412-777-0715 days, 412-258-4153 eves, fax 412-777-0727.

Wisconsin (Milwaukee)—Nov 10; sellers 7 AM, public 8 AM-1 PM. *Spr:* Milwaukee Rptr Club. Serb Hall, 51st & Oklahoma Ave. VE sess. *TI:* 146.31/91 & 146.52. *Adm:* adv $3, door $4. *Tables:* adv $4, door $5. SASE to The Milwaukee Repeater Club, PO Box 2123, Milwaukee, WI 53201.

At the Foundation

Conducted By Mary E. Carcia, N7IAL
Secretary, The ARRL Foundation

Want Some Money for School?

There's a new ARRL Foundation-administered scholarship available. In the upcoming 1991-92 academic season you'll be able to apply for the $500 *Irving W. Cook, WAØCGS, Scholarship*. Founded by an active Kansas radio amateur concerned about education, it's geared to Kansas students/residents who attend school in Kansas or other states. We encourage application for as many scholarships as you feel qualified for, even if a particular scholarship lists a regional preference. You can get our free scholarship package by writing to The ARRL Foundation, 225 Main Street, Newington, CT 06111.

More to Be Thankful For

As we approach Thanksgiving, I'd like to express my gratitude to all the ARRL Members and others who have shown such tremendous support of our programs. Your letters and phone calls have told us that we're on the right track with our ever-growing scholarship program, the Victor C. Clark Youth Incentive Program and our large grants that support such projects as the Courage HANDI-HAM System Equipment Loan Program. You are what we are most thankful for. Have a safe and enjoyable holiday season!—*ARRL Foundation President Paul Grauer, WØFIR*

SUPPORT THE WARC FUND DRIVE

Foundation programs aren't the only ones you can support through your generous contributions. Amateur Radio preparations for the World Administrative Radio Conference (WARC), scheduled to begin in Spain in February of 1992, are funded by ARRL and its sister societies of the IARU. Allocations issues are important to every ham and deserve your attention and financial support. A commemorative certificate noting your WARC-92 support will be sent to you when you join thousands of brother and sister hams to help. Make your contribution to ARRL WARC Fund, ARRL, 225 Main Street, Newington, CT 06111.

Contributor's Corner

We thank the following for their generous contributions to:

The PhD Scholarship Fund
Michael Little, KBØFHL
Robert L. Richardson, KEØWF
Southwest Missouri ARC
Edward Lloyd Jones, GJ4TAF
Kenneth Kirk Bayley, GJØKKB

The Mississippi Scholarship Fund
Phil Sager, WB4FDT
  in memory of Jim Taylor, WA4JJF
William P. Gearhiser, W5EPW†
Andrew W. Bell Sr, KB5PB
Jim Akers, W5VZF
Malcolm P. Keown, W5XX
  in memory of L. L. Lamb, K5ZRO
The Magnolia Report (Mississippi)
Mississippi Traffic CW Net
Mississippi Slow CW Net

The Jesse Bieberman Meritorious Membership Program
Thomas J. McBride, WB1FIV
  in memory of Russell F. Hobart, W1AAR

The Victor C. Clark Youth Incentive Program Fund
Robert S. Elec, W3HKK
  in memory of Ralph J. D'Orio, K5GX
Elizabeth Youse, KD7VR
  in memory of Ernest S. Luce, N7EL
Virginia DX Century Club
  in memory of Gay Milius Jr, W4UG
Marianne Smith

The Edmond A. Metzger Scholarship Fund
Six-Meter Club of Chicago (Illinois)

The Goldwater Scholarship Fund
Six-Meter Club of Chicago (Illinois)

The General Fund
Lowell L. Lewis, N6IRM
  in memory of Kenneth E. Lewis, N6IRN
Reading Radio Club (Pennsylvania)
  in memory of Harold E. Schearer, W3MB
George S. Caldes Jr, N3EEO
Sigmund M. Hyman, N3DYW
Paul S. Vydareny, WB2VUK
Beulah G. Thorpe
Retired Officers Wives Society (Virginia)
  all above in memory of Gay Milius Jr, W4UG
Hampton Roads Retired Officers
  in memory of CDR Gay Milius, W4UG, USN, Retired
Texas ARES Net & Daytime Texas Traffic Net
  in memory of Bettye Jo Henning
Alan Lauter, WA2WLQ
  in memory of Clyde B. Tower, WA2MXB
Peter Gellert, W2WSS
  in memory of Lou Ella Blessum
William J. Weiss, KA2YOE
  in memory of George Nugent, W2VMW
Floyd W. Smith, N4VGY
  in memory of Ray Goode, W3SUA
Robert Aasen, KE0XT
  in memory of H. B. Burner, WØOEL
Hartford County ARA, Inc. (Connecticut)
  in memory of Frank A. Pearson, KA1AVY, and Roland L. Lalanne
Alex, N8BEL, and Elaine, N8CBE, Nickoloff
Jack, KA8BOG, and Margaret Clayton
Michael, N8JWE, and Lon Merritt
Kathy and Doug Cox
Shirley Diacono
Judy Ernst
Dean and Patricia Finchem
John Harris
Kendy and Karl Knipple
Kevin Knipple
Paul Kolenko
Lin & Karin Marsh
Gayle F. McClure
Julie Melito
Albert and Barbara Moll
Phyllis L. Stanken
Sally A. Wilkinson
Metropolitan Life-Kalamazoo (Michigan)
Metropolitan Life-New York City
Metropolitan Life-Traverse City (Michigan)
Metropolitan Life Employees (Michigan)
L'Anse Creuse ARC (Michigan)
  all above in memory of Virginia Schietecatte, N8EQA
Mr and Mrs William Hall
  in memory of Leona Peacor, W1YPH
Joanna Hopkins
Marie H. Goodwin
Mr and Mrs John W. Bates Jr
Dorothy K. Ervin
Mr and Mrs Robert R. Harrison Jr
  all above in memory of Dr James K. Hall Jr, W4BLX
Sharlene Richardson
  in memory of Ralph Cox, KA5PGE
Marijean W. Bradreau
  in memory of John E. Baxter
Robert A. Dixon, KA1MAT
Charles Levine, W1MOJ
Ernest M. Robinson, W1NDO
William E. Witinok, W1OFV
Steve Mussman, N2CVV
William J. McCarren, K2LV
Steve Mussman, N2CVV
Sidney Wolkins, WA2EEA
John A. Goetz, WA2FDK
Gabe Agardi, N2GJF
Patricia Vowell, KA2NOH
John M. Walch, KA2QLR
Chester E. Riker, W2QMK
Lewis E. Elicker Jr, W3ADE
Jerry R. Sullivan, KD3AF
Dan R. Matchette, WB3BVQ
Horst Gutweniger, KA3CWN
James R. Newham, WA3MIE
David R. Anderson, WA3WZX
John S. Ferguson, K3PFW
John E. Wilcox, NO3R
Gentry S. North Jr, WD4AOJ
Barry B. Chapman, W4IBI
Francisco Gutierrez, WP4IDW
Jack L. Tripp, KC4LHG
Archibald M. Colquhoun, N4LMW
Harry R. Mead, W4MRY
Wayne W. Cooper, AG4R
D. Charles Hofferber, N5FMU
Aladar Czerna, N5MQP
Tore R. Bellis, N5NFP
Joan Ash, WD6BNH
Richard L. Minton, WD6CJT
David White, WD6DRI
David Hartsman, WA6ENL
Aldo Bussi, W6FMK
Lawrence E. Small, K6GZM
John J. Neal, KA6LNO
Harvey De Boer, N6RIA
Gary E. Jones, KD6VV
Andrew G. Romanisky Jr, WA6WXD
Marvin M. Meek, W7RDJ
Carol Lee Smith, KF7SA
Phillip R. Gendreau, W7PFZ
Gary D. Burrows, WD8DHF
Ronald P. Coleman Sr, K8LHT
Seth Hirschfeld, N8LMB
Craig D. Corkery, N9FCP
Robert H. Bauman, W9NZM
Paul S. Warren, WA9ZDL
Gaylord W. Bennett, NØIJL
Robert A. Evans, KØIQR
Winston W. Kratz Jr, KBØKK
Dean A. Calkins, NØKXV
Dale D. Scott, KAØQPV
Dallas ARC (Texas)
Michel T. Grunardt, CE3JTH
Jorge Juan Deleua, LU4EHY
Wesley H. Church
Clayton DeCosterd
Marco A. Garcia, Jr
Ron Sidell

The Barbara Price Memorial Fund‡
Tom Frenaye, K1KI
Dave Sumner, K1ZZ
Stephen Mendelsohn, WA2DHF
Paul S. Vydareny, WB2VUK
Hugh A. Turnbull, W3ABC
Kay Craigie, KC3LM
John C. Kanode, N4MM
George S. Wilson III, W4OYI
Frank M. Butler Jr, W4RH
Joel M. Harrison, WB5IGF
Jim Haynie, WB5JBP
Chuck McConnell, W6DPD
Fried and Sandra Heyn, WA6WZO & WA6WZN
William J. Stevens, W6ZM
Rodney J. Stafford, KB6ZV
Allan Severson, AB8P
Edmond A. Metzger, W9PRN
Paul Grauer, WØFIR
Marshall Quiat, AGØX
Howard Mark, WØOZC

†Charter/Founder
‡Proposed

As received and acknowledged during the months of **July** and **August**.

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

K1BGI, Kenneth E. Dermon, Henniker, NH
W1BMW, Albert L. Chesbro, East Harwich, MA
K1GGG, Fred Tamm Flynn, Glenbrook, CT
W1GUI, Ellis G. Holden, Lancaster, MA
WA1JXL, Herbert E. Backus, Bridgeport, CT
W1KCL, Alwyn L. Carter, Falmouth, MA
KA1LLH, David L. Stewart, Stamford, CT
W1NDO, Ernie Robinson, Norwalk, CT
W1NWG, Charles E. Hayward, Westford, MA
KA1UWF, Hugo Zimmer, Niantic, CT
*K1VJH, William A. Quigley, Greenwich, CT
K2BTX, Paul R. Patterson, Albany, NY
N2BUY, Richard L. Dunklee, Cherry Hill, NJ
WA2CKG, Harrison L. Barclay Jr, Elma, NY
W2DW, Joseph A. Johnson, Claverack, NY
*W2IC, Edward V. Daly, Huntington, NY
KD2IJ, William H. Gnadinger, Colonia, NJ
WB2JFJ, Kenneth Harris, Iselin, NJ
AA2K, David Henderson, Montclair, NJ
WA2KOV, Rufus T. Humphrey, New Britain, CT
W2MSG, George W. Fabel, Port Charlotte, FL
W2PF, David Talley, Bal Harbour, FL
WB2PKH, Daniel S. Patterson, Utica, NY
WT2T, Karl H. Koemm, Brick, NJ
WB2VMC, Victor C. Otto, Framingham, MA
KA2WIC, Edith L. Dickenson, Port Jefferson, NY
N3ACK, William B. Talipsky, Bristol, PA
W3BCA, Marvin L. Wagner, Easton, PA
W3MB, Harold E. Schearer, West Reading, PA
W3UBZ, Rufus L. Williams, Washington, DC
WB4AFQ, Rex E. Purcell, St Petersburg, FL
KB4BAS, Willard E. Hobbs, Oak Ridge, TN
KC4BBL, James C. Arnold, Spartanburg, SC
*WB4CBP, Theodore R. Wayne, Miami, FL
W4CJZ, Thomas G. Humphreys, Vestavia Hills, AL
WA4CMM, Harold L. Bowen, Sumter, SC
W4FZC, Louis J. Martin, Sheffield, AL
K4FZJ, Clayton P. Elam, Memphis, TN
WB4HAK, Albert J. Canning, De Bary, FL
K4HCL, Fred O. Nazar, Clearwater, FL
K4IEQ, Albert H. Dell, Tryon, NC
*WB4JLT, Raoul S. Trudell, Southern Pines, NC
*K4KJ, John J. Nagle, Herndon, VA
W4LNB, James E. Walker, Gadsden, AL
WA4NWH, Ernest A. Heckler, Hartselle, AL
W4OBG, James W. Williams, Stanford, KY
W4PCJ, Fred A. Dame, Sarasota, FL
K4ROD, John E. Vest, Johnson City, TN
WA4WBG, William E. McInnis, Gainesville, FL
*W5ATB, Edward R. Durham, Tulsa, OK
WA5BSA, Richard E. Myers, San Antonio, TX
K5DFR, James A. Robison, Tyler, TX
W5ERD, Theron J. Old, Texarkana, TX
K5HEK, Claude B. Dunlap, Jefferson, LA
N5HQD, John E. Scott, Bremond, TX
W5IFM, Lester J. Gueldner, Cebu, Philippines
*W5JZY, Martin G. Gudzin, Dallas, TX
K5MWG, Al Abrams, Baton Rouge, LA
W5RZS, Jerry E. Brinker, Muskogee, OK
W5VMA, Walter A. Grayson, Anaheim, CA
KA5WLU, Freeman A. Ballard, III, New Orleans, LA
N6IRN, Kenneth E. Lewis, San Marino, CA
KB6IWK, Fred A. Harper, Kenosha, WI
WA6JII, Robert L. Cunningham, Fresno, CA
WB6KEG, E. B. Caustin, Arroyo Grande, CA
K6RG, Ivan L. Farman, San Antonio, TX
K6SBR, Loman Zane, San Bernardino, CA
KA6SOT, Walter E. Harvey, La Jolla, CA
W6TEZ, William C. Arrasmith, Pacific Palisade, CA
K6TLR, Arnold C. Amundson, Lakewood, CA
KW7F, Charles G. Barnett, Burlington, WA
WA7GRN, William H. Rassbach, Seattle, WA
*W7INH, Stephen Guelde, Littleton, CO
W7JQE, Kenneth D. Smith, Tucson, AZ
WA7KSW, George D. Essig, Hornbrook, CA
W7KV, Ralph J. Gibbons, Kirkland, WA
W7MRX, Howard J. Hanson, Federal Way, WA
N7MWS, William S. Hart, St George, UT
K7OFW, Dwight Helgerson, Electric City, WA
N7OGX, David B. Kincaid, Phoenix, AZ
W7OUX, Tracy H. Elder, Powell, WY
W7RRF, Lawrence J. Anderson, Tooele, UT
W7TZ, D. W. Pascoe, Hoquiam, WA
KB8CYS, Playford L. Collins, Kingwood, WV
W8GBT, Robert D. Leland, Farmington Hills, MI
W8KLC, Thomas B. Coon, Celina, OH
W8KUW, John M. Shaull, Kearneysville, WV
K8NEU, Milton J. Flowers, Edgerton, OH
W8NM, George P. Cherney, Sr, Lorain, OH
W8OGM, Marion J. Keyoski, Moundsville, WV
K8RWF, Roosevelt Wilder, South Charleston, WV
*WB8SAE, Daniel J. Pressede, Plymouth, MI
KC8TZ, Wilson L. Griesinger, Celina, OH
W9AMI, Francis J. Bock, South Bend, IN
WA9BSH, James D. Sullivan, Clewiston, FL
WA9EMC, Arthur G. Topf, Dunedin, FL
K9IWC, C. R. Whipple, Wauwatosa, WI
W9JNB, Robert J. Sinnett, Rock Island, IL
W9MAM, Alex H. Niedbalski, South Bend, IN
W9OMD, William J. Quick, Muncie, IN
KA9PIX, Russell F. Hollenback, Rushville, IL
W9PMT, Robert E. Witte, Fort Wayne, IN
WB9VOY, Robert L. Patterson, Soldotna, AK
KA9YFJ, Wayne L. Keen, Hudson, IN
W9ZIB, Galen R. Miller, South Bend, IN
WAØERG, Kenneth W. Lohmeyer, St Louis, MO
WAØHGN, Verne E. Johnson, Browerville, MN
WAØKMF, Robert C. Hutchison, Jr, Webster Groves, MO
WØPXW, Elmo V. Boswell, Springfield, MO
KØYHO, Bud Hilton, Cedar Rapids, IA
Rudolf Burian, Brno, Czechoslovakia
ZL3CP, Charles W. Parton, Christchurch, New Zealand
G3ZN, F. B. Holt, Blackpool, Great Britain
VK4KT, K. T. Robertson, Townsville, Australia
EI4N, J. J. Malone, Dublin, Ireland

*Life Member, ARRL

Note: All Silent Key reports sent to HQ must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

In order to avoid errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from HQ. Canadian reports should be sent to the CRRL HQ address on p 9.

Many hams have remembered a Silent Key with a memorial contribution to the ARRL Foundation. Should you wish to make a contribution in a friend or relative's memory, you might designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund or for the Victor C. Clark Youth Incentive Program Fund or for the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation, Inc, 225 Main St, Newington, CT 06111.

50 Years Ago

November 1940

☐ "It Seems to Us—" responds to events in Europe by soothing radio amateurs' fears that money spent on new gear and parts may be money wasted; by prepping hams on what to do if they're called to serve in the armed forces (the first peacetime draft in US history begins on November 1); and by overviewing Amateur Radio's likely place in home defense, and what the League is doing to ensure it.

☐ Staffer Don Mix, W1TS, describes a two-tube (6L6-807), five-band transmitter later marketed by *the James Millen Mfg Co as the 90800 exciter.*

☐ Technical Editor George Grammer, W1DF, gets down to "Modernizing the Regenerative Superhet" by presenting a single-ended-tube, 1941 version of a 1938 design.

☐ John D. Kraus, W8JK, describes "The Square-Corner Reflector Beam Antenna for Ultra High Frequencies."

☐ The Eighth A.R.R.L. Field Day (June 1940) saw the highest FD activity ever, with 2041 individual operators (141 clubs) participating.

☐ "What the League is Doing" reports that the 160-meter band has finally been shifted per the 1937 Interamerican Radio Conference in Habana: On November 1, the old 1715- to 2000-kc. band becomes 1750 to 2050 kc.

☐ In "An Electron-Coupled Oscillator, 1941 Model," F. G. Southworth, W5JJ, describes a band-switched variable-frequency oscillator featuring output at 7 or 14 Mc. A 13-watt-output audio amplifier/modulator shares the chassis.

☐ You *can* build a good 112-Mc. "pot" oscillator *without the services of a machine shop, and staffer* Byron Goodman, W1JPE, shows how in "A Stabilized 2½-Meter Oscillator."

☐ Last September 27th saw an Amateur Radio first: two-way *television* communication, with W2USA at the New York World's Fair contacting W2DKJ/2 at the New York Daily News Building, eight miles away.

☐ I.A.R.U. News reports that Lithuanian (LY) hams were closed down July 1 by government order.

25 Years Ago

November 1965

☐ Lead-article author Wendell G. Anderson, K2RNF, describes a system for receiving 136.95-Mc. Automatic Picture Transmission imagery in "Amateur Reception of Weather Satellite Picture Transmissions."

☐ Optimum amateur space communication requires circular antenna polarization, and Assistant Technical Editor Doug DeMaw, W1CER, describes how to get it in "The Basic Helical Beam."

☐ Jesse L. (K6KWX/7) Meredith's compact, stable 5-Mc. V.F.O. uses a tetrode Nuvistor tube as its active device.

☐ More than just "an all-time list of ARRL directors," *Perry (W1UED) Williams's "Men Who* Made League History" provides a glimpse into the early evolution of the representative democracy embodied by the ARRL.

☐ *QST*'s V.h.f. Editor, Edward P. Tilton, W1HDQ, modifies a 2-meter turnstile for two-band operation in "A Turnstile/Dipole for 6- and 2-Meter Mobile."

☐ Equipment control and configuration, and on-the-air procedures, are the topics in Irvin M. (K8DKC) Hoff's "Operating the RTTY Station."

☐ Amateur Radio's role in the Mankato and Winona, Minnesota, and La Crosse, Wisconsin, areas made headlines when last April's rains brought "Floods in the Midwest."

☐ *PICON* usually signifies Amateur Radio service in the public interest, convenience or necessity, but Gray Berry, K2SJN, sees another meaning in that acronym. Writing on how his club overcame its community's anti-antenna-support sentiment by laying a solid foundation of public support for Amateur Radio, Berry reports that the key is to Plan It Carefully, Or Nothing.

☐ Catherine B. Rochlitzer, W7OBH, describes ham radio doings at July's 1965 Senior Girl Scout Roundup, Pend Oreille Lake, Idaho, including 547 contacts by special-event station K7GS.

☐ As reflected in the 1460 logs received at Hq., Field Day 1965 comprised 3400 stations and 14,200 participants.—*WJIZ*

Field Day 1990

It's the hams against nature—and sometimes the hams win!

By Billy Lunt, KR1R and Warren C. Stankiewicz, NF1J
Contest Manager Assistant Contest Manager

Field Day is the most popular of the ARRL's operating events and is held the fourth full weekend in June, this year on June 23-24, 1990. Field Day translates to emergency preparedness, camping out, picnics, contesting, club get-togethers, public awareness of Amateur Radio, passing traffic and more, but most of all, it's just plain fun! Field Day is popular largely because of the camaraderie.

Field Day sites can be almost anywhere, but usually they're in an open field where antennas can be spread out. Some groups take advantage of bonus points for operating in a public place and setting up in shopping centers, public parks and so on. Jack, WD6EJJ, noted that with a 24-hour limit on putting up a Field Day station, it takes a team effort to get everything done. A club venture pays off by pulling members together to do the work. Ed, WD9AYR, reporting from the Bollingbrook ARS FD site, describes, "There were little groups here and there; everyone was busy doing something." Wherever you set up your operation, the name of the game is to have fun while participating in the FD activities! Art, KA2DOT, sums it up with "Field Day is a fun summer outing!"

This year's W1AW Field Day bulletin announced bonus points for making at least ten slow-speed CW QSOs in the Novice CW subbands with stations using call signs from *the Group "C" or Group "D" call sign* blocks. Thanks for slowing your keyer to pick up those bonus points—Novices and 100% emergency power. There were 1450 generator-powered stations and 147 on batteries. If the need arises for an emergency network of self-contained Amateur Radio stations, we'll be ready. Art, KA2DOT, reminds us that "Field Day is an exercise that sharpens our skills toward preparation for such a crisis."

In 1990, the favorite category was again the 2A entry class with 556 entries. The second most-popular class was 3A with 301 entries. Check the boxes for further breakdowns as you plot your 1991 Field Day strategy.

Comments from Field Day groups appear below. You may get some interesting ideas for next year. See you June 22-23 for Field Day 1991!

Field Day offers something for the whole family. Here, the father-and-son team of Erich, KA1VCX, and Rudy, W1GUA, make contacts together at KL7DN/1 in Vermont.

Jonesy, WB7BTJ, fighting to hear through the noise on 80 phone at WF2L.

Entries per Field Day Class

1A — 248 2A — 556 1C — 104

SOAPBOX

W9AA, 3A

This year's Field Day was completely different from recent club history. Changes were made in our budget, which necessitated cuts. The first casualty was Field Day. We borrowed, scavenged and begged to get what we needed to bring everything together. One of our teams received permission to operate from the North Palos fire protection district's new van, which will be used as a hazardous material response vehicle.

and ran around our site shouting "I did it! I did it!" The rest of us couldn't figure out what all the excitement was about.

Al, N4ZLF, who had been licensed only since Friday night, made his first-ever CW contact on 40 meters. He jumped right up from the rig and began pacing around, saying "He came back to me!" Boy, was he excited! We provided plenty of operating opportunities for newly licensed hams during the 24-hour event.

Thunderstorms interfered with our operation several times. The lightning at our site induced voltages high enough to arc across the conductors of open-wire feed line lying in the water. Wind and rain messed up our information booth and display of municipal proclamations, but we managed to get set up again.

W2TZ, 3A

Last year was the Rochester (New York) DX Association's first time entering 3A (up from 2A because of club growth!) and we ended up seventh. This was the year we were shooting for the top five in 3A. The conditions made it a challenge.

We were ready with a station dedicated to 40 meters, and one each for SSB and CW for the rest of the bands. We also had both satellite modes covered and a serious packet setup. Our KB2CHC Novice station was ready with a 4-element 10-meter beam and a multiband sloper for CW. We even started setting up on Friday afternoon for the first time to get an even better start. As it turns out, we seem to take all the time we have to get set up, no matter when we start!

The priority was CW, CW, CW—get those two-point contacts. We hoped for good conditions for the Novice/Tech station. We had a great group of new operators all ready to set some records!

Things started out well with more than 200 QSOs per hour for the first couple of hours, 120 per hour on 40-meter phone. Then it seemed to slow down faster than we expected. We were starting to wonder what had happened. We stayed ahead of last year's totals, but only barely. Of course, more of this year's contacts were on CW. The sad part was no 10-meter action again this year (and 15 was only barely there). It's getting depressing! But everybody hung in and we just kept grinding away. We finally ended up with 3000 contacts, nearly half on CW. With bonuses, we just made 10,000 points.

WU8R, 1A

It was a most enjoyable weekend for the three of us, indeed. The station was manned by WU8R, WB8NNJ and KA8WWI. The family farm provided a terrific site. Our 140-foot center-fed Zepp was hung from the top of the grain elevator and worked great.

The most exciting part came at 3:40 AM when we made our satellite contact on the RS-10 bird. Our packet contact was more difficult than expected. The height of our antenna enabled us to connect to many BBSs, but making a person-to-person contact was difficult. It was interesting to follow the propagation on the bands. Ten meters opened late at night and we made many SSB contacts.

The rig was active almost all of our 23 hours of operation. Toward the end, the refueling break every three hours was a welcome rest.

We may not have set a record in the point standings, but we had a great time that we'll remember for a long time. We'll be set up next year with an even better station.

VE6FD, 1A

As we began setting up our station in the bright Alberta sunshine, the skies darkened, lightning crashed, a vulture perched on a nearby branch and 13 crows circled 13 times around the camp (okay, so we exaggerated a little). All the omens were false: The weather was perfect and Murphy was clearly occupied elsewhere. We had a great weekend! Previous VE6FD Field Days have established the tradition that operating takes place during occasional pauses in a gourmet feast, and that was true again this year. Steaks and baked potatoes, chili by the cubic yard, salads, pies, apple crisp, ice cream and, of course, plenty of hot coffee and cold 807s were just the beginning.

We managed to stagger away from the banquet long enough to get in 15 hours of operating. So, once again, VE6 Flying Dinosaur flapped (groaning) onto the airwaves, albeit a little over optimum takeoff weight.

Band conditions were exceptional and we had constant pileups on 20 and 15 meters. This made our logs look less disgraceful than they would have otherwise, considering our lackadaisical operating schedule.

The only sad point was that our plan to generate electricity using a generous natural resource—the local beavers—failed. Nobody could figure out a way to persuade a beaver to swim around while harnessed to a generator. Next year, if we can only find a way to use all those mosquitoes, we'll have all the power we want.

K7EFA, 2A

On the cool, beautiful evening of June 22, the advance group for the Yellowstone RC Field Day arrived at its site high in the Little Snowy Mountains of central Montana.

Set-up of the base camp began and the club tent was erected. Individuals set up private sleeping tents or arranged their quarters in a van or pickup. There were anxious moments as some took a longer, more scenic route to the location.

Everyone got involved in setting up the operating stations. Everyone who wanted to operate did so and we all enjoyed the conversation and companionship.

Ready to roll! John, N6OJN, demonstrates his completely portable emergency vehicle at NALCO ARES/University of California ARC station W6BB.

W8LXE, 1A

Field Day was a bust for us in this, our 37th year of participation. It rained practically solid Friday and Saturday, making it difficult to put up antennas and set up the pop-up camper. At 7:30 PM, 4½ hours into FD, we completed the antennas and camper setup and found we had no power—the generator had gotten thoroughly soaked and wouldn't start. We took it over to the farmer's barn and put a heater on it to dry it out. It started, but only ran half an hour before it conked out again. We tried a number of things, but never got it to run for more than a half hour. We fooled with it until midnight and then decided to use another generator.

It was 1:33 AM when we finally got on the air—11½ hours late with half of FD over. We got a few hours sleep during the night, but we had no relief operators throughout the operation.

ARRL Field Day 1990 Scores

Class A stations are clubs or groups operating with more than two operators. Score listings are grouped according to the number of transmitters in simultaneous operation. The listings show club or group name, call sign(s) used, total number of QSOs, number indicating power output used (5 is less than 5 W; 2 is less than 150 W; 1 is more than 150 W), number of participants and total score including bonus points. Scores are listed from highest to lowest in each class. Nonclub groups are identified by the letters "NCG." Class B stations are portables manned by one or two operators. These may have one or two transmitters in simultaneous operation. Class 1B stations manned by one operator are listed first, followed by those with two operators, then Class 2B stations. When there are two operators, the other operator's call is listed in parentheses if it's known. Numbers following the calls indicate QSOs, power and final score. Class C stations are mobiles. They are listed by call, QSOs, power, number of operators and final score. Class D stations are home stations using commercial power. Line scores are the same as Class C. Class E stations are home stations using emergency power. Line scores are the same as Class C.

Club/Non-Club Portable

1A Battery

Panama City ARC
W4RYZ 1488- 5- 25- 10,375
Meriden ARC
W1NRG 574- 5- 25- 6,340
MMBG & C
WB6ITM 537- 5- 5- 5,895
WV-CW-NUTS
W8DL 530- 5- 4- 5,600
Central North Carolina DX Chasers
N4DAZ 669- 5- 9- 5,600
Callaway ARC
KS0M 521- 5- 16- 5,390
DX Assn of Connecticut
K1WJ 602- 5- 3- 5,310
Spectrum First
ND7A 560- 5- 3- 5,260
RCA ARC
N9RJ 1012- 5- 12- 5,185
Those Guys from Cleveland QRP ARC
N8AGU 541- 5- 3- 5,176
University ARC
WB7I 410- 5- 37- 4,040
Hiawatha/Falls City ARC
WE0C 435- 5- 9- 3,980
Saskatoon ARC
VE5AA 575- 5- 12- 3,595
Central Missouri Radio Assn
ND0N 288- 5- 30- 3,580
W4GHZ RC
KD8IM 326- 5- 4- 3,560
Land of Great ARC
NC8X 290- 5- 10- 3,400
Morgan Co ARC
KO4O 371- 5- 12- 3,300
Field Day Fanatics
NR7P 303- 5- 3- 3,280
Steubenville-Weirton ARC
KE8SX 302- 5- 20- 3,120
N New Mexico ARC
W5NE 357- 5- 8- 3,035
UM des Sans-filistes de Montreal
VE2UMS 225- 5- 30- 2,560
Surely Temple Solar Society
WA8OJR 206- 5- 4- 2,455
Aerial Launchers
AA5KK 226- 5- 3- 2,395
Lookout Mtn QRPers
AB4QL 264- 5- 7- 2,225
NCG
N2CVJ 217- 5- 25- 2,170
Black Diamond Ring
N7GGJ 166- 5- 4- 1,960
Burrows X-ing ARC
WD4NBN 244- 5- 4- 1,890
Tulia ARC
N5AE 205- 5- 4- 1,885
Satellite ARC
W6AB 184- 5- 7- 1,160
NCG
WB4WXE 7- 5- 5- 135

1A

Bozo & the Lids
W9TG 1203- 2- 7- 5,800
Acadiana ARA
W5DDL 1389- 2- 30- 5,120
Fist & Mouth Contest Company
W5EW 1276- 2- 4- 4,940
Mama's Radio ARC
W7MR 1463- 2- 12- 4,828
Raytown ARC
KM0E 1087- 2- 10- 4,728
Hannibal MO ARC CW Group
KI0W 985- 2- 21- 4,540
Collins ARC
K5BU 1438- 2- 12- 4,440
Harry Diamond Laboratories RC
K3TM 1249- 2- 3- 4,284
GHRC Contesters
KE7X 994- 2- 12- 4,276
Desert DX Corps
AA7A 1180- 2- 3- 4,226
Dr Loomis Memorial Jr Mechanics League
N4YE 1157- 2- 13- 4,104
NCG
KA7T 860- 2- 6- 4,080
Motley Crew ARC
KK9H 1160- 2- 30- 3,808
N Ohio DX Assn
W8XD 1142- 2- 20- 3,792
Mississippi Valley ARA
KR9A 1155- 2- 9- 3,714
Reeve's Hill Group
NG1I 958- 2- 6- 3,672
Austin ARC
W5KA 1186- 2- 15- 3,658
Three Men in a Loft
KN8S 1145- 2- 3- 3,570
Coverdale's Commandoes
VE3ICV 841- 2- 9- 3,550
Arrowhead ARC
W0GKP 1019- 2- 35- 3,542
Montrose ARC
K0GAS 951- 2- 15- 3,480
First State ARC
K3QBD 971- 2- 30- 3,414
Maui ARC
KH6RS 2250- 1- 27- 3,381
Rock Chuck ARC
KC9QZ 729- 2- 3- 3,216
Hilltoppers
WA5CMI 920- 2- 4- 3,168

N Ohio DX Assn
K8MR 1006- 2- 3- *3,136*
Buster's Beach Bums
K4IX 639- 2- 7- 3,056
York Co ARS
K4YTZ 810- 2- 25- 3,036
Norwood ARC
K1JMR 808- 2- 4- 3,032
CUBS ARS of Sedro Woolley HS
WY7Q *1105- 2- 18- 2,952*
SRO/CFMC
W9EJ 788- 2- 16- 2,908
HFWAR
KA0VNM 1093- 2- 35- 2,886
NW St Louis ARC
K0AXU 1185- 2- 4- 2,860
Pine Belt RA
KC5K *1230- 2- 20- 2,860*
Azalea Coast ARC
KB4IL 991- 2- 22- 2,836
Madison Co ARES
KD2A 695- 2- 10- 2,804
Stanly Co ARC
K4OGB 898- 2- 16- 2,742
Thibodaux ARC
W5YL *941- 2- 30- 2,736*
Gunnison Valley ARC
W0GYV 1207- 2- 10- 2,732
N Illinois RA
WA9P 622- 2- 6- 2,732
IBM Atlanta RC
NK9Q 1032- 2- 30- 2,668
Le Frog
KA9WRL 492- 2- 25- 2,668
Just for Fun Contesters
NI9E 998- 2- 7- 2,640
Case Institute of Tech ARC
W8EDU 586- 2- 3- 2,568
Hawk Mt Skunks
WA4YGG 1132- 2- 6- 2,556
Dinosaur Valley DX Soc
K5MW 742- 2- 8- 2,534
Millers Maverick Contest Club
N6YJY 647- 2- 11- 2,516
Randallstown ARC
N3IC 627- 2- 6- 2,478
Sheboygan Co ARC
NI9Z 601- 2- 4- 2,404
N Augusta-Belvedere RC
K4FR 454- 2- 20- 2,390
SMARTTC
W8KFV 611- 2- 12- 2,316
Merrymeeting ARA
N1MA 631- 2- 22- 2,316
Four Serious Dudes
VE4SO 682- 2- 4- 2,302
Jug Southgate's Bunch
N2EY 612- 2- 6- 2,260
Egyptian RC
W9AIU 1498- 1- 25- 2,198
Pepperell AWA
K1BG 628- 2- 6- 2,188
Suncoast ARC
WA4T 633- 2- 10- 2,166
NCG
N4MJY 872- 2- 3- 2,146
Trailer Buddies
K7SF 608- 2- 4- 2,116
Mallard Lake Wouff Hong Society
K9NO 633- 2- 25- 2,102
Gypsy Moths
KZ2S 688- 2- 5- 2,094
Bass Hill Repeater Group
W1KX 507- 2- 5- 2,076
Mid-Willamette ARC
W7AEP 576- 2- 13- 2,074
Granite State Hilltoppers
AF1T 774- 2- 5- 2,066
Hellgate ARC
NZ7M 682- 2- 22- 2,052
Metro Miami RA
KY8V 694- 2- 8- *2,050*
The LLs
N5LLK 872- 2- 25- 2,044
Oskosh ARC
KD9BC 679- 2- 6- 2,040
Chillicothe Radio Guys
WU8R 493- 2- 3- 2,028
Lancaster Co ARC
AK4N 568- 2- 18- 1,976
Sussex ARA
K3JL 444- 2- 20- 1,970
Medina 2-Meter Group
K8TV 427- 2- 8- *1,944*
Tuscaloosa ARC
W4XI 441- 2- 25- 1,938
Anoka Co RC & ES
W0CF 609- 2- 21- 1,932
Mason Co RC
K8DXF 509- 2- 35- 1,920
Novatel ARC
VE6NOV 507- 2- 8- *1,920*
OCARE
WA5ZAA 474- 2- 5- 1,906
Edisto ARS
AD4U 592- 2- 31- 1,888
Olathe Area ARG
K0KS 563- 2- 14- 1,882
Woodchucks
N8DKO 777- 2- 10- *1,854*
Bankhead ARC
N4GKE 493- 2- 7- 1,846
Lake of the Woods ARS
VE3LWR 709- 2- 18- 1,846
Kauai ARC
KH6LG 1340- 1- 32- 1,841
Los Alamos ARC
W5PDO 528- 2- 9- 1,836
Texas Mule Skinners
K5TMS 1506- 1- 4- 1,806
BARES
VE3LPM 473- 2- 6- 1,804
Washington Co ARC
W9SIZ 391- 2- 8- 1,802
Silicon Gulch ARC
AE6C 1680- 1- 13- 1,786
Murphy's Lawyers
N6JF *626- 2- 4- 1,772*
Shafamma
N6GKD 423- 2- 8- 1,764
WRECS
K8NI 729- 2- 8- 1,760
ARA of SW Florida
K4FU 574- 2- 15- 1,752
Issaquah ARC
W7BI 603- 2- 14- 1,714
NCG
W8ZX 623- 2- 10- 1,696
Highland Operators Group
KG8W 455- 2- 8- 1,692
RATS
K0PB 652- 2- 7- 1,674
Antigonish/Pictou ARC
VE1HR 550- 2- 10- 1,674
NCG
W0YHE 590- 2- 3- 1,654
IITRI FD Group
W3MR 358- 2- 8- 1,618
N Shore ARC
VE7NSR 293- 2- 25- 1,616
Anaconda ARC
W7VNE 652- 2- 32- 1,604
Livingston ARC
WF2Z 367- 2- 6- 1,566
Thumb ARC
W8AX 495- 2- 6- *1,538*
ENARS
WB7WTS 718- 2- 6- 1,536
Great Bend ARC
K0WRZ 514- 2- 10- 1,532
Bawating ARC
VE3LSC 607- 2- 6- 1,514
NCG
W1EQO 482- 2- 3- *1,508*
Florence ARC
W4ULH 551- 2- 11- 1,502
Halton ARC
VE3OD 461- 2- 10- 1,478
Utah ARC
W7SP 457- 2- 28- 1,470
Macomb Co RACES
WB2C 383- 2- *15- 1,468*
Augusta ARA
W1TLC 470- 2- 27- 1,454
Central Carolina ARS
WR4E 460- 2- 14- 1,454
Lima Area ARC
W8EO 341- 2- 9- 1,420
S Huron ARC
VE3LRD 427- 2- 4- 1,392
Pioneer ARC
VE3NA 385- 2- 25- 1,388
Three Sparks and a Gap
WN0B 588- 2- 4- *1,376*
Central Wisconsin RA
W9NN 433- 2- 18- 1,368
Huntington Beach DX Assn
N6RDL 386- 2- 5- 1,362
WACO
K3NW 316- 2- 5- 1,362
Jamestown FDG
NX2G 623- 2- 4- *1,346*
Pioneer ARA
AF8B 362- 2- 29- 1,338
Sam Houston ARK
N5IF 358- 2- 22- 1,332
Worldradio Staff ARC
N6WR 387- 2- 3- 1,322
Rainbow Canyons ARC
N7KM 347- 2- *50- 1,294*
Lockheed ARC
WA6GFY 393- 2- 15- 1,276
Red Dawn ARC
KH6JJX 486- 2- 7- 1,272
Ramsey Co ARC
WD0FFQ 424- 2- 7- 1,268
Ugly Duck ARS
W3RP 430- 2- 15- 1,260
Audrain ARC
NU0H 267- 2- 5- 1,252
Fair Weather Contest Club
WR6O 550- 2- 8- 1,244
Ionia Co ARES
W8LCU 215- 2- 12- 1,220
Parsons Area ARC
NB0V 361- 2- 12- 1,220
Mid-Wisconsin ARG
N9ADT 398- 2- 6- 1,196
New Cuyama Quad Hoppers
N6PC 343- 2- 4- 1,192
Van Isle RC
VE7VCC 429- 2- 17- 1,188
Bellbrook ARC
KI8O 421- 2- 5- 1,162
Spencer Co ARC
WJ9A 438- 2- 6- 1,154
Pembina River Flying Dinosaurs
VE6FD 851- 1- 7- 1,151
Tippecanoe River Radio
WD9I 269- 2- 3- 1,150
Kishwaukee ARC
WA9GJN 323- 2- 10- 1,146
Oak Park ARC
W8MB 278- 2- 9- 1,130
Denton Co ARA
W5NGU 239- 2- 15- 1,108
Nanticoke ARC
NC3O 289- 2- 18- 1,108
Tuscola Co ARA
N8CFF 239- 2- 9- 1,102
Sand Hills ARC
W8MI 398- 2- 16- 1,096
Central Missouri RA
WA0R 393- 2- 17- 1,086
Kamloops ARC
VE7UT 388- 2- 6- 1,082
Menomonee Falls RC
K9RHH 281- 2- 10- 1,062
Kerr Lake Campers
N4SW 372- 2- 5- 1,044
Martuni Group
KU7K 224- 2- 7- 1,044
NCG
W4VZB 470- 2- 5- 1,040
Chevron ARC
AA6WP 303- 2- 11- 1,034
look Skunk Breakfast
WB8NSL 484- 1- 9- 1,033
Iowa Radiosport Society
WE0U 203- 2- 3- 1,032
405 Group
W5VBO 338- 2- 8- 1,030
Winnipeg ARC
VE4BB 285- 2- 20- 1,030
N Kentucky ARC
K4CO 389- 2- 6- *1,022*
Univ of Idaho ARC
W7UQ 236- 2- 25- 1,006
Mahaska ARC
NR0C 452- 2- 12- 1,004
NCG
N8AHA 307- 2- 26- 996
S Ohio ARC
KM4TS 280- 2- 12- 960
GTE
N5PLS 340- 2- 6- 956
Tipton ARS
K4HAZ 138- 2- 13- 916
Lawrence Tech Univ ARC
W8QOA 223- 2- 6- 910
St Croix Valley RA
WD9GWH 294- 2- 11- 906
ARC of Shelbyville
N4VFB 247- 2- 9- 904
Hannibal ARC
W0KEM 200- 2- 6- 900
S Lyon Area ARC
N8AR 288- 2- 7- 898
KY-7 ARES
WA4BRM 348- 2- 3- 896
Huron ARC
W0NOZ 264- 2- 10- 892
Centralina ARC
N4QR 178- 2- 40- 884
Enterprise ARS
WD4ROJ 230- 2- 15- 860
Coon Valley ARC
KV0N 259- 2- 10- 828
NCG
KF7MD 227- 2- 1- 796
Wake Tech ARC
WB4TOP 144- 2- 29- 790
Pallotta FDC
KC1TE 393- 2- 3- 786
9-0-4 ARC
N9BDL 281- 2- 5- 780
SW Dallas Co ARC
WT5G 287- 2- 30- 760
Chenango Valley ARA
KD2WP 147- 2- 5- 770
Sunset Empire ARC
W7BU 220- 2- 10- 740
Lamb's Legion
KF7OP 300- 2- 5- 704
Highland ARC
KF7MY 227- 2- 6- 654
Hedgesville Four
WB4J 174- 2- 4- 650
Gene Olig Group
KD9ZP 242- 2- 4- 646
Jake's Group
N7IWD 258- 2- 6- 616
Koolau ARC
KH6OS 147- 2- 40- 600
Last Mtn RC
VE5LM 218- 2- 10- 588
Southpoint RG
KA4FUB 235- 2- 10- 570
Barton Flat Bears
K6IG 203- 2- 4- 556
Detroit Metropolitan RC
W8LXE 67- 2- 4- 534
NCG
W8NSH 202- 2- 3- 512
NCG
W7VLG 105- 2- 7- 510
Canton Gang
WB0YGW 137- 2- 3- 488
De Forest ARC
KA8FJM 105- 2- 6- 412
E Ohio AWA & N Panhandle ARC
WK8T 93- 2- 26- 400
Harrison ARC
N8TF 73- 2- 3- 392
NW Elec Inst ARC
KB0DQW 80- 2- 6- 360
Ozymandias Despair
N8ALB 88- 2- 3- 352
NCG
WA9JLV 49- 2- 7- 298
Lions Rock ARG
N7KC 147- 2- 3- 294
Museum of Science & Industry ARC
WA4DLL 146- 2- 3- 292
Spencer Co Hams
N9JRA 52- 2- 4- 292
Porter Co ARS
WR9U 129- 2- 15- 258
University of Waterloo ARC
VE3UOW 71- 2- 3- 242
Kings Co ARC
VE1EMO 68- 2- 17- 236
Colquitt Co Ham Radio Soc
WD4KOW 61- 2- 6- 222
We Dixie ARC
WB4MZO 31- 2- 29- 162

1A Commercial

N Indiana Lake Shore Burnouts
KE9OI 1480- 2- 10- 3,192
Porter Co ARC
N9RD 1465- 1- 55- 2,477
Indianapolis Power & Light ARC
N9TT 653- 2- 9- 1,862
CRA Sorel-Tracy
VE2CBS 576- 1- 10- *1,262*
Pasadena RRL
W5PWG 420- 2- 22- 1,118
IV ARA
WM6Z 353- 2- 7- 906
Rowan ARS
W4EXU 316- 2- 5- 832
Moose Jaw ARC
VE5MA 106- 2- 9- 612
NCG
KA7STG 207- 2- 4- 540
Piedmont ARC
AB4IG 81- 2- 6- 462

2A Battery

Arapahoe RC
K0NA (+KB0FHW)
1631- 5- 17- 14,485
Chaffee-Lake ARA
W0LSD (+N0LXZ)
1706- 5- 23- 12,550
S Humboldt ARC
W6JTI (+KB6WZN)
1265- 5- 8- 10,315
Hebron AWG
K1DW (+W1ORI)
1087- 5- 10- 10,195
Zygo ARC
NX1Q (+KA1MWT)
843- 5- 10- 8,010
W Park Radiops
W8VM (+WA8NVW)
752- 5- 14- 7,035
LARA QRPers
K2ECQ (+KB2KNU)
796- 5- 10- 6,895
Davis Co ARC
NZ7X 789- 5- 40- 6,885
Walton RA
W2LZ 611- 5- 10- 6,395
Berrys Mtn ARC
W3TS 721- 5- 5- 6,210
Michigan-QRP Club Chapter II
K8DD 599- 5- 16- 5,995
Maryland Mobileers ARC
N3EI 643- 5- 12- 5,625
Lodi ARC
KJ6SR (+KB6ONI)
645- 5- 16- 5,340
KARC-QRP
WS8H 557- 5- 6- 4,985
Niagara Co DX ARC
KE2PV (+N2KJA)
618- 5- 14- 4,215
Eagle Rock ARC
K7ARJ 514- 5- 10- 4,170
Choctaw ARC
WD5G (+KB5KSR)
449- 5- 15- 4,070
Bloomington ARC
W9NX 425- 5- 16- 3,725
Illinois Fox Valley QRP Club
W9NJP 319- 5- 3- 3,665
NCG
VE5II 443- 5- 8- 2,740
Skunk Hollow ART
WA9PWP 302- 5- 8- 2,650
Foothills ARC
W3LWW *366- 5- 10- 2,610*
S Pennsylvania Comm Group
K3NXU 169- 5- 9- 1,990
NCG
AA5PB 285- 5- 6- 1,790
Club VE2CRG
VE2ABO 103- 5- 12- 1,730
Noah's ARC
W2FMM 96- 5- 9- 1,350
Lafayette HS ARC
KA2WFT 15- 5- 5- 350

2A

Texas DX Society
K5DX (+WB5RUS)
4133- 2- 28- 12,366
Albuquerque DX Assn
N5RR (+N5GFR)
3121- 2- 23- 9,468
Mercer Co ARC
W3LIF (+N3IDG)
2755- 2- 13- 9,000
Harris ARC
W4KS (+N4RTL)
2944- 2- 35- 8,912
Silicon Junction RC
K1VT (+N1FKV)
2942- 2- 14- 8,750
Bat A RC
NG5M (+N5PON)
2997- 2- 20- 8,734
San Angelo ARC
W5QX (+N5MMR)
2804- 2- 35- 8,680
Serious Hams ARC
AA4W (+KB4OFA)
3102- 2- 11- 8,390
MARC
W5EJK (+KA5JIS)
3070- 2- 26- 7,992
Boulder RAG
K2NA (+KB4THF)
2498- 2- 14- 7,914
Columbia ARA
K3EF (+KA3VQG)
2201- 2- 25- 7,676
Lake Co RACES
K9SA (+KB9AEE)
2152- 2- 18- 7,532
IBM Boca Raton ARC
N4TL 2339- 2- 10- 7,202
San Jose State ARC
W6YL (+WD6EEY)
2310- 2- 12- 7,194
Radio Oregon
K7RO 2130- 2- 7- 7,104
Delaware ARA
W8QLS (+KB8EOE)
2192- 2- 29- 7,048
Cape Fear ARS
K4MN (+N4LBB)
1954- 2- 33- 7,004
Mountaineer ARA
W8SP (+KA8AVQ)
2082- 2- 46- 6,976
Big Bend ARC
K5FD (+N5JOE)
2249- 2- 18- 6,956
Owensburo ARC
K4HY (+N4PLU)
1908- 2- 15- 6,714
SW Missouri ARC
W0EBE (+N0KNB)
2124- 2- 20- 6,680
Ft Wayne RC
W9TE (+KB9AYS)
2169- 2- 25- 6,442
Kingsport ARC
W4TRC (+KC4PLA)
1761- 2- 22- 6,428
W/K ARC of Greater Milwaukee
N9AW (+KA9TEP)
2128- 2- 12- 6,400
St Louis ARC
K0LIR (+KB0GDS)
1955- 2- 21- 6,344
Mid-Missouri ARC
N0SS (+KA0DLD)
1603- 2- 30- 6,286
Carroll Co ARC
K3PZN (+KA3KDG)
1868- 2- 24- 6,276
Halifax ARC
VE1FO (+VE1RGG)
1872- 2- 50- 6,264
Williamsburg Area ARC
K4MU (+WD4UYQ)
1724- 2- 25- 6,048
Elgin ARS
W9IKN (+N9JPU)
1666- 2- 14- 6,046
Twin City FM Club
K0AD (+KB0FJB)
1823- 2- 18- 6,028
Ham Assn of Mesquite
WC5M (+N5MKC)
1878- 2- 25- 5,960
Cedar Valley ARC
W0GQ (+N0BJK)
1542- 2- 45- 5,840
Green Mt Wireless Soc
N1VT (+KA1OLE)
1889- 2- 25- 5,820
Overlook Mountain ARC
K2HA (+N2JHJ)
1703- 2- 25- 5,810
Georgia Tech ARC
W4AQL (+N4RMM)
1526- 2- 10- 5,664
Loveland RA
W0DZ 1754- 2- 30- 5,660
Riverland ARC
W9UP (+KB9BIS)
1588- 2- 23- 5,646
Central Kansas ARC
W0CY (+N0KSC)
1450- 2- 25- 5,588
Utica ARC
K2IQ 1841- 2- 30- 5,566
Metropolitan ARC/Little Rock
AA5BI (+N5OOI)
1500- 2- 40- 5,510
N Chautaugua ARC
W2SB (+KB2EOQ)
1773- 2- 21- 5,380
SCARS/EARS
AE8L (+N8JDC)
1494- 2- 30- 5,362

Hattiesburg ARC
W5NA (+KB5LVU)
1796- 2- 14- 5,298
Anderson RC
W4FX (+WD4BUH)
1281- 2- 18- 5,276
Las Cumbres ARC
K6FB (+N6MOV)
1658- 2- 25- 5,246
Reading RC
W3BN (+KA3MVN)
1453- 2- 38- 5,228
Arkansas River Valley ARF
K5PXP (+N5QXB)
1437- 2- 27- 5,222
Ohio Valley ARA
W4FU (+KA8SEG)
1444- 2- 10- 5,220
Oklahoma City Autopatch Assn
K5NK (+N5DLM)
1475- 2- 35- 5,212
NW Arkansas AR ARC
N5XR (+KB5JIL)
1782- 2- 40- 5,180
Far Out ARC
WB8SMC (+KB8IDM)
1802- 2- 30- 5,118
Rocky Mtn/Wilson
NE4J (+N4UCO)
1873- 2- 28- 5,040
Limestone ARES
W4LRE (+KC4AFH)
1561- 2- 35- 5,000
CAREN
WN5X (+N5OUS)
1546- 2- 150- 5,000
Decatur ARC
W4ATD (+KC4PBM)
1857- 2- 22- 4,968
MATPARC
W4QO (+KC4NID)
1401- 2- 46- 4,950
Oak Ridge ARC
K4PJ (+N4PXM)
1427- 2- 36- 4,936
Fauquier ARA
W4VA (+N4YXW)
1382- 2- 12- 4,926
Rockwell-Autonetics RC
KI6X (+KB6EID)
1313- 2- 20- 4,882
E Alabama ARC & Auburn Univ RC
KE4T 1411- 2- 17- 4,860
Blue Ridge ARS
K4WJV (+KC4JXS)
1182- 2- 20- 4,860
Free State ARC
K3IVO (+N2GTE)
1597- 2- 18- 4,842
University of Alabama ARC
K4CWW (+KB4CZN)
1443- 2- 8- 4,824
Arinc ARC
W3ZH (+WA3ZMN)
1325- 2- 17- 4,798
St Peters ARC
WØOGS (+KBØDYP)
1198- 2- 25- 4,794
Piscataway ARC
KQ2K (+N2JLM)
1878- 2- 22- 4,772
University of Cincinnati ARC/
Fairfield ARA
W8YX 1661- 2- 6- 4,708
Campbell Co ARC
WC7M (+KB7JVO)
1215- 2- 9- 4,670
Milford ARC
W8SDL 1343- 2- 20- 4,660
Dickson Co ARC
NY4N (+N4UTW)
1406- 2- 18- 4,650
Canton ARC
W8AL 1504- 2- 51- 4,632
GDRA ARC
W5IU (+KB5EYQ)
1712- 2- 25- 4,632
Tri-Co Ham RC
N8CG (+KB8IKK)
1144- 2- 23- 4,632
Forx ARC
KEØA (+KBØCTG)
1394- 2- 13- 4,622
ARA of S New England
W1AQ 1448- 2- 21- 4,616
Ozarks ARS
KEØI (+NØGNH)
1646- 2- 27- 4,596
Williamson Co ARC
W5XD (+KB5MXD)
1349- 2- 14- 4,550
ERAA 50th Anniversary FDT
K8VA 1371- 2- 40- 4,550
W Valley ARA
W6PIY (+N6UTR)
1341- 2- 58- 4,526
Union Co ARS
WK4S (+N4MMM)
1268- 2- 20- 4,514
Stockton Delta ARC
W6SF 1250- 2- 10- 4,496
Brazosport ARC
WB5J (+KA5COA)
1145- 2- 40- 4,484
EMARC/FARS
K6YA (+N6ZER)
1403- 2- 20- 4,468

Penn-Mar RC
W3MUM (+KA3IXG)
1187- 2- 18- 4,452
Tucson IBM ARC
WO7F (+N7KAN)
1477- 2- 16- 4,448
AT&T CRES ARC
W6ZPF 1321- 2- 20- 4,446
E Bay ARC
W6CUS (+N6VMK)
1080- 2- 80- 4,430
NCG
KI6EO 1552- 2- 4- 4,430
HP/ATL ARCs
NN7N (+N7OON)
1170- 2- 23- 4,406
OARC/OVMRC
VE3JW 1201- 2- 25- 4,398
Antelope Valley ARC
K6OX 1374- 2- 75- 4,364
Kaw Valley ARC
WØCET (+NØLJK)
1242- 2- 15- 4,304
MARC-Plantation
WA4LZR 1321- 2- 10- 4,290
Twin State RC
W1FN (+KA1VZS)
1295- 2- 10- 4,246
Lewis & Clark RC
N9BHW (+KB9EXC)
1322- 2- 35- 4,238
Penny Pines Brass Pounders
N7CW (+N6VRG)
1357- 2- 6- 4,220
Onslow ARC
WD4FVO (+KA4SFF)
1431- 2- 20- 4,208
Hanover Area Hamming Assn
W3ZY (+KA3VEI)
1261- 2- 12- 4,192
Valley Forge Mtn FDG
N3KZ (+WB3BSN)
1324- 2- 15- 4,178
PEARL
K2AV (+N2EGS)
1088- 2- 34- 4,118
Spartanburg ARC
K4II (+N4TIR)
1017- 2- 22- 4,098
SWVWA & Roanoke ARES
KC4DY (+KC4ODE)
1127- 2- 21- 4,052
Falmouth ARA
K1AK (+KA1SGL)
1151- 2- 15- 4,034
Hopkins Co/Tradewater/Dawson
Springs ARC
KM4FO (+N4ZEE)
969- 2- 15- 3,994
Racine Megacycle Club
W9UDU 1245- 2- 25- 3,950
Calgary ARA
VE6NC 1124- 2- 21- 3,930
Watertown ARC
N9HR 1137- 2- 15- 3,914
NCG
WR9R 1312- 2- 3- 3,904
Coconino ARC
NN7A (+N7NUR)
1415- 2- 21- 3,864
Band Dit-Dahs
K2UW (+KB2DNF)
1030- 2- 11- 3,854
Huntington Co ARS
NC9P (+N9JJW)
1391- 2- 17- 3,840
Sweetwater RC
K4PI (+N4PYP)
1436- 2- 35- 3,838
Shy-Wy ARC
W7NE (+N7JPR)
991- 2- 16- 3,800
Tamagua Area ARA
W3VA 1065- 2- 16- 3,756
Suburban RC
WØDCW (+KBØDIQ)
1056- 2- 45- 3,754
Arkansas Tennessee RA
WZ5S 1448- 2- 27- 3,750
ARC of Savannah
W4HBB (+WD4FIH)
975- 2- 32- 3,750
St Paul RC
KØAGF 1062- 2- 24- 3,742
Henderson ARC
W4KVK (+N4UTS)
908- 2- 26- 3,740
Kanawha ARC
W8GK (+KB8ERE)
1200- 2- 15- 3,740
Albemarle ARC
WA4TFZ (+N4PGS)
992- 2- 26- 3,740
Calumet ARES
KN9P (+N9JAE)
907- 2- 10- 3,726
Pioneer ARC
N4LSJ 993- 2- 11- 3,720
Escondido ARS
N6WB 2016- 1- 20- 3,719
UNM ARC Alumni
WV5G 1269- 2- 3- 3,704
Stonewall Jackson ARC
WJ8G (+KB8CMY)
1057- 2- 10- 3,700
Metuchen RC
K2YNT 894- 2- 14- 3,688
Joliet ARS
W9OFR 1361- 2- 25- 3,674

Lynchburg ARC
K4HEX (+N4YLD)
1024- 2- 30- 3,654
Saline Co ARC
K5NE 1058- 2- 33- 3,648
Yonkers ARC
WR2I (+N2GAK)
956- 2- 15- 3,628
Pilgrim AWA
KA1GG (+KA1VVK)
1313- 2- 25- 3,622
Langley ARA
VE7VQ 1033- 2- 10- 3,622
Syosset HS Alumni
K2PV 1161- 2- 15- 3,594
Upper Valley ARC
AA8Q 1250- 2- 18- 3,584
Rochester ARC
WØMXW (+N8LKS)
1927- 1- 35- 3,578
San Andreas Faultline Survivors
NZ6N 1172- 2- 15- 3,570
Metro-DX
KF9H 1110- 2- 7- 3,562
Motley FD Crew
WD4AHZ 1056- 2- 12- 3,554
Emergency ARC
KH6BI 967- 2- 41- 3,538
Hendricks Co AS & Hoosier
Contesters
N9SF 1109- 2- 30- 3,516
West Virginia AR
W8AH (+N8GZA)
897- 2- 22- 3,514
S Bay ARC
WATT (+KC6KSF)
934- 2- 14- 3,490
Bartlesville ARC
W5NS 900- 2- 20- 3,434
Hartford AREMT
K3EI 926- 2- 6- 3,394
Central Michigan ARC
W8MAA (+KB8DGC)
771- 2- 18- 3,394
Newington ARL
W1OKY 852- 2- 10- 3,374
Boone Co ARC
NX8Q (+N9HLL)
1100- 2- 28- 3,370
CRA Vallee du Richelieu
VE2CVR 1031- 2- 12- 3,364
Waterton ARS
WØNT 975- 2- 20- 3,324
Malibu DCS
N6FDR (+N6ZIQ)
881- 2- 100- 3,300
Muncie Area ARC
NV9A (+KA9TBO)
799- 2- 31- 3,298
Ole' VA Hams ARC
N4FS (+KB4RKL)
914- 2- 25- 3,296
NW Illinois ARC
W9AF (+N9HRE)
813- 2- 16- 3,278
Racal Milgo ARC
ND4G (+KB4THK)
817- 2- 19- 3,250
Mancorab Club
W9DK (+KB9EHI)
932- 2- 21- 3,240
Ft Myers ARC
W4LX (+KC4ONO)
1178- 2- 25- 3,238
San Fernando Valley ARC
W6SD (+KC6LHC)
939- 2- 100- 3,222
Colorado Big Horn ARC
KFØEX (+KBØFRD)
1138- 2- 12- 3,220
Conyers ARG
AA4SW (+KC4HSG)
944- 2- 22- 3,208
Great Fall Area ARC
K7ABV 836- 2- 20- 3,194
Hampton Roads RA
WT4R (+KA4UQW)
782- 2- 15- 3,190
Bodega Beach Bums
WB6RVR 974- 2- 11- 3,182
Gurnet Gulls
KR1B 878- 2- 6- 3,182
Xerox ARC
K2OID (+KB2JDT)
832- 2- 24- 3,178
Old Bridge RA
WQ2N (+N2JTU)
1024- 2- 40- 3,170
St Croix ARC
NP2B 784- 2- 25- 3,170
River Cities ARA
KZ4G 911- 2- 20- 3,164
Oregon Tualatin Valley ARC
AA7CV (+KB7JFU)
877- 2- 50- 3,158
Yellowstone RC
K7EFA (+KA7JVQ)
994- 2- 17- 3,158
N Arkansas ARS
K5LG (+KB5JXE)
1008- 2- 15- 3,154
Portland AWA
W1KVI (+KA1PRD)
970- 2- 25- 3,148
Florida Keys ARC
KA4TTS (+KC4JSD)
1251- 2- 15- 3,128

Garland
K5QHD (+KB5JNL)
1157- 2- 38- 3,120
Tallahassee ARS
KC4N (+N4XSY)
759- 2- 30- 3,096
Clinton Co ARC
W9PC 820- 2- 17- 3,096
New Providence ARC
K2JV (+KB2BBP)
870- 2- 21- 3,094
Sun City ARC
K5WPH (+KB5KYN)
702- 2- 50- 3,078
Algoma ARC
VE3SOO 772- 2- 18- 3,070
Sarasota ERC
N4TKS (+KC4LNU)
1236- 2- 8- 3,068
Bullitt ARS
AA4KY (+KA4TEV)
1083- 2- 54- 3,060
Prime ARA
WE9A 851- 2- 20- 3,052
N Rhode Island RC
NZ1H (+KA1OSP)
991- 2- 15- 3,030
Kent ARS
N3QA (+KA3TLF)
995- 2- 12- 3,020
Clairemont RA
N6IGI (+N6VNI)
817- 2- 30- 3,002
Gulfcoast ARC
WC4D 813- 2- 27- 2,978
Beaches ARS
WU4R 885- 2- 20- 2,960
Centerville ARS
K8GN 977- 2- 12- 2,958
Johnson Co RAC
WØERH (+NØJRB)
755- 2- 34- 2,956
Upper Yuba-Sutter ARC
K6AAW (+KB6NMY)
1034- 2- 6- 2,936
ARA of Bloomington
WTØW (+NØBUA)
822- 2- 45- 2,934
Fresno ARC
W6TO (+KC6LWN)
838- 2- 40- 2,932
Comsat ARC
WA3LOS 869- 2- 12- 2,930
Candlewood ARA
W1QI (+WB1EPO)
845- 2- 20- 2,906
Athens Area ARC
AG4F 911- 2- 14- 2,888
Reno Co ARC
WØUY (+KBØFJI)
983- 2- 19- 2,884
Stu Rockafellow ARS
W8NJH (+KB8BIT)
897- 2- 20- 2,856
Three Rivers ARC
WØBRN 957- 2- 20- 2,832
Sterling Park ARC
W4RW (+KC4ATU)
574- 2- 15- 2,828
Santa Clara Co ARA
W6UW (+N6VUW)
588- 2- 51- 2,810
Faulkner Co ARC
W5LL (+KB5LUG)
873- 2- 15- 2,808
Sangamon Valley RC
W9DUA 686- 2- 5- 2,804
Bryan ARC
WC5Q (+N5NHL)
983- 2- 30- 2,798
McDonnell-Douglas ARC
W6VLD (+KC6EXM)
1267- 2- 12- 2,788
Pike & Lincoln Co ARES
KE8AH (+KB8ESL)
885- 2- 12- 2,778
Black River Valley ARC
NQ2W (+KA2SJG)
664- 2- 10- 2,776
Laurel ARC
N5KKG (+KB5CCW)
831- 2- 30- 2,774
Kent Co ARC
W3HZW (+N3HLS)
953- 2- 20- 2,772
W Pennsylvania FD Assn
KS3N 840- 2- 25- 2,772
Holland ARC
K8DAA 871- 2- 20- 2,768
Lubbock ARC
K5LIB 827- 2- 25- 2,766
CRA de Quebec
VE2CQ 720- 2- 33- 2,760
Stewart Lake ARC
WD7X 947- 2- 25- 2,758
El Paso ARC
W5ES (+KB5MMD)
984- 2- 35- 2,756
Canadian Valley ARC
WB5U (+KB4QWZ)
819- 2- 19- 2,740
Central Vermont ARC
W1BD 962- 2- 25- 2,726
Kern River Valley ARC
K6DHS 669- 2- 12- 2,696
Fellowship ARC
AI4I (+N4SYK)
937- 2- 34- 2,694

Mason-Dixon ARS
N3DVK (+KA3WNG)
820- 2- 35- 2,686
NE Missouri ARC
WØCBL 657- 2- 11- 2,664
Osceola ARC
K4MF (+N4ZIQ)
725- 2- 15- 2,664
Glynn ARA
K4TVE (+KC4DNI)
626- 2- 15- 2,652
Parker Co RC
WI5J (+N5ONE)
695- 2- 20- 2,634
Mobridge (SD) Area ARC
KØERM 513- 2- 7- 2,630
Mecklenburg ARS
W4BFB (+N4XCW)
894- 2- 100- 2,628
Pecos Valley ARC
K5LWU (+KB5LKB)
530- 2- 17- 2,618
Gonzaga Prep Ham RC
KC7FJ 1002- 2- 10- 2,604
Peterborough ARC
VE3RB 564- 2- 12- 2,596
Tyler ARC
AA5AA (+N5LVN)
951- 2- 41- 2,584
Motorola ARC
NR4P (+WA4BZJ)
914- 2- 10- 2,564
Tamaqua Transmitting Society
W3TI 569- 2- 12- 2,530
AREN of Saline Co
N5EL (+KB5MBJ)
620- 2- 18- 2,518
Blue Ridge ARC
W4WZ 641- 2- 30- 2,516
Albemarle ARS
WT4C (+KC4QLP)
731- 2- 30- 2,512
IBM San Jose ARC
N6KL 1328- 1- 12- 2,499
Tri-Co ARA
WI6T (+KB6SMW)
570- 2- 41- 2,472
Clinton Co ARA
WF8B (+N8JWR)
618- 2- 10- 2,450
West Haven ARA
K1RH 800- 2- 10- 2,448
W Michigan WA
W8FH (+N8KWX)
575- 2- 5- 2,448
SW Regional React ARRL FD
NZ2T (+N5EYR)
636- 2- 30- 2,442
S Maryland ARC
W3PT (+N3GHE)
657- 2- 50- 2,432
Manatee ARC
K4GG 987- 2- 20- 2,420
Allen Co ARTS
W9INX (+KB9DOV)
910- 2- 43- 2,414
Blackstone Valley ARC
W1DDD (+K1FLD)
809- 2- 14- 2,402
Appalachian RAA
NC3V 602- 2- 12- 2,392
Hiawatha ARA
KO8U 564- 2- 32- 2,380
N Kitsap ARC
WO7B (+KB7DTS)
537- 2- 20- 2,380
Menno-Net
K3SW 754- 2- 10- 2,378
Muscle Shoals ARC
W4JNB 675- 2- 25- 2,372
Rappahannock Valley RC
K4ME 480- 2- 10- 2,360
Ogden ARC
WW7N 823- 2- 58- 2,356
Tandem RAC
AA6BS (+N6UGX)
660- 2- 15- 2,348
Fair Lawn ARC
WK2T (+N2IXK)
513- 2- 14- 2,330
Champlain Valley ARC
K2TTI 597- 2- 20- 2,326
Mt Baker ARC
K7SKW (+KB7IGR)
786- 2- 40- 2,308
Gadsden ARC
K4JMC (+KC4RCK)
680- 2- 20- 2,298
Moreno Valley ARA
K6KB (+KC6EHY)
513- 2- 27- 2,282
Quad State RG
N4PMQ (+N8MDC)
638- 2- 10- 2,276
Nanaimo ARA
VE7NA 526- 2- 15- 2,256
Kaptain & Krew
K1DII (+N1HFN)
924- 2- 20- 2,248
New Ulm ARC
NØBMA (+WBØTYZ)
475- 2- 11- 2,244
Wilderness Trail ARC
KI4B (+KB4MGB)
593- 2- 11- 2,244
McComb ARC
W5WQ 574- 2- 12- 2,240
Irvington RAC
K2GQ 664- 2- 30- 2,230

Gaston Co ARS
KK4T 626- 2- 23- 2,220
Ellsworth AWA
W1TU 559- 2- 40- 2,218
60/60 Bandidos
KBØXL 1000- 2- 25- 2,214
Gallatin Ham RC
W7ED 649- 2- 10- 2,208
Comox Valley ARC
VE7CXW 834- 2- 25- 2,196
Pine State ARC
WB1E (+N1EVN)
584- 2- 20- 2,190
N Shore RC
WV7T (+KB9CNU)
661- 2- 50- 2,160
W Georgia ARS
W4FWD (+KC4RAK)
535- 2- 20- 2,154
NOARS
K8KRG (+KA8VTS)
545- 2- 40- 2,144
YSARC Valley Group
WA6OWH (+N6VPI)
749- 2- 12- 2,140
Humboldt ARC
KA4P 543- 2- 30- 2,140
NCG
WA5BRF (+N5ONS)
437- 2- 23- 2,132
Ephrata Area RS
N3RJ 731- 2- 27- 2,130
Central Kentucky ARC
WA4UXJ 570- 2- 10- 2,130
Melfort ARC
VE5YD 707- 2- 18- 2,128
Lewisville Texins ARC
KC5NG (+N5GEJ)
569- 2- 14- 2,128
AWARE
KD3GB 665- 2- 30- 2,128
NCG
AA5OM (+N5LSS)
553- 2- 7- 2,126
ARCOM
W9BFO (+N9IUG)
558- 2- 30- 2,122
Spam, Baked Beans and Spam
AC9C 1440- 1- 8- 2,119
Hermiston ARC
KD7VX (+KB7GJP)
651- 2- 27- 2,114
Calhoun Co ARA
WX4O (+N4NAU)
630- 2- 30- 2,106
ARA of Bremerton
W7VE 391- 2- 17- 2,106
Panther ARC
WA3TBL 382- 2- 7- 2,090
Clinton Co Illinois ARC
WA9YKO 417- 2- 13- 2,084
Auburn ARA
WA2L (+KB2EMX)
522- 2- 15- 2,072
Nappanee ARC
NN9X (+KA9UPN)
834- 2- 35- 2,068
NCG
W8PIF 573- 2- 9- 2,068
NCG
W2UB (+N2HXK)
629- 2- 10- 2,064
W Iowa GWAG
AKØN 442- 2- 13- 2,050
Harrison ARC
KM9E (+KB9ABA)
422- 2- 30- 2,046
Amoskeag RC
NS1S (+KA1UFC)
724- 2- 12- 2,040
Franklin ARC
NT4K 535- 2- 20- 2,038
RARA
VE5NN 715- 2- 32- 2,038
Trojan ARC
NSØO 496- 2- 16- 2,030
Greater Norwalk AC
N1II (+KA1RAD)
483- 2- 20- 2,030
Salem Area ARA
KB8GAE (+KB8HOC)
388- 2- 12- 2,026
Magnolia FDG
WE5E (+KB5MLS)
537- 2- 19- 2,026
RAC of Knoxville
W4BBB 567- 2- 75- 2,026
Ft Madison ARC
NWØX (+KBØHAE)
642- 2- 18- 2,014
Amateur Radio Caravan Club
K5BIS (+N5JUQ)
516- 2- 20- 2,006
Saratoga Co RACES
WA2UMX 726- 2- 10- 1,990
3M ARC
K9MBB (+N5POJ)
582- 2- 22- 1,988
Freemont City ARS
K7MM (+KB7JHM)
523- 2- 20- 1,986
Campobello RC
VE1FDR 625- 2- 14- 1,986
Lehigh Valley ARC
W3OI 674- 2- 25- 1,980
Fulton ARC
NT2F 549- 2- 22- 1,978
NCG
K8BI (+N5QEC)
526- 2- 25- 1,972

Rideau ARC
VE3BPC 445- 2- 15- 1,966
Bristol ARC
WB4DKI 424- 2- 24- 1,956
310 Irregulars
AA6SQ (+N6QLH)
720- 2- 10- 1,950
Harvard Repeater
KA1T 623- 2- 17- 1,950
HF Ops
KE7UA 701- 2- 12- 1,944
Quahnapowitt RA
W1EKT 395- 2- 19- 1,934
Mad Scientists ARC
AA6DE (+N6YVC)
473- 2- 10- 1,932
Hams & Eggs Society
W5KV (+KB5JJW)
633- 2- 15- 1,930
Big Island ARC
KH6CC (+NH6ER)
517- 2- 77- 1,906
Matagorda Co ARC
WA5SNL 422- 2- 14- 1,904
Keno ARC
KF7JZ (+N7ORI)
486- 2- 19- 1,900
Hoffman Estates, Illinois, ESDA
KE9NA 633- 2- 7- 1,892
Roanoke Valley ARS
AA4SJ 354- 2- 10- 1,888
S Towers ARS
WB2ELW (+N2KBI)
642- 2- 44- 1,882
Jackson Co Outlaws
KBIMR (+KB8HAN)
524- 2- 8- 1,872
Tompkins Co ARC
WK2K 490- 2- 25- 1,868
Lake Monroe ARS
W4FI 603- 2- 10- 1,848
Siemens ARC
AB4SZ 432- 2- 12- 1,842
LARK
K1WGO (+KA1FZY)
414- 2- 20- 1,834
Casper ARC
W7VNJ 585- 2- 15- 1,824
Mtn State Transmitters
K8VNQ 394- 2- 9- 1,822
Combined Orange RACES
W6HK (+N6WOW)
703- 2- 20- 1,814
Gratiot Co ARA
NO8V 606- 2- 12- 1,812
Clarkston Crazies
WD8RMC 572- 2- 6- 1,810
Columbia AA
W3GES (+KA3UQA)
491- 2- 20- 1,808
American Red Cross ARC
NR9M (+KB9DQP)
551- 2- 30- 1,808
Bell System of Indiana ARC
AK9U 625- 2- 12- 1,804
Mercury Columbus Contingent
K8ES (+KA4MWP)
318- 2- 18- 1,794
NCG
NEØJ 379- 2- 15- 1,794
Fox Cities ARC
W9ZL (+N9JLH)
471- 2- 12- 1,792
MCARS
WB8SRM (+KB6TIU)
690- 2- 7- 1,792
Smoky Valley ARC
KEØWY 591- 2- 5- 1,786
Las Vegas RAC
WI7D 644- 2- 34- 1,770
South Canadian ARS
W5OU 421- 2- 20- 1,768
Bay Area ARS
N3AWG (+KA3WIX)
526- 2- 8- 1,762
W Marin RACES
K6JOQ (+KC6KQM)
249- 2- 7- 1,760
Shenandoah Valley ARC
W4RKC 406- 2- 16- 1,740
Liberty Co ARC
KF4UM 394- 2- 15- 1,734
American Airlines ARC
KR5P 481- 2- 15- 1,728
Sandy River ARC
KI1B 545- 2- 5- 1,726
Copper Co RAA
W8CDZ 520- 2- 35- 1,726
N Coast Contest Club
WB8BTO 521- 2- 6- 1,724
Michigan Radio Boys
N8KLI (+N8KKJ)
454- 2- 5- 1,698
Theodore Roosevelt ARC
KØND (+N8LZO)
540- 2- 14- 1,680
Tarsands ARC
VE6TRC 524- 2- 7- 1,680
Guantanamo Bay ARC
KG4FD 399- 2- 25- 1,674
Oklahoma State University ARC
W5YJ 583- 2- 11- 1,668
Greer ARC
W4IOQ (+N4WON)
470- 2- 15- 1,664
Huber Heights ARC
N8TD (+N8MMZ)
300- 2- 9- 1,656

Cherryland ARC
NF8T 506- 2- 49- 1,654
Granite State ARA
K1RD (+KA1VZB)
465- 2- 13- 1,654
Hou-Texins ARC
WB5LIN 437- 2- 7- 1,646
Hartford Co ARA
W1NEM 496- 2- 15- 1,642
Muscatine HRG
KJ9H (+KB9ENE)
462- 2- 13- 1,638
Golden Triangle FDG
W5RIN (+KB5MOM)
395- 2- 32- 1,636
Lakeview ARC
KF7IO 712- 2- 10- 1,636
AMSAT-Houston/HTTY
N5EM 417- 2- 12- 1,616
Klugemasters
WK2I 461- 2- 11- 1,614
S Central Connecticut ARA
W1GB 608- 2- 10- 1,604
Palos Verdes ARC
WS6V 640- 2- 13- 1,594
SMARTS
NA5G (+KB5MAW)
390- 2- 10- 1,594
Clarksville ATS
KF4L 430- 2- 20- 1,588
Sky High ARC
KB2AR 481- 2- 7- 1,582
Aroostook ARA
K1JK (+N1HSQ)
450- 2- 42- 1,578
S Alberta ARC
VE6CAM 425- 2- 11- 1,570
Kings ARC
AA6GZ (+N6WZV)
478- 2- 10- 1,556
Polk CCDACS
W4TJM (+KC4ONC)
316- 2- 15- 1,552
Bays Mountain RC
W4ZJA 262- 2- 4- 1,550
Fullerton RC
W6ULI 489- 2- 30- 1,546
Montcalm Area ARC
WB8Z (+KB8FUA)
489- 2- 24- 1,542
SW Louisiana ARC
W5BII 521- 2- 18- 1,542
Nevada Co ARC
K6ZK 531- 2- 20- 1,540
NCG
KØBPR 506- 2- 4- 1,528
St Peter ARC
WQØA (+NØJHG)
277- 2- 10- 1,526
S Brevard ARC
N4MIR 308- 2- 9- 1,514
Branch Co ARC
WB8R 297- 2- 24- 1,508
Honeywell ARC
WAØNLP 427- 2- 18- 1,508
Yolo ARS
N6GF 520- 2- 16- 1,502
Coos Co RC
K7CCH 367- 2- 7- 1,500
400 Foot FD Fanatics
N7KFV 290- 2- 4- 1,496
Borderline ARC
WX7L (+N7JCP)
442- 2- 56- 1,492
Zero Beater's ARC
WAØFYA 745- 2- 7- 1,490
Pike Co ARC
W9CZH 267- 2- 7- 1,484
Clinton ARC
W8CS 591- 2- 20- 1,482
Rip Van Winkle ARS
W2FSL 409- 2- 12- 1,478
Greenwood ARC
AA4TZ 326- 2- 25- 1,468
River City ARC
KG6XX 389- 2- 8- 1,468
SE ARC
K8EMY (+KB8CZU)
288- 2- 16- 1,466
Moose Horn ARC
KL7IEJ 326- 2- 11- 1,462
Piqua ARC
W8SWS 398- 2- 45- 1,460
McDonnell-Douglas ARC
WAØCGV (+NØKBG)
347- 2- 7- 1,434
Mission Emergency ARS
VE7MIS 401- 2- 10- 1,432
Cascades ARS
K8MJZ (+KA8VMJ)
462- 2- 16- 1,428
W Texas ARC
WU5N 388- 2- 15- 1,404
Starke Co ARC
K9VCM 488- 2- 16- 1,404
Radio Operators of S Texas
AA5FX 449- 2- 15- 1,400
Delta Co ARS
K8ZAS (+WD8RTH)
352- 2- 20- 1,394
CIARS
WØCUO 417- 2- 14- 1,394
Kansas Nebraska RC
WØTQ 239- 2- 10- 1,394
NETCARS/Grapevine ARC
K5HB 416- 2- 25- 1,388
Statesboro ARS
WD4IVC 251- 2- 4- 1,384

Central Dakota ARC
WØZRT 340- 2- 15- 1,382
Paul's Pals
K6DYX 208- 2- 4- 1,382
Marshfield Area ARS
WA9K 439- 2- 14- 1,376
Billy the Kid
WV5U (+N7KKQ)
295- 2- 9- 1,374
SMARTS/Carver Co ARES
NIØX (+KAØMCM)
285- 2- 17- 1,370
Tampa ARC
W4DUG (+KB4FFI)
761- 1- 43- 1,368
LYARS
WM7D (+N7OLN)
425- 2- 17- 1,366
Ski Country ARC
K9MWM (+KB8FXB)
389- 2- 10- 1,364
R & S Group
KD3BS (+KA3RBJ)
440- 2- 9- 1,362
Wantagh ARC
W2VA 440- 2- 22- 1,352
Convair ARC
W8UUS (+N8SBO)
348- 2- 20- 1,300
Outcasts RG
VE4KR 562- 2- 5- 1,292
Umpqua Valley ARC
AE7Q (+KB7KZR)
236- 2- 13- 1,290
Huntsville ARS
WA5APS (+KA5CYF)
415- 2- 8- 1,270
Northwoods ARC
AA9Y 320- 2- 44- 1,268
Hog Wallow FDG
KN4HN 380- 2- 5- 1,258
Catalpa ARS
W8AQ (+N8LFJ)
245- 2- 13- 1,258
Neptune ARC
N2GT (+N2HGI)
293- 2- 43- 1,256
Yates Co
ND2Z 225- 2- 5- 1,250
Tri Co RA
W2LI 474- 2- 10- 1,248
CRA Laval Laurentides
VE2CRL 579- 2- 32- 1,240
Northrop B-2 RC
W6VPZ (+KB6TIN)
415- 2- 14- 1,238
Manhattan Area ARS & KSU ARC
WØQQQ (+NØKMC)
257- 2- 25- 1,216
Chehalis Valley ARS
NO7S (+KA7ODR)
258- 2- 11- 1,214
Cascade RG
N7EYO (+N7NXE)
353- 2- 8- 1,206
Farmington ARC
WS8Z (+N8KIE)
457- 2- 11- 1,200
Twentymile Bottom Boys
WA5CYR 335- 2- 5- 1,188
Three Rivers RC
W9NT 489- 2- 17- 1,188
Greenwood ARC
VE1WN 292- 2- 10- 1,184
Sunshine Coast ARC
VE7SCA 317- 2- 20- 1,180
Butler Co VHF Assn
W8CCI (+N8KRC)
445- 2- 10- 1,166
Yellow Thunder ARC
WB9FDZ (+KB9ERR)
281- 2- 15- 1,162
Radio Amateurs des Pionniers Telephone
VE2CPT 347- 2- 4- 1,154
Indian Foothills ARC
WAØI 197- 2- 8- 1,152
SE Louisiana ARC
WB5NET 344- 2- 14- 1,150
Bremerton Chapter MARA
KC7FN (+KB7ITD)
275- 2- 52- 1,150
Kootenai ARS
N7AH 301- 2- 7- 1,140
Illinois Valley ARC
NN9M 267- 2- 10- 1,136
D-CAT
WA5WCY 184- 2- 7- 1,134
St Johns Co ARES
AB4EY (+N4XHV)
339- 2- 11- 1,118
Dust Bowl ARC
KY5C 359- 2- 15- 1,118
Camden ARC
W5KEG 354- 2- 10- 1,108
Ogdensburg ARC
NR2B (+KA2CCU)
184- 2- 11- 1,108
SE Metro ARC
NØIPN 232- 2- 9- 1,088
American Red Cross ECS
N2MH (+KB2KHY)
370- 2- 20- 1,078
Roan Co ARC
AA4KS 311- 2- 7- 1,076
USAF MARS—Hawaii
KH6CTQ 149- 2- 3- 1,076
Cricket Wireless Assn
KA1ST 272- 2- 12- 1,060

NCG
N3GSA 396- 2- 6- 1,032
N6ENV RG
KB6C (+N6ENV)
270- 2- 20- 1,020
NW Amateur Radio/Electronics Assn
NOØG 279- 2- 15- 1,014
Mogollon Monsters
WB7CAG 239- 2- 15- 1,012
NCG
AA6DG 194- 2- 4- 986
Humboldt ARC
KF6FY 296- 2- 7- 966
LaPorte/Michigan City ARC
W9CSF (+KB9ESQ)
335- 2- 22- 954
Carthage ARS
N5IKB 274- 2- 17- 948
Capilla Peak FDG
K5FSB 651- 1- 6- 917
Old Post ARS
W9EOC 253- 2- 8- 906
Capital City ARC
WC7U 346- 2- 5- 900
Sheridan RAL
W7GUX 255- 2- 6- 894
Lower Columbia ARA
W7DG (+KA7YXF)
230- 2- 22- 890
Foothills ARC
AB4TF 90- 2- 3- 888
Norfolk ARC
VE3SME 323- 2- 7- 870
Jackson Co ARC
K8BST 285- 2- 20- 870
Elmwood Park ARC
K9YHB 182- 2- 5- 868
NCG
WA8TON 281- 2- 25- 864
Dixie ARC
WI7J (+N7LZY)
125- 2- 11- 860
Straits Area ARC
W8GQN 141- 2- 12- 850
Santa Ynez Valley Hams
N6JNS (+N6SUP)
206- 2- 18- 828
Lake Bluff RG
KC9NG (+N9GZT)
168- 2- 7- 808
St Cloud ARC
WØSV 225- 2- 25- 808
James Gang
N8DGD (+KB8KBY)
236- 2- 5- 784
Acadia Naval ARC
K1NAN 181- 2- 16- 782
Johnson City RA
W4ABR (+KC4OWD)
674- 1- 24- 776
Rogers City RA/Presque Isle Co ARES
WB8TQZ 216- 2- 4- 760
Morongo Basin ARC
W6BA 182- 2- 12- 754
Spring Hill ARC
N4US 117- 2- 23- 750
Steamboat Mtn ARC
N5DOX 140- 2- 10- 744
Crawford ARS
W3MIE 261- 2- 20- 736
S Peninsula ARC
Yakima ARC
W7AQ 212- 2- 10- 734
KL7HAY 225- 2- 10- 732
Dunnville ARC
VE3AKO 12- 2- 10- 728
Bath ARC
KL7IEI 155- 2- 20- 710
GE Camden ARC
NG2R 164- 2- 5- 704
Chisholm Trail ARC
W5MOF 101- 2- 13- 702
Lambda ARC
K9AT 34- 2- 10- 688
Lanierland ARC
W4IKR 312- 2- 25- 686
Georgia Radio Engineers & Technicians
WB4RRD 172- 2- 5- 646
RELAVA/Woodland RG
KJ6RJ (+KB6RYY)
156- 2- 100- 636
Botsford ARC
KC8GP 216- 2- 9- 632
NCG
KI6SP 198- 2- 3- 604
Gwinnett ARS
AB4NI 241- 2- 22- 582
Mt Shasta ARC
W6LXK 134- 2- 4- 576
Chilliwack ARC
VE7AFA 198- 2- 12- 544
Triangle ARC
W4LEN (+N4SVZ)
110- 2- 12- 542
Lake Huron ARC
KE8OQ 166- 2- 21- 538
Lakes Area ARC
WB9PZH (+KA9TVC)
180- 1- 10- 521
Calaveras ARS
WA6YGA 155- 2- 7- 510
Cascade Kilowatt Contesters
N7NOP 214- 1- 4- 458
Connecticut Valley FM Assn
W1GUA 75- 2- 3- 450
RASON
NN1S 197- 2- 5- 420

Stanwood-Camano ARC
N7GMA (+KB7KWN)
53- 2- 8- 418
Kalamazoo Mercury ARAG
W8RTY (+KB8KBU)
44- 2- 6- 388

2A Commercial

Pottstown ART
N3WW 1614- 2- 15- 4,928
Boiled Owls of New York
W2AX 2634- 1- 12- 4,009
Central Illinois RC
W9AML 1248- 2- 20- 3,892
Greater Fairfield ARA
K1BR (+KA1USX)
888- 2- 40- 3,484
Sumter ARA
KK4TK (+N4IVU)
1325- 2- 45- 3,426
Midway ARC
K0TD 938- 2- 50- 2,276
Shore Points ARC
W2HRW 529- 2- 15- 2,022
Bully Hill ARG
WR2Y (+N2EXN)
686- 2- 12- 1,784
Miami Co ARC
K9ZEU 393- 2- 14- 1,594
Navarro ARC
N5ASF 465- 2- 21- 1,488
Wiregrass ARC
NS4U 472- 2- 15- 1,254
Athens ARC
W5CR 294- 2- 10- 1,030
Beaver Valley ARA
W3SGJ 276- 2- 10- 784
Marshall Co ARA
WG4U 265- 2- 9- 760
React ARC
N3EOG (+KA3EQT)
38- 2- 8- 576
TARCOM
W2FWG 47- 2- 9- 106

3A Battery

Summit ARA
K3JL (+N3DPB)
2431- 5- 20- 17,170
N Coast ARC
KB8A (+N8MIL)
1465- 5- 25- 9,810
Montgomery ARC
N3BE (+KA3VYN)
923- 5- 30- 7,265
Ampex Employees' ARC
K6QEZ 734- 5- 10- 6,800
"A" Team
W4RRW 628- 5- 7- 6,680
Univ of Maryland ARA & John Hopkins ARC
W3EAX (+N3HOU)
844- 5- 16- 6,150
Oklahoma QRP
W5LGO (+WD5IRL)
228- 5- 9- 2,430
Michigan QRP Club
W8LHG 136- 5- 5- 1,615
HCARA
WB4NOD (+KB4BFB)
136- 5- 14- 1,565
NCG
WB0T 82- 5- 10- 1,075

3A

Ashtabula Co ARC
W8CY (+KA8LTE)
3459- 2- 26- 11,788
Hughes Fullerton Employees Assn ARC
N6AW (+N6RNG)
3840- 2- 50- 11,306
Red Ryder Contest Group
W8VS (+KB8GLJ)
3731- 2- 10- 10,680
Rochester (New York) DX Assn
W2TZ (+KB2CHC)
2998- 2- 40- 10,030
Radio Central ARC
K2VL (+KB2BSG)
2749- 2- 75- 9,564
Hamfesters RC
W9AA 2641- 2- 25- 8,858
Motor City RC
W8MRM (+KB8HGM)
2665- 2- 46- 8,802
Poughkeepsie ARC
N2YL (+KB2HAP)
2784- 2- 25- 8,704
Redwood Empire DX Assn
N6OJ (+N6UZJ)
2629- 2- 20- 8,290
Acton Boxboro ARC
W1UC (+KA2DJH)
2448- 2- 25- 8,290
Shelby Co ARC
AC4T (+N4YOO)
2181- 2- 50- 7,950
Shreveport ARA
W5AU (+N5OCB)
3102- 2- 25- 7,946
S Peninsula AR
W4PRO (+KC4IVE)
2439- 2- 56- 7,516
Jet Propulsion Lab ARC
W6VIO (+N6PBS)
2005- 2- 32- 7,174
Albany ARA
K2GT (+K2CBA)
2121- 2- 27- 7,154
Twin City ARC
K9CW (+KA9QZO)
2558- 2- 30- 7,114
Cape Way RC
K1BU (+KA1BBU)
1955- 2- 25- 6,996
Springhill ARC
N5II 2308- 2- 13- 5,898
Daubenville DX Assn
NM3E (+N3HWJ)
2539- 2- 25- 6,844
ARTS
W4CN (+KC4HUY)
1708- 2- 40- 6,225
San Mateo RC
W6LMN (+KB6VNY)
1771- 2- 23- 5,966
Parkersburg ARK
K8UC (+N8MMG)
1331- 2- 46- 5,864
Thomasville ARC
W4UCJ (+N4YPO)
1551- 2- 25- 5,810
Jones Co ARC
W3GN 1572- 2- 13- 5,778
Palo Alto ARA
W6OTX (+N6YUE)
1855- 2- 30- 5,770
Smoky Mtn ARC
W4OLB (+KC4PDQ)
2070- 2- 25- 5,616
Fredericton ARC
VE1ND 1461- 2- 12- 5,548
Virginia Beach ARC
WA4TGF (+KC4JGC)
1476- 2- 165- 5,288
McHenry Co WA
KB9K (+KB9DNT)
1784- 2- 35- 5,256
E Bay Amateurs
WA1S (+KA1UOW)
1376- 2- 13- 5,166
Japanese American ARS
W6AN (+KB6GIT)
1555- 2- 35- 5,068
E Pasco ARS
AA4RU (+KC4LXG)
1499- 2- 20- 5,044
Goz's Gang
K2SA 1308- 2- 12- 5,008
Chattanooga ARC
W4AM (+WA4CRO)
1643- 2- 52- 4,978
Boeing Employees ARS
K7NWS (+N7MUT)
1165- 2- 70- 4,900
Upper Lake Livingston WA
W5USD (+KB5LIG)
1918- 2- 11- 4,862
Sioux Empire ARC
W0ZWY (+KB0GNG)
1377- 2- 24- 4,850
Bill Hoehl Memorial FDG
W4UOT (+N4YJD)
1314- 2- 30- 4,808
Paso Robles ARC
W6LKF (+KC6DFA)
1352- 2- 85- 4,808
Waterbury ARC
NT1I (+KA1RRG)
1919- 2- 25- 4,762
Elkhart Co Club Coalition
W9XD (+N9IOX)
1289- 2- 20- 4,742
Paducah ARA
W4NJA (+KC4ENA)
1442- 2- 20- 4,726
3M ARC
W0MR (+KA0ZIA)
1320- 2- 20- 4,724
N Ottawa ARC
KC8P 1440- 2- 16- 4,720
Mississippi Coast ARA/Keesler ARC
N5WE 1289- 2- 25- 4,704
W Seattle ARC
W7AW 1307- 2- 17- 4,680
Washington Co ARA
KC1G (+KA1RCI)
1181- 2- 25- 4,622
Calumet ARE
KE9I (+KA9ZFG)
1339- 2- 15- 4,598
Abbotsford ARC
VE7ECC (+VE7CTE)
1542- 2- 30- 4,590
Greater Memphis FD
W4EM (+N4WAH)
1334- 2- 153- 4,548
Massanutten ARA & Valley ARA
N4JEG (+KB4OLM)
1359- 2- 35- 4,492
Colonial Wireless
K1TW (+N1FER)
1342- 2- 20- 4,476
S Georgia ARC
AB4HO (+N4UXE)
1559- 2- 14- 4,466
San Lorenzo Valley RC
N6TU (+N6VAR)
2948- 1- 34- 4,431
Schaumburg ARC
K9SB (+KB9CMX)
1243- 2- 45- 4,402
St Charles ARC
N0GL (+N0LBR)
1199- 2- 36- 4,290
Tuscarora ARA
NO3O (+KA3TIX)
1717- 2- 12- 4,242
Palisades ARC
NK9Y (+KA9ZKT)
1071- 2- 17- 4,242
Nashville Area ARC
W4AY (+N4XKI)
1227- 2- 250- 4,218
N Shore RA
W1ND (+N1HLK)
1242- 2- 25- 4,214
Ft Smith Area ARC
W5ANR 1151- 2- 30- 4,206
Tioga Co ARC
NO3R 1080- 2- 25- 4,196
NCG
KA5BEE 1474- 2- 7- 4,196
Cambridge ARA
W8VP 1253- 2- 18- 4,196
Indian Hills RC
W8ICS 978- 2- 40- 4,104
Tri-City ARC
W7VPA (+KB7ILC)
1237- 2- 45- 4,080
The "G" Force
WG1H (+KA1TBM)
1129- 2- 5- 4,034
Mid-Ohio Valley ARC
WF8U (+N8KVU)
1488- 2- 25- 4,014
Douglas Co ARC
KC0W (+N0LNU)
1120- 2- 18- 3,988
N Hills ARC
W3XX (+W3BIS)
911- 2- 35- 3,966
Murgas ARC
K3YTL 1298- 2- 10- 3,966
Maryland Apple Dumpling RAS
W3ZZ (+N3GKZ)
1166- 2- 24- 3,964
Providence RA
W1OP 1206- 2- 22- 3,936
Golden Triangle ARC & Fallbrook ARTS
AA6VO (+KC6CAZ)
1316- 2- 60- 3,916
Tri-State ARC
KW3U (+KB2KNC)
1164- 2- 17- 3,874
Corona orco ARC
KJ6B (+K6LEF)
1452- 2- 15- 3,854
Mid-State ARC
NT9J (+KB9AXD)
1176- 2- 22- 3,834
Weasel's Weirdos
KW4M (+WB4OLD)
1087- 2- 12- 3,790
Old Pueblo RC
W7GV (+KB7GOW)
1228- 2- 40- 3,764
Souhegan Valley ARC
NE1K (+WB1HBW)
1020- 2- 16- 3,728
Trident ARC
AA4IX (+N4YUI)
943- 2- 15- 3,726
Burnaby ARC
VE7BAR 1219- 2- 41- 3,718
Independent ARC
WE0M 1042- 2- 15- 3,716
CRA St Hyacinthe
VE2CAM 789- 2- 12- 3,688
Club de Radio Sherham
VE2FC 982- 2- 25- 3,678
Kokomo ARC
KK9I 864- 2- 17- 3,652
NALCO ARES/Univ of California ARC
W6BB (+N6TQS)
837- 2- 20- 3,614
S Bay ARS
K6QHQ (+N6RSL)
762- 2- 14- 3,548
Triac ARC
W3SV 1399- 2- 26- 3,528
LIMARC
KO2G 848- 2- 35- 3,522
Orrville ARS
KD8EU 1284- 2- 46- 3,502
Chesapeake Bay RA
NY3U (+N3GMU)
953- 2- 10- 3,478
McKean Co ARC
W3VU (+KA3WJC)
1040- 2- 20- 3,466
Mound ARA
W8DYY 775- 2- 45- 3,442
Port City ARC
W1WQM (+N1HSM)
1111- 2- 23- 3,400
Old Dominion Chapter 10-X Int'l
AA4JN (+N4RVR)
1133- 2- 24- 3,354
Shoreline ARC
W1BCG (+N1HAX)
835- 2- 46- 3,350
Marshall RC
W0BMJ (+KB0CHM)
1151- 2- 20- 3,348
Oakville ARC
VE3HB 914- 2- 20- 3,346
Middlesex ARC
W1HEB (+WB1ABI)
822- 2- 8- 3,274
Chatham-Kent ARC
VE3CRC 1260- 2- 25- 3,250
Westark ARC
WE5L 1365- 2- 17- 3,230
Coastal ARS
AB4B (+KC4AWZ)
1186- 2- 13- 3,222
PART of Westford
AB1A (+N1GRC)
805- 2- 22- 3,166
Delaware Valley RA
W2ZO (+KA2VJO)
945- 2- 15- 3,164
Adams Co ARC
K9HA 807- 2- 22- 3,128
Tri-City ARC
NY1V (+KA1VLZ)
761- 2- 75- 3,126
SE Michigan ARA
K8BYI (+KB8DSC)
820- 2- 40- 3,080
Quinte ARC
VE3RL 762- 2- 24- 3,076
Jayhawk ARS
W0LB (+N0LPI)
697- 2- 38- 3,068
Rogue Valley ARC
W7OEK (+KB7KRF)
915- 2- 80- 3,032
Queen City Emergency Net
W8VVL (+KA8SQE)
666- 2- 25- 3,000
Surrey ARC
VE7SAR (+VE7FXB)
903- 2- 12- 2,998
Jefferson ARC
W5GAD 891- 2- 15- 2,994
St Clair Co ARES
NA8I (+KA8UKO)
788- 2- 19- 2,988
Trans-Indiana TS
WB9QBR (+KB9DIZ)
894- 2- 45- 2,950
Ocean-Monmouth ARC
KC2O (+WB2FNO)
880- 2- 18- 2,944
Field Day's Finest
N9DD 728- 2- 6- 2,912
Natchaug ARC
WD1U (+N1GUT)
920- 2- 24- 2,846
Ausable Valley ARC
WT8G 792- 2- 12- 2,844
Flathead Valley ARC
K7LYY 785- 2- 22- 2,828
31 ARG
N4AZY 606- 2- 7- 2,824
Tri-Town RAC
W9VT (+N9FUW)
743- 2- 12- 2,802
Beach Cities Wireless Society
N6VY 734- 2- 25- 2,798
Rappahannock ARA
AA4HQ (+N4YMY)
858- 2- 24- 2,778
Naval Post Graduate School ARC
K6LY (+KC6AMI)
722- 2- 30- 2,774
Peninsula ARC
W4MT (+KA4UJZ)
906- 2- 16- 2,768
F-22 Group
AA6SP 1143- 2- 5- 2,766
Coastside ARC
WA6TOW 762- 2- 9- 2,764
Kendall ARS
WK5O (+N5QPU)
999- 2- 13- 2,750
Ascension ARC
WN5K 772- 2- 50- 2,746
RPI ARC/Rensselaer RACES
W2SZ (+KB2GPK)
620- 2- 17- 2,730
Central Washington ARC
W7GB 775- 2- 6- 2,712
Pymatuning ARC
NM3C (+KA3LUH)
1104- 2- 11- 2,708
Zephyrhills Area ARC
K4VLD (+KB4UET)
702- 2- 17- 2,692
Pierre ARC
WV0H 662- 2- 18- 2,686
Dalton ARC
KK4LL (+KC4LHS)
736- 2- 60- 2,670
Stamford ARA
K1GF (+KA1WVR)
749- 2- 70- 2,666
Two Docs in the Sticks
N6MI 926- 2- 3- 2,666
S Hills Brass Pounders and Modulators
K3WNX 911- 2- 35- 2,638
Allegan Co ARC
K8CJQ 794- 2- 14- 2,626
Madison Co ARC
W9VCF 858- 2- 26- 2,610
Hazleton ARC
W3SJI (+KA3UPA)
861- 2- 20- 2,608
Niagara Peninsula ARC
VE3VM (+VE3PIO)
753- 2- 23- 2,600
Key West ARC
K3ML 649- 2- 9- 2,594
Central Georgia ARC
AB4MS 678- 2- 21- 2,586
Thunder Bay ARC
K8CHS (+KB8HJD)
875- 2- 13- 2,556
Portage ARC
KJ3O 561- 2- 15- 2,556
Framingham ARA
W1FY (+KA1TAT)
688- 2- 25- 2,546
ARC Silverton
KD7X 697- 2- 12- 2,544
Cape Ann ARA
W1RK (+KA1GTA)
425- 2- 45- 2,532
Melpar ARC
WB4YZS 699- 2- 8- 2,524
Marple Newtown ARC
NM3S 678- 2- 24- 2,516
Larkfield ARC
WA2PNU (+KB2ING)
786- 2- 25- 2,508
Peninsula ROS
NB3Y 719- 2- 19- 2,484
Ucluelet ARC
VE7UEP 499- 2- 14- 2,482
Bill Gremillion Memorial RC
K4SEX 885- 2- 22- 2,470
Spa ARA
WB5OMG (+KB5LJK)
931- 2- 43- 2,470
X-WARN
WD8PWG (+KB8GRO)
638- 2- 15- 2,464
ESL ARC
AA6OZ (+N6VIV)
485- 2- 16- 2,462
Grays Harbor ARC
W7ZA 853- 2- 27- 2,462
Horseshoe ARC
NU3T (+N3IBU)
642- 2- 52- 2,458
Olympia ARS
WC7I 585- 2- 45- 2,364
Poway ARS
K6CD (+N6VJV)
604- 2- 35- 2,328
Campbell Co ARC
W4YZG (+KC4MFB)
788- 2- 40- 2,310
Giant Co ARC
W9EBN 592- 2- 33- 2,246
Bloomfield ARC
W1CWA 545- 2- 13- 2,216
Lake Area RK
N0DL 521- 2- 18- 2,214
Mammoth Cave ARC
KD4SS 477- 2- 20- 2,200
Puerto Rico ARC
KP4ID (+WP4INK)
395- 2- 11- 2,170
HCARC
WI4M 614- 2- 12- 2,166
OCARS
NE3H 684- 2- 10- 2,156
Sleepy Hollow Badgers
N8IAG 427- 2- 5- 2,148
Pawnee ARC
AF0N 498- 2- 20- 2,130
Twin Cities RC
W0BU 604- 2- 10- 2,128
Mid-Atlantic ARC
W3SA (+KA3VTQ)
599- 2- 32- 2,122
Suburban ARA
KU8B 1058- 2- 20- 2,112
Nutley ARS
W2GLQ 489- 2- 30- 2,108
STARS
N4IRV (+WA4UOF)
690- 2- 35- 2,088
Delaware Valley OMIK Elect Comm Assn
W3WZU (+N3GGB)
639- 2- 24- 2,076
S Sierra ARS
K6RL 388- 2- 10- 2,064
SBARA
N6VD (+N6TYE)
542- 2- 35- 2,008
Kachina ARC
WA7GWG 553- 2- 25- 2,006
Kachina ARC
WA7GWG 553- 2- 25- 2,006
Texins ARC
K5OJI 492- 2- 4- 1,990
Martin Co ARA
K4ZK 451- 2- 25- 1,984
Laurel ARC
NA3T 797- 1- 35- 1,979
W Allis RAC
W9FK (+KB9AUQ)
814- 2- 20- 1,962
MITRE-Washington ARC
N4PDY (+N4UUA)
402- 2- 9- 1,926
Pioneer ARC
W0RCH 457- 2- 30- 1,904
Cameron Co ARC
KD3LM 657- 2- 8- 1,904
21 Repeater Group ARC
W9WM 719- 2- 12- 1,890
Kings Co RC
W2RAK 443- 2- 38- 1,886
Elgin ARS
VE3RSE 733- 2- 20- 1,866

WY7Q's (l-r) John, KG7EU; Aaron, KB7GGY; and Todd, KF7LX; squeeze in a little operating time at the CUBS ARS of Sedro Woolley (Washington).

The Delaware-Lehigh ARC ran a full-fledged Novice station. Brownie, W3CJI, watches Eric, make a contact.

Julie, N2KNA (l), upgraded to Advanced during Field Day with the Arkansas Tennessee RA. She and Marsha, N4TPU, try out her new privileges at WZ5S.

Telephone Employees ARA
K2RB 534- 2- 7- 1,864
Tippecanoe ARA
W9REG 570- 2- 27- 1,846
Auburn Academy ARC
W7WR 596- 2- 18- 1,844
Silvercreek ARA
WD8PNF 604- 2- 17- 1,834
Lorain Co AA
KE8ZA (+KA8WMX)
464- 2- 53- 1,830
Runestone ARC
WA0VVM 411- 2- 14- 1,798
EIMAC RC
W6AY 631- 2- 10- 1,774
Kinston ARS
W4OIX 571- 2- 20- 1,774
Metrocrest ARS
KB5A 393- 2- 75- 1,748
Elkhorn Valley ARC
NR0A (+N0KWP)
495- 2- 18- 1,746
Rantoul ARA
W9ZK 506- 2- 6- 1,732
Chesco ARA
K3BKG 573- 2- 19- 1,716
Kennehoochee ARC
W4GTS 473- 2- 17- 1,688
Raritan Bay RA
K2GE 499- 2- 20- 1,654
Mohawk ARC
KC1TF (+N1FDR)
422- 2- 33- 1,644
Cumberland ARC
K3IEC 761- 2- 15- 1,642
National Trail ARC
K9UXZ (+KB9AHH)
425- 2- 20- 1,610
Mt Tom ARA
NA1V 468- 2- 18- 1,604
Mobile ARC
W4IAX 401- 2- 12- 1,600
N Shore ARC
VE3NSR 492- 2- 15- 1,594
Wayne Co ARC
K4CYP 380- 2- 15- 1,580
Six-Meter Club of Chicago
K9ONA 404- 2- 10- 1,578
Bluestone ARC
KA8RAB (+KB8EQC)
532- 2- 10- 1,564
Endless Mt ARC
NX3Y 779- 2- 12- 1,558
W Colorado ARC
W0RRZ (+KB0CMR)
471- 2- 18- 1,552
Johnson Co ARC
AA5PL (+KB5MMA)
406- 2- 25- 1,552
Michiana ARC
W9ATS 431- 2- 22- 1,548
Milwaukee RAC
W9RH (+KB9EWG)
391- 2- 16- 1,544
Arlington Communications League
KC9IL 463- 2- 19- 1,540
CHARC
W8EL 561- 2- 6- 1,538
Greene Co ARES/RACES
WT2C (+WA2KCK)
219- 2- 17- 1,528
US Center ARC
NX0R 382- 2- 25- 1,526
Elmira ARC + Chemung Co ARES
W2ZJ 400- 2- 25- 1,514
Briar Patch ARC
N4VL 603- 2- 46- 1,506
SEMO ARC
K0CEA (+N0JTU)
400- 2- 40- 1,502
Slo N Coast ARES
W6SCR (+N6UMW)
419- 2- 17- 1,492
S Cos ARA
K2BR 356- 2- 50- 1,484
Socorro ARA
KS5H 373- 2- 8- 1,484
Sun Parlour ARC
VE3SPR 588- 2- 55- 1,466
Moultrie Amateur Radio Klub
W9BIL 431- 2- 13- 1,462
No-Name Group
K6PD 305- 2- 4- 1,456
Golden Empire ARS
W6RHC 459- 2- 43- 1,444
Raleigh ARS
N4TH (+KC4PHJ)
566- 2- 30- 1,432
Salem ARC
W7SAA 383- 2- 11- 1,418
Snohomish Co HC
WA7LAW (+KB7FPW)
347- 2- 14- 1,398
Three Generations Group
W6BIV 324- 2- 4- 1,396
NCG
N1FS 798- 1- 8- 1,379
Herndon RG
KI4RO 246- 2- 25- 1,352
Chelsea ARC
WW8M (+KB8GCN)
314- 2- 15- 1,352
Frost Peak Mountaintoppers FDG
AA7DT 465- 2- 7- 1,330
Crawford-Roscommon ARC
WW8U 382- 2- 9- 1,324
ARPSA
K9SGV 240- 2- 24- 1,316
Wolf Mtn ARC
AA7ES (+KB7KMU)
214- 2- 14- 1,304
Idaho Soc of RA
K7QQP 487- 2- 25- 1,298
Ozone ARC
ND5O 342- 2- 10- 1,274
Country Pride HRC
N5MCI (+KB5LRL)
376- 2- 11- 1,260
Naval Research Lab ARC
W3MNU 250- 2- 20- 1,258
Iowa City ARC
W0JV 325- 2- 30- 1,250
TARA ARA
N6ELV 573- 2- 125- 1,246
RF Rascals
KA3MJN 359- 2- 4- 1,242
Metropolitan ARC
K8NOW 412- 2- 6- 1,224
NCG
W7NX 352- 2- 3- 1,212
Barne ARC
VE3GCB 353- 2- 30- 1,170
Cinclantflt ARC
NS3F (+N4YPT)
298- 2- 9- 1,148
Ray-Clay RC
K0EET 291- 2- 24- 1,144
TCARA/PARA
WA6BAI 300- 2- 17- 1,100
Caddo Creek Critters
WC5Z (+N5NAT)
336- 2- 11- 1,088
High Plains ARC
W0LHA 338- 2- 8- 1,056
SW Arkansas RC
N5KIG 226- 2- 18- 1,052
Ellis Co ARC
N5KFC 309- 2- 18- 1,024
Crete ARC
K0JOQ 249- 2- 8- 998
Ames ARC
AC6N 273- 2- 4- 994
NCG
K3USN 162- 2- 6- 992
Chippewa ARC
K0VEV 248- 2- 7- 964
Quad Co ARC
K3PS 180- 2- 20- 964
Bay Area ARC
WG8X 168- 2- 11- 948
Mid-Michigan ARC
N8ARI 307- 2- 8- 914
Sandusky REL
W8LBZ 600- 1- 21- 900
MARA
N7IFD 111- 2- 25- 874
Poplar Bluff ARC
KE6GX 205- 2- 6- 870
Indiana Co ARC
W3BMD 414- 2- 5- 828
Plano ARK
W5UC (+WD5ERD)
158- 2- 25- 816
Santa Cruz Co ARC
K6BJ 104- 2- 3- 792
SONRA
VO1AA 247- 2- 11- 700
N Peninsula Electronics Club
W6PMK 134- 2- 11- 668
Waterman Eight
N6TFS 121- 2- 8- 542

3A Commercial

Cape May Co ARS
K2CGD 904- 2- 18- 2,630
Pearl River Co ARC
W5UO (+N5PEN)
814- 2- 27- 2,494
Appalachian RA
WB8CNN (+N8KUR)
1034- 2- 15- 2,392
Radio Assn of W New York
W2PE 368- 2- 10- 1,456
Jamestown ARC
W0FX 455- 2- 15- 1,402
Knob Hill Gang
AB4DP (+KA4WPH)
439- 2- 6- 1,330
Irving ARC
KX5G 492- 2- 13- 1,288
Somerset Co ARC
NG3S 448- 2- 12- 1,138
Streator ARC
K9CAU 279- 2- 17- 868
Lawton-Ft Sill ARS
W5KS (+KB5IYB)
320- 2- 55- 840
E Illinois HC
W9GWF 137- 2- 10- 818
Columbia-Montour ARC
KC3TX 271- 2- 10- 696

4A Battery

Portland ARC
W7KYC (+KA7ZDD)
1047- 5- 20- 8,735
Magnolia HS ARC
K8HS (+KB8IZK)
1109- 5- 18- 7,945
Brookhaven ARC/Suffolk Co RC
W2DQ (+KB2KHH)
762- 5- 45- 6,570
Benicia ARC
NR6E 668- 5- 15- 5,120

4A

Woodbridge Wireless
W4IY 4669- 2- 60- 14,688
NCG
W2GD (+KB2EED)
4681- 2- 20- 14,562
Scottsdale ARC
K7TR (+N7NEV)
3461- 2- 30- 11,266
Hughes El Segundo Employees Assn ARC
K6ZT (+KC6IVW)
3242- 2- 28- 11,120
Kettle Moraine RA
N9KS (+N9HZF)
3442- 2- 49- 11,080
Sturdy Memorial Hospital ARC
K1ZZJ (+KA1PES)
2959- 2- 37- 9,272
N Florida ARS
W4IZ (+KC4FWS)
3512- 2- 65- 9,090
Wayne ARTS
WD8LLD (+KB8HWY)
2477- 2- 12- 8,514
NW ARC
W9LM 2442- 2- 25- 8,356
Santa Barbara ARC
K6TZ (+N6RRJ)
2488- 2- 73- 7,940
Delaware-Lehigh ARC
W3OK (+KA3TER)
~2231- 2- 65- 7,782
S Pickering ARC
VE3SPC (+VE3WMD)
1895- 2- 25- 7,432
Westchester Emergency Comm Assn
N2SF (+KB2GTD)
2108- 2- 50- 7,310
E Connecticut ARA
K1MUJ (+KA1VVI)
1792- 2- 20- 7,134
Hamilton Co ARES
KN9K 2065- 2- 25- 7,060
NW ARS
N5FD (+KB5DFS)
1752- 2- 80- 6,344
Pentagon ARC
K4AF (+N4VZU)
1817- 2- 16- 6,328
Grumman ARC
WA2LQO 1620- 2- 49- 6,032
Two Rivers ARC
W3UST (+KA3QOY)
1713- 2- 30- 5,624
Argone ARC
W9QVE (+WD9GTI)
1318- 2- 30- 5,396
Downey ARC
W6TOI (+N6MYY)
1515- 2- 66- 5,324
DuPage ARC
W9DUP (+N9HRT)
1747- 2- 34- 5,312
Carthage ARS
W0LF (+KA0RPU)
1527- 2- 12- 5,036
Saginaw ARA
K8DAC (+KB8GXK)
1314- 2- 20- 4,774
Ozaukee RC
W9CQO 1315- 2- 27- 4,772
Zanesville ARC
WX8J (+KB8JVP)
1467- 2- 30- 4,724
Everglades ARC
W4SVI (+KA5HXL)
1397- 2- 15- 4,704
Ripley Co RA/Laughery Valley ARC
WB9I (+N9HEH)
1645- 2- 30- 4,480
Sierra Foothills ARC
W6RFF (+N6ZKN)
1287- 2- 35- 4,468
Riverside Co ARA
W6TJ (+KB6ZCX)
1452- 2- 15- 4,438
Frontier ARS
NW7S (+KB7IRF)
1264- 2- 34- 4,422
Van Wert ARC
W8FY (+KB8JYU)
1437- 2- 18- 4,322
Discrete Componnents of 955 DVARS
K3WJV 1239- 2- 10- 4,306
Orange Co ARC
W6ZE (+WA6PFA)
1624- 2- 32- 4,292
MOARC/GARC
WF2L (+KB2KKH)
1134- 2- 25- 4,292
Santa Clarita ARC
W6JW (+KC6EIK)
1423- 2- 46- 4,284
W Palm Beach ARC
W4HAW (+N3CNK)
1508- 2- 50- 4,130
Reservoir ARA
K8QYL (+N8LEC)
1255- 2- 16- 4,116
Goddard ARC
WA3NAN (+N4OSD)
989- 2- 15- 4,098
York RC
W9PCS (+KB9DVB)
1167- 2- 24- 4,084
Roanoke Valley ARC
W4CA (+N4MII)
1061- 2- 40- 4,052
Central New Hampshire ARC
N1LT (+KA1VIJ)
1121- 2- 35- 4,014
Alamange ARC
K4EG 1106- 2- 20- 4,012
Wichita ARC/Boeing Employee ARS
W0SOE (+KB0DGI)
1077- 2- 45- 3,988
Steel City ARC
W3KWH 1098- 2- 25- 3,776
Kankakee Area RS
W9AZ 1052- 2- 25- 3,696
Alliance ARC
WI8T (+KB8GAB)
897- 2- 32- 3,664
Chicago Suburban RA
WB9B 1287- 2- 30- 3,620
Brightleaf ARC
W4AMC (+KC4AJM)
1203- 2- 65- 3,526
London ARC
VE3QST 1105- 2- 20- 3,518
Sonoma Co RA
W6LFJ (+KB6PTA)
1097- 2- 50- 3,514
Kansas City ARC
W0AR 1217- 2- 35- 3,512
MESAC
N6FM (+KB6TMR)
945- 2- 15- 3,436
OH-KY-IN ARS
K8SCH (+KB8JVK)
901- 2- 30- 3,414
Marin ARC
W6SG (+KC6AAN)
912- 2- 24- 3,402
ARES Dist 22
N0AUS (+N0KSR)
858- 2- 26- 3,250
Delaware ARC
W3SL 1056- 2- 10- 3,208
Lincoln ARC
K0KKV (+KA0ZHF)
910- 2- 50- 3,198

Hazel Park ARC
W8JXU (+KB8IKZ)
978- 2- 40- 3,074
SARA
KØAAR 1153- 2- 25- 3,006
Ebonaire ARS
NZ2J (+KA2ZHD)
938- 2- 18- 2,666
Great S Bay ARC
WY2E (+N2KNR)
672- 2- 67- 2,838
Ft Pierce ARC
KJ4YF (+N4XEO)
809- 2- 20- 2,832
Patrick AFB MARS Team
K4FD 930- 2- 12- 2,776
Shasta Cascade ARS
NC6A 916- 2- 15- 2,774
Massasoit ARA
WB1FLD (+WB1CNX)
719- 2- 24- 2,738
N Hills RC
K6IS 760- 2- 8- 2,646
Catalina RC
N7WS 724- 2- 12- 2,634
Marion ARC
W8GVB (+KB8IJR)
777- 2- 45- 2,624
Blue Valley ARC
WAØHOU 847- 2- 22- 2,618
Randolph ARC
KK4YW 712- 2- 15- 2,606
The Brass
K3AA 667- 2- 12- 2,572
Triple States RAC
KBAN (+KB8KFS)
690- 2- 14- 2,570
Poinsettia ARC
N6SR 584- 2- 31- 2,526
Central Massachusetts ARA
W1BIM 660- 2- 12- 2,500
Titusville ARC
KB4RBU 867- 2- 30- 2,490
N Shores ARC
K6HAI 757- 2- 19- 2,476
Staten Island ARA
W2CWW (+N2GMU)
829- 2- 21- 2,392
Lebanon Valley SRA
NW3J (+N3FOG)
624- 2- 20- 2,358
OMIK Elec Comm
W8CEV (+KB8BKI)
534- 2- 18- 2,254
Jackson Co ARC
W5WA 745- 2- 25- 2,244
Tri-Co ARC
NA4T 528- 2- 15- 2,230
Rio Hondo ARC
W6GNS (+N6XFO)
609- 2- 68- 2,204
NCG
NXØC 573- 2- 25- 2,132
Chicago ARC
W9CAF (+KB9DEA)
520- 2- 35- 2,078
San Francisco ARC
W6PW 399- 2- 20- 2,064
Newport Co RC
W1SYE 464- 2- 19- 2,056
W Island ARC
VE2CWI 636- 2- 30- 2,050
London Bridge ARA
WB7DSW 522- 2- 20- 1,994
Club Radio Amateur De L'Outaouais
VE2CRO 581- 2- 42- 1,964
Michiana FDG
NI9A 581- 2- 12- 1,936
Watauga ARC
N4SNF (+N4YGY)
695- 2- 10- 1,904
Christian Co ARC
WF9N (+KB9BAJ)
539- 2- 12- 1,896
Smoky Hills ARC
KFØKP (+NØLWR)
469- 2- 7- 1,894
BRATS
WB3DZO 607- 2- 46- 1,882
Fayette ARA
KE8FQ 469- 2- 14- 1,870
ACLR
WI9W 564- 2- 45- 1,842
Gabilan ARC
WU6Y 465- 2- 25- 1,746
Dual Banders
KD2IX (+KB2CLQ)
516- 2- 10- 1,746
Refugio Co ARC
K5UMH (+KB5LZE)
426- 2- 22- 1,686
Susquehanna Valley ARC
KD3RN 327- 2- 10- 1,678
Allegany Highlands ARC
W2SAM 797- 1- 25- 1,667
BOMB Squad
N6DN (+KC6KSX)
381- 2- 25- 1,524
SW Iowa ARC
WAØYRS 556- 2- 20- 1,512
Columbia ARS
WB4JEM (+N4XQH)
408- 2- 20- 1,470

Beloit ARC
KC9GG 476- 2- 6- 1,462
Hot Springs ARC
WØHOJ (+KAØFUI)
305- 2- 23- 1,428
Tri-State ARA
W8VA (+N8LUA)
329- 2- 25- 1,402
Bedford Co ARS
K3NQT 408- 2- 12- 1,368
Santiam Canyon ARE
KM7P 286- 2- 7- 1,360
Hayward RC
K6EAG 235- 2- 25- 1,346
Republic of the Rio Grande ARC
NR5W 366- 2- 15- 1,332
Spokane Radio Amateurs
W7NBR 610- 2- 23- 1,238
Luna Co AR & RC
N5JNA 103- 2- 4- 1,182
Highlands Co ARC
WG4M 325- 2- 25- 1,150
Bobcat RC
WB6DEJ 281- 2- 9- 962
S Waterloo ARC
VE3SWA 223- 2- 4- 946
Livermore ARK
K6TS 348- 1- 8- 858
Eaton Rapids ARG
KB8GOY 139- 2- 4- 760
Hill Tops
K8OBS 166- 2- 3- 432

4A Commercial

High Point ARC
ND4S (+KC4PTH)
891- 2- 40- 3,790

5A Battery

Central Oregon RA
W7YJ 852- 5- 15- 5,655
SCARS
N4KIM 258- 5- 6- 3,225

5A

Huntsville ARC
K4SFT (+N4TXK)
4270- 2- 35- 13,342
Palomar ARC
W6NWG (+N6UZH)
4178- 2- 36- 12,308
United RAC
K6AA (+KA6AAA)
3113- 2- 55- 10,410
Mike & Key ARC
K7LED (+KA7SEH)
3135- 2- 45- 9,722
L'Anse Creuse ARC
K8RO (+KA8YOJ)
2852- 2- 30- 8,718
Livingston ARK
KW8G (+N8MIS)
2237- 2- 25- 8,242
Billerica ARS
WA1I (+N1HIR)
2368- 2- 38- 8,048
Atlanta RC
W4DOC 2284- 2- 25- 8,044
RC of Tacoma
W7DK (+KB7IQX)
2473- 2- 30- 7,864
Armadillo Gang
N5MIV 2732- 2- 30- 7,480
SJRA
K2AA 2185- 2- 38- 7,440
Clark Co ARC
W9WWI (+N9DPR)
1962- 2- 50- 7,202
Old Barney ARC
N2OO (+N2JGZ)
2221- 2- 39- 7,042
Cuyahoga Falls ARC
WS8Q (+KB8BKJ)
2321- 2- 38- 6,532
Arizona ARC
W7IO (+N7MRP)
2087- 2- 50- 6,530
Schenectady ARA
K2AE (+KA2JHX)
2127- 2- 36- 6,468
Mt Vernon ARC
N4BV (+KC4GCQ)
1813- 2- 40- 5,754
Tulsa ARC
W5OK (+KA5NTZ)
1402- 2- 43- 5,568
Mt Diablo ARC
W6CX 1798- 2- 34- 5,304
Hamilton ARC
VE3DC 1854- 2- 20- 5,268
Bergen ARA
K2ZO (+KB2KEB)
1652- 2- 25- 5,118
Montgomery ARC
W4AP (+N4MDV)
1274- 2- 23- 4,804
Four Lakes ARC
W9JZ 1422- 2- 15- 4,770
Montachusett ARA
W1GZ (+N1GYZ)
1499- 2- 60- 4,736
GE Astro ARC
W2DU (+KB2FXV)
1185- 2- 16- 4,722

Danville ARS
W4MAV 1702- 2- 29- 4,610
Algonquin ARC
WB1Y (+KA1WAA)
1141- 2- 25- 4,606
Great Bay RA
WB1CAG (+N1HNH)
1293- 2- 30- 4,472
OCARS
W8TNO (+N8LOD)
1111- 2- 34- 4,308
Burlington Co RC
K2KED 1195- 2- 18- 4,304
Starved Rock RC
W9MKS 1202- 2- 22- 4,224
ARC of El Cajon
WA6BGS 1251- 2- 25- 4,200
Davenport RAC
WØBXR (+KAØRIU)
1161- 2- 50- 4,028
Amateur Radio Fellowship
N8MC (+N8HUN)
1114- 2- 17- 3,972
Rock Creek ARA
W3RCN (+KA3UBJ)
1085- 2- 25- 3,806
San Gabriel Valley RC
W6QFK (+N6YGA)
1050- 2- 55- 3,768
W Carolina ARS
W4MOE 905- 2- 13- 3,738
Clear Lake ARC/JSCARC/IBMARC
WA5NOM (+KB5KJO)
820- 2- 60- 3,548
Garden State ARA
W2GSA 1020- 2- 25- 3,520
Greater Lawrence ARF
W1FW (+KA1UAB)
961- 2- 15- 3,496
NBARC
AA4HR (+N4PPD)
1062- 2- 45- 3,432
Wisconsin Rapids ARC
W9DQA (+KB9DVS)
927- 2- 18- 3,378
Durango ARC
WIØS (+N6UTE)
1077- 2- 14- 3,356
Alamogordo ARC
N5MYI 807- 2- 16- 3,284
Wheaton Community RA
W9CCU (+N9JEQ)
2056- 1- 30- 3,281
Pasadena ARC
W6KA 1901- 2- 50- 3,250
Independent RA
KB8WV (+KA8OCG)
1093- 2- 28- 3,200
Susquehana Co ARC
KM3E (+N3HRQ)
704- 2- 20- 3,192
Newark ARA
W8SG 758- 2- 46- 2,934
Lambton Co RC
VE3IG 771- 2- 14- 2,916
Mich-a-con ARC
N8LT (+KB8LXD)
929- 2- 12- 2,836
Harrisburg RAC
W3UU 688- 2- 21- 2,834
Victor Valley ARC
SCATS
WB6LRU 1042- 2- 25- 2,784
Champaign Logan ARC
W8EBG 540- 2- 40- 2,664
Warren Co RACES
WE8O 838- 2- 44- 2,616
S Berkshire ARC
W1BAA (+KA1ODC)
778- 2- 12- 2,528
Ambassador ARA
N8SN 763- 2- 10- 2,434
Jefferson Co ARC
W7LD (+KB7JLU)
549- 2- 31- 2,416
Edmond ARS
N5HIP 499- 2- 54- 2,364
Indian River ARC
W4NLX 594- 2- 12- 2,348
Mayflower ARC
NM1F 578- 2- 15- 2,328
Sub Club ARA
KF6TG (+KA6NOO)
634- 2- 20- 2,088
NCG
WA6SLA 489- 2- 25- 1,978
Palatka ARC
N4VHR 554- 2- 26- 1,908
Firelands ARA
NI8G 300- 2- 25- 1,874
Highland ARA
NS8G 387- 2- 14- 1,840
Whitman ARC
WA1NPO 385- 2- 26- 1,738
Dixie ARK
K4KZD 517- 2- 15- 1,734
Houston Echo Soc
NZ5V 342- 2- 8- 1,624
Baldwin Hills ARC
WA6P 412- 2- 25- 1,624
Turlock ARC
W6BXN 328- 2- 20- 1,494
Drumlins ARC
WA2AAZ 355- 2- 11- 1,474

Skywide ARC
VE3ATD 306- 2- 7- 1,254
Club de Radio Amateur VE2SAG
VE2SAG 191- 2- 8- 1,084
Country Cousins
K3KW (+N3HEE)
122- 2- 9- 954
Palestine/Anderson Co ARC
W5ORW (+KB5MDO)
54- 2- 20- 908

5A Commercial

Cowley Co ARC
WAØJBW (+KBØGBC)
341- 2- 10- 1,138

6A Battery

Zuni Loop Mtn Expeditionary Force
W6SKQ 1186- 5- 13- 9,940
Raleigh ARS
W4DW 972- 5- 12- 9,260

6A

Birmingham ARC
W4CUE (+KC4PCT)
3787- 2- 76- 12,068
Orlando ARC
W4PLB (+N4WOR)
3652- 2- 102- 11,492
Hoodview ARC
WB7QIW (+KB7GUJ)
2977- 2- 60- 9,146
W Coast ARC
WD6X (+N6YLQ)
2968- 2- 70- 9,044
Northrop RC & Palos Verdes ARC
W6GN (+KC6HTE)
3329- 2- 40- 8,774
Bolingbrook ARS
NW9K (+KB9ENA)
2246- 2- 30- 7,730
Windsor ARC
VE3OW 2205- 2- 50- 6,658
Vienna Wireless Soc
K4HTA 1731- 2- 34- 6,232
Peoria Area ARC
W9UVI (+KA9IJH)
1809- 2- 37- 5,704
RF Hill ARC
W3AI 1423- 2- 35- 5,586
Middlesex ARS
W1EDH (+N1HAT)
1703- 2- 35- 5,376
10-70 RA
K2KR 1360- 2- 34- 6,044
Kalamazoo ARC
W8VY (+N8MCF)
1175- 2- 40- 4,406
Brantford ARC
VE3BA 1148- 2- 30- 4,400
Augusta ARC
W4DV (+N4YPG)
1488- 2- 14- 4,340
Triple "A" ARA
AC3J 1363- 2- 40- 3,922
Monongalia Wireless Assn
K8WV 1270- 2- 32- 3,768
Antietam RA
W3CWC 1056- 2- 35- 3,760
Empire RC
NØAY 921- 2- 20- 3,588
KB6TVL
N6RMJ 1352- 2- 25- 3,556
Orange Park ARC
NU4Y (+N4OOF)
703- 2- 28- 3,074
20/9 ARC
W8BOO 685- 2- 15- 2,840
Island Co ARC
W7PN 552- 2- 15- 2,520
Toledo Mobile RA
W8HHF 752- 2- 35- 2,432
AREA & Markham ESDA
KE9X 645- 2- 15- 2,420
Sierra ARC
WA6YBN 451- 2- 10- 2,364
Midland ARC
W8KEA (+N8KRT)
512- 2- 27- 2,304
LARC of Liverpool
WA2ISC (+KB2JLG)
475- 2- 12- 2,110
Iredell Co ARS
KB4QP 462- 2- 18- 2,068
Canois ARC
K9HGX 393- 2- 18- 2,036
La Grange ARC
AB4GA (+N4TCE)
543- 2- 20- 2,036
Kimberling ARC
NQØG 405- 2- 15- 2,014
Ft Venango Mike & Key Club
W3ZIC 344- 2- 20- 1,992
Headwaters ARC
KØGUV 472- 2- 6- 1,832
KCRA-BEMARC-TARC
W2ODV 378- 2- 45- 1,808
Cedar Creek ARC
KA5Y 282- 2- 35- 1,756
Randolph Co Amateurs
K9EKP 457- 2- 15- 1,714
Monterey Park ARC
K6GIP 345- 2- 18- 1,648
Macoupin Co IL ARES
NØAP 348- 2- 8- 1,624

Amador Co ARC
N6KD 271- 2- 35- 1,452
Mobile Sixers RC
W3AWA 382- 2- 18- 804

6A Commercial

RATTS
N4IV 945- 2- 25- 3,300

7A

Lake Co ARA
K8BL (+KB8EVA)
4586- 2- 39- 13,894
TRW ARC
W6TRW (+KC6FNO)
4198- 2- 23- 12,348
Gloucester Co ARC
W2MMD 2085- 2- 68- 7,446
Fox River Radio League
W9CEQ (+N9IJ)
2240- 2- 60- 7,134
Aksarben ARC
WØEQU 1767- 2- 28- 5,212
Gainesville ARS
K4DPZ (+KB4HCK)
1483- 2- 20- 4,586
W Branch ARA
W3AVK (+KA3WCG)
1166- 2- 7- 4,300
State Line RC
K2LSA (+KB2DJJ)
781- 2- 25- 3,228
Richland Co ARES
W8WE 1067- 2- 30- 3,198
Alexandria Arlington ARC
W4WVP (+N4HCP)
840- 2- 40- 3,022
Mt ARC
W3YMW 753- 2- 15- 2,946
WACOM
W3IBT (+KA3UWW)
589- 2- 25- 2,490
Bellevue ARC
WØWYV 375- 2- 14- 2,388
S Patuxent ARC
N3WE 597- 2- 25- 2,288
Panorama Land ARC
W7JTR 445- 2- 18- 2,150

8A Battery

Alameda Co RC
N6WG 1126- 5- 25- 6,700

8A

Penn Wireless Assn
WA3TSW 3868- 2- 25- 13,436
Crystal RC
W2DMC 3182- 2- 21- 10,456
Pinellas Co Amateurs
KF4BE 1640- 2- 136- 5,672
ARA Long Beach
W6RO 1426- 2- 47- 4,110
S Michigan ARS
W8DF 769- 2- 20- 3,702
Wellesley ARS
W1TKZ 565- 2- 45- 2,768

9A

Hampden Co RA
W1NY (+N1GVV)
4432- 2- 40- 13,280
Interstate RS
KX1T (+KA1RAJ)
1245- 2- 54- 4,628
Rockford ARA
W9AXD 1121- 1- 25- 2,704
E Ontario ARC
VE3SAU 504- 2- 10- 2,532

10A

Warminster ARC
K3JA (+KA3SVT)
3701- 2- 60- 12,780
Scarborough ARC
VE3WE 765- 2- 70- 3,496
Toledo RAC
W8FU 617- 2- 16- 2,978

12A

USECA
WF8I (+N8MBK)
3722- 2- 243- 12,650
San Antonio RC
W5SC 1641- 2- 42- 6,268

13A

El Dorado Co ARC
W6AJJ 990- 2- 25- 3,820

14A

Nortown ARC
VE3NAR 1052- 2- 16- 3,748

17A

Nashua ARC
N1NH (+KA1SIE)
3875- 2- 80- 12,914

18A Battery

Conejo Valley ARC
K6CAB 2569- 5- 30- 21,275

24A Commercial

Englewood ARA

K2ND	91-	2-	15-	608

One- or Two-Person Portable

1B-1 op Battery

K3MD	475-	5-		5,150
N9FVN	373-	5-		3,630
KEØY	321-	5-		3,510
K5ER	263-	5-		3,190
WB2MBM	330-	5-		2,900
NR8J	257-	5-		2,770
NO8D	255-	5-		2,650
KEØUI	253-	5-		2,600
KIØG	215-	5-		2,450
WB5IUG	219-	5-		2,390
K4RDU	216-	5-		2,260
KM8X	188-	5-		1,980
K7BFL	180-	5-		1,810
AC7A	165-	5-		1,650
WA6YPE	192-	5-		1,455
KA8SAY	125-	5-		1,450
WJ0I	249-	5-		1,445
VE3DOP	147-	5-		1,435
K6LMN	215-	5-		1,375
W8WEJ	163-	5-		1,340
AA6AV	157-	5-		1,280
N7JAM	228-	5-		1,240
WD1M	221-	5-		1,225
NZØP	103-	5-		1,210
KEØL	100-	5-		1,200
W1XH	103-	5-		1,030
W9YYV	125-	5-		925
WB2DLA	66-	5-		860
WA2DFI	65-	5-		850
N8FGB	79-	5-		825
AB7E	83-	5-		820
N9FBG	80-	5-		740
AJ6T	71-	5-		675
WA1WPR	34-	5-		640
KA1NDY	78-	5-		590
WB6QZK	71-	5-		555
WB2VXS	4-	5-		550
W6ZH	60-	5-		530
WA6FIT	55-	5-		475
KØLIO	26-	5-		460
KH6CP/1	11-	5-		355
WA2IUU	23-	5-		315
N4EE	47-	2-		264
N7NZ	1-	5-		*205*
W6MHS	9-	5-		90

1B-1 op

WD8AUB	758-	2-		*2,910*
W4NW	659-	2-		2,636
WB3ESR	426-	2-		1,728
N6WQH	337-	2-		1,634
K8RYU	448-	2-		*1,472*
NR6J	*358-*	2-		*1,434*
WB9COY	473-	2-		1,254
VE3NUL	295-	2-		1,180
KA7MPX	533-	2-		1,166
WA4GNR	162-	2-		748
NC6U	*209-*	2-		644
ND3P	41-	5-		605
NYØQ	164-	2-		584
NF3X	126-	2-		576
KB5CNG	78-	2-		564
KC7O	165-	2-		548
WS2L	42-	5-		520
KE9XL	138-	2-		480
WB2AXF	76-	2-		396
AA6D	125-	2-		376
WB6VIC	172-	2-		348
AJ1G	88-	2-		298
VE2BHV	*62-*	2-		264
N1FUS	79-	2-		258
KFØJY	68-	2-		236
KA7PDH	27-	2-		170
VE3EWK	21-	2-		142
VE4AED	9-	2-		118
WD4NIT	3-	2-		106
KB7HPU	33-	2-		106
WB8WFK	50-	2-		100

1B-1 op Commercial

N8NF	230-	2-		708
WA1UMA	49-	2-		192

2B-1 op

WA6RND	112-	2-		944

1B-2 ops Battery

W7EL (+ KØED)	484-	5-		5,040
NK1I (+ N1FJ)	360-	5-		4,205
AA4YZ (+ KA9EKP)	358-	5-		3,325
N1EVR (+ N8HLE)	293-	5-		3,130
K3SS (+ WF4U)	424-	5-		3,045
WF6B (+ KB6YAR)	263-	5-		2,470
KB9S (+ KFØT)	231-	5-		2,410
NI1L (+ WB2AMU)	243-	5-		2,405
WB9TOW (+ op)	220-	5-		2,400
KK7C (+ N7MZZ)	218-	5-		1,945
N8MFW (+ N8MFN)	177-	5-		1,870
KBØIH (+ W8NF)	199-	5-		1,610
NTØI (+ NAØZ)	148-	5-		1,580
WB6JJE (+ N6AWA)	89-	5-		1,045
VE3EQP (+ VE3IMG)	109-	5-		850
NØKMA (+ WA7NWP)	77-	5-		815
N6KR (+ WB6CIC)	81-	5-		810
NØEUL (+ NØGVP)	121-	5-		705
KA9QOT (+ KB9EZO)	232-	2-		564
WW6O (+ N6ODO)	109-	2-		418
KA5B (+ op)	31-	5-		410

1B-2 ops

KC1SJ (+ N1RIH)	1673-	2-		4,316
KE3Q (+ WA3G)	1191-	2-		4,130
KB9X (+ NY9C)	857-	2-		3,728
W4XD (+ AB4RI)	793-	2-		3,204
KDØY (+ KBØEBH)	920-	2-		3,022
N8AM (+ N8IIP)	840-	2-		2,848
AD7L (+ KA7WDM)	838-	2-		2,810
N7AZ (+ WB7SRC)	779-	2-		2,704
K4PB (+ AB4FR)	568-	2-		2,596
WAØOUI (+ op)	524-	2-		2,172
VE2QST (VE2BP,VE2WH,ops)	360-	2-		2,088
KJ6JJ (+ NH6HQ)	877-	2-		1,826
WM8W (+ WA8GAU)	758-	2-		1,818
W8XY (+ N4VYT)	674-	2-		1,764
W1WP (+ AD1C)	421-	2-		1,712
K3UAV (+ op)	344-	2-		1,694
K2OC (+ K9SO)	397-	2-		1,688
N3GPZ (+ N3GWZ)	693-	2-		1,486
NØFKC (+ NØKCA)	366-	2-		1,380
K9UT (+ K9VP)	449-	2-		1,266
WN5TEN (+ KE5SR)	290-	2-		1,260
K8CCP (+ N8EHW)	569-	2-		1,250
KC3ZG (+ KC3ZT)	348-	2-		1,108
NØGSM (+ KDØAN)	367-	2-		1,090
N7DLV (+ op)	257-	2-		1,004
W6FA (+ N6DLU)	326-	2-		996
N9HZQ (+ N9IAQ)	300-	2-		902
ND9Z (+ KA9LOE)	643-	1-		863
KØHYG (+ WAØPWE)	237-	2-		774
KB9Y (+ KA9EHU)	218-	2-		692
WA3KEY (+ WA3RXP)	213-	2-		688
KE9UR (+ op)	188-	2-		676
WB7NRC (+ WA7NCL)	229-	2-		674
KL7CQ (+ AL7LB)	533-	1-		633
W7POE (+ KB7AWK)	156-	2-		620
KFØFP (+ KBØDVM)	148-	2-		598
N1DUS (+ N2HZI)	243-	2-		586
WB8YGG (+ KB2JKP)	220-	2-		546
WA7PRC (+ N7MCG)	202-	2-		504
KB6TOQ (+ N6WMF)	172-	2-		444
KC4QMW (+ op)	206-	2-		412
KE7AX (+ N7HQT)	84-	2-		378
VO1SO (+ VO1FK)	128-	2-		256
KA9EPO (+ op)	119-	2-		238
K7WWR (+ KA7WEY)	26-	2-		190
AH6HU (+ NH6HZ)	39-	2-		78

1B-2 ops Commercial

KB5GEO (+ op)	918-	2-		2,236
W8UMU (+ op)	93-	2-		186

2B-2 ops Battery

NO6B (+ WB6VRN)	560-	5-		3,400
N6MBY (+ WB6UER)	262-	5-		2,320
N1DGO (+ N1BYT)	164-	5-		1,270
WD6CLZ (+ K6ZYU)	146-	5-		930
NØHOT (+ KAØJDE)	20-	5-		680

2B-2 ops

KE6B (+ WB6HEU)	2432-	2-		7,208
K9LJN (+ KS9O)	1849-	2-		6,632
K8GIV (+ K8BQI)	1048-	2-		3,838
KØAF (+ KBØBMK)	398-	5-		3,760
WE9K (+ KA9UOA)	426-	2-		1,970
AFØZ (+ WB9BVZ)	457-	2-		1,836
WB2EKK (+ WA3WHE)	465-	2-		1,762
W9HRQ (+ KA9GYX)	546-	2-		1,300
WA4KDO (+ WB4LBG)	301-	2-		1,260
WA7SNU (+ N7GVR)	464-	2-		1,228
KA9OTU (+ N9BJB)	207-	2-		1,078
KF6YU (+ KG6WX)	434-	2-		1,068
WB5OAP (+ WB5OAO)	151-	2-		1,056
KA4RQB (+ KC4ESQ)	309-	2-		918
W9FOZ (+ KE9FL)	284-	2-		884
WB3GOK (+ WB3DPR)	340-	2-		880
N6OXT (+ N6SMW)	174-	2-		768
KO9S (+ KØAM)	121-	2-		762
WB2HYP (+ WS2F)	178-	2-		556
KA5MCP (+ op)	96-	2-		*520*
N9INN (+ KB9EMF)	238-	2-		476
N6SMW (+ op)	80-	2-		360
KW7R (+ N7FWS)	148-	2-		296

2B-2 ops Commercial

VE3GAM (+ VE3AUI)	719-	2-		2,280
KJ8I (+ N8JSZ)	586-	2-		2,002

Mobile Stations

1C

KB4GID	393-	5-	2-	3,925
N6OP/NP2	383-	5-	1-	3,330
AA6DP	896-	2-	4-	2,862
K8HVT	838-	2-	2-	2,804
KK4NO	684-	2-	5-	1,724
K5PRE	630-	2-	6-	1,626
AB4EL	570-	2-	1-	1,586
K1WGM	309-	2-	1-	1,236
K6TQ	330-	2-	2-	1,164
NØGYN	516-	2-	2-	1,050
NR9B	178-	2-	1-	708
KB8U	126-	5-	1-	665
W6BKY	146-	2-	1-	584
WN6I	196-	2-	4-	524
WA2EPK	164-	2-	1-	490
WA8LOW	238-	2-	1-	476
KC2JS	224-	2-	2-	448
W5KL	*98-*	2-	1-	392
WD9EGW	85-	2-	1-	340
NIØN	159-	2-	1-	318
WAØWAU	152-	2-	4-	304
WI8G	150-	2-	1-	300
N4SCV	122-	2-	2-	292
W2MTA	127-	2-	3-	254
KG5HR	111-	2-	1-	222
N5PT	53-	2-	1-	160
W6MMG	80-	1-	1-	156
KJ6NO	75-	2-	1-	150
WO8V	66-	2-	1-	132
KB2C	59-	2-	1-	118
N7LOD	59-	2-	1-	118
KDØFW	88-	1-	1-	88
W9CNF	42-	2-	1-	84
WV2B	34-	2-	1-	68
N1EE	32-	2-	1-	64
KØYOX	*13-*	2-	1-	*48*
WA3SCW	21-	2-	1-	42
K1FJM	15-	2-	2-	30
WA7PTM	2-	5-	1-	10
N7IMI	5-	2-	1-	10

2C

N6DD	1216-	2-	13-	2,432
W1TUM	295-	2-	2-	610

Home Stations

Commercial Power

1D

KM9P	1039-	2-	1-	3,500
KFØJB	1113-	2-	1-	2,226
KR8V	741-	2-	3-	2,114
VE5GC	746-	2-	4-	1,660
W8FW	614-	2-	6-	1,608
WØOSK	1504-	1-	2-	1,504
W3GG	978-	1-	2-	1,471
KS7T	959-	1-	1-	1,439
KO9A	356-	2-	2-	1,424
W4WKQ	547-	2-	1-	1,338
NØFFZ	312-	2-	1-	1,248
KA3RRF	305-	2-	1-	1,220
WB2DVU	300-	2-	1-	1,200
VE2GIW	290-	2-	1-	1,160
W5YM	531-	2-	3-	1,072
KAØIAA	437-	2-	*29-*	*1,050*
K1TN	329-	2-	1-	1,038
N9AX	295-	2-	1-	1,038
WN2R	473-	2-	2-	1,010
KØHP	287-	2-	4-	1,008
K3SA	303-	2-	1-	978
WT2U	440-	2-	2-	884
AK1M	210-	2-	1-	840
KB9UG	216-	2-	1-	838
AB6I/4	204-	2-	1	816
NU9J	406-	2-	1-	816
KA5AGD	403-	2-	1-	806
K2MK	504-	1-	1-	803
WA3RGH	391-	2-	1-	782
KQØA	194-	2-	2-	776
KE8RU	219-	2-	1-	758
WB9ZAJ	235-	2-	2-	756
WB4GBY	174-	2-	1-	684
K5ZD	462-	1-	1-	638
WA8MJY	319-	2-	1-	638
WD9ISG	158-	2-	2-	632
KC3LM	219-	2-	1-	568
N4ID	246-	2-	5-	542
W5EHM	442-	1-	1-	528
N8ICI	456-	1-	1-	500
WA5IYX	*247-*	2-	1-	494
KA5CYH	242-	2-	1-	484
KS4S	130-	2-	1-	474
KM3D	116-	2-	1-	464
W8YNY	131-	2-	2-	456
WB5L	226-	2-	2-	452
W8FN	106-	2-	1-	424
KA1GWQ	149-	2-	1-	424
AA6OC	196-	2-	2-	418
N7GUC	368-	1-	6-	368
W1TR	183-	2-	1-	366
WA6HRK	179-	2-	1-	358
W6PRI	99-	2-	1-	356
WDØAVV	84-	2-	1-	336
W4TYU	80-	2-	1-	320
W5NR	79-	2-	1-	316
KB5FET	155-	2-	2-	310
WB8IMY	153-	2-	1-	*306*
N5EMC	151-	2-	1-	302
W3ZGD	148-	2-	5-	296
W5MPX	143-	2-	6-	286
KB9CRJ	75-	2-	1-	254
KD4BT	120-	2-	1-	240
VE3OMU	60-	2-	1-	240
N2EZ	59-	2-	1-	236
AB4GI	83-	2-	2-	234
WB2CBA	75-	2-	1-	228
KI5EZ	57-	2-	1-	228
W5JUV	108-	2-	1-	216
WB4DVN	103-	2-	1-	206
W4LEP	102-	2-	-	204
K5EIS	102-	2-	2-	204
KA1DSQ	89-	2-	1-	178
N4IOZ	87-	2-	1-	174
KB9CRY	68-	2-	1-	152
NO2J	73-	2-	2-	146
NX1C	35-	2-	1-	140
W9REC	40-	2-	1-	140
WA6CBQ	68-	2-	1-	136
NX9T	*127-*	1-	1-	*132*
KC4LSG	65-	2-	1-	130
KA2MCU	33-	2-	1-	130
WC7C	51-	2-	3-	128
KC4PAO	54-	2-	2-	124
KN3C	111-	1-	1-	111
KA9RAQ	47-	2-	1-	94
KK8J	45-	2-	3-	90
KØYQX	36-	2-	1-	88
WJ2L	43-	1-	1-	85
KL7DN	41-	2-	2-	82
N2KLJ	40-	2-	1-	80
W9RZW	37-	2-	1-	74
VE3ADX	*18-*	2-	1-	*72*
KE7FZ	32-	2-	1-	64
KA4ZBN	26-	2-	1-	52
WBXT	22-	2-	1-	60
KA3SFZ	29-	2-	2-	58
AA6RE	*19-*	2-	1-	*54*
WD4BMG	27-	2-	1-	54
W6UVP	23-	2-	1-	46
KN4DK	42-	1-	2-	42
WB5CIT	8-	2-	1-	32
K6UYK	29-	1-	1-	29
AA6EE	5-	2-	1-	20
WA6TGF	1-	2-	1-	2

2D

AA5B	2112-	2-	3-	5,536
WE1B	658-	2-	6-	2,130
KA8ZOA	550-	2-	5-	1,902
WØTS	394-	2-	15-	1,020
WØRKU	442-	2-	5-	936
AB4GB	407-	2-	2-	814
W7EK	207-	2-	3-	668
WØVBD	334-	2-	4-	668
W6DTV	304-	2-	4-	608
KA3QFC	267-	2-	3-	606
N4QH	486-	1-	5-	486
NJ1Q	92-	2-	2-	260
KD2PQ	71-	2-	4-	142

3D

KM4X	769-	2-	18-	1,944
KD8YL	544-	1-	9-	557
KF1F	207-	2-	9-	456
KCØVG	139-	2-	10-	290

4D

W1AW	1821-	1-	6-	2,372
W2USA	1093-	2-	8-	2,198

7D

KO4J	2186-	2-	16-	5,314

Home Stations

Emergency Power

1E

KVØI	1078-	5-	1-	9,535
K3ONW	559-	5-	1-	5,590
K9SH	1938-	2-	1-	3,978
KB5MM	1775-	2-	7-	3,626
W9WOK	*775-*	2-	2-	*2,886*
K6LL	2221-	1-	35-	2,545
WB2UEY	1267-	2-	1-	2,534
WR4I	262-	5-	2-	2,455
K3DI	675-	2-	1-	2,342
WB4ENE	629-	2-	2-	2,230
N4PC	1046-	2-	5-	2,092
W5ORM	206-	5-	1-	2,060
WA4CUG	202-	5-	1-	2,020
K8CV	187-	5-	1-	1,820
VE2CLM	480-	2-	5-	1,770
KB3WN	313-	5-	1-	1,585
NN1G	152-	5-	1-	1,515
WA2DHF	653-	2-	1-	1,384
WA9YLB	315-	2-	1-	1,230
N6GL	307-	2-	1-	1,228
K5CVD	512-	2-	5-	1,172
KI4VY	210-	5-	3-	1,140
WU7F	107-	5-	1-	1,070
KA9YMV	527-	2-	4-	1,054
W5NZ	282-	2-	2-	964
W3DP	*96-*	5-	1-	*960*
AA9A	941-	1-	2-	941
W3BUC	466-	2-	1-	932
W1FM	237-	2-	2-	850
WR2G	422-	2-	1-	844
WA1Z	204-	2-	2-	816
KN4DS	403-	1-	1-	806
KD1N	198-	2-	1-	792
N6NZX	384-	2-	2-	772
KB5IIL	374-	2-	2-	748
KB5AYO	72-	5-	1-	720
KA1JAN	183-	2-	2-	702
AA4RV	143-	2-	1-	572
N5GFX	53-	5-	1-	530
K5JRN	45-	5-	1-	450
WA9NPS	204-	2-	1-	408
W2CVW	38-	5-	1-	365
WB6YYZ	174-	2-	1-	348
N4QN	113-	2-	1-	344
W7DFO	57-	5-	1-	335
KA3PCX	164-	2-	2-	328
AA7DO	149-	2-	1-	298
WDØDDU	67-	2-	1-	268
W3HMH	25-	5-	1-	260
KK4RV	127-	2-	1-	254
WA1TYG	98-	2-	2-	254
VE7FB	*126-*	2-	2-	*252*
N2EW/6	122-	2-	8-	244
K3DG	63-	2-	2-	220
N5BF	42-	2-	1-	124
N6VPM	49-	2-	1-	98
WN2A	24-	2-	1-	96
NM4A	45-	2-	1-	90
KB5LES	24-	2-	1-	48

2E

K4XS	3673-	2-	2-	9,452
K3NA	2786-	2-	3-	8,198
N3AE	1082-	5-	2-	7,565
W7NI	2169-	1-	7-	3,301
KS8O	620-	2-	3-	1,364
WB6EGE	312-	2-	5-	1,190
W1YK	320-	2-	4-	782
K8HDE	*275-*	2-	4-	*764*
W2CXN	158-	2-	19-	328

3E

KE9WT	1839-	2-	2-	3,678
W3VI	970-	2-	15-	3,198
AF9M	558-	2-	25-	1,716
KM4CR	615-	2-	16-	1,230
NM1K	114-	5-	3-	1,140

4E

KD6SA	1042-	2-	9-	2,186
N6RUB	508-	2-	25-	1,016
WB6KQY	208-	2-	10-	482

5E

N8HTT	1315-	2-	32-	3,826

8E

K4GSO	1642-	1-	16-	1,649

13E

AA5EQ	235-	2-	7-	544

Checklogs

AA8AJ, K6MP, KA3PCD, N5KWM/MM, V31KX, WØDJV, *W2WOE*, W4AT, W7LQU, W9TAL, W9UK, WA3SCW, WN6AOH, XE2IZ

Rules, ARRL 10-Meter Contest

1) **Object:** For amateurs worldwide to exchange QSO information with as many stations as possible on 28 MHz.

2) **Contest Period:** Second full weekend of December (December 8-9, 1990). Starts 0000 UTC Saturday; ends 2400 UTC Sunday. All stations operate no more than 36 hours out of the 48-hour period. Listening time counts as operating time.

3) **Categories:**

(A) *Single operator:* One person performs all operating and logging functions. Use of spotting nets (operator arrangements involving assistance though DX alerting nets, etc) is not permitted. *Three power-output categories: QRP—5-W output or less; low power—150-W output or less; and high power—more than 150-W output.*

(1) Mixed mode (phone and CW)
(2) Phone only
(3) CW only

(B) *Multioperator:* Single transmitter, mixed-mode only. Those obtaining any form of assistance, such as relief operators, loggers or use of spotting nets.

4) **Contest Exchange:**

(A) W/VE stations (including KH6/KL7) send signal report and state or province (District of Columbia stations send signal report and DC). Novice and Technician stations sign /N or /T.

(B) DX stations (including KH2/KP4, etc) transmit signal report and serial number starting with 001.

(C) Maritime or aeronautical mobile stations send signal report and ITU Region (1, 2 or 3).

5) **Scoring:**

(A) *QSO points:* Count two points for each complete two-way phone QSO. Count four points for each two-way CW QSO. Count eight points for CW QSOs with US Novice or Technician stations signing /N or /T (28.1-28.3 MHz only).

(B) *Multipliers:* Fifty US states (plus District of Columbia), Canada (NB [VE1], NS [VE1], PEI [VE1 or VY2], PQ [VE2], ON [VE3], MB [VE4], SK [VE5], AB [VE6], BC [VE7], NWT [VE8], YUK [VY1], NF [VO1], LAB [VO2]), DXCC countries (except the US and Canada), ITU regions (maritime and aeronautical mobiles only) per mode (phone and CW).

(C) *Final Score:* Multiply QSO points by total multipliers (the sum of states/VE call areas/DXCC countries/ITU regions per mode). Example: W1XX works 2245 stations including 1305 phone QSOs, 930 non-Novice CW QSOs, 10 Novices CW QSOs, for a total of 6410 QSO points. He works 49 states, 10 Canadian multipliers, 23 DXCC countries and a maritime mobile station in Region 2 on phone; and 30 states, 8 Canadian multipliers and 19 DXCC countries on CW for a total multiplier of 140. Final score = 6410 (QSO points) × 140 (multiplier) = 897,400 points.

6) **Miscellaneous:**

(A) Call signs and exchange information must be received by each station for a complete QSO.

(B) No crossmode contacts; CW QSOs must be made below 28.3 MHz.

Sample 10-Meter Contest Exchanges

Phone

CQ Contest CQ Contest
From Kilo Alfa Five Whiskey Mike Juliett
KA5WMJ

November Seven India Papa Golf

N7IPG Thank you
You're 59 Texas

Roger, you're 59 Utah
N7IPG

QSL, QRZed
KA5 Whiskey Mike Juliett

CW

CQ Test CQ Test
DE KA5WMJ KA5WMJ/N

DE N7IPG/T

N7IPG/T
599 TX

R 599 UT N7IPG/T

R TU KA5WMJ/N QRZ

(C) Single-operator mixed-mode and multioperator stations may work stations once on CW and once on SSB.

(D) Your call sign must indicate your DXCC country (K6LL in Arizona need not send K6LL/7, but K1JD in Hawaii must send K1JD/KH6).

(E) One operator may not use more than one call sign from any given location during the contest period.

(F) All entrants may transmit only one signal on the air at any given time.

(G) The use of non-Amateur Radio means of communication (eg, telephone) for the purpose of soliciting a contact (or contacts) during the contest period is inconsistent with the spirit and intent of this announcement.

(H) A transmitter used to contact one or more stations may not subsequently be used under any other call during the contest period (with the exception of family stations where more than one call is assigned by FCC/DOC).

7) **Reporting:**

(A) Entries must be postmarked no later than 30 days after the end of the contest (January 10, 1991). No late entries can be accepted. Entries with more than 500 QSOs must include cross-check sheets (dupe sheets). Use ARRL 10-Meter Contest forms, a reasonable facsimile or submit entry on diskette.

(1) Official entry forms are available from ARRL HQ for an SASE with two units of first-class postage or four IRCs.

(2) You may submit your contest entry on diskette in lieu of paper logs. The floppy diskette must be IBM-compatible, MS-DOS-formatted, 3½- or 5¼-inch (40- or 80-track). The log information must be in an ASCII file, following the ARRL Suggested Standard File Format, and contain all log exchange information (band, mode, date, time in UTC, call sign of station worked, exchange sent, exchange received, multipliers [marked the first time worked] and QSO points). One entry per diskette. An official summary sheet or reasonable facsimile with signed contest participation disclaimer is required with all entries.

8) **Awards:** A certificate will be awarded to the highest-scoring single-operator station (in each category) from each ARRL Section and DXCC country. The top scoring Novice/Technician station (in each category) in each ARRL Section will be awarded a certificate. Top multioperator entries in each ARRL Division and each continent will receive certificates. Additional certificates will be awarded as participation warrants.

9) **Condition of Entry:**

(A) Each entrant agrees to be bound by the provisions and the intent of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) **Disqualifications:** Excess duplicates and call sign/exchange errors. See January 1990 *QST* for complete details.

Rules, ARRL 160-Meter Contest

1) **Object:** *For amateurs worldwide to* exchange information with W/VE amateurs on 1.8-MHz CW only. DX-to-DX QSOs are not permitted for contest credit.

2) **Contest Period:** 2200 UTC November 30 *until 1600 UTC December 2. Forty-two-hour* period with no time limitation.

3) **Categories:**

(A) **Single operator:** One person performs all transmitting, receiving, spotting and logging functions.

(1) *QRP:* 5-W output or less.

(2) *Low Power:* 150-W output or less.

(3) *High Power:* More than 150-W output.

(B) **Multioperator:** Single transmitter only. Those obtaining any form of assistance, such as relief operators, loggers or use of spotting nets.

4) **Contest Exchange:**

(A) *W/VE:* Signal report and ARRL/CRRL Section.

(B) *DX:* Signal report. Country name is obvious from the prefix. Send ITU Region if maritime or aeronautical mobile.

5) **Scoring:**

(A) *QSO Points:* Two points for QSOs with amateurs in an ARRL/CRRL Section. W/VE stations count five points for DX QSOs.

(B) *Multipliers:* ARRL/CRRL Sections plus VE8/VY1 (maximum of 77) and DXCC countries (W/VE participants only).

(C) *Final Score:* Multiply QSO points by multiplier. Example: K1MM works 357 stations, *including* 13 DX *stations, and has a* multiplier of 67. His score would be 753 QSO points [(344 × 2) + (13 × 5)] multiplied by 67 for 50,451 points.

6) **Miscellaneous:**

(A) *Participants are reminded that* 1.830 to 1.850 MHz should be used for intercontinental QSOs only, in conformance with the ARRL band plan.

(B) The use of non-Amateur Radio means of communication (eg, telephone) for the purpose of soliciting a contact (or contacts) during the contest period is inconsistent with the spirit and intent of this announcement.

7) **Reporting:**

A) Entries must be postmarked no later than 30 days after the end of the contest (January 2, 1991). No late entries can be accepted. Entries with more than 200 QSOs must include cross-check sheets (dupe sheets). Use ARRL 160-Meter Contest forms, a reasonable facsimile or submit entry on diskette.

(1) Official entry forms are available from HQ for an SASE with two units of first-class postage or four IRCs.

(2) You may submit your contest entry on diskette in lieu of paper logs. The floppy diskette must be IBM-compatible, MS-DOS-formatted, 3½- or 5¼-inch (40- or 80-track). The log information must be in an ASCII file, following the ARRL Suggested Standard File Format, and contain all log exchange information (band, mode, date, time in UTC, call sign of station worked, exchange sent, exchange received, multipliers [marked the first *time worked] and QSO points). One entry per* diskette. An official summary sheet or reasonable facsimile with a signed contest participation disclaimer is required with all entries.

8) **Awards:** *Certificates will be awarded to* the top-scoring QRP, low-power and high-power single-operator stations in each ARRL/CRRL Section and DXCC country, and to the top-scoring multioperator stations *in each ARRL Division and continent.*

9) **Condition of Entry:**

(A) Each entrant agrees to be bound by the provisions and the intent of this announcement, the regulations of his or her licensing *authority and the decisions of the* ARRL Awards Committee.

(B) **Disqualifications:** Excess duplicates and call sign/exchange errors. See January 1990 *QST* for complete details.

W1AW Schedule

October 28, 1990—April 1, 1991 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0300, 1400; TThS: 0000; TThSSn: 2100; Sn: 0300
	Fast Code Practice	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300: Sn: 0000
	CW Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Teleprinter Bulletins	Dy: 0200, 0500, 2300; MTWThF: 1600
	Voice Bulletins	Dy: 0230, 0530
EST	Slow Code Practice	MWF: 9 AM, 7 PM; TThSSn: 4 PM, 10 PM
	Fast Code Practice	MWF: 4 PM, 10 PM; TTh: 9 AM; TThSSn: 7 PM
	CW Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Teleprinter Bulletins	Dy: 6 PM, 9 PM, 12 PM; MTWThF: 11 AM
	Voice Bulletins	Dy: 9:30 PM, 12:30 AM
CST	Slow Code Practice	MWF: 8 AM, 6 PM; TThSSn: 3 PM, 9 PM
	Fast Code Practice	MWF: 3 PM, 9 PM; TTh: 8 AM; TThSSn: 6 PM
	CW Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Teleprinter Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Voice Bulletins	Dy: 8:30 PM, 11:30 PM
MST	Slow Code Practice	MWF: 7 AM, 5 PM; TThSSn: 2 PM, 8 PM
	Fast Code Practice	MWF: 2 PM, 8 PM; TTh: 7 AM; TThSSn: 5 PM
	CW Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Teleprinter Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Voice Bulletins	Dy: 7:30 PM, 10:30 PM
PST	Slow Code Practice	MWF: 6 AM, 4 PM; TThSSn: 1 PM, 7 PM
	Fast Code Practice	MWF: 1 PM, 7 PM; TTh: 6 AM; TThSSn: 4 PM
	CW Bulletins	Dy: 2 PM, 5 PM, 8 PM; MTWThF: 7 AM
	Teleprinter Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Voice Bulletins	Dy: 6:30 PM, 9:30 PM

Code practice, Qualifying Run and CW bulletin frequencies: 1.818*, 3.5815, 7.0475, 14.0475, 21.0775, 28.0775, 147.555* MHz.

Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.
Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

Slow code practice is sent at 5, 7½, 10, 13 and 15 WPM.
Fast code practice is sent at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from September 1990 *QST*, pages 16 and 79," indicates that the main text is from the article on page 16 and the mixed number/letter groups at the end of each speed are from the contest scores on page 79.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Tuesdays and Saturdays at 2330 UTC, Keplerian Elements for active amateur satellites will be sent on the regular teleprinter frequencies.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8 AM to 1 AM EST and on Saturday and Sunday from 3:30 PM to 1 AM EST. If you desire to operate W1AW, be sure to bring a copy of your license with you.
W1AW is available for operation by visitors between 1 and 4 PM Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on December 24 and 25, January 1 and February 18.

*Temporarily off the air on 160 and 2 meters.

Contest Corral

Conducted By Warren C. Stanklewicz, NF1J
Assistant Contest Manager

OCTOBER

31

West Coast Qualifying Run, 10-35 WPM, 0500Z Nov 1 (9 PM PST Oct 31). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3.590 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL HQ for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

NOVEMBER

3-4

International EME Competition, see Sep *QST*, p 78.

***QST* QSO Award Party**, phone, sponsored by the Canadian Radio Relay League, Nov 3-4, 1400Z-2200Z each day (CW—Nov 10-11). The award is available to any amateur who makes phone, CW or mixed contacts with eight of the 11 *QST* stations in Canada. To receive the award, send an SASE or IRC to Garry Hammond, VE3XN, 5 McLaren Ave, ON N4W 3K1, Canada.

3-5

ARRL November Sweepstakes, CW, see Oct *QST*, p 93.

10

W1AW Qualifying Run, 10-35 WPM, Nov 11 0300Z (10 PM EDT, Nov 10). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 18.0975 21.0775 28.0775 50.08 147.555 MHz. See Oct 31 listing for details.

10-11

North Carolina QSO Party, sponsored by the Alamance ARC, from 0000Z Nov 10 until 2400Z Nov 11. Work stations once per band/mode. Mobiles may be worked again as they change counties. Exchange RS(T) and QTH (NC county, state, or country). Suggested frequencies: SSB—3.860 7.260 14.260 21.360 28.360; CW—3.540 3.740 7.040 7.140 14.040 21.140 28.040 28.140. Count one point per phone QSO, two points per CW QSO, and 5 points for Novice/Tech contacts. NC stations multiply points by total NC counties, states, provinces and countries. Others multiply points by total NC counties worked (max 100). Blank forms are available from K4EG for an SASE. Mail logs by June 30 to NC QSO Party, c/o K4EG, PO Box 3064, Burlington, NC 27215. Include an SASE for results and certificate.

European DX Contest, RTTY, see July *QST*, p 81.

***QST* QSO Award Party**, CW, see Nov 3-4 listing.

17-19

ARRL November Sweepstakes, phone, see Oct *QST*, p 93.

24-25

***CQ* World-Wide DX Contest**, CW, see Sep *QST*, p 81.

West Virginia QSO Party, sponsored by the West Virginia State ARC, 1800Z Nov 24 to 1800Z Nov 25. Work stations once per band/mode. Exchange signal report and state or province (WV stations send signal report and county). Score one point per phone QSO and two points per CW QSO. Score 25 points for working W8WVA. Final score is QSO points × total WV counties worked (WV stations multiply QSO points by WV counties, states, and provinces worked). Send logs by Dec 21 to Jimmie Hewlett, WD8MKS, 2207 Fairlawn Ave, Dunbar, WV 25064.

27

W1AW Qualifying Run, 10-35 WPM, Nov 27 2100Z (4 PM EST Nov 27). See Nov 10 listing for more details.

30-December 2

ARRL 160-Meter Contest, see this issue, p 85.

DECEMBER

4

West Coast Qualifying Run, Dec 5 0500Z (9 PM PST Dec 4). See Oct 31 listing for more details.

8-9

ARRL 10-Meter Contest, see this issue, p 84.

9

W1AW Qualifying Run, 10-35 WPM, Dec 10 0300Z (10 PM EST Dec 9). See Nov 10 listing for more details.

27

W1AW Qualifying Run, 10-35 WPM, Dec 27 1400Z (9 AM EST Dec 27). See Nov 10 listing for more details.

Contest Announcements: Items for this column can be sent on a 5¼- or 3½-inch MS-DOS floppy diskette in ASCII format to ARRL HQ, via modem (ARRL HQ BBS, 203-665-0090, 2400-8-N-1) or in written form. The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **December 1** to make the **February** issue. Please include the name of the contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Standard Contest Guidelines

1) Make sure your log details the date, time, band, call sign and complete exchange sent and received for each QSO claimed for contest credit.

2) Your summary sheet should indicate your score, including how you figured it and a declaration that you followed FCC/DOC regulations and the contest rules. Your name, call sign and complete address should be typed or printed in block letters.

3) Crossband, crossmode and repeater contacts are usually not permitted. Contacts with the same station on different bands are usually permitted.

4) Your log should be checked carefully for duplicate QSOs and if more than 200 QSOs are made, dupe sheets should be included with your entry.

5) Your log may be considered a checklog or disqualified if it is incomplete or if too many errors are detected by the contest committee.

6) Avoid standard net frequencies.

7) International contests generally offer awards to top scorers from each US call area and each country; state QSO parties to each state/province.

8) Your summary sheet should include the following statement: "I have observed all competition rules and all regulations established for Amateur Radio in my country." The declaration should be signed and dated. QST

Special Events

Conducted By Warren C. Stanklewicz, NF1J
Assistant Contest Manager

Calvary, Georgia: The Albany ARC will operate W4MM 1300Z-2000Z **Nov 3** to commemorate the 18th Mule Day Festival. 3.975 7.260 14.320 28.383. For certificate, send SASE to ARRC, PO Box 70601, Albany, GA 31707-0011.

The **Armed Forces Net** will operate 0000Z **Nov 7**-2400Z **Nov 11** to celebrate the 50th anniversary of US Armor and to honor all veterans. CW—7.065-7.125; phone—3.920, 7.283, 14.250, 21.375, 28.450, 28.460. For certificate, send a SASE to WB1DWR, 16 Berkeley Cir, Newington, CT 06111.

Clinton, North Carolina: The Samson County ARS will operate AB4TT 1700Z-2400Z **Nov 8** in conjunction with the Sampson County Expo and Pork Festival. Operation is in the lower portion of the General bands. QSL to SCARS, PO Box 64, Clinton, NC 28328.

Fort Pierce, Florida: The Fort Pierce ARC will operate KJ4YF 1400Z-2100Z **Nov 10** to commemorate the 5th anniversary of the UDT-Seal Museum. Operation is on the General 20 and 15 meter phone bands and the Novice portion of 10 meters. For certificate, send QSL and SASE to FPARC, PO Box 0004, Fort Pierce, FL 34954.

Pittsburgh, Pennsylvania: WB3L will operate 1300Z-2400Z **Nov 10-11** to commemorate "Light Up The Night At The Point." 7.240 14.240 21.340 28.340. For QSL, send QSL and SASE to WB3L, 3444 Bench Dr, Pittsburgh, PA 15236.

Nitro, West Virginia: The Tri-County Ham RC will operate W8WVA 1500Z **Nov 10**-2200Z **Nov 11** to commemorate the living memorial to WW1. Operation is 25 kHz up from the General 80, 40 and 20 meter bands and Novice 10 meters. For certificate, send QSL and SASE to W8WVA/N8CG, c/o Chub Goodwin, 103 Cleveland Ave, Nitro, WV 25143.

Washington, DC: HAMVETS will operate N3EKX **Nov 11-12** to commemorate Veteran's Day. Operation is in the General 80, 40 and 20 meter phone bands. For QSL, send QSL and SASE to K9ICF, 13300 Wye Oak Dr, Darnestown, MD 20878.

Pensacola, Florida: N4PHH will operate **Nov 11-17** during Geography Awareness Week. Operation is on 14.250, the General phone portion of 15 meters and the Novice portion of 10 meters. For certificate, send QSL to Fred Gamble, Dept of Physical Science, Pensacola Junior College, Pensacola, FL 32504.

Special Event Announcements: Items for this column can be sent on an MS-DOS floppy disk in ASCII format to ARRL HQ, via modem (ARRL HQ BBS, tel 203-665-0090, 2400-8-N-1) or in letter form. The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **December 1** to make the **February** issue. Please include the name of the sponsoring organization, the call sign of the special-event station, the city location, dates and times (Z), suggested frequencies and QSL information. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9- × 12-inch envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail your QSL and your SASE to the address listed or to the address given on the air by the station you QSO. Be patient; special-event stations often print their cards and/or certificates after the operation is over so they will know how many to order. QST

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

ATLANTIC DIVISION

DELAWARE: SM, Bob Pegritz, KC3TI—I'm *still* in the tedious process of moving (it must be the gypsy in me) & info, especially with regard to tfc, is coming to me a bit slowly. I'll have to combine this month's tfc reports with next month's. See the Dec '90 issue of *QST*! Thanks to all who helped with recent runs, races & NDMS activity. Congrats to AWARE for becoming a Special Service Club and a big DE welcome to our newest club, the Penn-Del ARC, which presently sports a new rptr freq of 224.22 MHz—Novice ops take note. With the fall season comes more news of classes being held for upgrades & Novices. If you need a complete schedule, give me a call. Does your club have an activity worth publishing in this column? Please send me your club newsletter & we'll be happy to help. Happy Thanksgiving & very 73!

EASTERN PENNSYLVANIA: SM, Robert M. Stanhope, KB3YS—ASM: N3ECL @ WB3AFL, WA3PZO @ WB3JOE. ACC: KC3QB. BM: KD3OA; OOC: W3IS. PIC: W3ZVX. SGL: WA3IAO. SEC: WB3FPL. STM: KD3AO. TC: W3FAF. I sit here ea month & wonder what I'll write about, as I'm allotted 63 lines of space. It's Sept 10 as I write this & all of a sudden we have a military crisis in the world. The amateurs of EPA have direct involvement in the situation. The Nat'l Disaster Medical System (NDMS) has been activated & is on standby. Should the situation in the Middle East become a major conflict, many of the wounded would be flown into the Philadelphia area. These wounded would then be distributed to area hospitals. This distribution is done by Amateur Radio. As many as 200 persons in ARES will be involved in this program at a time, as we'll be working with more than 30 hospitals, Federal, State & local gov't agencies & social agencies such as the Red Cross. This is an awesome responsibility & is what many have trained for. This is the 1st time in yrs Amateur Radio has had to go to war. Never have we had this responsibility! Should the crisis escalate, you will make us proud. I hope this doesn't come to pass & by the time you read this, we may have the answer to this question. On a lighter note, I want to congratulate the SM of Maryland, Ken Cohen, NI3F & his wife, Gillian, on the birth of the new ASM, as yet to be named. Mother & child are fine; the father was the one who got hurt at the hospital! Gads, Dad! I had the honor to speak at the Warminster ARC this past wk; it was their annual ARRL night. Also speaking were the Atlantic Div Dir, W3ABC & Vice Dir KC3LM. EPA/ASM WA3PZO spoke about the involvement of NDMS & EPA/PIO W3ZXV on PR. The club has had wonderful success in training students in the radio arts. They've helped form 2 RCs in area elementary schools! No, this isn't a misprint! I hope to gain info on their training program. It was a good time for me & N3FVO, thanks to all. This week I'm in my NE corner of the state to teach the SKYWARN program in Nazareth for the Allentown office of the Nat'l WX Service. I'll be a guest of the Delaware-Lehigh ARC. Then, I'm off to visit the newest affiliated club, the Columbia Area ARC, K3FHC/R in Lancaster Co. Their 37 members sold submarine sandwiches door-to-door to purchase & maintain their rptr. They will have a hamfest in Jan 1991 (indoors). For more info, contact their club president, Scott, KA3LUW @ KA3PLC. Then it's the York hamfest. I'll be having a staff mtg at this time to develop our course of action concerning the proposed Communicator license, SKYWARN & NDMS—more on that next month. I have 2 appointments this month, OOs John Miller, WA3OVD & Bill Freiler, N3EYM. Tfc (Aug): WA3DFU 588 Warminster ARC, N3DRM 280, W3IVS 215, KD3AO 156, KA3ORF 154, WA3EHD 134, N3CD 114, W3JKX 108, W3PIX 80, W3DP 77, W3KAG N3EFW 67, W3KOD 65, W3ADE 62, N3AT 44, KB3QW 42, KA3JKB 21, KU3R 20, WB3EVL 18, W3FAF 13, WB8KPE W3CL W3BNR 9 & NZ3G 6. Nets: PFN 163, EPAEPTN 479, EPA 471, PTTN 216, D6ARES 80, MARCTN 118, SEPATN 73 & MARCNET 53. PBBSs: WA3TSW 530, K3RLI 279, WB3JOE 100, WB3AFL 6. N3ET 5 PSHR: NM3K 86 & N3DRM 74. BPL: WA3DFU 588 & WA3TSW 530. 73 de Carter, KD3AO STM/EPA. This Thanksgiving, pray for peace 73 de Bob, KB3YS @ WB3AFL.

MARYLAND/DC: SM, Ken Cohen, NI3F (@WA3ZNW)—ASM/PKT: KJ3E. ASM/ACC: WA3YLO. OOC: NB3P. SEC: WA1QAA. TC: W3VVN. STM: N3EGF. SGL: KW3X. PIO/BM: WA3SCW. Our diligent SEC, WA1QAA, has issued the 1st edition of his newsletter. Mike is busy getting his troops ready for the SET. MMARC plans a Novice class—FB! Does your club have one? Teachers—scoutmasters! Please push the ARRL *Archie* comic—it's great PR! KC3UQ has published a recipe in the CARA newsletter . . now, how about a food column entitled "The Hamfest Gourmet?" Goddard ARC has been training helpers to man the shuttle retransmissions of astronaut club member Dr Ron Parise, WA4SIR. AG3L returned to Solomons safely Aug 25 after a 4-month solo sailboat voyage to the Virgin Is. CW contact with K3NNI & KJ3E was about 98% successful. Keep your tfc-handling skills up to par. . .the gulf crisis is heating up. Oops! I interrupt this column to announce that my XYL has just informed me that she is going into labor! What am I doing typing? I gotta go to the hospital. . .yipes! I'll tell you what it is next month. *(See Bob Stanhope's report above—Ed.)* 73 & 88! With the nets: *NM/QND/QTC/QNI* MSN/KC3Y 31/46/295 PON/WB3BFK 27/5/27 MDD/K3GHH 62/144/388 (Top Brass, KC3Y/156, WA3YLO/98, W3FZV/91, NR3Q/89) MEPN/K3RXK 31/130/656 MPTN/KJ3E 31/840/513. Tfc: W3IWI 925 (BPL), N2GTE 840 (BPL), N4QQ 545 (BPL), KJ3E 534 (BPL), KA3T 262, KC3Y 170, NR3Q 170, K3GHH 141, KN1K 134, K3RXK 133, N3GPR 131, WA3YLO 116, NB3P 102, K3NNI 91, N3DE 59, W3FZV 57, K2EB 55, NC3Z 50, N3EGF 45, W3YVQ 45, K3USO 42, WB3BJM 39, K3ORW 28, WB3V 25, N3GIY 22, WA3VAT 15, WB3BFK 12, KK3F 10, WA1QAA 6, WA3GYW 5, KC3ZJ 4, WA3SCW 2, WA2WDT 1. PSHR: KJ3E 109, W3YVQ 87, KC3Y 76, K3RXK 72, WA3YLO 66, K3GHH 61.

SOUTHERN NEW JERSEY: SM, Richard Bater, WA2HEB—SEC: W2HOB. STM: WB2UVB. ACC: K2IXE. TC: N2BQT. PIO, SGL & BM: Vacant. OOC: WA2HEB. ATC's K2JF, KA2RJA & WB2MNF. In Aug, I accidentally came across a bill that could affect many of us in the state. Our State Assembly has before it a bill, A- 1174, sponsored by Assemblywoman Kalik, that if enacted, would allow amateurs who lease their vehicles the privilege of having their amateur call signs on license plates. Currently, if you lease a vehicle, you cannot apply for amateur plates because the leasing agency is the owner of the vehicle & the owner is not an Amateur Radio operator. This bill seems noncontroversial because other "vanity" plates are allowed on leased vehicles, providing the lessor gives permission. Please take a few moments to write your state assembly person about this bill. I also wrote to Assemblyman Felice, W2YMG, about getting the necessary legislation enacted to put *Amateur Radio* at the bottom of our call sign license plates. Until next month, 73. Tfc: (July) WB2ZJF 33. (Aug) WB2UVB 338, N2FET 63, N2JXG 53, WB2ZJF 43, KB2CDB 24, WB2SYJ 22, K4FFM 21, KA2CQX 18, NG2R/GE ARC 16, WA4JRP 14, W2AZ 13, WA2JSG 10, KC2PB 10, WA3EMY 9, W2FFE 8, KA2YKN 6, N2HQL 6, N2EPH 5, K2QIJ 4, K2OG 4, NG2R 3, KB2HJJ 2, KB2GUH 2, N2HMX 2.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—ASMs: W2BCH W2GJ W2GLH WB2YQH. ACC: N2EH. BM: K2KWK. OOC: W2MTA (A). PIC: WA2PUU. SEC: NN2H. STM: N2EIA. SGL: WB3CUF. TC: KQ2R. Club officers: Liverpool ARC WA2ISC K2QCI N2DMP KB2EVU. RAGS NT2D KC2KB NN2M WA2URK WA2PUU; Utica ARC K2BRF WA2TVE WA2FSU WA2AZA. The PROS Ham-of-the-Yr was awarded to KC2JY. Lancaster ARC will miss Matt Gorski, NS2M, who has joined Silent Keys. Matt was important to the greater Buffalo-area VE & other ham activities. Utica ARC lost a great one when Howard La Munion, K2XU, became a Silent Key. Of the 57 active affiliated clubs in WNY, 16 have not reported yet this yr. One, the Auburn ARC, which last reported in 1987, will become an inactive affiliate if an Annual Report is not received soon. If your club needs the report form, request a copy from the Field Services Dept at ARRL HQ in Newington, CT.

Net	*QNI-QSP-QND*	*Net*	*QNI-QSP-QND*
NYSEMO	093-008-04	Earlybird	246-000-23
NYSR	015-004-04	Blue Line	250-014-30
NYS/M*	288-165-31	NYS/E*	430-167-31
WDN/M*	337-094-31	WDN/E*	416-151-31
NY Phone*	132-083-30	JCRACN	395-019-30
NYPON*	384-164-31	OARCN	089-004-05
NYSPT&EN	445-072-31	TIGARDS	032-004-04
Empire SS	362-139-31	VHF THIN	035-000-04
LCARES	049-000-04	BRVSN	250-001-31
OCTEN/E*	851-202-31	OCTEN/L*	283-132-31
Q Net	334-001-30	CNYTN*	277-062-33
STAR*	244-027-29	ORTN	031-000-05
WDN/L*	415-085-31		
*NTS Net		NYS/L*	287-131-31

NA2B reports PBBS activity of KT = 3, T = 287 for Aug. Aug BPL to N2JAW. PSHR: N2EIA N2EVG WA2FJJ W2FR KA2GJV KC2HJ KB2IWN N2JAW N2JRS W2MTA WB2OEV WB2QIX KA2QOO ND2S WA2UKX NJ3V KD2WP K2YAI KA2ZNZ. Tfc (Aug): N2JAW 688, W2MTA 368, K2YAI 239, KA2GJV 185, KA2ZNZ 172, N2EIA 148, W2FR 135, WA2FJJ 131, NJ3V 129, KA2QOO 127, ND2S 102, WB2OWO 98, NN2H 97, AF2K 96, WB2QIX 95, WB2OEV 86, KC2HJ 85, KD2WP 83, N2EVG 80, WA2UKX 71, N2JRS 70, WB2IJH 65, KG2D 61, N2DLN 61, KA2SJG 48, KB2IWN 46, W2PPS 42, KA2DBD 38, KB2JOP 20. (Jun) NJ3V 163, W2FR 160. (July) KB2IWN 18, KB2EOQ 14, KB2JOP 8. Seasons' greeting...don't eat too much cobbler with the gobbler!

WESTERN PENNSYLVANIA: B. E. Fuller @ K3ASI—ASM: KA3OEM @ NM3G. SEC: WA3UFN @ W3YA. STM: WA2QXA @ KA3NVP. TC: K3LR. BM: KC3ET @ KA3NVP. OOC: KX3V. ACC: AK3J. The crisis in the Middle East has pointed up the necessity for the ham community to make sure we're equipped to handle emergency comms if we are called upon. This is especially true of ARES groups committed to assist NDMS in emergencies. Make sure that your equipment is in top working condition & ready to go. If you are heavily committed to the NTS, you can expect an increase in tfc because of the increase in the number of people assigned to the crisis area...refiles of tfc from MARS to NTS will probably increase. If you aren't involved in tfc handling, this would be a good time to get your feet wet in a real-time situation. The failure of the NTS occurs when tfc is allowed to go unpassed—this is especially true of pkt tfc. Check the local PBBS & take any tfc you're in a position to pass—just command LT & you'll see what's waiting to be forwarded. I would like to welcome Tim Duffy, K3LR, to the WPA Section leadership team. Tim has been appointed to the position of Tech Coord (TC) for the section. Expect to hear from Tim; he'll especially be looking for an expanded corps of Asst TCs to compliment our coverage throughout the section. I'm sure we'll all enjoy working with Tim & give him our support. We still need active, energetic volunteers to fill these positions: Public Info Coord (PIC) & State Gov't Liaison (SGL). Let me or Bob, KA3OEM, the ASM, know if you are interested in joining the team, or if you know of someone who fits the bill. KUDOS. A visitor to the section was supported during an emergency by the New Castle rptr group (147.195). I join him in thanking the hams in the New Castle area who assisted during the medical emergency that happened during a commercial power outage. The sort of cooperation rendered is what Amateur Radio is all about. Once again commendations go out to the SKYWARN groups in the western part of the section- activating a net at 2AM is no fun, but it's amazing how complete the participation & coverage is, even at that early hour.

Net	*QNI*	*QTC*	*SessNM*		*Freq/Time*
WPA CW	189	122	30	WA3UNX	3585 7 P Dy
WPAPTN	221	68	31	WA3HLN	3983 6 P Dy
KFN	Temporarily Suspended				
PFN	168	189	31	WA3THT	3958 5 P Dy
WPA2MTN	336	42	31	KA3BGC	146.88 8 P Dy
NWPA2MTN	733	35	29	WA3ZSC	145.13 9 P Dy

Tfc: N3EMD 365, N3FM 347, W3EGK 282, W3OKN 127, WA3UNX 88, W3NGO 70, NO3M 58, WA3DBW 52, N3AES 44, WA2QXA 63, W3RUL 23, WA3QNT 20, KA3VBY 18, K3LTV 5, KC3YE 5, KA3EGE 4, N3FQQ 4, KB3BG 3. (Jul) WA3QNT 6, K3LTV 3, KB3BG 2. (Jun) KB3BG 8.

CENTRAL DIVISION

ILLINOIS: SM, Sharon Harlon, WB9SFT—SEC: W9QBH. BM: K9EUI. ACC: KI9G. STM: K9CNP. SGL: K9IDQ. TC: N9RF. OOC: W9TT. PIC: N9EWA. DEC: WD9EBQ Summer is always a busy time for Amateur Radio activities & the RCs in IL are no exception. The members of the Sterling-Rock Falls ARS provided comms for the Rock Falls Day parade & the American Cancer Society/Whiteside Co Chapter Bike-a-thon. Those who participated were KA9GNR, WB9RXK, KA9CZD, KA9QYT, KA9GPE, KE9TY, N9HCL, KA9UKN, KB9APW, KD9YK, KA9DBG, WD9EHM, WA9BSO. On July 15, members of the York RC provided comms for the Villa Park 5- & 10-K run & on Aug 19, the Hillside Veterans Parade. Participating were WA9OHU, WD(DOX, WK9U, WK9J, K9BFU, WB9ASX, KA9ASX, KA9ZNL, W9GSA, W9YNK, WA1MRH, KE9VC, KC9DS, NU9B, W9KBU, WB9DUV. The Rockford ARA held its annual picnic Aug 19 with 6 special guests attending. Dick, DJ9UN (US call, N9UN), his YL Hanne, DK3XJ; their son Robert, KA9UUH; Elke, DL3NDC; Tanja, DL3NEC & Gunther, DL3NCC, were on vacation in the US & made a stop in the Rockford area to visit old friends. Dick, Hanne & Robert are former Rockford- area hams. While visiting in the US, Robert passed his Tech exam. I'm pleased to announce the appointment of Carol Melton, KI9G, as ACC for the IL section. Carol lives in Lisle & has been active in teaching Novice & upgrade classes, DXing & is a VE. Welcome aboard, Carol. On Aug 30, a devastating tornado hit the village of Plainfield. Hams from the N IL area are volunteering time & radios around the clock to help with this disaster as this column is being written. More next month.

Net	*Freq*	*Time*
ISN	3905	1800 Dy
ILN	3690	1830, 2200 Dy
ITN	3705	1900 Dy
CTN	147.69/09	2100 Dy
ILARES	3905	1630 1st, 3rd Sun
IEN	3940	0900 Sun
ILPN	3855	1645 M-F, 0830 Sun
NCPN	3915	0700 M-Sat
NCPN	7270	1215 M-Sat

Tfc: W9KLN 229, NS9F 140, W9HOT 100, K9CNP 97, WD9EBQ, N9HWO 55, W9LWH 42, W9KR 14, WA9RUM 6.

INDIANA: SM, Peggy Coulter, W9JUJ—SEC: WB9ZQE. STM: KJ9J. OOC: N9INN. SGL: WA9VQO. BM: W9OCL. PIC: N9IPA. I regret to report the Silent Keys: Aug 10, George A. Mahorney, WA9SDH, Montpelier; Aug 20, Norbert F. Polakowski, KD9OK, Terre Haute; Aug 21, Fred D. Brunk, WA9TQD, Marion; Aug 23, Al Miller, N9AHP, Ireland & Aug 29, Lewis T. Mabbitt, N9DOD, Indianapolis. Sympathy extended to their families & many friends, they will be sadly missed. W9OCL received OBS reports from WB9SYK, N9BAC, K9SBW, WA9IJXP & N9BS. Activity reports from N9DTG, KA9ZOD & WB9YRT. ATC report from WA6OIZ. N9INN received 5 reports. If you have an appointment, send a report of what you've been doing to your appointed chairman—they appreciate it & can report to me. We need these reports to know what's happening out there. VHF NMs, send your monthly net reports to STM KJ9J; he will get totals to me. Have enjoyed seeing & talking to many at the different hamfests. Wish I could be at every one, but when several come on the same date, it's impossible. If you send me dates for next yr's hamfest as soon as possible, I can let you know if any other is listed that date—maybe we can separate them. Want to wish everyone a Happy Thanksgiving. EC reports were received from WB9ZQE N9OTH K9ET WN9Z N9GKQ WA9RXP N9GSX N9BHA N9ADS WB9VQK WB9SOY WB9FLK K9EFY W9CFI WB9RVN WA4VWV NX9Q KS9N WB9CIF WN9G KB9BGV W9KGE WA9HEE KD9HB N9EYG WA9DOL KA9MNR K9KTH WD9BKA K9PT8 WA9OQT KA9DZM KA9KTD W9YDP KC9CV WA9BLA NG9Y N9GYO KA9ZLG & WB9AHJ. 46 countries reporting. Aug net reports:

Net	*Freq*	*Time*	*QNI*	*QTC*	*QTR*	*Sess*
ITN	3910	1330/2130/2300	2933	414	1851	93
QIN	3656	1430/0000/0300	348	262	752	61
IWN	3910	1310	1748		323	31
IWN VHF Bloomington			776		485	31
IWN VHF Kokomo			970		156	31
IWN VHF Northeast			692		620	31
Hoosier VHF Nets (9 nets)			1499	42	1688	61

9RN July tfc 229 in 62 sess, Ind 98% by N9HZ KJ9J W9JUJ NR9K WA9QCF WB9UYU W9PPO & W9CSJ. 9RN Aug tfc 203 in 62 sess, Ind 98% by N9HZ KJ9J W9JUJ NR9K WA9QCF WB9UYU. PBBS reports are made by adding total bulletins, personal msgs & NTS msgs handled; PBBSs reporting: KD9WH 4284, N5AAA 2454, WJ9U 2402, KD9LP 1792, KA9LQM 1775, WA9IVB 1624, N9BAC 1522 & KK9G 1425. Tfc: NR9K 321, WA9OHX 261, W9UMH 224, KA9LQM 194, KJ9J 179, W9JUJ 137, *W9UEM 92, KE9GM 62, WA9QCF 47*, K9ZLS 44, W9PPO 36, W9ZGC 32, K9GBR 31, N9BS 31, W9EDE 14, N9DTG 13, WB9IHR 10, KA9ZOD 9, KD9ER 5, WD9CIV 4, AB9A 3, W9XD 2, K9OUP 2, W9KMY 2.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9ZAG. STM: KC9CJ. ACC: KA9FOZ. BM: WB9JSW. OOC:

WORLDWIDE DISTRIBUTION

HAM RADIO OUTLET

LARGEST HAM OUTLET IN THE WORLD

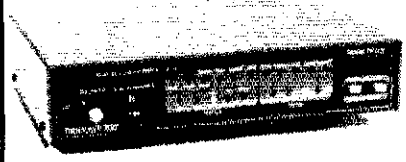
FOR AN HRO 72 PAGE COMMUNICATIONS EQUIPMENT CATALOG send $1 to any HRO store

10 STORE BUYING POWER !

Advanced Electronic Applications

PK-232 Multi-mode Data Controller

Now with PakMail function



- NEW IBM Fax Screen Display Program Available
- Transmit/Receive on Six Modes
- CW/RTTY/ASCII/ AMTOR/Packet/FAX
- IBM and Commodore terminal programs available
- Radio Ports for HF and VHF

In Stock for Quick Delivery

Free Shipment

/KAM

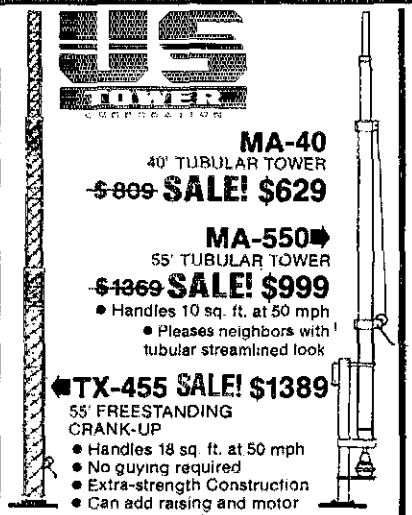
True dual port – simultaneous HF/VHF packet operation

- Personal Bulletin Board
- RTTY/ASCII/AMTOR/CW/Weather Fax
- Programmable MARK and SPACE tones
- Terminal programs for PC compatibles and Commodore
- WEFAX programs for PC, Commodore, and Macintosh

One-year Warranty

CALL FOR LOW, LOW PRICE

US TOWER



MA-40
40' TUBULAR TOWER
~~$809~~ **SALE! $629**

MA-550
55' TUBULAR TOWER
~~$1369~~ **SALE! $999**
- Handles 10 sq. ft. at 50 mph
- Pleases neighbors with tubular streamlined look

TX-455 SALE! $1389
55' FREESTANDING CRANK-UP
- Handles 18 sq. ft. at 50 mph
- No guying required
- Extra-strength Construction
- Can add raising and motor drive accessories

Shown with optional MARS rotor base

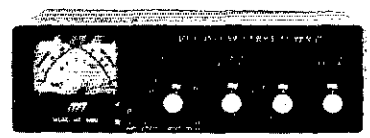
TOWERS RATED TO EIA SPECIFICATIONS
OTHER MODELS AT GREAT PRICES

• • • Call any of our 10 stores nationwide for low, low outlet prices ! • • •

MFJ

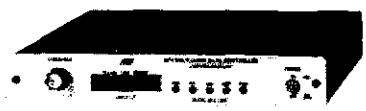
Full MFJ line stocked in depth!

MFJ ... making quality affordable



MFJ-949D 300 Watt Tuner
- *Built-in dummy load*
- *New **peak** and Average Lighted 2-color Cross-Needle SWR/Wattmeter*
- *Built-in antenna switch, balun*
- *Covers 1.8-30 MHz*

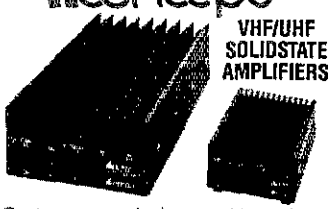
All MFJ Packets Stocked!



MFJ-1278 Multi-mode
- *All 9 digital modes*
- *Easy Mail™ Personal Mailbox*
- *20 LED Precision Tuning Indicator*
- *Includes free power supply*
- *Includes free eprom upgrade*

Call now for all MFJ products ... wattmeters, dummy loads, coax switches, keyers, clocks, speaker/mics, software, books and more! *One year **unconditional** guarantee.*

concepts



VHF/UHF SOLIDSTATE AMPLIFIERS

Contemporary design, quality and a 5 year warranty on parts and labor. 6 months on the RF Final transistors.

All amplifiers have GaAsFET receive pre-amps and high SWR shutdown protection

GEDCHRON

GLOBAL TIME INDICATOR

SALE!

- Detailed illuminated map shows time, time zone, sun position and day of the week at a glance for any place in the world. • Continuously moving - areas of day and night change as you watch. • Mounts easily on a wall. Size: 34¼"x22¼".

$1295 **$1159.95**

FREE Shipment! most items over $100 UPS surface

ALL MAJOR BRANDS IN STOCK NOW!

CALL TOLL FREE

NOW! Toll free in California !

WEST	MID-WEST/COLORADO	SOUTHEAST	MID-ATLANTIC	NEW ENGLAND
1-800-854-6046	1-800-444-9476	1-800-444-7927	1-800-444-4799	1-800-444-0047

(call toll-free to nearest store) Toll free incl. Hawaii. Local phone hours, 9:30 AM to 5:30 PM. AZ, CA, CO, GA, VA residents, add sales tax.

WALK-IN HOURS: 10AM-5:30PM • CLOSED SUNDAYS

Prices, specifications, descriptions, subject to change without notice.

WORLDWIDE DISTRIBUTION

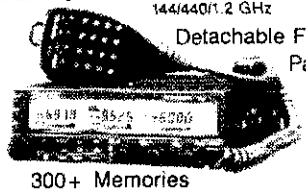
HAM RADIO OUTLET

LARGEST HAM OUTLET IN THE WORLD

ANNOUNCING A NEW STORE: HRO is in DENVER! — GRAND OPENING THIS MONTH! —

10 STORE BUYING POWER!

KENWOOD NEW
TM-941A TRI-BAND FM 144/440/1.2 GHz

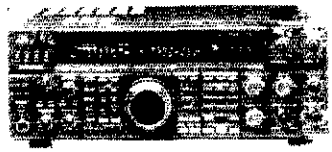


Detachable Front Panel

300+ Memories
PL Encode/Decode Built-in

CALL FOR LOW, LOW PRICE

KENWOOD
TS-950S



DIGITAL DX-CLUSIVE PERFORMANCE
150W HF DUAL RECEIVE

CALL FOR PRICE

KENWOOD
TS-440S

HF TRANSCEIVER

- 160 m to 10 m Amateur Bands
- 100-KHz to 30 MHz Receiver
- Available with optional built-in Antenna Tuner.

CALL FOR PRICE!

KENWOOD
TH-26AT/46AT/55AT

2m 70cm 1200MHz

First Pocket Sized Handheld Transceivers
Extended Receive Capability

GREAT PRICE!

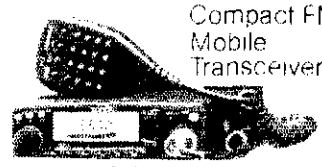
COAST TO COAST

HRO= *Rapid deliveries from the store nearest you!*

KENWOOD
TM-241A/331A/441A/541A

2 MTR 220 MHz 70 cm 1200 MHz
AIRCRAFT RX

Compact FM Mobile Transceivers

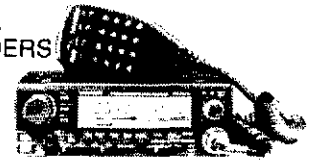


LOW PRICE
FREE SHIPMENT
MOST ITEMS UPS SURFACE

KENWOOD
TM-731A/631A/701

2m/70cm 2m/220MHz 2m/70cm

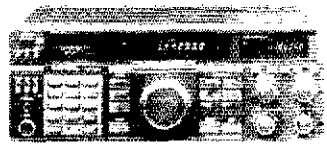
DUAL BANDERS



GREAT PRICES.CALL

KENWOOD
TS-790A

144/450/1200 MHz OPTIONAL — ALL MODE TRIBANDER



SATELLITE TRANSCEIVER
ROCK SOLID TCXO

KENWOOD

Super Compact HT
700 MAH Battery

TH-27A NEW
RX 118-165 MHz
2 MTR/2.5 W DTSS

TH-47A
440/1.5 W DTSS
41 Memories

GREAT PRICE

TH-225A 2 MTRS
TH-315A 220 MHz/2.5 W
TH-415A 440 MHz/2.5 W
TH-75A 2m/70cm
10 Memories

FREE Shipment! most items over $100 UPS surface

Bob Ferrero W6RJ
President/Owner

Jim Rafferty N6RJ
VP – National Sales Manager

ALL MAJOR BRANDS IN STOCK NOW!

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

ATLANTA, GA 30340
6071 Buford Highway
(404) 263-0700
Larry, WD4AGW, Mgr.
Doraville, 1 mi. north of I-285

BURLINGAME, CA 94010
999 Howard Av.
(415) 342-5757
Rich, WA6WYB, Mgr
5 mi. south of SFO on 101

NEW STORE!!
DENVER, CO 89231
8400 E. Iliff Ave., #9
(303) 745-7373
(800) 444-9476

OAKLAND, CA 94606
2210 Livingston St.
(415) 534-5757
Rich, WA6WYB, Mgr
I-880 at 23rd Ave. ramp

PHOENIX, AZ 85015
1702 W. Camelback Rd.
(602) 242-3515
Gary, WB7SLY, Mgr.
East of Highway 17

SALEM, NH 03079
224 N. Broadway
(603) 898-3750
(800) 444-0047
Paul, NW1U, Mgr.
Exit 1, I-93, 28 mi. no. of Boston

SAN DIEGO, CA 92123
5375 Kearny Villa Rd.
(619) 560-4900
Tom, KM6K, Mgr.
Highway 163 and Clairemont Mesa Blvd.

VAN NUYS, CA 91411
6265 Sepulveda Blvd.
(818) 988-2212
Al, K6YRA, Mgr.
San Diego Fwy. at Victory Blvd.

WOODBRIDGE, VA 22191
14803 Build America Drive
(703) 643-1063
(800) 444-4799
Curtis, WB4KZL, Mgr.
Exit 54, I-95, South to US 1

CALL TOLL FREE
NOW! Toll free in California !

WEST 1-800-854-6046
MID-WEST/COLORADO 1-800-444-9476
SOUTHEAST 1-800-444-7927
MID-ATLANTIC 1-800-444-4799
NEW ENGLAND 1-800-444-0047

(call routed to nearest store) Toll free incl. Hawaii. Local phone hours, 9:30 AM to 5:30 PM. AZ, CA, CO, GA, VA residents, add sales tax

WALK-IN HOURS: 10AM-5:30PM · CLOSED SUNDAYS

Prices, specifications, descriptions, subject to change without notice

WORLDWIDE DISTRIBUTION

HAM RADIO OUTLET

LARGEST HAM OUTLET IN THE WORLD

ANNOUNCING A NEW STORE: HRO is in DENVER! — GRAND OPENING THIS MONTH! —

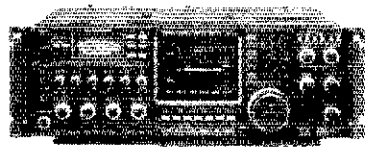
10 STORE BUYING POWER!

ICOM IC-765

100W GENERAL COVERAGE RECEIVER
HF ALL BAND TRANSCEIVER
Maximum Operation Flexibility

SALE! CALL FOR PRICE

ICOM IC-781

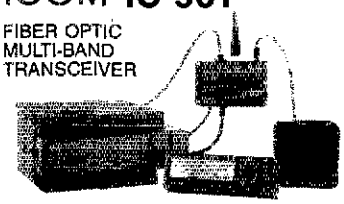


THE ULTIMATE
150 W, ALL BAND
HF TRANSCEIVER

GREAT PRICE!

ICOM IC-901

FIBER OPTIC
MULTI-BAND
TRANSCEIVER



2 METER AND 440 MHz
EXTRA-LARGE MULTI COLOR LCD
HM14 TOUCH TONE MICROPHONE

CALL FOR PRICE

ICOM A Models 25 WATTS H Models 100 WATTS

IC-275A/275H, 138-174 MHz
IC-475A/475H, 430-450 MHz

LOW PRICE!

COAST TO COAST

HRO= *Rapid deliveries from the store nearest you!*

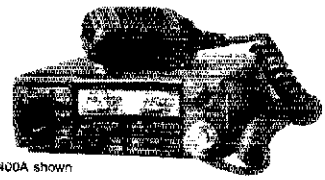
ICOM HAND-HELD VHF/UHF

MICRO SIZE

IC-32AT Dual Band Hand Held
IC-2GAT 2 Meter HT 7 WATT
IC-4GAT 440 MHz 5 WATT
IC-2SAT, 2 MTR
IC-3SAT, 220 MHz
IC-4SAT, 440 MHz
IC-24AT, Duo-Band

ICOM IC-2400A/3220

2m/440 MHz / 2m/440 MHz



IC-2400A shown

VHF/UHF DUAL BAND
FM TRANSCEIVER

ICOM IC-229H

2 METER MOBILE

NEW

50 W/20 Memories/Small Size
Extended RX Coverage, 118-174 MHz

GREAT PRICE

ICOM IC-725

100W GENERAL COVERAGE RECEIVER
HF ALL BAND COMPACT TRANSCEIVER

GREAT PRICE

FREE Shipment! most items over $100 UPS surface

ALL MAJOR BRANDS IN STOCK NOW!

Bob Ferrero W6RJ
President/Owner

Jim Rafferty N6RJ
VP – National Sales Manager

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

ATLANTA, GA 30340
6071 Buford Highway
(404) 263-0700
Larry, WD4AGW, Mgr.
Doraville. 1 mi. north of I-285

BURLINGAME, CA 94010
999 Howard Av.
(415) 342-5757
Rich, WA9WYB, Mgr.
5 mi. south of SFO on 101

NEW STORE!! DENVER, CO 89231
8400 E. Iliff Ave., #9
(303) 745-7373
(800) 444-9476

OAKLAND, CA 94606
2210 Livingston St.
(415) 534-5757
Rich, WA9WYB, Mgr.
I-880 at 23rd Ave. ramp

PHOENIX, AZ 85015
1702 W. Camelback Rd.
(602) 242-3515
Gary, W8TSLY, Mgr.
East of Highway 17

SALEM, NH 03079
224 N. Broadway
(603) 898-3750
(800) 444-0047
Paul, NW1U, Mgr.
Exit 1, I-93; 28 mi. no. of Boston

SAN DIEGO, CA 92123
5375 Kearny Villa Rd.
(619) 560-4900
Tom, KM6K, Mgr.
Highway 163 and Claremont Mesa Blvd.

VAN NUYS, CA 91411
6265 Sepulveda Blvd.
(818) 988-2212
Al, K6YRA, Mgr.
San Diego Fwy. at Victory Blvd.

WOODBRIDGE, VA 22191
14803 Build America Drive
(703) 643-1063
(800) 444-4799
Curtis, WB4KZL, Mgr.
Exit 54, I-95, South to US 1

CALL TOLL FREE
NOW! Toll free in California !

WEST	MID-WEST/COLORADO	SOUTHEAST	MID-ATLANTIC	NEW ENGLAND
1-800-854-6046	1-800-444-9476	1-800-444-7927	1-800-444-4799	1-800-444-0047

(call routed to nearest store) Toll free incl. Hawaii. Local phone hours. 9:30 AM to 5:30 PM, AZ, CA, CO, GA, VA residents, add sales tax.

WALK-IN HOURS: 10AM-5:30PM • CLOSED SUNDAYS

Prices, specifications, descriptions, subject to change without notice.

WORLDWIDE DISTRIBUTION

HAM RADIO OUTLET

LARGEST HAM OUTLET IN THE WORLD

ANNOUNCING A NEW STORE: HRO is in DENVER! — GRAND OPENING THIS MONTH! —

10 STORE BUYING POWER!

YAESU FT-4700 RH

2 MTR/440 MHz 50W/40W

REMOTE HEAD DESIGN

GREAT PRICE!

YAESU FT-1000

NEW

200 WATTS RF power output
Built-in TCXO **Dual VFO's**

CALL FOR PRICE

YAESU FT-470

COMPACT DUAL BAND
2m/70cm
FM Transceiver
Built-in 10 memory
DTMF autodialer

GREAT PRICE!

YAESU FT-736R

VHF/UHF All Mode Transceiver

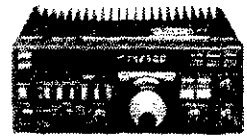
THE ULTIMATE OSCAR MACHINE

• November 17 • GRAND OPENING DENVER STORE!!

YAESU DAY IN DENVER

- See YAESU product demos!
- Talk to YAESU representatives!
- Prizes! Free refreshements!

YAESU FT-757GX/II



Compact HF Mobile Transceiver

YAESU FT-411 HANDHELD

Standard 2.5W
49 Memories
2m/140 to 174 MHz
EXTENDED RECEIVE

CALL FOR PRICE

FT-811
440 MHz VERSION
REG. $410.00 **SALE $339.95**
SALE PRICE

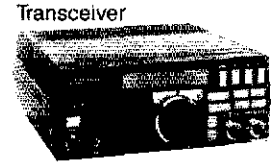
YAESU FT-767GX

HF/VHF/UHF

DUAL VFO's, FULL CW BREAK IN
Optional Modules 50/144/430-440 MHz

YAESU FT-747GX

Computer Aided
HF All Mode
Transceiver



100 WATTS, DUAL VFO'S
Receives 100KHz to 30 MHz
BUILT-IN CW FILTER

FREE Shipment! most items over $100 UPS surface

ALL MAJOR BRANDS IN STOCK NOW!

Bob Ferrero W6RJ
President/Owner

Jim Rafferty N6RJ
VP – National Sales Manager

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

ATLANTA, GA 30340
6071 Buford Highway
(404) 263-0700
Larry, WD4AGW, Mgr.
Doraville, 1 mi. north of I-285

BURLINGAME, CA 94010
999 Howard Av.
(415) 342-5757
Rich, WA9WYB, Mgr
5 mi. south of SFO on 101

NEW STORE!! DENVER, CO 80231
8400 E. Iliff Ave., #9
(303) 745-7373
(800) 444-9476

OAKLAND, CA 94606
2210 Livingston St.
(415) 534-5757
Rich, WA9WYB, Mgr
I-880 at 23rd Ave. ramp

PHOENIX, AZ 85015
1702 W. Camelback Rd.
(602) 242-3515
Gary, WB7SLY, Mgr.
East of Highway 17

SALEM, NH 03079
224 N. Broadway
(603) 898-3750
(800) 444-0047
Paul, NW1U, Mgr.
Exit 1, I-93; 28 mi. no. of Boston

SAN DIEGO, CA 92123
5375 Kearny Villa Rd.
(619) 560-4900
Tom, KM6K, Mgr.
Highway 163 and Claremont Mesa Blvd.

VAN NUYS, CA 91411
6265 Sepulveda Blvd.
(818) 988-2212
Al, K6YRA, Mgr.
San Diego Fwy. at Victory Blvd.

WOODBRIDGE, VA 22191
14803 Build America Drive
(703) 643-1063
(800) 444-4799
Curtis, WB4KZL, Mgr.
Exit 54, I-95, South to US 1

CALL TOLL FREE

NOW! Toll free in California!

WEST	MID-WEST/COLORADO	SOUTHEAST	MID-ATLANTIC	NEW ENGLAND
1-800-854-6046	1-800-444-9476	1-800-444-7927	1-800-444-4799	1-800-444-0047

(call routed to nearest store) Toll free incl. Hawaii. Local phone hours, 9:30 AM to 5:30 PM. AZ, CA, CO, GA, VA residents, add sales tax.

WALK-IN HOURS: 10AM-5:30PM • CLOSED SUNDAYS

Prices, specifications, descriptions, subject to change without notice.

WORLDWIDE DISTRIBUTION

HAM RADIO OUTLET

LARGEST HAM OUTLET IN THE WORLD

ANNOUNCING A NEW STORE: HRO is in DENVER! — GRAND OPENING THIS MONTH! —

10 STORE BUYING POWER !

TEN-TEC

MADE IN USA

OMNI-V

- Optimized for reduced Phase Noise
- Dual VFO's, 100 W Output
- All bands 160-10

TITAN 425

- Pair 3CX800A7 • External Power Supply
- Performance at legal limit
- 3 MS QSK, 1.6 to 22 MHz • Assures "Loaf Along"
- With authorized modification through 29.999 MHz

IN STOCK NOW! FREE SHIPMENT!

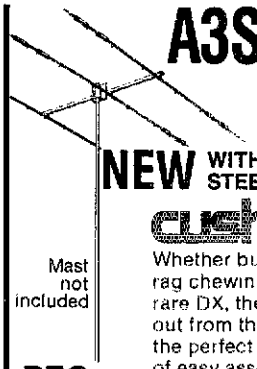
TEN-TEC

CENTURION 422

HF Linear Amplifier

- Pair 3-500Z Tubes
- QSK for CW/Digital Modes
- PEP PWR LED Bargraph

CALL FOR PRICE



Mast not included

A3S

DX THAT STANDS OUT FROM THE CROWD

10, 15, 20 Meters

NEW WITH STAINLESS STEEL HARDWARE

cushcraft

Whether busting pileups, rag chewing or hunting rare DX, the A3 stands out from the crowd with the perfect combination of easy assembly, the right size, rugged durability and great performance.

- Boom Length 14 ft., Weight 27 lbs.
- Wind Surface Area 4.36 ft.

REG. 425.00

SALE 299.95

SALE

AR-270

NEW DUAL BAND RINGO

cushcraft

The AR-270 has Ringo Ranger technology in a durable all aluminum antenna with stainless steel hardware. Instant assembly and 3 short radials make it easy to install anywhere. AR-270 features sealed phasing coil and base matching network with single 50 Ohm cable connection.

- 2 Meters (144-148 MHz) 70 CM (435-450 MHz)
- Height: 3.75 feet

REG. 80.00

SALE 69.95

SALE

SALE

R5

14, 18, 21, 24, 28 MHz Half Wave Vertical

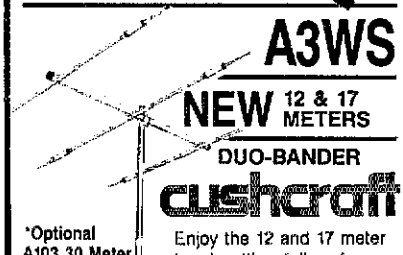
cushcraft

The new R5 has a broadband solid state impedance matching network for full coverage of all 5 bands. Frequency selection is completely automatic. There are no moving parts or remote tuner. The only connection required to the antenna is your 50 Ohm coax.

- The unique counterpoise has four 48" long .100" diameter stainless steel rods for excellent ground isolation
- No radials required

REG. 340.00

SALE 249.95



A3WS

NEW 12 & 17 METERS

DUO-BANDER

cushcraft

Enjoy the 12 and 17 meter bands with a full performance beam. Easy to use kit will add 30 meters. Mount it on a lightweight tower and rotator or with your existing tribander. A3WS features all aluminum construction with stainless hardware.

- Boom Length: 14 feet
- Weight: 22 lbs.
- Turning Radius: 14 4 ft
- Wind Area: 4.1 ft²

*Optional A103 30 Meter Add-on

Reg. 135.00

Sale 109.95

REG. 350.00

SALE 269.95

SALE

FREE Shipment! most items over $100 UPS surface

Bob Ferrero W6RJ
President/Owner

Jim Rafferty N6RJ
VP – National Sales Manager

ALL MAJOR BRANDS IN STOCK NOW!

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

ATLANTA, GA 30340
6071 Buford Highway
(404) 263-0700
Larry, WD4AGW, Mgr.
Doraville, 1 mi. north of I-285

BURLINGAME, CA 94010
999 Howard Av.
(415) 342-5757
Rich, WA9WYB, Mgr
5 mi. south of SFO on 101

NEW STORE!!
DENVER, CO 89231
8400 E. Iliff Ave., #9
(303) 745-7373
(800) 444-9476

OAKLAND, CA 94606
2210 Livingston St.
(415) 534-5757
Rich, WA9WYB, Mgr
I-880 at 23rd Ave. ramp

PHOENIX, AZ 85015
1702 W. Camelback Rd.
(602) 242-3515
Gary, WB7SLY, Mgr.
East of Highway 17

SALEM, NH 03079
224 N. Broadway
(603) 898-3750
(800) 444-0047
Paul, NW1U, Mgr.
Exit 1, I-93; 28 mi. no. of Boston

SAN DIEGO, CA 92123
5375 Kearny Villa Rd.
(619) 560-4900
Tom, KM6K, Mgr.
Highway 163 and Clairemont Mesa Blvd.

VAN NUYS, CA 91411
6265 Sepulveda Blvd.
(818) 988-2212
Al, K6YRA, Mgr.
San Diego Fwy. at Victory Blvd.

WOODBRIDGE, VA 22191
14803 Build America Drive
(703) 643-1063
(800) 444-4799
Curtis, WB4KZL, Mgr
Exit 54, I-95, South to US 1

CALL TOLL FREE

NOW! Toll free in California !

WEST	MID-WEST/COLORADO	SOUTHEAST	MID-ATLANTIC	NEW ENGLAND
1-800-854-6046	1-800-444-9476	1-800-444-7927	1-800-444-4799	1-800-444-0047

(call routed to nearest store) Toll free incl. Hawaii. Local phone hours. 9:30 AM to 5:30 PM. AZ, CA, CO, GA, VA residents, add sales tax.

WALK-IN HOURS: 10AM-5:30PM • CLOSED SUNDAYS

Prices, specifications, descriptions, subject to change without notice

WORLDWIDE DISTRIBUTION

HAM RADIO OUTLET

LARGEST HAM OUTLET IN THE WORLD

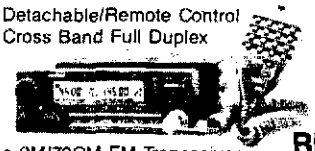
ANNOUNCING A NEW STORE: HRO is in DENVER! — GRAND OPENING THIS MONTH! —

10 = STORE BUYING POWER!

ALINCO DR-590T Twin Band

NEW

Detachable/Remote Control
Cross Band Full Duplex



- 2M/70CM FM Transceiver
- 45 watts 2 meters
- 35 watts on 70 centimeters
- High Power/User Friendly

REG. 899.95
SALE 649.95

ALINCO DR-112T

NEW

2M, 45W
2M Mobile

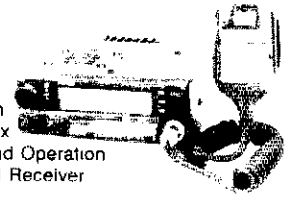
Backlit LCD Readout
Wide Range RX

CALL FOR PRICE

ALINCO DR-570T

REG. 749.00
SALE 549.95

The Twin Band
2m/70cm FM Transceiver



40W 2m
35W 70cm
Full Duplex
Cross Band Operation
Twin Band Receiver

ALINCO DJ-120T 2 Meter H.T.

LCD Display

- 2.5 watts (Standard Battery)
- 6.5 watts (Optional Battery)
- Easy to use

REG. 245.00
SALE 209.95

NEW

COAST TO COAST

HRO= *Rapid deliveries from the store nearest you!*

ALINCO DJ-500T

SUPER SALE ~~379.95~~ 339.95

2m/70cm
FM Transceiver
Dual Bander HT

2.5W 2M/2W 70cm
CAP + MARS MODIFIABLE
Promotional Item, Limited Invt
SPECIAL
30 Day Warranty Std.
Alinco 2 Year Warranty Available

ALINCO DJ-160T 2 Meter H.T.

Most Features Built In

- 2 Watts (Standard Battery)
- 5 Watts (Optional Battery)

Reg. 369.00
Sale 259.95

ALINCO DJ-560T

NEW

Duo-Band H.T.

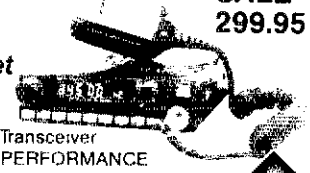
2M/440 MHz
Built In PL Encode

CALL FOR PRICE

ALINCO DR-110T 2m Mobile

REG. 519.00
SALE 299.95

Great For Packet



2m FM Transceiver
GREAT PERFORMANCE
45 Watts
CAP + MARS MODIFIABLE

FREE Shipment! most items over $100 UPS surface

Bob Ferrero W6RJ
President/Owner

Jim Rafferty N6RJ
VP – National Sales Manager

ALL MAJOR BRANDS IN STOCK NOW!

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

ATLANTA, GA 30340
6071 Buford Highway
(404) 263-0700
Larry, WD4AGW, Mgr
Doraville, 1 mi. north of I-285

BURLINGAME, CA 94010
999 Howard Av.
(415) 342-5757
Rich, WA9WYB, Mgr
5 mi. south of SFO on 101

NEW STORE!! DENVER, CO 89231
8400 E. Iliff Ave., #9
(303) 745-7373
(800) 444-9476

OAKLAND, CA 94606
2210 Livingston St.
(415) 534-5757
Rich, WA9WYB, Mgr
1-880 at 23rd Ave. ramp

PHOENIX, AZ 85015
1702 W. Camelback Rd.
(602) 242-3515
Gary, W87SLY, Mgr.
East of Highway 17

SALEM, NH 03079
224 N. Broadway
(603) 898-3750
(800) 444-0047
Paul, NW1U, Mgr
Exit 1, I-93; 28 mi. no. of Boston

SAN DIEGO, CA 92123
5375 Kearny Villa Rd.
(619) 560-4900
Tom, KM6K, Mgr.
Highway 163 and Claremont Mesa Blvd

VAN NUYS, CA 91411
6265 Sepulveda Blvd.
(818) 988-2212
Al, K6YRA, Mgr.
San Diego Fwy. at Victory Blvd

WOODBRIDGE, VA 22191
14803 Build America Drive
(703) 643-1064
(800) 444-4799
Curtis, WB4KZL, Mgr.
Exit 54, I-95, South to US 1

CALL TOLL FREE

NOW! Toll free in California !

WEST	MID-WEST/COLORADO	SOUTHEAST	MID-ATLANTIC	NEW ENGLAND
1-800-854-6046	1-800-444-9476	1-800-444-7927	1-800-444-4799	1-800-444-0047

(call routed to nearest store) Toll free incl. Hawaii. Local phone hours, 9:30 AM to 5:30 PM. AZ, CA, CO, GA, VA residents, add sales tax

WALK-IN HOURS: 10AM-5:30PM • CLOSED SUNDAYS

Prices, specifications, descriptions, subject to change without notice

NC9G. PIO: K9ZZ. SGL: W9RYA. TC: K9GDF. Congratulations to the 1990-91 $500 W Allis RAC Memorial Scholarship winners: KA9LWN of Shawano (3rd consecutive yr winner), WE9V in Greenfield & KA9MSR of Kaukauna, all of whom hold Amateur Extra Class licenses. WARAC also donated Amateur Radio books to the Greenfield Public Library. Thanks to the Four Lakes ARC & President KC9GO for the warm welcome recently given me when I presented a program at their club. Milwaukee RAC presented 4 programs on Amateur Radio at the Public Library Discovery World displays downtown. W9ZM worked 130 countries on 18 MHz & 50 on 24 MHz. W9YCV worked 39 grids on 70 cm. Exams: Nov 3, Credit Union in Menomonie, WF9I; Nov 3, Red Cross Bldg in Racine, NW9P; Nov 7, E HS in Wauwatosa, MRAC W9JK; Nov 17, St Nicholas Church in Milwaukee, WI9M. Nov 4, Fox Cities ARC Hamfest at Starlite Club, corner of Co CC & State 55 in Kaukauna, with exams, info from NB9J. Nov 10, the Milwaukee Rptr Club holds the 6.91 Friendly Fest, open at 8 AM, 7 AM for sellers, inside Serb Hall & OK in Milwaukee, with free parking; contact K9IZV for info—see you at the friendly ARRL table. The Friendly Fest will have on-site exams given by the Milwaukee RAC VEC starting at 9 AM. Marshfield Area ARS & Antigo Jr HS ARC becoming League-affiliated. Watertown ARC has 22 members. Indicate your club participation when submitting an entry in the Nov phone or CW ARRL Sweepstakes, mark your log accordingly. Don't delay your antenna work any longer, winter is coming. Happy Thanksgiving to all. Sorry to report Silent Key W9GIT.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KCØT—The smartest dumb thing I've done in a long time has been to move my "shack" from the basement to the upstairs office/den. I underestimated the magnitude of the project, although the new console I built is working fine. But, by the time I rerouted antenna leads, a new ground, installed the equipment & interconnected everything with mostly new cabling...wow! All is up & running now, except for pkt. But I should have all the nice things finished soon. Blew a few skeds as I got toward the end of the project, but I think I'm going to enjoy the new location. I don't want to repeat that performance soon. Paul, KAØPDM, doing some antenna work in a tree, had a nasty fall & fractured his right wrist & a vertebra, so, Paul is out of biz at this time. Best wishes, Paul, for a speedy recovery—we'll be listening for you. Riley, WDØCEL, Int'l Falls, reports the passing of long-time (more than 60 yrs) ham, Harry Overson, WØVUW & Harold Case, KCØFB. Both became Silent Keys in August. We regret to hear of this, but thanks, Riley, for the info. Our lone BPL for the month was Judy, WBØWNJ, with 1101 points— congratulations, Judy. Overall, not too bad a month, considering all the heavy weather, competing demands & summer malaise. With 21 stations reporting, we garnered a tfc-handling total of 2751—up from July!

Net	Freq	Time	QNI/QTC/Sess	NM
MSN/1	3685	6:30P	255/31/31	KDØNH
MSN/2	3685	10:00P	194/46/31	KØQBE
MSSN	3710	6:00P	341/35/31	KAØSBY
MSPN/N	3860	12:05P	264/125/27	WAØTFC
MSPN/E	3860	5:30P	630/211/31	KCØT
PAW	3925	9:00A	No report	WDØBAC

Tfc: WBØWNJ 1101, WØGRW 404, WAØTFC 291, KFØFI 182, NIØA 138, NØFOO 114, W9DM 92, KAØARP 73, KCØNH 66, KØQBE 49, KAØVON 41, KCØT 34, KT9I 32, KAØSBY 30, WDØGUF 27, KØPIZ 27, KØWPK 20, NØJP 10, KØOGI 7, NØFKU 7, KN9U 6.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—It was a busy summer for ND hams & it's swiftly drawing to a close. With more rain in the state this summer, we had more SKYWARN activity than we've had for the past 2 summers. I've received reports that Dickinson, Devils Lake, Fargo, Minot, Bismarck & Grand Forks have been called out several times ea. Congratulations to KBØFVV & KBØCIR on upgrading to Adv & NØMEC to Gen. The Dickinson Club (TRARC) was a success again with about 100 registered. Fargo hams had a good time at their picnic with 25 attending. The Fargo group also provided comms for the MS Bikeathon. The Corn feed was held again at Ft Abercrumbie with good attendance & a good time was had by all. Grand Forks has been busy providing comms for tfc control for the temporary reopening of the Starlight Drive-in Theater, soon to be turned into a parking lot, and helping out with the Triathalon & setting up a station at the E Grand Forks Heritage Days. Tfc: NØLKX 82.

Net	Freq	Time	Sess/QNI/QTC	NM
Goose River	1895	9 AM Sun	4/49/2	NTØV
DATA	3937	6:30 Dy	23/488/6	NØJR
WX Nets	3937	9 AM, 12:30 PM CT Sat Nov-Mar		WØGFE
Storm Net		During storms only		
North 40	146.64	8 PM Sun MT	4/26/1	NØELA
MON-DAK	146.73	8 PM MT	5/49/10	NØELA
Superlink		All Superlink rptrs 7 PM CT	5/127/3	NØKMG KAØZOK

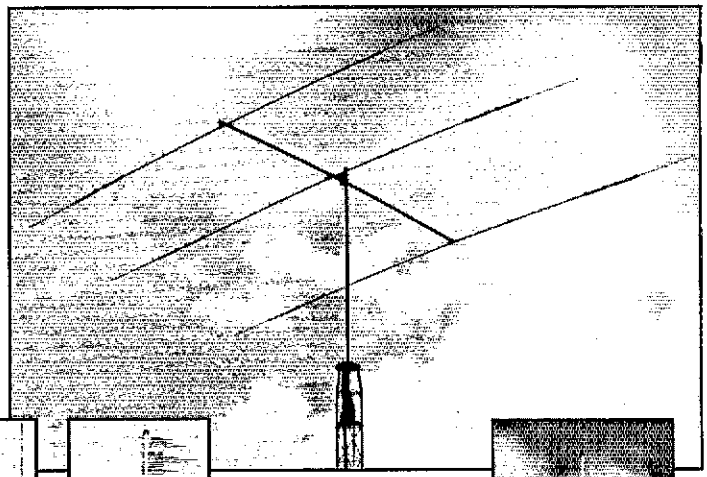
SOUTH DAKOTA: SM, R. L. Cory, WØYMB—ASMs: NØABE, WAØFPR. SEC: KAØKPY. STM: KDØYL. Congratulations to the Hot Springs club for the fine convention they put on. They had an excellent site & a well-planned program. The large crowd had a great time. VE sess schedule at Rapid City: Dec 8, 1990; March 8, June 8, Sept 13 & Dec 14, 1991; for info, contact Neal, KAØSEZ, at 605-394-1298 or Frank, NUØF, after 5 PM at 605-348-6564 or write to Black Hills ARC, Box 75, Rapid City, SD 57709-0075. Novice classes start in Oct—contact Frank or Neal. The SD CW net is growing—it's a lot of fun, so join us on 3650 at 7 PM Central time, 6 Mtn time, M-F. With fall here, there's more activity on the bands. Need more reports from club secretaries. Total tfc reported for Aug was 488.

DELTA DIVISION

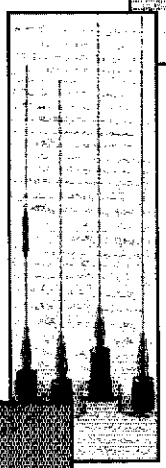
LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX. ACC: K5KR. SGL: KD5SL. STM: WB4FTD. SEC: KG5PV. Packet WB5ASD. TC: KE5FZ. Jerry Wilkinson, WB4KGF, regretfully submitted a letter of resignation as the OOC for the LA section because of the widespread malicious interference occuring on the amateur bands with little concern from the FCC & a cumbersome & ineffective volunteer amateur reporting system. He states that volunteer amateurs have assumed the frustrating role of policing the amateur bands with no authority & no support. As SM, most of my mail & phone calls relates to this deteriorating situation. While many consider this a sign of the times, the greatest influence toward

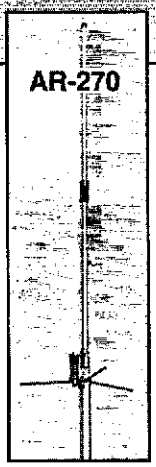
Tuned To The New World Of Amateur Radio

From Novice to Extra Class Cushcraft has the antenna you need.



Cushcraft offers high performance antennas to make every phase of your ham radio activity more satisfying. We have been creating innovative and exciting new products for more than 35 years. Call or write for a free copy of our full line antenna and accessory catalog or see your local dealer.

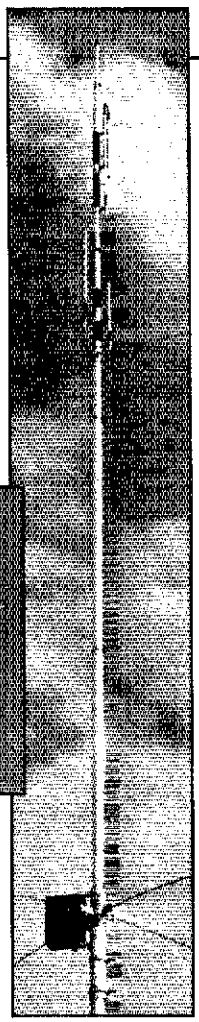


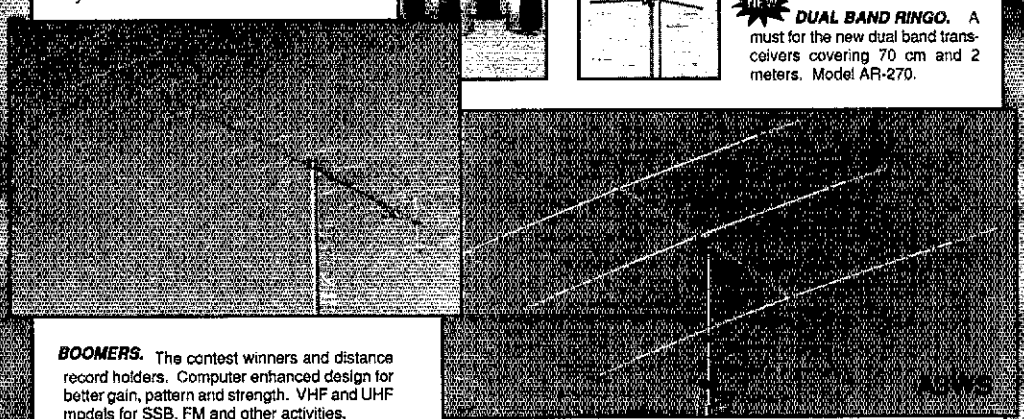


HF TRIBAND BEAM. *A3S.* The most popular compact 10,15, 20 meter beam. *A4S.* A high performance 18' long wideband beam with all stainless steel hardware. 40 meter add on kits for each.

NEW! ***CUSHCRAFT/SIGNALS*** magnetic mount mobile for 10 meters. An ideal companion to the new 10 meter multi mode rigs. Model CS28M. Models available for 2 m and 70 cm.

NEW! ***DUAL BAND RINGO.*** A must for the new dual band transceivers covering 70 cm and 2 meters. Model AR-270.





BOOMERS. The contest winners and distance record holders. Computer enhanced design for better gain, pattern and strength. VHF and UHF models for SSB, FM and other activities.

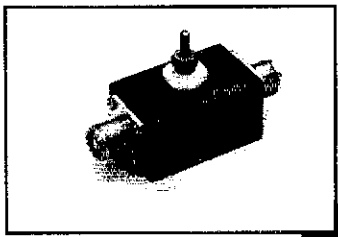
RINGO RANGER II. Still the world's favorite 2 meter, 70 cm or 220 MHz omni antenna, with more gain. A must for your FM or packet station.

NEW! ***A3WS HF WARC BEAM.*** Enjoy the excitement on the new 12, 17 and 30 meter bands. This high performance Yagi has a 14' boom, weighs 23 lbs and has all stainless steel hardware. 30 meter add on kit available.

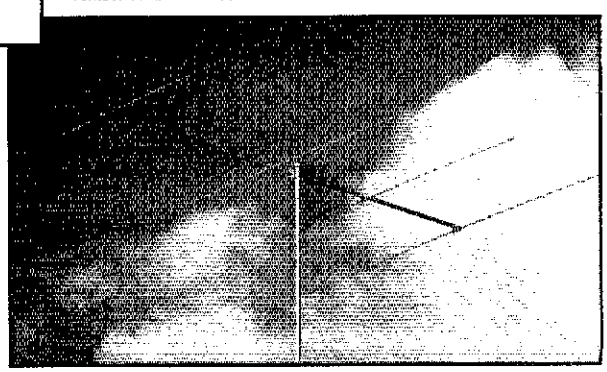
NEW! ***R5 HALFWAVE 10, 12, 15, 17, 20 METER VERTICAL.*** Amazing DX performance in a small space without ground radials. Includes a solid state broadband impedance matching network that requires no tuning. Model R5.

SKYWALKER MONOBAND. 10, 12, 15 and 20 meter Yagis for more contacts, less waiting and a better signal. Preferred by contesters and DX-Peditions.

FAST ACTION GAS TUBE LIGHTNING ARRESTERS.
Protect your valuable radio equipment. High and low power models with SO-239 or N connectors.



NEW! ***10 METER 3 ELEMENT***
for the novice, technician or any ham who wants more gain with a good front to back ratio. Model TEN-3



cushcraft
CORPORATION
THE ANTENNA COMPANY

P.O. Box 4680, 48 Perimeter Road, Manchester, NH 03108 USA
Telephone: 603-627-7877 / Telex: 4949472 / FAX 603-627-1764

AVAILABLE THROUGH DEALERS WORLDWIDE

improvement is guidance & education. I welcome your constructive suggestions. Better yet, share your thoughts with the ARRL Delta Div Dir—if you feel you can make an improvement, please volunteer for appointment as the LA OOC. The Shreveport ARA Field Day message was not acknowledged in my recent column—I goofed. Double congratulations to the Acadiana ARA in Lafayette. They've been designated as an ARRL Special Service Club and they won the 1990 LA Section Field Day Plaque. 73 & GL de "Wondy," K5KR.

TENNESSEE: SM, Harry Simpson, W4MI—E ASM & PIC: W4TYU. W ASM & ACC: K4CXY. STM: WB4LAL. OOC: K4LSP. TC: W4HHK. The TN Phone Net is on 3980 kHz with early sess at 6:40 AM Eastern, regular sess at 7:45 AM Eastern M-F, at 9 AM Central Sat, Sun & holidays. Eve sess M-Sat at 6:30 PM Central. CW Net sess are on 3635 kHz at 7 PM Central, M-F. The combination of Bays Mtn & Kingsport RCs puts out an excellent monthly bulletin called *Zero Beat*. The one just published has a membership roster & shows that members of one club or the other, or both clubs, total 362! I have no doubt that is a fine neighborhood. They're always active, always doing something for the good of the community. Congratulations to the Johnson City Radio Assn for having renewed as an ARRL Special Service Club. STM WB4LAL is jubilant! He received monthly net reports from TEN section tfc nets, including TN CW, Early Morning TN Phone, Morning TN Phone, Evening TN Phone, Short Mtn Rptr Info, Mid-East TN Hospital Net, RACK Tech Net, Oak Ridge 2-meter, Knox Co ARES, W TN WX net. DRN5 Mgr W5YDD reports TN was represented on 90% of their 62 sess by K4WWQ, K4ZUY & KN4HL. I know Harmon appreciates the help. This item is being written in W TN, where I've had rainfall totalling 1.6" in July, .61" in Aug & so far in Sept, just .31" with recent temps around 100° ea day. You're reading this in Nov & I predict cooler, wetter WX, perhaps even wet enough to dampen all the high-tension ground rods & stop the noise! Congratulations to new ECs David Siglin, KC4LTC, of Tipston Co; Vollie T. Miller, WB4TDB, of Dickson Co & DEC Ben Timmerman, N4RJY, of Hamilton Co & Chattanooga area. Tfc: WA4FMR 140, WB4LAL 63, W4DDK 44, KA5KDB 38, K4WOP 37, W4MI 36, W4TYV 22, W4TYU 18, WA4GZZ 14, WA4HKU 12, AB4DP 9, K4CXY 8, W4PSN 4.

GREAT LAKES DIVISION

KENTUCKY: SM, John Themes, WM4T—Asst. SM: KC4WN. SEC: WB4NHO. STM: KA4MTX. (Aug) KA4MTX is moving to AL & has resigned his STM post, which he held for more than 4 yrs. My sincere thanks to Glenn for a fine job. K4AVX will be the new STM, effective Sep 1. The Georgetown hamfest was well-attended & ARRL forum was packed, assisted by Dir Severson, AB8P. WA4SWF is the new DEC for District 9. It's good to have Fred's continued support. N4VRP is a new EC for Mason Co. WB4NHO has returned from a well-deserved vacation out west. Nets:

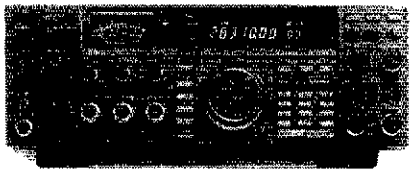
MKPN	*1330*	*67*	*31*	*WD4RWU*
KTN	780	47	31	KC4FRA
KYN (both)	346	91	62	K4AVX/KZ8Q
TSTMN	366	25	31	KZ8Q
KNTN	201	42	38	KB4UJA
CARN	208	26	30	KN4IV
KRN	470	20	31	------

Tfc (Aug): WD4RWU 64, KB4UJA 55, K4VHF 48, KC4WN 45, K4AVX 34, KA4MTX 33, W4OGP 18, WB4AUN 15, WB4ZDU 10, N4PEK 7, WA4HLW 6, WD4CQF 3.

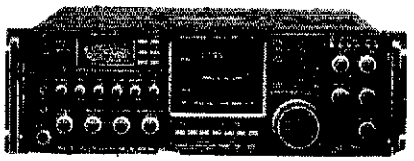
MICHIGAN: SM, George E. Race—WB8BGY (@ WA8URE). STM: WB8R (@ NT8R). SEC: K8CQF (@ N8JAT). SGL: N8CNY. TC-W8YZ. OOC: WA2AJQ. BM: N8IWS (@ WA8OOH). PIC: WR8R. (@ KC8TU). ACC: W8POX. Quote of the month from Rick, N8GGO; "Into each life a little rain must fall...followed by large hail & damaging winds." This sums up the feeling about the last wk in Aug & 1st week in Sep from the ARES folks. Thanks to all for the time & effort put into the severe WX watches & warnings. As we head for the end of 1990, it's fitting that I also thank the tfc handlers, NCSs, NMs & our STM for another yr of dedication to tfc handling; I'm sure the year-end totals are going to show another record yr for tfc in MI. Thanks also to my hard-working staff & for the support you give us from all over the state. Thanks to the Saginaw, Traverse City & Novi amateurs for the kind reception given me at your club mtgs. As you can probably tell, I do enjoy appearing before you. If you're looking for a club speaker, please let me know well in advance. K8CQF & the 5 Co 1991 Nat'l Convention team have been making appearances all over the State. Contact Joe, K8CQF, if you'd like a 1991 Convention Program at your club mtg. Livingston Co Amateurs & the Co EOC have been awarded a $6500 matching FEMA grant for Amateur Radio equipment—what a great operating position this is going to be! Please join me at the ARRL Forum at the Oak Park ARC Swap-N-Shop Nov 4 at the Southfield Pavilion Ctr; come find out the latest info on what's going on in the MI section & the ARRL. From discussions on the MI nets, this yr's SET is going to be one of the best in yrs. The training is in place & we all await the wknd of Oct 20. Please join your local ARES/RACES group & take part in one of the MI Nets to handle SET tfc & provide liaison from your co. This yearly event provides on-the-air training that teams up ARES, RACES & NTS. Our served agencies are important. Let's show them again how useful we can be when they're in need of emergency comms. 73...George. Please support the following MI area nets:

Net	*Freq*	*Time/Day*	*QNI*	*TFC*	*SessNM*
MITN	3953	7 PM Dy	585	171	30WD8EIB
QMN*	3663	6 PM Dy	415	112	62WB8SYA
SEMTN	145.33	10:15 PM Dy	341	97	31N8HSC
MNN*	3722	5.30 PM Dy	No report		KF8AU
MACS*	3953	11 AM M-Sat	349	40	10K8OCP
GLETN	3932	9 PM Dy	967	49	31KE8TJ
UPN*	3921	5 PM Dy	1115	57	35WA8DHB
NMTN	147.12	7:30 PM Dy	307	465	
WSSBN	3935	7 PM Dy	522	28	28K8GOU
VHF Net Activity			664	7	50N5CRV

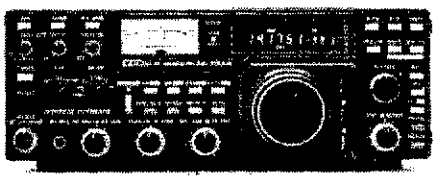
*QMN Early-6:30 PM Dy; QMN Late-10 PM Dy; MNN Late-8 PM Dy; MACS-1 PM Sun: UPN-12 PM Sun.
Tfc for Aug: KA8CPS 465, WA8OOH/BBS 150, WB8I/BBS-108, WB8SYA 96, N8FPN 86, WB8R 80, K8GXV 64, W8YIQ 52, N8HSC 50, K6HAP 49, WB8BGY 48, N6CRV 46, W7LVB 42, WD8MJB 41, WA8DHB 40, NY8W 39, KB8DXZ 38, WB8YDZ 36, K8ZJU 35, N8JCL 32, K3UWO 31, N8IIC 31, W8IHX 30, N8CNY 27, K8UPE 26, W8CUP 25,



HF Equipment	Regular	SALE
IC-765 Xcvr/ps/keyer/auto tuner.....	3149.00	**2699**



IC-781 Xcvr/Rcvr/ps/tuner/scope 6149 **5199**



IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	**1469**
PS-35 Internal power supply.....	219.00	**199.95**
FL-63A 250 Hz CW filter (1st IF).....	59.00	
FL-52A 500 Hz CW filter (2nd IF)....	115.00	**109.95**
FL-53A 250 Hz CW filter (2nd IF)....	115.00	**109.95**
FL-70 2.8 kHz wide SSB filter.....	59.00	

IC-735 HF xcvr/SW rcvr/mic.....	1149.00	**989.95**
PS-55 External power supply	219.00	**199.95**
AT-150 Automatic antenna tuner	445.00	**389.95**
FL-32A 500 Hz CW filter.....	69.00	
EX-243 Electronic keyer unit.....	64.50	
UT-30 Tone encoder	18.50	
IC-725 HF xcvr/SW rcvr..... *(Special)*	949.00	**799.95**
AH-3 Automatic ant tuner .. *(Special)*	489.00	**379.95**
IC-726 10-band xcvr/6m/.5-30MHz rx	1299.00	**1129**

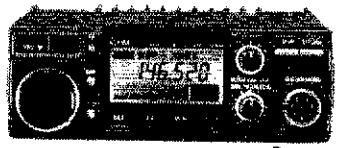
Accessories	Regular	SALE
IC-2KL HF solid state amp w/ps.....	1999.00	**1699**
IC-4KL HF 1KW out s/s amp w/ps.....	6995.00	**5995**
EX-627 HF auto. ant. selector *(Special)*	315.00	**269.95**
PS-15 20A external power supply	175.00	**159.95**
PS-30 Systems p/s w/cord, 6-pin plug	349.00	**319.95**
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal; 751A, etc ...	79.00	
SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, scan	89.00	
AT-100 100W 8-band auto. ant. tuner ...	445.00	**389.95**
AT-500 500W 9-band auto. ant. tuner ...	589.00	**519.95**
AH-2 8-band tuner w/mount & whip	758.00	**689.95**
AH-2A Ant tuner system, only .. *(Special)*	559.00	**469.95**
GC-5 World clock..... *(Special)*	91.95	**69.95**

Accessories for IC-765, 781, 725 • CALL for Prices

ICOM

★ *Large Stocks*
★ *Fast Service*
★ *Top Trades*
at **AES**®

VHF/UHF Base Transceivers	Regular	SALE
IC-275A 25w 2m FM/SSB/CW w/ps...	1299.00	**1129**
IC-275H 100w 2m FM/SSB/CW.....	1399.00	**1199**
IC-475A 25w 440 FM/SSB/CW w/ps	1399.00	**1199**
IC-475H 100w 440 FM/SSB/CW *(Spec)*	1599.00	**1269**
IC-575A 25w 6/10m xcvr/ps *(Special)*	1399.00	**1099**
IC-575H 25w 100w 6/10m xcvr.....	1699.00	**1469**



VHF/UHF Mobile Transceivers	Regular	Sale
IC-228H 45w 2m FM/TTP scan *(Special)*	539.00	**419.95**
IC-229A 25w 2m FM/TTP mic	449.00	**389.95**
IC-229H 50w 2m FM/TTP mic.....	479.00	**419.95**
IC-448A 25w 440 FM/TTP ...*(Closeout)*	599.00	**499.95**

Dual-band FM Transceivers	Regular	Sale
IC-3210A 25w 2m/440 FM...*(Closeout)*	739.00	**499.95**
IC-3220A 25w 2m/440 FM/TTP mic...	659.00	**569.95**
IC-3220H 45w 2m/35w 440 FM/TTP	699.00	**599.95**
IC-1200A 10w 1.2GHz FM....*(Closeout)*	699.00	**549.95**
IC-2400A 2m/440 FM/TTP ...*(Special)*	899.00	**699.95**
IC-2500A 35w 440/1.2GHz FM.....	999.00	**869.95**

Multi-band FM Transceiver	Regular	Sale
IC-901 2m/440 fiber opt. xcvr *(Special)*	1199.00	**929.95**
UX-R91A Broadband receiver unit...	389.00	**349.95**
UX-19A 10w 10m unit.....	299.00	**269.95**
UX-59A 10w 6m unit.....	349.00	**319.95**
UX-S92A 2m SSB/CW module	599.00	**529.95**
UX-39A 25w 220MHz unit *(Special)*	349.00	**279.95**
UX-129A 10w 1.2GHz unit	549.00	**499.95**

VHF/UHF Mobile Transceivers	Regular	Sale
IC-970A 25w 2m/430 MHz transceiver	2895.00	**2499**
IC-970H 45w 2m/430 MHz transceiver	3149.00	**2699**
UX-R96 50-905 Mhz receive unit....	389.00	**349.95**

Mobile Antenna	Regular	Sale
AH-32 2m/440 Dual Band mobile ant	39.00	
AHB-32 Trunk-lip mount.....	35.00	
Larsen PO-K Roof mount	23.00	
Larsen PO-TLM Trunk-lip mount.....	24.70	
Larsen PO-MM Magnetic mount	28.75	

Repeaters	Regular	Sale
RP-1510 2m 25w repeater	1849.00	**1649**
RP-2210 220MHz 25w repeater	1649.00	**1399**
RP-4020 440MHz 25w repeater	2299.00	**1999**
RP-1220 1.2GHz 10w repeater.....	2599.00	**2249**

MasterCard VISA DISCOVER *Use your* CREDIT CARD AMERICAN EXPRESS

Hand-helds	Regular	SALE
IC-02AT/High Power	409.00	**349.95**
IC-04AT 440 *(Closeout)*	449.00	**329.95**
IC-2SA 2m ...*(Special)*	419.00	**299.95**
IC-2SAT 2m/TP *(Spec)*	439.00	**359.95**
IC-3SAT 220 *(Special)*	449.00	**369.95**
IC-4SAT 440 HT/TTP	449.00	**399.95**
IC-2GAT 2m HT/TTP	429.00	**379.95**
IC-4GAT 440MHz, TTP	449.00	**389.95**
IC-32AT 2m/440 HT	629.00	**549.95**
IC-24AT 2m/440 HT	629.00	**549.95**

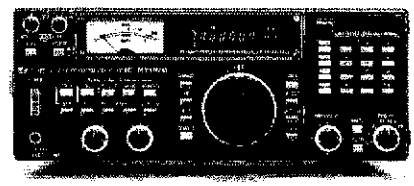
Limited Offer! **.. FREE** BP-82 external 7.2V @ 300ma. battery w/ **IC-2SAT** or **IC-3SAT** puchase.

IC-12AT 1.2GHz FM HT/TTP...*(Closeout)*	473.00	**349.95**
IC-12GAT 1w 1.2GHz HT/batt/cgr/TTP	529.00	**469.95**

Aircraft band handhelds	Regular	SALE
A-2 5W PEP synth. aircraft HT.....	525.00	**479.95**
A-20 Synth. aircraft HT w/VOR.....	625.00	**549.95**

For HT Accessories • CALL for Prices

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver.....	$999.00	**869.95**
RC-11 Infrared remote controller....	70.99	
FL-32A 500 Hz CW filter	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-44A SSB filter (2nd IF).....	178.00	**159.95**
EX-257 FM unit.....	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stability oscillator xtal	79.00	
SP-3 External speaker.....	65.00	
CK-70 (EX-299) 12V DC option.....	12.99	



R-7000 25MHz-2GHz receiver.....	1199.00	**1029**
RC-12 Infrared remote controller....	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit.....	139.00	**129.95**

R-9000 100KHz-2GHz all-mode rcvr ... 5459.00 **4699**

Due to the size of the ICOM product line, some accessory items are not listed. If you have a question, please call. Prices subject to change without notice.

Top Trades ! • We'll take your Clean Late Model gear in trade towards New ICOM Equipment.
Write or Call for our Quote Today!

AES® ★ *Over 33 Years in Amateur Radio*
HOURS: Mon. thru Fri. 9-5:30; Sat. 9-3

Order Toll Free: 1-800-558-0411

Toll Free in Wisconsin: 1-800-242-5195
FAX: 1-414-358-3337

AMATEUR ELECTRONIC SUPPLY® *Inc.*

5710 W. Good Hope Road; Milwaukee, WI 53223 • Phone (414) 358-0333

AES® BRANCH STORES — Associate Store

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio WATS 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (407) 894-3238
Fla. WATS 1-800-432-9424
Outside Florida 1-800-327-1917

CLEARWATER, Fla. 34625
1898 Drew Street
Phone (813) 461-4267
No In-State WATS
No Nationwide WATS

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
Outside Nevada 1-800-634-6227

CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
Outside Illinois 1-800-621-5802

W8EOI 25, K8OCP 22, KA8BYK 21, K8GOU 20, WD8EIB 13, KA8NCL 12, WT8J 11, W8URM 9, WA8MVH 7, W8RNQ 6, WB8WJV 6, KN8JDN 3, N8EXS 3. July: WB8YDZ 69.

OHIO: SM, John Haungs, WA8STX @ KC8TW, tel 513-563-7373— ASM: David Kersten, N8AUH @ NO8M, tel 216-221-6740. SEC: WD8MPV @ WA8SXN, tel 216-274-8240. STM: KF8J. ACC: KJ3O. BM: W8PH @ AD8I. TC: KB8MU. OOC: WB8ZCE. SGL: N8CVK. PIC: K8QOE. Aug is the wrap-up of vacations & the tail end of severe summer storms & tornados. OH skimmed through without major damage. WARN organizations were active throughout the state, watching the WX conditions & reporting. We need a list of any of our amateurs that have taken off to serve in the Desert Shield operation. Please send their names to WA8STX. *Westlink Report* asked, "Will Radio Operations Continue if War Comes?" It appears that the likelihood of Amateurs being ordered off the air if the US goes to war in the Persian Gulf is small This is because amateur stations in the US don't constitute a threat of interference in the Gulf. Thanks to all the RCs that have sent me copies of their monthly newsletters with a wide assortment of activities listed. Many clubs come up with clever ideas to keep their members interested. It's important to have a good program chairperson who can find good programs to put on. Congratulations on Athens Co ARA new 6-mtr rptr, N8EEG. The 1990 SET is Oct 20, so be prepared to check in to your local ARES net & register. Attend the OH Section Conf in Columbus Oct 14. Congratulations to LCARA members, K8BL, KO8O & W1HEO, for their help in establishing a Boy Scout ham station in Anguilla. Local clubs might want to order a few copies of the ARRL publication *Operating an Amateur Radio Station* (FSD-900) to have available for your members. Dave Kersten, N8AUH, the new SM, will be writing the next column. It's been a pleasure serving as SM & I wish the section continued success in its endeavors.

Net	QNI	QTC	Sess	Time (local)	Freq	NM
BN(E)	186	88	31	1845 Dy	3.577	WD8C
BN(L)	241	126	31	2200 Dy	3.577	KD8HB
BNR	—	—	—	1800 Dy	3.605	W8EK
OSSBN	1559	626	93	1030,1615,18453	3.9725	N8IBS
OSSN	215	77	31	0645 M-F	3.577	WB8FSV
OSSN	—	—	—	0800 Sat-Su	3.577	WB8FSV
OSN	226	72	30	1810 Dy	3.708	WD8KBW
OH Section ARES Net				1700 Sun	3.875	WD8MPV

Tfc: KC8HB 301, W8BO 239, KD8KU 234, K8JDI 184, WA8STX 141, N8IIP 139, KE8CV 118, K8DHD 104, WD8KFN 104, WA8HED 100, N8FWA 96, K8ALV 86, KB1OW 86, W8RG 80, WB8DPZ 72, KA8HBN 67, WB8JGW 67, WB8FSV 65, WD8RIB 61, W8LDU 60, W8QZK 57, W8SKP 56, KC8TW/PBBS 54, W8PBX 52, W8JLW 51, WA8SSI 45, KA1S 44, WD8KBW 43, KB8ESU 41, NS8C 40, NF8B 36, WD8IKC 26, KC8UR 32, WB8KWC 32, KA8BNQ 31, KA8SON 29, KA8YIT 28, K8BAX 26, WB8WTS 26, N8CXI 26, N8HJB 25, KA8CGF 24, N8GOB 21, NY8V 20, WV8B 20, W8VND 20, W8SBD 19, WD8RAO 18, N8INP 18, WB8HHZ 16, W8LDQ 16, N2NS 15, W8GDQ 15, W8BDC 14, KB8DUX 14, N8JOC 14, KC8JV 13, KA8GJV 11, W8PH 11, N8JRV 11, KE8WA 11, KE8S 10, WB8NHV 10, K8CKY 9, KB2IFD 9, N8JHT 9, WD8JYE 9, N8XX 8, K8QIP 7, K8WZX 7, N8CW 6, K8XL 6, W8FPA 5, N8FPH 5, KB8HJJ 4, KZ8I 3, KB8GUM 3, W8XT 3, N8CEI 2. (Jul) WD8KFN 107, K8LQM 26, N8CEI 8.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK— STM/ASM: K2ZM. SEC: WA2ZYM. ACC: KV2A. SGL: KB2HQ. BM: WB2IXR. OOC: N2DVQ. PIC: KB2TM. ATC: WA2VGM. ASM/Pkt: N2FTR. ASM/Newsletter: WB2NHC. Club news: Albany ARA saw a videotape of Field Day & heard from Hudson Div Dir WA2DHF on current happenings in Amateur Radio. Catskill Mtn ARA had a successful picnic & held a rabbit/fox hunt on Sept 23. WB2NHC discussed new technologies in personal comms devices at the Communications Club of NR. Mt Beacon reports a successful summer hamfest. Overlook Mtn ARC held their annual Quiz Bowl in Sep. PEARL had an enjoyable Field Day & 10th anniversary picnic. Poughkeepsie ARC is running Novice through General classes. Saratoga RACES had another successful hamfest on Sep 15 (sorry to say—I missed it). W2JVF discussed EMI, its causes & solutions at Schenectady ARA. Yours truly gave a presentation at Westchester ARA. WECA held a discussion on emergency preparedness with WB2NVR, the EC for Westchester Co, N2IMZ & K2ZVI, SDN NM. WA2YBM reports successful activities by Albany ARA at the Conrail yards with KA2HTU KB2HPX WD2AJS K2XA KB2TFM N1CC ND2V KB2CR N2DU MW2J assisting. Schenectady ARA had WB2s SMK VJC SPN MCO BEJ N2s AIG EKU CNZ GXH KA2s OPG RME VNP JHX AXN OHU DVM FEN FWT EXB WA2s OJS GYY TSW KB2BSE K2s BST RI KE2UJ W2s ARQ CJO KE DHT KD2XZ helping at Air Show. Don't forget to offer help to your club newsletter editor. Net reports for Aug (Check-ins/Tfc passed): AESN 33/4 CDN 566/62 HVN 360/47 NYP 132/83 NYPON 384/184 NYS/E 430/167 NYS/L 287/131 NYS/M 288/165 SDN 430/77. Aug PSHR: WB2VUK WE2G KB2EPU WF2M N5MEA WB1BTJ WA2GYY N2JBA. Aug Tfc: WB2VUK 206, N5MEA 179, WB2IIV 130, WF2M 71, WA2JBO 65, KB2EPU 63, WE2G 56, WB1BTJ 47, WA2YBM 42, N2FTR 32, K2LYE 26, WA2GYY 15, N2JBA 10.

NEW YORK CITY-LONG ISLAND: SM, Walter M. Wenzel, KA2RGI— ASM: WB2IBO. ASM: N2GQR. ASM/ACC: KA2LCC. SEC: W2HPM. STM: K2MT. OOC: NB2T. PIC: KA2JMA. TC: W2QUV. BM: W2JUP. VE sess: LIMARC (ARRL) 2nd Sat ea month at 9:30 AM, Salten Hall, NY Inst of Tech, Old Westbury—contact Al Jones, W2ZDB, at 516-676-5790; Suffolk Co VE Team (ARRL) 2nd Sat ea month at 9:30 AM, Suffolk Co Community College, Islip Arts Bldg, Selden, NY—contact George Sintchek, WA2VNV, 516-751-0894; Grumman ARC (W5YI) 2nd Tues ea month at 5 PM, Grumman Rec Ctr, Plant 113, 600 S Oyster Bay Rd, Hicksville, NY—contact Howard Liebman, W2QUV, 516-354-6861; Great S Bay ARC (ARRL) 4th Sun ea month at 12 noon, Babylon Town Hall Office Annex, 281 Phelps Ln, N Babylon, NY—contact Walter Wenzel, KA2RGI, 516-957-5726. If your group is planning a VE sess, please let me know so it can be added to this listing, even if you don't hold a regular sess, please let me know of it at least 2 months in advance so it can make the column. Upcoming events: Nov 4 NYC Marathon; Nov 11 HAMexpo '90 at Suffolk Community College. There's been activity on the local ham bands from other services or unidentified operators—if you've noticed this activity, please pass the info on to Lou, NB2T, the OOC, or to Harry, WB2IBO, so it can be handled properly. The section is always looking for people to assist with technical info & "Elmering" people who might have trouble in their stations. If you can assist, please contact me or Howard, W2QUV. I want to thank the operators who have been doing a yeoman's job in the preparation for the NDMS exercise. The network now in place is getting stronger every day & the teamwork displayed has already been commented on by the other agencies involved. I'm assured that, by the time for the next column, the results will be highly impressive & favorable because of the efforts of all involved. Best wishes & much success to Bill, KE2IG & his YL, as they start a new life in FL, leaving the Metro NY area behind. Best wishes to Frank, KA2FWC & his family on their relocation to the Carolinas. Attn hamfest coordinators: Notify me of the dates you're scheduling your hamfest so we can assist in the calendar arrangement for everyone. This yr, we had some problems because of multiple events on the same date or on sequential dates. The following are ttc nets in & around the section that handle NLI;

Net	Freq	Time	Day	NM
BAVHF	145.350/R	2000	Dy	K2TWZ
NCVHF	146.745/R	1930	M-F	N2IMP
NCVHF	146.805/R	1930	Sat-Sun	N2IMP
SCVHF	145.210/R	2000	Dy	KA2JMA
NYP	3.925 MHz	1300	Dy	W2MTA
NYPON	3.913 MHz	1700	Dy	KA2UBD
NYS/M	3.677 MHz	1000	Dy	N2EIA
NYS/E	3.677 MHz	1900	Dy	N5MEA
NYS/L	3.677 MHz	2200	Dy	W2YGW
NLT	28.450 MHz	2100	Wed	N2IMP
ESS*	3.590 MHz	1800	Dy	W2WSS

*Independent Net, recognized by NTS, local times.

*** Pkt Node Stations ***

AI2Q-4 Freeport 145.010 Nassau, W Suffolk
W2HPM-4 Farmingville 144.970 Central Suffolk
NR2L-4 Water Mill 145.090 E Suffolk
WB2IBO-4 Massapequa 145.030 Backup for AI2Q-4

NORTHERN NEW JERSEY: SM, Richard S. Moseson, NW2L @ KD6TH—ASMs: Recruitment KA2F; Youth (Vacant); Vol Counsel N2IGO; SE KY2S; SW KC2ZA; NW NW2S; ACC WA2QYX; BM K2ULR; OO AAC KA2BZS; PIC WE2R; SEC WB2HBZ; STM WB2FTX; TC WG2W. Ham radio infoline: 201-680-1585. As this is written, the Assembly version of the "scanner law" revision bill, A-3044, is still stuck in committee. This bill will permit the possession & use in your car of ham rigs that incidentally receive outside the amateur bands (it's currently a crime to do so). This bill has already passed the Senate. Please invest 75 cents in the effort to pass this bill by sending a QSL card to each of the 5 members of the Assembly Judiciary, Law & Public Safety Committees (listed below). Ask them to support A-3044 & quickly report it to the full Assembly for a vote. Remind them of the free public service routinely performed by amateurs. The committee members are: Hon Marlene Lynch Ford, Chmn, 2611 Spruce St, Pt Pleasant 08742; Hon Frank Pelly, 470 Georges Rd, N Brunswick 08902; Hon John Girgenti, 100 Hamilton Plaza—Rm 1403, Paterson 07505; Hon Thomas Shusted, 212 Haddon Ave, Westmont 08108 & Hon Gary Stuhltrager, 234 S Broad St, Woodbury 08096. Your active support is vital to making this bill become law! Congrats to Tom Brown, KA2UGQ, on being awarded a $750 QCWA scholarship. Tom is one of central NJ's leaders in pkt radio & operates a major PBBS, KA2UGQ-4. He's a sophomore at Lehigh Univ (tnx K2AGI). New Providence ARC Sep mtg featured K2BIV demo of digital voice recorder & ham applications; NPARC is also running a hidden receiver hunt Sep 30—stay tuned for results. If you're interested in the world of TV sound effects, NNJ BM K2ULR (who does this for a living) will put on a great show at the RATS mtg Thurs, Nov 8 at 8 PM at Howard Johnson's, Rt 3, Clifton. NW2L spoke in Oct at Nutley ARS; I'm available to speak to your club, too—drop me a note by mail at my p & address, by phone at the no. above, or by pkt @ KD6TH. Aug net stats (QNI = no. of checkins, QTC = no. of msgs passed):

Net	NM	Freq	Time	Sess	QNI	QTC
NJM	WB2ZJF	3695	1000	31	221	103
NJN/E	KA2INE	3695	1900	31	170	52
NJN/L	WA2OPY	3695	2200	31	94	20
NJPN	W2CC	3950	1800	35	35	82
NJSN	WR2E	3735	1830	31	153	20
OBTTN	WR2E	147.12	2000	31	198	81
NJTTTN	N2DXP	223.88	2100	31	166	39
NJVN/E	WB2FTX	146.895	1930	31	469	86
NJVN/L	KA2KJF	146.49	2230	31	226	47

Aug Tfc (Call/Total messages/PSHR): W2QNL/42/105 N2XJ/132/100 N2DXP-T/127/63 W2RRX/124/105 WB2FTX/106/68 K2PBP-T/106/61 KA2INE/88/77 W2MTO/82/88 K2VX/81/77 KA2KJF/47/- WA2PAC/43/79 W2DMM/41/86 KB4CYC-T/37/61 W2CC/20/- WA2CLP/19/- W2PTZ/17/- N2GJ/15/43 W2XD/14/- WB2GJE/2/-.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—ASM: KØCNM. SEC: KDØBG. STM: WØCON. ACC: NUØP. OOC: WAØMQU. BM: KØIIR. TC: KØDAS. SGL: WRØG. PIC: WEØM. NØJCM experienced substantial damage to his shack & major appliances when lightning came in on the ac line. The KAØRIU rptr was also damaged by lightning. Members of the Davenport ARC used Amateur Radio & TV for relief comms during recent flooding in the area & they helped with comms for the BIX-7 Run. KEØUC is now AAØBL. WØMME was operated as a special-event station at the Old Threshers Reunion. WRØU & WBØB operated a special-event station at the 24th Grand Nat'l shoot of the Civil War Skirmish Assn in Bloomfield. I enjoyed seeing you at the Cedar Rapids Summerfest; 41 people were examined at the VE sess at Summerfest. Upgrades to Amateur Extra Class WAØTGH, KØSIA, WØGWK, WAØODZ, KFØFA & NØLJO; to Adv NØLNR, NØLNS, WDØDOY & KBØFDO; to Gen KAØPNT & KAØCWR; to Tech KBØHJY, KAØKNJ, KBØGOK & KB9FHP. Congratulations to all. Midwest Div Dir Paul Grauer, WØFIR, was a guest speaker at the mtg of the E IA DX Assn. Newsletters: IA-IL ARC, Cedar Valley ARC, Mt Pleasant ARC, Davenport ARC, Ft Madison ARC, Central IA Tech Society. Tfc: KØPT 232, WØSS 156, KAØADF 90, KØGP 53, KAØVBA 28, KØCNM 22, WBØMCX 12. July: WBØMCX 30, KAØVBA 5.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: KØBIX. STM: WØOYH. ACC/OOC: KØBXF. TC: KAØHEP. BM: open. PIO: WBØWSG. SGL: NØIZE. Looks like this was "bypass month;" KBØEY & WØOYH each had a turn in the hospital with triple bypasses. Get well fast, guys, we need you. I had a fractured flywheel resulting in new parts, including new crankshaft, etc; 23,000 mi & now I know many new 4-letter words that go with auto problems. Osborne rptr group going all out with Amateur Radio demos; likewise, the Jayhawk ARS in Wyandotte Co. We need all the publicity we can get with mall & fair-type activities. Let us know of any unusual activity taking place with this publicity. I have a report that the Mound

OFF THE BENCH AND RUNNING

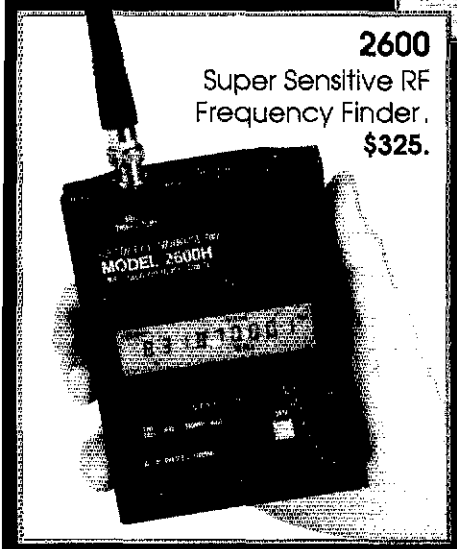
When *OPTOELECTRONICS* took frequency counters off the bench we created a whole new dimension - Frequency Finding.

Our Handi-Counters™ make Frequency Finding a reality by allowing you to pick-up radio transmitters at the maximum possible distance.

Monitoring Enthusiast, Security Specialists, Broadcast and Design Engineers, Two Way and Amateur Radio Operators and Service Technicians have all made the move. ***Shouldn't you?***

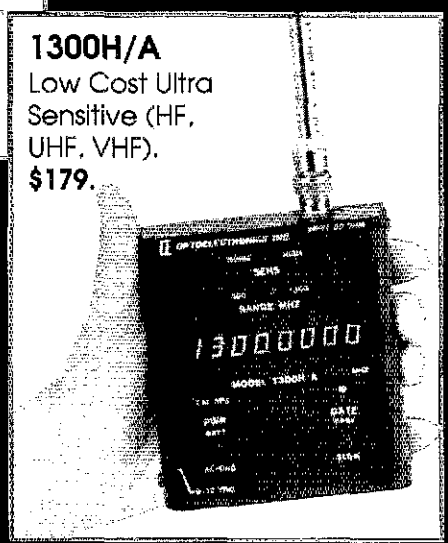
3000
Top of the Line Universal Handi-Counter™.
$375.

2600
Super Sensitive RF Frequency Finder.
$325.

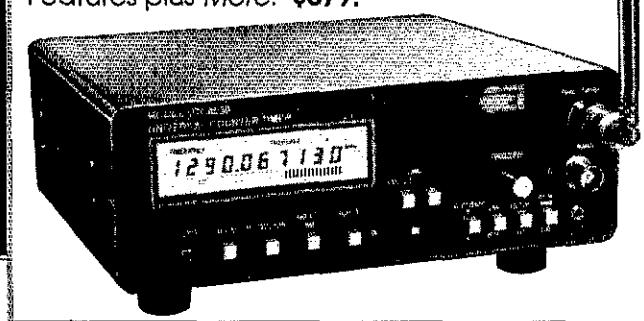


2210A
Full Range *Pocket* Size LED.
$239.

1300H/A
Low Cost Ultra Sensitive (HF, UHF, VHF).
$179.



8030
Bench Portable (Fits in an attache *case) with ALL the* Handi-Counter™ Features plus *More.* **$579.**



Model	Range *Low* *High*	Display *8 Digit LED*	Display *10 Digit LCD*	Signal Strength Bargraph	Universal Counter	TCXO *Option*
8030	10Hz 2.4GHz		•	•	•	±.1ppm add $125.
3000	10Hz 2.4GHz		•	•	•	±.2ppm add $ 80.
2600	1MHz 2.4GHz		•	•	•	±.2ppm add $ 80.
2210A	10Hz 2.4GHz	•				±.5ppm add $ 75.
1300H/A	1MHz 1.3GHz	•				± 5ppm add $ 75.

Sensitivity: <1 to <10mV typical. NiCads & AC Charger/Adapter Included. Carry Case, Antennas and Probes extra. One year parts & labor warranty on all products.

OPTOELECTRONICS

Toll Free Order Line:
1-800-327-5912
In Florida call (305)771-2050
FAX (305)771-2052

5821 NE 14th Avenue • Ft. Lauderdale, Fl. 33334
Visa, MC COD, Cash, M.O accepted *Personal* Check allow 3 weeks 5% Shipping, Handling. (Maximum $10) U.S. & Canada. 15% outside continental U.S.A.

City Rptr on 147.285 is back up & running. I haven't seen the scores for Field Day yet, but it looks like the BEARS of Wichita made a real good score this yr. The Great Bend ARC has been parading its stuff lately. A thriving new club— keep your eye on them! The end of the yr is nearing, are you prepared for ? Net activity for July '90: KSBN QNI 1378; QTC 81. KPN396/16. KMWN 719/591. KWN 1071/643. CSTN 1983/74. QKS 420/56. QKS-SS 15/12. Tfc: WØFRC 255, KØBXF 239, WØFE 232, WØFIR 220, NZØM 187, NØKOJ 155, NBØZ 103, WTØE 79, WØOYH 74, WDØV 70, WBØZNY 57, WAØYXK 32, WOØE 28, WØMYM 25, WØCHJ 7, KXØI 7. WZØB 5, KØFPC 2.

MISSOURI: SM, Bill McGrannahan, KØORB—Aug saw lots of ham activity & the return of really hot weather! The Ozark Regional Hamfest in Spfld was a smashing success. We worked the ARRL booth with Div Dir Paul Grauer, WØFIR & Vice Dir Chuck Miller, WAØKUH. SEC Jim Schroeder, KFØBM, made contacts for ARES. He still needs ECs in a few counties; don't be coy—volunteer if you can help—please! Ann Guptil, WBØTEG, is the new NM of CMRA & Emery Smola, KCØMV, has taken over the CARL Net. 53 Kansas City vicinity hams worked the 2nd annual Hooptest & the 2nd annual MDA Bike Tour. Leaders were KAØSXY, WBØTIN & KØUAA. Thanks to all for supporting ham radio & your community. The officers & directors of QCWA Mid-Continent Chap 35 met several times planning for the QCWA nat'l convention. ASM Roger Volk, KØGOB, informs us of an agreement between St Louis Co & the Monsanto Club for use of the Monsanto Rptr. Mike Redman, KAØYXU, is the RACES Coord. Also in St Louis Co, Fred Langeneckert, KBØZG, is doing a great job organizing ARES members. Dr John Turner, NDØN & Carol Rosson, WBØWLU, represented ham radio at a mtg of SEMA in Jefferson City. I'm sorry to report that Eugene Fischer, KØKMO, is a Silent Key. Gene recently received a plaque from the Jefferson Barracks ARC for his outstanding service. The McDonnell-Douglas publication *Recreation Roundup* carried an excellent article telling about the many facets of our great hobby. The author, Art Habighorst, NØILX, of Chesterfield, emphasized our public service. The month ended with another exciting hamfest, this one in St Charles—a lot of people had a lot of fun & I'm sure that a lot of electronic "treasures" found new homes for the coming yr...and will soon appear at another flea mkt! 73 de KØORB. Net reports will appear double next month. Tfc reports follow: NØFBW 1132, WAØYJX 239, AIØO 110, WRØR 106, KØORB 98, WØOTF 77, WØBMA 54, WBØWLU 44, KFØBM 23, WBØCJB 14, KØPCK 6, KEØAH 4.

NEBRASKA: SM, Vern J. Wirka, WBØGQM—Several new appointments have been made in the NE Section Field Organization. Dan Garner, KBØEMX, of Lincoln, is NM for the Union College ARC 2-Meter Net, which meets Sun at 1900 local time on the 147.24 (+) MHz rptr in Lincoln; Phillip Ambrose, KBØFNH, of Fairbury, is EC of Jefferson Co; Jack Barnard, WYØF, of Grand Island, is NM of the Nebraska Storm Net, which meets dy on 3.982 MHz at 1830 during Standard Time & at 1900 during Daylight Savings Time. Lynn Blesh, KØEK (formerly WAØODH), of Lincoln, became a Silent Key in Aug—we offer our condolences to the family. Lynn was active in many facets of Amateur Radio & was NM of the Nebraska Storm Net. Planning discussions have been held in the Lincoln & Omaha areas on establishing a high-speed backbone link for the PBBSs to ease the congestion on 145.01 MHz. The Lincoln Pkt Committee meets on the 3rd Thurs of the month at the Anderson Library (Touzalin & Fremont Sts) in Lincoln, 1900-2100 local time. Skip Miller, WØKVM, of Lincoln, invites anyone with ideas & suggestions about pkt comms to attend the mtgs of the Lincoln Pkt Committee. The Lincoln ARC annual Christmas party is scheduled for Dec 8 at Misty's North Restaurant; contact Mary Rea, KQØK, for info. Tfc: KØDKM 40, KEØXQ 36, WAØBOK 28, KØKKV 11, KØGND 9, WBØGQM 9, WCØO 5, WDØEWH 4, KØBOY PBBS 217, NFØN PBBS 12.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Caesar Rondina, N1DCS—ASM: KB1H. STM: K1EIC. SEC: N4GAA. ASEC: N1FIQ. COC: KY1F. ACC: NK1J. BM: N1API. PIC: WA1CMF. TC: W1HAD. SGL: K1AH. Greetings to all, I'm continuing to receive club reports & activities for groups that have renewed their club affiliations—congrats to all & thanks. As we approach the holiday season, we'll be involved with many Amateur Radio-related activities, I'm glad to see so many clubs participating in various functions. Good luck to all groups at their flea mkts this fall. Thanks to Tri-City ARC for their continuing Amateur Radio classes. Thanks to WARC for their participation again in providing comms for the annual Cheshire H S band competition. Thanks to SARA for their support in providing comms in the Stamford Demark race & the Marathon Oct 14. Congrats to John Yacovelli, W1IKB, for his achieving ARRL DXCC Honor Roll. The above assistance & accomplishments take a great deal of time on the part of individual hams. The WHARA wishes to welcome John Perry, N1EOD, to their Board of Dirs. John will serve as Dir of Emergency Services for the group; good luck, John. Sincere thanks to those who reach their goals & those who give so unselfishly of their time & resources to make the events successful. Congrats to the Natchaug ARC on their successful flea mkt Sept 16. MARS/CARES has a full-service PBBS, W1EDH-2, up on 145.09 MHz in Portland. Thanks to Van, W1WCG, who has retired from the ranks of NM for CN—he's done a great job for the tfc people in CT & I know you join me in saying "a job well done." On the same front, Anne Marie Macha, KA1JAN, has taken on the job & we all wish her luck in this position & welcome to the team. CT tfc people had 95% rep in FRN for Aug & 100% rep in 1RN cycle 3 & 4. By the way, Halloween is over, so we can take off our masks—HI HI. Till the next time...73.

Net	Sess	Stations	Tfc	NM	Liaison
CPN	30	390	128	KY1F	1RN
CN	61	357	180	KA1JAN	1RN
NVTN	31	326	133	K1HEJ	CPN
RTN	31	341	69	WA1FCA	CN
WESCONN	31	377	84	KA1GWE	CPN

PBBS Reports

PBBS	Received	Forwarded	Total
CSTN N1DCS- 4	236	175	411)

Tfc: NM1K 505, KA1VED 413, KA1JAN 231, K1EIC 219, K1HEJ 185, W1WCG 185, KA1GWE 167, N1GBP 164, W1EFW 154, KA1VEC 148, KY1F 128, WA1K 116, KA1SHO 38, W1YOL 31, N1GUU 31, W1KYD 29, N1API 21, N1ES 18, NX1Q 12, NY1V 12, KA1TBM 11, W1CUH 5, W1QV 4, KICE 4, K1HEJ 98, KY1F 69, N1GUU 57, W1NJM 45, KA1SHO 43, W1KYD 38, N1GKJ 33, W1YOL 29, KF1B 22, N1API 18, KA1TBM 12, NX1Q 11, W1CUH 5, W1GPS 5.

MAINE: SM, Jeff Weinstein, K1JW—New Section appointments: EC W1CUW; ATC W1RQG; PIO/OES KB1P; OO KA1IQA; ORSs AC1G, AF1L, K1RQG, NR1F, WA1YNZ. A history of ME Amateur Radio is being compiled, from the "early days" to the present. Please mail me any interesting stories, notable achievements, anecdotes & humorous incidents about ME amateurs. There's a wealth of fascinating Amateur Radio history in this state & it should be recorded before key sources are no longer available. Our Section CW Nets are experiencing a rebirth of popularity & activity. The Pine Tree Net (PTN), under the able leadership of NM W1KX, operates Mon-Sat at 1900 local time on 3596 kHz; the PTN/MSSN publishes a comprehensive monthly newsletter edited by W1KX, which is available to PTN/MSSN participants. The ME Slow Speed Net (MSSN), operating under the guidance of NM K1UNQ, meets Sun, Tues & Thurs at 1800/2000 local time on 3725 kHz. The MSSN sked may have changed by the time you read this; listen on 3725 kHz or contact me or K1UNQ for updates. Join a group of friendly folks by checking into a CW net sometime! The Windsor Hamfest Sept 8, sponsored by the Augusta Emergency Amateur Radio Unit, was well-attended, with productive mtgs, a large flea mkt & great WX contributing to Windsor's success. The Yarmouth RC, which meets the 3rd Tues ea month at 1900 at the Yarmouth Community House, has been certified as an ARRL Affiliated Club. ME humor *au naturel* is in its full glory most early morns on 3936 kHz, where quick wit blossoms into incisive humor on a regular basis. If you're an enthusiast of pkt, ATV, VHF/UHF/SHF, moonbounce, space comms or DX, I'd like to hear about your activities! Also, I'm looking for nominations for ME's Outstanding Amateurs of 1990. Awards will be presented in several categories. See your club for details & nomination forms. The Yankee ARC newsletter, *The YARN*, edited by W1CUW, with articles from many club members, is enjoyable "just plain folks"-type reading; join the YARC to get your own copy delivered to your door! The Section Pkt Tech Committee is developing a comprehensive plan for the integration & distribution of NTS tfc within the section's Pack-Net; more on this later. I look forward to visiting with you on the club circuit.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—Aug tends to be a quiet month in Amateur Radio activities as vacations & summer events capture our attention. But not entirely—tfc still moves throught the NTS system & NH is well-represented with 100% representation on 1RN/3 & 98.4% on 1RN/4! And the academic community is hard at work getting ready to inject Amateur Radio into the school system. WB1GXM reports that Pete, AE1T, computer science inst at Plymouth State is going to include Amateur Radio in his classes. Dr Ted Cooley N1GMC at Dartmouth is working to tie a mainframe computer into the pkt network. Butch has been in contact with Al, K1ADQ, who wants to get ham radio into his 6th-grade class in Lyndonville, VT. Mt Washington has a working rptr once again, thanks to efforts of WA1WOK, KA1OU, N1CKX, N1CGF & WA1PTC & others. The essentials are: 146.055/146.655 MHz, CTCSS 100 Hz. The output is 15 W & call signs are W1BPI & WA1WOK/R. From the mgmt of the American Tour de Sol solar car race—thanks to the NH ARA & the NH hams who helped make the 1990 race a safe & successful race. Ham radio will be at the NEA-NH Instructional Convention with WB1GXM leading a workshop entitled "Amateur Radio & Classroom Instruction" (grades 4-6). Finally, Hugh, W1LIM, has a slide & talk show on a recent tour of China! Contact Hugh & schedule him for your club this fall or winter! Aug 1990 NH NTS summary— nets: VTNH 210, GSPN 101, GSFM 79. Stations: W1PEX 1455, W1FYR 723, K1TQY 196, N1CPX 163, KB4N 143, W1ALE 82, N1ALM 46, KK1E 41, WB1GXM 28, KA1ROH NU1A 23, KA1LMR 17, WB1EAF 13, KA1SXM KI1M 12, N1DCT 10,KA1GOZ WA1YZN 9, KA1HPO 8, KA1KFX 7, NE1J K1PDY W1ECA 5, K1IOJ W4PAS 4, WB1HBB N1CUG N1BAC KB1XU 3, NR1N 2. BPL: W1PEX, W1FYR. PSHR: N1CPX, W1PEX, W1ALE, KA1HPO/T.

VERMONT: SM, Mitch Stern, WB2JSJ (@ N1GMU)—Announcing the availability of the *Vermont Amateur Radio Directory*! This 50-page booklet lists the 1300 + amateurs of VT by call sign & name, rptrs, pkt systems, exams & RCs. The *Directory* is available from your local RC for a reasonable charge. VT ARES is starting to take shape again. SEC NB1K now has DECs KB1GY (NW VT), K1WML (NE VT), KA1TIF (CEN VT) & KA1CZO (SE VT). If you're interested in joining this fine ARES team, contact the DEC for your area or NB1K. Yet another train wreck: 5 engines & 6 cars derailed in Sharon on Aug 7. N1EMF & KA1TIF were on hand to provide backup comms. Amateurs in N VT got to listen to the tactical comms of the Mohawk Indians blocking the Mercier Bridge in Montreal—on the amateur freq of 145.87 MHz! The folks at the FCC & DoC have been notified & we hope this activity will have QSYed by the time you read this. Howy, N1GOH, has upgraded to Gen & should be in FL on the 1st leg of his year-long boating cruise. Active trafficker KC1KI is in CO for the fall. We regret to report the passing of Will Campbell, NB1C, of Winooski; Ephrem "Bert" Berteau, W1HRG, of Colchester/FL & Walter Prince, W1SPK, of Middlebury. New PBBS in Rutland area is KA1NZA-4, which should have the bugs worked out by the time you read this. Exams this month: Nov 3 in Rutland; contact WA1ZOJ for details. Nov is ARRL Sweepstakes month—set your schedule for some good operating Nov 2-3 (CW) & Nov 16-17 (SSB). Nets: VTNH 31/247/210, Carrier 25/529/42, GMN 27/433/25, VPN 4/62/5, VPEN 4/26/0, CVFM 4/32/1, TSFMN-Keene 5/74/12, TSFMN-Ascutney 4/71/0. Tfc: WA2SPL 881, KT1Q 317, N1GMU 252, N1DHT 168, KC1KI 156, WA1JVV 134, NB1A 57, W3QQ/1 10.

WESTERN MASSACHUSETTS: SM, Jean Hurtle, KA1IFC—STM: KA1EXJ. PIC/ACC: K1BE. OOC/TCC: KA1SNA. Club mtgs are back in full swing & SET plans being made. The WMA picnic was attended & enjoyed by several with the WX cooperating. As of Sept 1, Art, W1KK, is NM of the CW WMN; many thanks to Joy, KA1EXJ, for her time & efforts as NM for the past 2 yrs. You will find the WMN on 3562 MHz at 0000 UTC & operates at 10 WPM +/- 2. Join in, peak your CW skills, have fun & support CW in the section. With clubs now having mtgs again, there's always a need for guest speakers—why not offer to do a talk at another club in return for doing a presentation at your club? This would help solve problems of

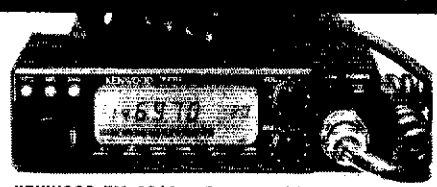
AES® / KENWOOD • Closeouts & Specials of the Month . .

KENWOOD TH-75A 2m/440 Dual Band FM Handheld

1.5W output. (2m) 144-148MHz with 141-163.995MHz receive, including weather. Modifiable. for MAR/CAP tx. (440MHz) 438-450MHz. Keyboard entry, 10 memories/band, 4 scan modes, full duplex, CTCSS enc/dec.

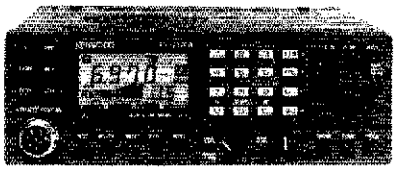
List $549.95 - **Closeout $399.95**

PB-10 600ma 7.2 Volt battery with **BC-2** wall charger (reg. $72.50) only **$10.00** with **TH-75A** purchase.



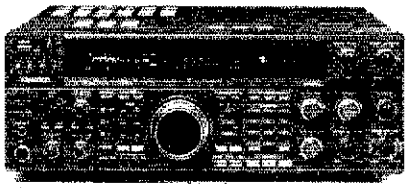
KENWOOD TM-231A • 2-meter, 50W transceiver. Programmable step digital VFO, 20 multi-function memories, various programmable memory/band scan modes, programmable CALL. Most function are controlled from the keypad microphone. Optional DRS Digital Recording System stores up to 32 seconds of rx/tx messages. 1-1/2"h x 5-1/2"w x 6"d, 2-1/2 lbs.

List $459.95 - **Closeout $389.95**



KENWOOD TM-3530A • 25/5W, 220MHz base/mobile FM transceiver. Keyboard entry, 16-key DTMF, DCL capability. 23 multi-function memories; linked to 15 telephone number memories. Frequency up/down control from microphone. 12V DC @ 6.5A, 2 ½"h x 7"w x 9⅞"d.

Regular $519.95 • ***Closeout* $389.95**



KENWOOD TS-950SD

All Band HF Transceiver with Digital Signal Processor and more!

Call for Special Price

Popular Current Models

Call for VHF/UHF Prices

TH-315A* 2.5W 220 FM HT/ batt/cgr/TTP

Special** - with the purchase of a TH-315A, one extra std. battery pack is only **$5.00

TH-26AT 2.5W 2m FM transceiver/batt/chgr/TTP
Opt. **PB-9** w/built-in chgr **$49.95** w/**TH-26AT** purchase.

TH-225A ¾W 2m HT/batt/chgr/TTP
Extra PB-12 battery **$8.00** with **TH-225A** purchase

Call for HF Special Prices

TS-440S 9-band HF transceiver
TS-440S/AT HF transceiver w/auto. tuner
TS-680S 9 band transceiver w/6 meters
TS-140S 9-band HF transceiver

Call for Duo-Band Special Prices

TM-631A 45/25W 2m/220MHz FM trans.
TM-701A 25W, 2m/440MHz FM transceiver
TM-731A 45/35W 2m/440MHz transciever

Limited Quantities - all prices and availability subject to change without notice. Check with your salesman.

Order Toll Free: 1-800-558-0411

Toll Free in Wisconsin: 1-800-242-5195
FAX: 1-414-358-3337

AMATEUR ELECTRONIC SUPPLY® *Inc.*

5710 W. Good Hope Road; Milwaukee, WI 53223 • Phone (414) 358-0333

AES® BRANCH STORES — Associate Store

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio WATS 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (407) 894-3238
Fla. WATS 1-800-432-9424
Outside Florida 1-800-327-1917

CLEARWATER, Fla. 34625
1898 Drew Street
Phone (813) 461-4267
No In-State WATS
No Nationwide WATS

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
Outside Nevada 1-800-634-6227

CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
Outside Illinois 1-800-621-5802

Contact AES® for all of your KENWOOD needs!

★ Low Prices ★ Large Stocks ★ Fast Service
★ Top Trades ★ Toll Free Ordering line
★ We Ship Coast to Coast

AES® ★ *Over 33 Years in Amateur Radio*

MasterCard VISA DISCOVER *Use your* CREDIT CARD AMERICAN EXPRESS

HOURS • Mon. thru Fri. 9-5:30; Sat. 9-3

Clip out this handy Coupon and Mail Today!

TO: AMATEUR ELECTRONIC SUPPLY®
5710 W. Good Hope Road
Milwaukee, WI 53223

I am interested in the following new KENWOOD Equipment:

_____

_____

I have the following to TRADE (What's your DEAL?)

_____

_____

Rush me your quote - I understand that I am under no obligation.

Name _____

Address _____

City/State _____ **Zip** _____

who to get for a guest speaker, enable clubs to get to know each other & raise the quality & interest of the mtg. Lots of you are knowledgeable in one or more areas—make the '90s a time to share it. When you draw from resources of other clubs, you can only strengthen your own. PIOs remember, without your input, folks in your area will see nothing here in the column. Everyone have an enjoyable holiday season. Tfc: KA1IFC 831, W1UD 752, WA1OUZ 205, KA1EXJ 204, W1KK 98, KA1ULT 40, NM1U 28, W1SJV 27, NX1K 23, KA1TDL 17, W1ZPB 13. PSHR: KA1EXJ, KA1IFC.

NORTHWESTERN DIVISION

ALASKA: SM, Harley Steward, KL7IZZ—ASM: KL7HO. OOC: KL7IKX & AL7BB. STM: AL7LX. TC: KL7CE. SEC: AL7KE. ORS: KL7LA. OO: KL7EB. By the time you read this, the Fairbanks Flea Mkt will be history. It can only have been successful, judging by the hams involved. Florence Weber, KL7AZJ, of College, AK, was awarded honors & special recognition for public service at USGS Nat'l Ctr in Reston, VA. Congrats, Florence, long-time member of AARC. Mike Rice, KL7YV & Lynn Rice, KL7FT, won 1st place in Oshkosh, WI, with their vintage Cessna L19 on floats. Brother George Feltes SJ, KL7EN, now of Los Gatos, CA, is celebrating his 93rd birthday. He served the AK Bush & Fairbanks areas for 53 of those yrs. He's still active on Alaska/Pacific net, 14.292.

IDAHO: SM, Don Clower, KA7T—ASM: K7REX. SEC: N7MAL. STM: W7GHT. OOC: WB7CYO. PIO: WG7E. The SW Idaho DX Club, with a claimed score of more than 4000 pts, had the high score for ID in the 1990 ARRL Field Day contest. Therefore, they win the plaque for 1990. Thanks to all who participated in FD & submitted a score. 73, Don.

Net	*Sess*	*QNI*	*QTC*	*NM*
FARM	31	1619	37	K7CDA
CD	23	707	14	K7UBC
IMN	31	287	48	WS7U
NWTN	-	-	-	N7AH

Tfc: N7MAL 76, W7GHT 65, WS7U 65.

MONTANA: SM, Pete Peters, KF7R—Congrats to the Anaconda ARC & the Capital City ARC on their renewal as ARRL affiliated clubs. A good article on lightning by Vern Phillips, W7KG, has been reprinted twice. Picnics such as Father's Day, W7OTJ, WB7SWH & Big Arm are becoming successful annual events. A new rptr (147.14 +) on Pats Knob near Plains now covers a part of I-90 N of Missoula, where 2-mtr rptr coverage was not avail. N7OQO is a new member of the QCWA. W7IOJ received a complimentary letter on the Glacier Ground Wave Net in the Flathead Valley Area. The Yellowstone RC made it into the *Billings Gazette* with a Field Day article—good work, Billings.

NET	*QNI*	*QTC*	*SESSNM*	
MSN	55	0	4	KF7R
MTN	1158	85	31	N7AIK
IMN	287	48	31	KA7EEB

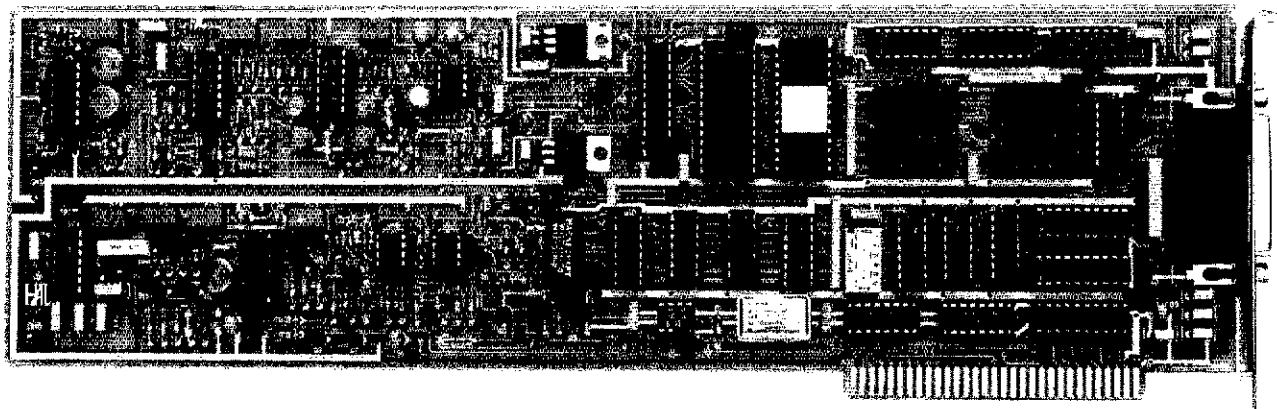
Tfc: W7TGU 573, WB7WVD 66. PSHR: WB7WVD 82.

OREGON: SM, Randy Stimson, KZ7T—ASM: W7FBP. ASM: AL7IN. STM: W7VSE. SEC: KV7F. PIO: KC7YN. SGL: KA7KSK. ACC: WF7Q. OO: WN7W. BTC: N7ENI. Bill Shrader, W7QMU, the NW Div Dir, has been named to the ARRL Planning Committee. This committee's mission is to draft a recommended long-range plan for the League. That's quite an honor for Bill to be picked from all the other Dirs & to be the 1st on this committee; congratulations, Bill, & good luck. The High Cascade Hamfair was a huge success. It was bigger than expected & they'll have to move it to a bigger facility next yr. Mark your calendar: Aug 10-11, 1991, is the 2nd High Cascade Hamfair; it's held at the foot of Mt Bachelor & is a beautiful setting. To show how things can get turned around, Dave Nelson, N7DCQ, was hiking on Mt Hood & came across a hypothermic climber. Dave got on the 147.120 rptr & brought up Mike Hurley, KG7BF, who called 911. The person was rescued. The local newspaper wrote an article about the rescue, but didn't mention the hams that were responsible for instigating the whole thing. Warren Night, N7BIJ, wrote the newspaper about the mistake & they published his letter, so we did get some credit. Thanks, Warren, for picking up on that & letting people know. John Hawley, W7VTW, the Emergency Mgr for Lincoln Co & president of OR Emergency Mgmt Assn, asked Pat, N7KMN, to be on the Communication Committee. I know Pat will do a great job. Tfc P = pkt: W7VSE 453, N7BGW 317, AL7IN 310 P, N7JQK 150 P, WB7VMS 118 P, KB7FOK 78, KA9DEN 70 P, AA7CU 66, W7ODG 66, K7OVK 66, W7LNE 57, N7DXT 55 P, KA7WFW 40, K7LNM 27, N7DRP 25, KA7AID 11, WA7ARI 10 P, WA7SHP 5 P. Late July: KA7WFW 19, KC7UF 10 P.

EASTERN WASHINGTON: SM, Tom Plaisance, KC7PH—STM: W7GB. SEC: WA7CBX. OOC: W7LKR. ASM: NQ7M. SGL: KD7AC. ASM & WEN NM: KE7WG. BM: W7EQU. PIC: N7DWD. ACC: WV7Y. Hope everyone had a great time at the 1st annual Lewis & Clark Hamfest Oct 20; if you missed it this yr, put it on the calendar for 1991. STM Don, W7GB, again requests that volunteers who'd like to learn or do tfc handling, please contact him. BM Ed, W7EQU, retransmits W1AW Bulletins as code practice on 28.200 MHz eves at 0400 in the Spokane area. Happy 73rd B-Day to Ed. 73, KC7PH @ N7HHU PBBS. Tfc: K7GXZ 203, W7GB 166, W7LBK 93, WA7YEN 108.

WESTERN WASHINGTON: SM, Mary Lewis, W7QGP—STM: KD7ME @ WØLVJ. SEC: NM7N @ VE7VBB BC, Canada. SGL: KD7AC. ACC: W7QGP. TC: W7JWJ. BM: N7CAK @ WØLVJ. OOC: N7DVR. W Seattle ARC picnic attended by 25 members & W7QGP at Ruth & Dick Bennett's home. K7YNP passed away July 18. John, W7HCN, is in his new home (former home totally destroyed by fire, including ham shack). John's new beam was installed atop a 90-ft tower with the help of a huge crane. WR7C became a Silent Key. Sat, Oct 13, Mt Baker ARC's 1st-ever flea mkt has 2 ham estates & other items to sell. Jefferson Cty ARC has 3 used HF transceivers to be loaned to new hams in the club; equipment donated by club members. Mike & Key ARC Pres & Pres of trustees (WA7UVJ & KA7CSE) have returned from USSR & are heading up a return visit of Soviet hams to this area next spring. W7QGP visited OARS mtg & presented their Special Club Certificate & a Certificate of Merit for an excellent Goodwill mtg with the DX operators. N Kitsap ARC hosted SM4IM of Sweden. would you like to visit a ham station with 1 side's call sign LG5LG (Norway), other side SJ9WL (Sweden)? Contact SM4IM; he will help make arrangements. July SEC report: New EC N7MUT (King). June. New EC N7AZO (Pierce), WB7CLF (King), New DEC KB7DCD (Mt Vernon) Can. EC

A Winning Combination . . .
The PCI-3000 and SPT-2 from HAL!



The HAL PCI-3000/PC-AMTOR system is designed to put your PC on the HF bands with outstanding performance at an affordable price. Amtor allows you to get through when other methods fail. If you've ever been DX-ing with someone on Amtor when 20 meters dies out in the evening, you know what we mean. Things may slow down, but you can usually keep up the QSO!

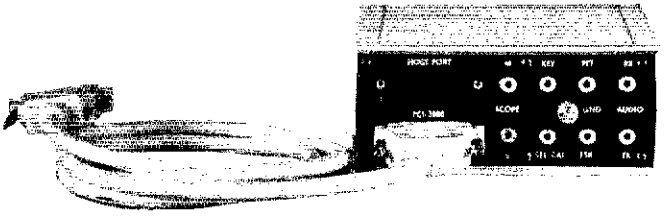
The PCI-3000 doesn't limit you to Amtor. You also get high-performance Baudot and ASCII RTTY, CW, and Search Mode. Search Mode lets you simply tune in the signal—we take it from there. The PCI-3000 automatically finds the correct code, speed, and polarity. No more guessing!

If you want to communicate on HF, do it right with the PCI-3000! Call HAL Communications—your AMTOR source—and put your PC on the air today!

SPT-2 Spectra-Tune:

For ease of tuning your PCI-3000, add the SPT-2 Spectra-Tune. The Spectra-Tune lets you tune in CW and RTTY signals quickly and accurately with a calibrated linear 30-segment bar graph. The bar graph represents a 600 Hz range of the audio spectrum, centered at 2210 Hz for RTTY and AMTOR, and 800 Hz for CW. Calibrated marks indicate the proper frequency for AMTOR, RTTY, and CW tuning.

A cable is included with the SPT-2 for providing power and control from the PCI-3000. The rear panel of the SPT-2 provides convenient "RCA" phono connectors for all radio connections. This avoids having to make radio connections directly to the PCI-3000. Enhance your PCI-3000 system with the SPT-2 Spectra-Tune Today!



HAL Communications Corp.
P.O. Box 365
Urbana, IL 61801
Phone (217) 367-7373
FAX (217) 367-1701

PCI-3000/PC-AMTOR with software **$395.**
SPT-2 Spectra-Tune with cable **$169.**
FIL-1 Amtor/RTTY filter (installs in SPT-2) **$69.**

(Low tone export models available.)

Pierce N7KMF. Public service hrs: July 327.5; Pierce 204.5; Clark Co; Skagit Co 10; San Juan Co 13; Thurston Co 80. Net reports NTN QNI 1681 QTC 217 QNS 31 July; NWSSBN July QNI 566/QTC 36/QNS 31, Aug QNI 699/QTC 37/QNS 31; PSTS July QNI 104/QTC 54/QNS 62, Aug QNI 107/QTC 60/QNS 62; WARTS July QNI 2640/QTC 167/QNS 31, Aug QNI 2805 QTC 164/QNS 31; WSN Aug QNI 529/QTC 145 62; Tfc (July) K7AJT 9, K7CLL 8, KA7CRN 21, W7IGC 268, W7LG 179, N7NKA 8, KD7OM 2, K7SUX 99, KA7TTY 28, W7TVA 261, WB7WOW 103. (Aug) W7AZU 8, K7CLL 2, KA7CRN 21, W7IGC 226, W7LG 211, N7NKA 6, K7SUX 156, KA7TTY 37, WB7WOW 80.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV. SEC: W6LKE. STM: K6APW. OOC: K6TI. TC: N6AMG. LARK's latest Novice, Tech & upgrade classes started Oct 9 at Granada H S, Rm 106, Science Bldg, 400 Wall St, Livermore. Contact K6TS, 447-5872 or N6FQQ, 462-8946 for info. W6KG & W6QL, of DXpedition fame, spoke at the last mtg. HRC welcomed new members N6YUO & N6YTL. *The Chewed Rag* saluted W6KCV on his celebration of 50 years in Amateur Radio, all with the same call sign—congrats, Al! KA9QMF is stepping down as ed of the NBARA newsletter & will be replaced by KI6YP. Members NH6CN, W6RJY, WA6OUC, WB6YYY, WD6EGP, N6OJY & WB6TRF supported the Vallejo Fire Dept & Solano Co OES in a Fire Watch July 4. NBARA members provided comms for the Historical Run & the Torchlight Parade. CCCC welcomed new members W6LRT, KA6ZFC, N6YGX, KC6KAR, K6ENP, N6MYG & congratulated KC6FAW & KC6DRX on their upgrades to Tech & Gen, respectively. EBARC mourns the loss of long-time member Muriel Hunter. WD6FRP. VVRC's newsletter will be edited by WA6CAX. SBARA's Novice class is underway in Fremont, call N6QWF, 790-9382 for info. MDARC members KB6EZL, KB6JZM, N6UMG, N6IUI, N6SPY, N6MNL, N6RFZ, KI6RP, AA6NM, N6ZA, W6NKF, KT6Y, WB6PQU, KI6YK, KB6UU, N6CPG & W6CPO provided comms for the Dept of Forestry & Fire Prevention July 4. Aug tfc: WB6DOB/270, W6VOM/139.

NEVADA: SM, Joe Lambert, W8IXD—ASM: Curly Silva, K7HRW. TC: NW7O. STM: KK4M. SEC: K7HRW. Thanks to Chuck, W6DPD, Pac Div Dir, for visiting the Reno area Aug 12 & addressing the SNARS breakfast; thanks to Curly for coordinating this visit with hams in the N NV area. Chuck was able to give a briefing on the summer ARRL Board mtg, give an update on League policies & projects, & answer questions from the audience. TARA reports on successful comms support for the Markleeville Death Ride, in which 2400 riders participated; TARA also reports extensive work & improvemnets on several rptrs. N7FFP & I attended the SW Div Convention in San Diego & saw many NV hams; it was a nice get-together. Pac Div Convention (PACIFICON) Oct 12-14 in San Jose; Shorty promises the usual good time & I hope to see a lot of NV hams there. 2 NV hams qualified for PSHR this month. See you in San Jose.

PACIFIC: SM, Ron Phillips, AH6HN—Bill, KH6S, reports that Brian, WH6AIL & Kurt, NH6WZ, upgraded from Tech to Gen—congrats to both. Kimo, WH6AXL, has returned to the Big Island after a couple of yrs on Kauai—welcome back, Kimo. WH6C, NH6H, WH6BX, KH6H, N6HPQ, KH6HHF, KH6PU, AH6IF, NH6QF & KH6UU provided public safety comms for the annual Haleakala "Run to the Sun" ultramarathon; thanks for a job well done. Corky, W6ORS, reports he received his new Navy MARS call sign—in addition to the other activities, that should keep him busy. Mahalo to Joe, KH6GDR, for keeping me informed of activities at Honolulu ARC, to Bill, KH6S, from Kauai & to Mel, KH6H, from Maui. Tfc: KH6S 22, KH6H 6.

SACRAMENTO VALLEY: SM, Jettie Hill, W6RFF—Club Editors: please send a copy of your newsletter to ACC Jeanne Cross, 1070 Poplar, Chico, CA 95928. It was good to see some of the section members at Pacificon; hope you enjoyed it. Still need ECs for some cos. Contact SEC Walt Cross, KE6EP. If you'd like a list of section appointees, send me your request & SASE. Contact your local EC for information on ARES. Many clubs hold elections at year end—please send me a list of your new officers. OOC WY6O & his group have been busy with rptr interference complaints. John does a good job with his OOs. KA6HVY, EC Plumas, is working on a MOU between the Plumas Nat'l Forest & ARES. By now the forest fire season should be over—think rain! If your club needs a speaker, your SM is available, in most cases, with a few day's notice. Tfc: WA6WJZ 93, W6CFQ 33, W6RFF 28, WB6SRQ 5.

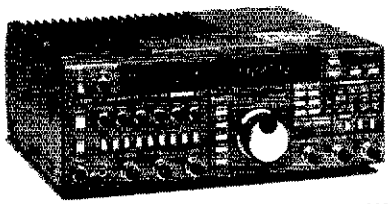
SAN FRANCISCO: SM, Dick Wilson, K6LRN—Steve Porter, KB6LRL, passed away Aug 16. W6FCQ & N6AQY give upgrade classes at Marin ARC. KB6ZJS reports many hams helping with CA Div Forestry fire comms in Aug: KE6WC KB6IFS WD6AOJ KB6LAG WA6CHU WB6PMS KA6TFQ KA6YRK N6BDE N6NKT KB6PDA WB6FRM WD6CMU W6QZE KK6BO G8HJD G8JUX KA6INI KC6CFF K6KGA W6GGR KA6NEO KB6HYS WB6NBG WB6ZUT KB6MRM KA6CHJ KA6YRK. Many travelled a long distance—thanks to all. Congrats to the Sonoma CDF contingent for FB Comms bus—a self-sufficient unit with many operating positions, built by N6ONZ's fine group & CDF volunteers. WA6MGK & W6JFN went to Ft Bragg for ATV comms in another CDF exercise. W6KTT KA6OFR N6MYQ AA6GV WD6BOR covered Vine Man Triathlon. W6MJO, WB6TKD, KA6BQF, N6YMQ, WA6PAC covered the "Escape from Alcatraz" Triathlon. WB6LYE, N6AFT, KA6NEO, WB6MYF, W6AEY, WB7VMS & S OR Pkt Group helped reestablish pkt link into Eureka area. K9AT & WB9LOZ took trip to AK. Lambda ARC is one of the more active clubs in the section with many activities & trips. Tfc: N6FWG 133.

SAN JOAQUIN VALLEY: SM, Byron Smith, WA6YLB—I'm pleased with the hams in this section. I've read that the hams came through with comms for the fire personnel during the Yosemite fires. It shows that ham radio is vital to ea & every emergency agency in your area. In total, it was reported that nearly 1000 hrs of service from 55 hams were used. If your area needs help showing your agencies how we can be utilized, please contact the US Forest Service—I'm sure they'll put in a good word for your group. Contact N6KFR or WB6WFF for info on how they got involved. New sess of on-the-air Novice code class: 0600-0700 Mon-Fri on 3760 kHz & on UHF, 441.900 MHz, for our nonham friends with scanners. Tfc report next month.

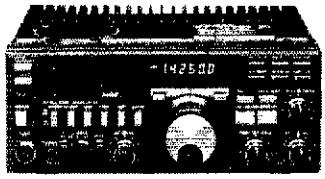
SANTA CLARA VALLEY: SM, Steve Wilson, KA6S—SEC: N6JQJ. TC: WA6PWW. STM: W6ZRJ. PIO: N6VQV. ACC:

★ Large Stocks ★ Low Prices ★ Top Trades at AES®

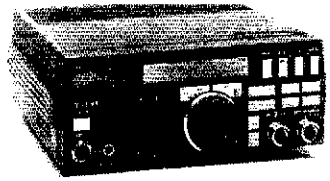
Call TOLL FREE for YAESU DISCOUNT PRICES & TRADE-IN QUOTES



HF Transceivers	LIST
FT-767GX 160-10m xcvr	Call for Special
2M/767 2m module	239.00
6M/767 6m module	196.00
430/767 430-440 module	296.00
440/767 440-450 module	296.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/phone patch	136.00
FAS-1-4R Remote antenna selector	120.00
FIF-232C Interface	95.00
FTS-8 Encoder/decoder	55.00



FT-757GX MkII 9-band xcvr w/mic	$1089.00
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
FC-757AT Automatic ant. tuner w/memory	429.00
FAS-1-4R Remote antenna selector	120.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/patch	136.00
FRB-757 External relay box	14.00
MMB-20 Mobile mount	26.00



FT-747GX HF transceiver	$ 889.00
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
SP-767 Speaker w/audio filters	99.00
MD-1B8 Desk microphone	115.00
MH-1B8 Hand microphone	29.00
FM-747 FM unit	47.00
MMB-38 Mobile bracket	14.00
TCXO-747 Increased freq. stability unit	42.00

FL-7000 Solid-state HF linear amplifier $2279.00

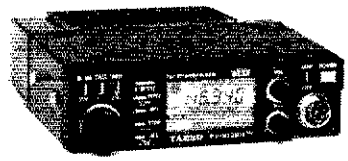
Misc. Accessories	LIST
MD-1B8 Desk microphone	$ 115.00
MH-1B8 Mobile microphone	29.00
YS-60 1.8-60 MHz 2KW wattmeter	Call for Special
YS-500 140-520 MHz 200w wattmeter	99.00
YH-55 Lo-Z headphones	28.00
YH-77 Lightweight headphones	26.00

VHF/UHF Base	LIST
FT-736R 25W 2m/430	Call for Special
FEX-736-50 6-meter module	294.00
FEX-736-220 220MHz module	322.00
FEX-736-1.2 1.2GHz module	589.00
TV-736 1.2GHz ATV converter	163.00
Keyer-B Electronic keyer unit	19.00
FTS-8 Encoder/decoder	55.00
FVS-1 Voice systhesizer	37.00

YAESU

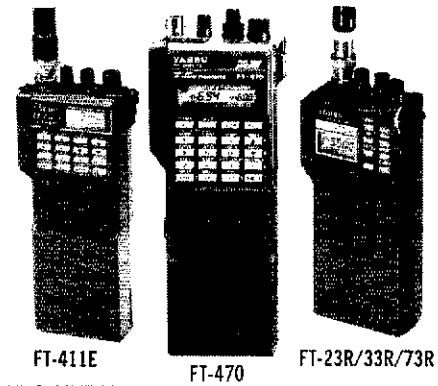
All Prices shown are LIST

For our DISCOUNT PRICES & TOP TRADES • Call TOLL FREE



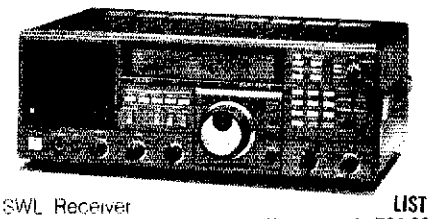
VHF/UHF Mobiles	LIST
FT-212RH/C8 45w 2m FM w/autodial mic	$405.00
FT-712RHT/C8 35w 440 FM w/autodial mic	497.00
FT-290R MKII 25w 2m FM/SSB xcvr	610.00
FT-690R MKII 10w 6m FM/SSB xcvr	752.00
FT-790R MKII 25w 430-450 FM/SSB xcvr	681.00
FBA-8 Holder for C-cell Nicads	32.00
NC-26B Wall Charger for FBA-8	10.00
CSC-19 Soft case	16.00
MH-10F8 Speaker/Microphone	30.00
MH-10E8 Hand Microphone	24.00
FTS-7 Encoder/decoder	40.00
FT-4700RHT/C8 50/40W 2m/440 FM/TTP	799.00
AD-2 50w 2m/440 duplexer	48.00

MasterCard VISA DISCOVER Use your CREDIT CARD AMERICAN EXPRESS



FT-411E FT-470 FT-23R/33R/73R

VHF/UHF Handhelds	LIST
FT-411E 2.5W 2m FM HT	406.00
FT-811 440MHz FM HT	410.00
FT-470 2m/440 FM HT	Call for Special
FT-23R-17 2m 2.5w HT	306.00
FT-33R 5w 220MHz HT	328.00
FT-73R 2w 440MHz HT	Call for Special
FT-73R/TTP 2w 440MHz HT w/TTP	Call for Closeout



SWL Receiver	LIST
FRG-8800 150 KHz-29.999 MHz Shortwave	$ 784.00
FRA-7700 Indoor active receive antenna	58.00
FRT-7700 Antenna tuner	77.00
FRV-8800 118-174 MHz VHF converter	107.00
FIF-232C Interface	95.00
DC-8800 DC kit	4.00
FM-W/8800 FM-wide kit	21.00

Antenna Rotors	List
G-500A Heavy duty elevation rotor	$249.00
G-5400B Az/El rotor combo	497.00

★ Large Stocks
★ Fast Service
★ Top Trades
★ Since 1957

AES® will take your Clean Late Model Ham Equipment in trade towards New **YAESU** Equipment shown in this listing. Call *(Toll Free)* for a quote today.

Some older tube-type equipment, handhelds, VHF/UHF amps and data controllers not accepted

AES® ★ *Over 33 Years in Amateur Radio*

HOURS • Mon. thru Fri. 9-5:30; Sat. 9-3

Please use WATS lines for quotes and ordering only. Use regular lines for infomation and service dept.

Order Toll Free: 1-800-558-0411

Toll Free in Wisconsin: 1-800-242-5195
FAX: 1-414-358-3337

AMATEUR ELECTRONIC SUPPLY® Inc.

5710 W. Good Hope Road; Milwaukee, WI 53223 • Phone (414) 358-0333

AES® BRANCH STORES — Associate Store

WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio WATS 1-800-362-0290
Outside Ohio 1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (407) 894-3238
Fla. WATS 1-800-432-9424
Outside Florida 1-800-327-1917

CLEARWATER, Fla. 34625
1898 Drew Street
Phone (813) 461-4267
No In-State WATS
No Nationwide WATS

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
Outside Nevada 1-800-634-6227

CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
Outside Illinois 1-800-621-5802

KB6ICQ. BM: (vacant). OOC: KB6FPW. Sept—This will be a rather short column this month, because of insufficient info—I can only report what you folks tell me about! If you'd like to get your club activities mentioned here, please include me on your club newsletter mailing list. The club newsletters are where I get most of the material. I'd also like to ask each of the ECs in the section to forward a copy of activity reports to me as well as your DECs and the SEC. SCARA is working hard on putting together a great convention this yr. Hope to see you at PACIFICON 90 this Oct 12-14. PAARA will be holding their annual auction Oct 13 so you have a ham radio double-header weekend. The lawsuit brought by the Perham Foundation against the Foothill College district to keep the Electronics Museum open saw another round on Aug 15; the College district motion for dismissal of the suit was denied. The Milpitas ARES set up a ham radio demo booth at the annual Milpitas Art & Wine festival. WN6I and N6KL gave a talk at the IBM ARC Aug mtg on foxhunting techniques. EMARC has their home-brew contest coming up Sept 7. It'll be interesting to find out which project wins! George, WA6YYM, has completed the a Santa Clara Co EC survey this month. The survey asks detailed questions about how each city ARES group is organized, & about the relationship with the city governments. The results of the survey should have come out in late Sep. I'd also like to welcome Kap, KJ6KV, as the DEC for San Mateo Co; Lilly, N6PGM, as the EC for Mtn View, Ben, KB6SIQ as the new EC for San Jose & Becky, N6VQV, as the new section PIC. I thank Clay, NG6A, for his hard work over the last several yrs as section training coord & EC for San Jose. I'd like to express my appreciation to Randy, KK6BO, our retiring section PIC, for his fine work. Phone numbers: Amateur Radio classes & clubs, 408-971-1424. License exams, 408-984-8353 (ARRL VEC) or 408-255-9000 (Sunnyvale VEC). Tfc this month: W6VZT 32 (1), W6ZRJ 26 (7), NR7E 86 (4).

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W—ASM: AB4S. SEC: N4MYB. STM: KI4YV. ACC: WC4T. TC: KM4OX. SGL: KE4ML. PIO: WA9NEW. Two new ECs have been appointed: KM4LB in Wake Co & N4GGD in Guilford Co. Please help them & let them know you support their efforts. The State Emergency Response Team (SERT) was activated on Sep 13 for repatriation of hostages from Iraq & Kuwait at the Raleigh-Durham Int'l Airport. SGL KE4ML, KM4LB & Durham Co EC KB4WGA responded to this activation by providing 20 ARES members (well-dressed & identified with Amateur Radio badges) at the airport & at the State EOC. Approximately 300 former hostages went through the repatriation process & each received an "Amateur Radio Arrival Message" form in a packet of info they were given after clearing customs. Our msg load was lighter than expected, because 2 telephone companies installed phones at the last minute & provided free calls. This did not, however, reduce the value of our presence. Amateur Radio received newspaper & TV coverage & favorable comments from State & Federal officials. A number of the former hostages took advantage of our service & msgs were delivered for those having difficulty contacting friends or family members. All were visibly relieved when notified that their msgs had been delivered. As always, our contribution was measured by our presence & visibility—not the no. of msgs delivered. Two more planeloads of hostages are scheduled to arrive Sept 20 & 23. NC ARES members will again be there to assist. The Greater Greensboro Hamfest is sched for Nov 24-25. Silent Key report, K4BF, who provided DX contacts for many during his extensive travels in Africa. Aug tfc: K4IWW 271, KI4YV 176, KB7LX 102, KA4EYF 77, W4EAT 74, N9CGD 73, KC4MWT 41, N4JTG 33, WD4LOO 37, WB4WII 36, N4UMI 33, W4EHF 32, N4WFU 31, N4VVX 30, N4UE 30, N4SVZ 27, WA4MNR 25, WA2EDN 25, K4AIF 24, KC4GCK 24, N4SSX 18, N4UOE 16, N4ZUD 16, N4SHE 15, N4DUI 15, AB4W 14, KN4HF 12, W4LWZ 12, WA9UTM 11, KA4KGZ 11, N4LST 11, W8CRS 10, N4YRD 6, N4XUN 2.

SOUTH CAROLINA: SM, Ned Moeller, N4FVU—OOC: W4NTO. PIC: AB4ID. SEC: K8AFP, STM: W4ANK. TFC: WA4UNZ. ACC & SGL: N4FVU. The PSHR, published ea month in *QST*, lists amateurs whose public service performance during the month qualifies for recognition. Our STM Hunter Wood, W4ANK, has achieved an unprecedented record of having his call sign listed ea month, including the 1st time the PSHR was published in *QST*. Each month, W4ANK has been listed in the PSHR with the exception of the 2 times the SC Section News got lost before it reached ARRL HQ. In Aug 1990, W4ANK, achieved 76 PSHR points after having to devote time to his XYL who was hospitalized for 12 days because of surgery. I suggest he's worthy of special recognition. We are saddened to hear N4MPP and W4PST are Silent Keys. Gus Moak, N4MPP, of Cordovan, SC, was a DXer with many QSOs. Wilber Campbell, W4PST, of Summerville, SC, was an SCSSB Net participant. Aug tfc: W4ANK 105, KA4LRM 63, W4DRF 43, N4FVU 30.

VIRGINIA: SM, Ted Dingler, N4KSO @ KC4IH—SEC: WB4ZTR @ WB4D. STM: N4GHI @ WA3TAI. ACC: KA4YUY. OOC: W8IRT. TC: N4UA. SGL: W4UMC. BM: W3ATQ. PIC: WB4QOJ. Congratulations to new ARES appointees: NH6E, EC Military District of Washington; KC4CMR, EC James City Co; KJ4EK, DEC for N Shenandoa District No. 1. DEC N4AKZ reports Mt Empire ARES provided comms for VA Lung Assn Bike Ride. KM4PB, N4RSF, WB4ZTR, KK4GC, WB4EEA, W2AAW, N4SCK attended SKYWARN training at the new Washington, DC, Forecasting Ctr at Dulles Airport. The tour of the ctr was enjoyed by all. N VA SKYWARN interest is growing rapidly, primary net on WA4TSC's 147.30 rptr. Contact WB4ZTR for more info. No matter how much or how little tfc you handle, N4GHI wants & needs your monthly report, just include the no. of Orig, Sent, Recd, Delvd & Total by the 5th of the month. KK4SN reports Portsmouth ARES was activated by local Red Cross Aug 24 because of flooding from heavy rains. AA4AT set up at Wilson H S shelter with 90 evacuees & K5SFM set up at EOC. N4SCK organized another Int'l Children's Festival comms event, held each Labor Day wknd in Fairfax Co. N4GHI & WB4KSG co- sponsored another VN picnic at N4GHI's Potomac R QTH; everyone enjoyed the boating, sports & Food! Thanks, Gen & Lon. KJ4EK, WB4ZTR, N4RSF, KM4PB, KB2CEV, WA4ITY, KF4HP, N4LXP, N4FWA, WB2CMV, WA4OTF, WA4CJX, N4OEF, WA4HVU, W4UGX, KD4TZ, provided comms for Multiple Sclerosis Bike Tour in Winchester Sept 8. From all of us in the VA to each of you: Happy holidays & may you enjoy happiness & peace in the coming yr. Tfc: N5DST 577, WBØTAX 504, N4GHI 446, K4DOR 434, W4JLS 340, WD4MIZ 260, N4EXQ 234, W4HOG 212, K4MTX 205, W3ATQ 145, AA4AT 128, N6ANQ 77,

C·COMM

COMPETENT SERVICE AND COMPETITIVE PRICES FOR 15 YEARS.

VISA MasterCard DISCOVER

TOLL FREE **800-426-6528** TOLL FREE

Nationwide service including Washington, Alaska and Hawaii
plus Canadian service to British Columbia and Alberta.

KENWOOD

TS 950 SD NEW

DIGITAL SIGNAL PROCESSING
FOR THE CLEANEST TRANSMITTED SIGNAL

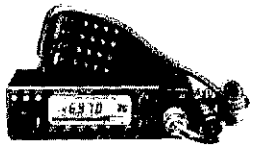
TH 27A
MINI
2 METER HT

TS 440S/AT

POPULAR HF TRANSCEIVER
WITH OR WITHOUT AUTOMATIC TUNER

TH 75A
DELUXE
DUAL BANDER

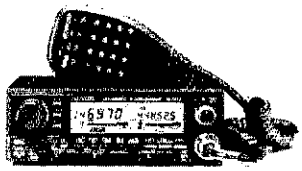
TM 231A



COMPACT 50 WATT
2 METER MOBILE

TH 225A
5 WATT
POWER
STANDARD

TM 631/731A



DUAL BAND MOBILES
TM631A 2M/220 TM731A 2M/440

TEN-TEC INC

OMNI V

HAM BAND TRANSCEIVER
GREAT RECEIVER

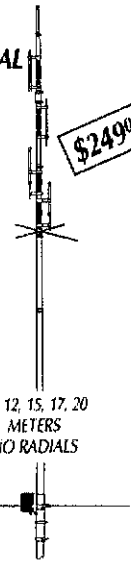
TITAN 425

LEGAL LIMIT PLUS
AMPLIFIER

AMERICA'S BEST

cushcraft CORPORATION

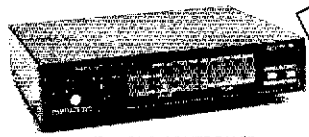
R5 VERTICAL $249.00



10, 12, 15, 17, 20
METERS
NO RADIALS

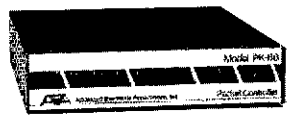
AEA

PK-232MBX $319.00



MULTI MODE CONTROLLER

PK-88 $119.00



PACKET CONTROLLER

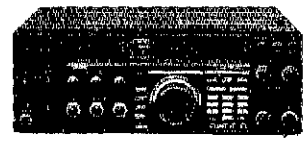
2 Meter $49.95

ISOPOLE

ICOM

SIMPLY THE BEST

IC-765



COMPETITION GRADE

IC-735

PROVEN WINNER

IC-229H NEW

VERSATILE 2 METER MOBILE

IC-24AT **IC-2SAT**

VERY COMPACT HANDHELDS
MULTI-FEATURED

STORE HOURS:
Mon. - Fri., 8:30am-5:00pm
Saturday, 10:00am-4:30pm

C·COMM

6115 15th N.W., Seattle, WA 98107
Local: (206) 784-7337
FAX: (206) 784-0541

Prices and availability subject to change without notice or obligation.

WB4ZTR 74, K4BGZ 63, KC4OJM 63, WB4KSG 62, WA4TVS 60, WB4FLT 59, KI4BR 58, KJ4LQ 58, WB4ZNB 54, WD4MIS 51, WA4DTE 45, W4TZC 43, K4YVX 39, N4NIG 37, N4FZA 30, KB2CEV 27, KB4PW 26, KB4CAU 22, WB4KIT 20, WB4EDB 18, K4MLC 17, K4JM 17, KN4DV 17, KB4OPR 13, WB4UHC 13, W4DM 12, KD4NH 12, K4VWK 10, KJ4EK 9, K4MLD 8, N4JEO 7, KI4RO 6, W4JSP 5, N4FNT 5, WA1VRL 4, KJ4UF 2, NM4R 2, KC4JGC 2, W4HU 2, KB2GII 1, N4MGQ 1, N6GVG 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. SGL: K8BS. TC: K8LG. ACC: WA8FLF. Repeater Coord: WB8GDY. A new RC, the Central ARA, has been organized in Weston; contact N8FIP for details. Ann, KA8ZGY, is recovering nicely & is going back to work. Ruth Rice, K8ARA, is getting along well after her illness. Anyone who wishes may send a card or letter to Freeman, W8QEC, & "Miss Lilly" Murphy at James River Conv. Ctr, 540 Aberthaw Ave, Newport News, VA 23601.

Net	*Freq*	*Time*	*QNI*	*QTC*	*Sess*	*NM*
WVFN	3865	6	853	173	31	WD8V
WVN-E	3567	7	164	65	31	KZ8Q
WVN-L	3567	10	141	514	31	KZ8Q
WVMD	7235	11:45	603	75	31	WD8V
WVRN	3840	6:30	150	24	30	K8LG
WVNN	3730	7:15	45	30	30	KA8ZGY
Hillbilly	14290	Noon Su	117	0	4	W8YP

Tfc: KA8WNO 398, WT8L 305, W8YP 148, K8QEW 143, N8FXH 30, K8KT 20, KA8OGF 18.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQØJ—SEC: K4UBU. STM: WTØG. ACC: WBØDUV. PIC: WBØFQB, . OOC: KAØCDN/WØIJR. TC: WØLJF. SGL: WDØHNQ/WDØHNP. BM: KAØVKM. I'd like to thank KBØZ for his yrs of time & effort as STM. Effective Sep 1st, Jack Patterson, WTØG, assumes the duties of STM, he has a great deal of experience with the section tfc program; let him know if he can be of help. This is my 1st month back as your SM, & I'm looking forward to working with the section again. If anyone in the state is interested in a section appointment, let me know. We're looking for ORS, PIO, OO & ATC appointments throughout all areas of the state. There are open EC positions on the W Slope & the E Plains. The Denver & CO Springs areas have new SWN Coords: congrats to WDØHNQ, Denver & N4TGO, CO Springs. A reminder to ECs to get your SET reports in even if you participated in the statewide SET; let's try to improve last yr's reports. 73, KQØJ. Nets: COL; QNI 1528, QTC 87-79, QNF 794, 31 sess. CWN QNI 67, QTC 77, QNF 164 31 sess. CWXN; QNI 1435, QTC 1100, QNF 2790, 31 sess. HNN; QNI 1895, QTC 121-607, QNF 1010. 31 sess. NCTN; QNI 158, QTC 67, QNF 210, 31 sess. SCTN: QNI 225, QTC 20, 27 sess. Tfc: WBØYNS 1282, WØLVI 615, K9DCX 549, KØYXK 442, NØHFZ 390, KCØVL 387, WTØG 330, WØACH 234, WØGVT 230, NØGVC 221, WBØVET 192, NØFCR 174, WØLJF 101, NØCYR 96.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. STM: ND5T. NMs: WA5UNO, K6LL & W5QNR. TC: W8GY. ACC: KA5BEM. SW Net meets dy, 3583 @ 0230 UTC, handled 63 msgs with 86 check-ins. NM Roadrunner Net meets dy, 3939 @ 0100 UTC, handled 100 msgs with 1281 check-ins. NM Breakfast Club meets dy, 3939 @ 6:30 AM, handled 144 msgs with 943 check-ins. Yucca 2-mtr Net, 78/18, handled 13 msgs with 426 check-ins. Caravan Club 2-mtr Net, 66/06 handled 10 msgs with 136 check-ins. SCAT Net, 66/06 handled 7 msgs with 589 check- ins. Into Net 12/72, with 88 check-ins. ZIA Sun Noon Packet Net with 62 check-ins. The Alamogordo Hamfest was certainly a success & thanks to Luck Hurder, KY1T, from ARRL HQ & Marshall Quiat, AGØX, Dir, Rocky Mtn Div, for their participation. Congrats to Milt Jensen, N5IA, father of the ZIA Link, as the NM Ham of the Yr for 1990. He is certainly well-deserving of this honor. Tfc: KF4VF 89.

UTAH: SM, Rich Fisher, NS7K—SEC/STM: Jim Brown. PIO: Lon Stuart. The Basin had a good turnout with the getaway. Duschene Co approved getting radios & they are on order. Davis Co ARC & Andogden ARC are having Amateur Radio classes this fall. There were a lot of upgrades this summer—congratulations to you all. QTC NS7K 72, N7ASY 2633, N7JLC 5. 73, Rich, NS7K

WYOMING: SM, Jim Raisler, N7GVV—ASM: Steve Cochrane, WA7H. SEC: Jim Anderson, W7TVK. STM: Dan Ransom, K7MM. PIC: Wilson Sellner, WB7RRZ. Shauna Richards, N7NGT, was selected as the 1989 recipient of the Hiram Percy Maxim Award— congratulations! A big thanks to Steve, WA7H, for filling in for me at WIMU & for accepting the chairmanship for WIMU 1991. Steve will be asking hams around the state for help with the various committees; please say Yes.

Net	*Freq*	*Time/Days*	*QNI/QTC*	*NM*
Cowboy	3927	6:45 PM M-F	685/3	WB7K
Pony Express	3923	8 AM	146/0	W7MZW
Area 5 ARES	2M		58/0	W7ILL
Albany ARES	2M		19/0	WB7K

Tfc: W7SQT 177.

SOUTHEASTERN DIVISION

ALABAMA: SM, Mildred Cullen, AA4XF—ASM: W4XI. TC: N4MOK. ACC: KA4PKB. OOC: KE8BP. STM: W4PIM. PIC: KB4KCH. SGL: WO4W. SEC: AB4EZ. BM: KA4ZXL. Tnx to Calhoun Co ARES/RACES for their help during a recent chemical leak. DEC, Norris, KB4KOY, with Tom, WB4ESO, as NCS & 17 amateurs were called at 4 AM & worked for 8 hrs with local emerg officials. Thanks to these dedicated hams. I regret to rpt 3 Silent Keys, Robert A. Harbor, KC4IXP, of Hamilton; Edwin C. Hand, W4NFW, Andalusa; & Lawrence E. Coleman Sr, KB4LS, B'Ham. To their families & friends, our sympathy. Thanks to Jack Rasnick, KM4FQ, DEC of NW AL & Bryan Turner, AB4AP, DEC for H'ville & surrounding cos—contact them & offer your help. Welcome to the newly formed Gulf Coast Chapter Telephone Pioneers ARC of Mobile. Officers are: Pres Scott Hillman, WA4TYH; VP Marc Molyneux, N4EM; Dir Warren Locklin, N4RUC. Montgomery hamfest is Nov 24. OOs, please send monthly rpts to OOC KE8BP & DECs, please send monthly rpts to SEC AB4EZ: These are important for records—thanks. ADN: QNI 628 QTC 172, 31 sess. ASN: QNI 376 QTC 100, 28 sess. ATNM: QNI 3024 QTC 118. AI ARES/RACES Net, Tues 3.965-0130 & Sat 7.260 1630 UTC. BPL: WA4JDH. PSHR: WA4JDH W4PIM W4QAT N4XFX W4CKS WB4MMD WB4IDB AA4XF KM4JD W4IBU AB4EZ KA4RZZ WA4RNP. Tfc: WA4JDH 706, W4PIM 255, W4IBU 196, W4CKS 122, KM4JD 107, W4QAT 88, AA4XF 75, N4XFX 65, KC4IVI 60, WA4RNP 47, WB4MMD 31, WB4IXA 12, W4XI

12, KA4RZZ 10, WB4IDB 10, AB4EZ 10, KN4HD 4, WB4TVY 2.

GEORGIA: SM, Eddy Kosubucki, K4JNL—ASM & BM: AA4UA. SEC: NC4E. STM: WB4WQL. Pkt: W4QO. ACC: KM4IH. OOC: W8BLA. SGL: WB4UWV. TC: W4ZTL. Ham Radio & Computer Expo '90 in Lawrenceville Nov 3-4; this is always a great one. Once again, the BGMRC of Newnan did their part in showing off ham radio at the annual Power's Crossroads Co Fair. Confederate Signal Corps 1990 officers are: Pres K4KQK; VP WA4WBL; Rec Secy W4BJT; Corr Secy: W4USG, Memb: Act W4DPZ; ditor. KA4KRN, Editor: W4BJT. Ga SSB Assn elected pres N4OTC; vp KA4HHE; secy/treas W4HON; dirs WB4LBM & WB4CJB. KA4HHE, GA Amateur of the Yr, & I presented a certificate of merit to W4HON for his yrs of service to the Assn. Thanks to the efforts of Carol, N4WBI, all 13 pupils received their licenses at the Addison Elem School, also known as "The Wacky Bear Institute." We sure can use more of these kind of instructors to start the youngsters into this great hobby. Thanks, Carol. At this writing (Sept), MATPARC doesn't know how it placed in the Goodwill Games, but they had lots of fun. If you have somebody in your club or group who needs to be recognized—please write & let me know. I hope the section had a successful SET. Now's the time to get the reports in to our SEC, NC4E, for tabulation. Dalton ARC officers for 1990: pres N4OTC; vp N4TFE; treas KM4DQ; secy KC4HUR. Nets are an important part of Amateur Radio, we exist because of the public service we render to the citizens of this great country & to the world during disasters, etc. Knowing how to handle tfc & perform during emergencies is important. Training is participating in nets, then you can be ready when needed. Tnx & God Bless, Eddy. Tfc: KA4HHE 183, WB4DVZ 82, KC4BHX 75, WB4WQL 53, W4AET 47, N4MWR 24, WD4DSS 21, N4UZ 14, K4BAI 2, K4JNL 2.

NORTHERN FLORIDA: SM, Rudy Hubbard, WA4PUP—ASM: N4ADI. ACC: KI4BI. BM: N4GMU. OOC: WB4GHU. SEC: W4MLE. SGL: KC4N. STM: KB9LT. TC: N4SS. PIC: KB4LB. Digital: K4CY. ARES NM W4FI doing a good job with the new ARES Net. W4MLE, SEC, is revising the NFL Section Emergency Plan. DECs requested to submit updated written ARES plans and the ECs to submit updated written ARES plans to the DECs. By the time you read this, SET will be upon us. Section plans for SET will have been received by now & everyone is urged to participate, if for no other reason than to acquaint newcomers on how to handle emergency tfc & test local procedures. Which brings to mind—formal written tfc has slowed down a bit. There are amateurs who need training on how to prepare & pass tfc. Jerry, K4UBR, is doing a great job on the NFPN. He needs NCSs as alternates—get in touch with Jerry. Anyone interested in other programs, ie, PIO, ATC, OBS, or OO, contact any of the staff listed & they will see that you get the data needed to take on responsibilities for the Section. Clubs that have sent me their newsletters, thank you; if your club has not placed me on your mailing list, won't you please do so? I want this column to be of interest to all & the only way to do that is to get input from you. Clover Leaf ARC renewed as Special Service Club. George, W4MLE, reports new appointments: DEC, Capital District, W1XO; Leon Co OES, WN4IIV; congratulations to both. 73, Rudy. Tfc: N4SS 383, K4UBR 335, KB9LT 252, WD4IIO 240, WA4QXT 156, N4JAQ 125, WA4EYU 97, N4GMU 84, WA4GYR 73, KC4FL 66, W4MLE 65, WC4D 61, KI4CQ 60, AA4FG 51, WB4GHU 50, N4JHI 50, WB4DNT 40, WA4PUP 35, W4KIX 31, KB4RTG 30, N2AOX 30, N4ADI 28, N4OZD 27, KM4NN 23, KC4MDY 22, N4QYS 22, WA4APQ 18, N4DY 18, NF4O 18, N4UF 19, N4YHE 15, W8IM 14, W4UEA 14, K4UTY 12, WA4NBA 12, WA4STZ 5.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—STM: K4ZK. SEC: W4SS. Asst SEC: WB4WDK. TC: KI4T. BM: WD4KBW. PIC: N4PBF. AA/OOC: WB4GHU. ACC: K4EUK. SGL: KC4N. Pkt Mgr: K4CY. I was sorry to hear from WA4EIC that WD4CHO of N Ft Myers is seriously ill. Leroy's pkt address at this time is WD4CHO @ WD9AGK with subject as Floyds Knobs IN 47119, for those wishing to contact him via pkt. The Ft Myers ARC *Modulator* had an interesting article on lightning written by K4FQU. The Sarasota ARC *Amplifier* reports that the 440 repeater has changed freq to 444.925 MHz transmit & 449.925 MHz receive. Word from the Titusville newsletter is that the antenna on the Titusville Police Dept's tower was tested & there was good coverage all over town using a hand-held transceiver at the base station & in the mobile units. The Englewood ARS newsletter indicates that they will provide comms for the Englewood Pioneer Days in Sept & will assist in another beach clean-up. The IBM ARC of Boca Raton bulletin & the ARA of SW FL *Bulletin Board* provided info about the exhibit at the Discovery Ctr in downtown Ft Lauderdale. The exhibit, "Forces of the Universe," explains the fundamental forces, including the electromagnetic force. An Amateur Radio display will be part of the exhibit & will be a registered ARRL Special-event station with special QSL cards. The exhibit will run Sept 15-March 15, wknds only (10-5 Sat, noon-5 Sun). For more info, contact David Oppenheimer, KB4NRC, at 305-563-1226. The S Brevard ARC *Sparc* has an interesting article by KI4TD relative to projecting storm tracks. A newsletter clipping mailed to me from Lee Co featured Lucille Gainer, KI4ZW. It was a nice article describing her efforts as a MARS operator in providing comms between military personnel sent to the Middle East & their loved ones back home. N4KFU, manager of the FL Medium-Speed Net, sent an informative newsletter describing net activities. Congrats to the W Palm Beach ARC, which has been officially renewed as a Special Service Club. The St Lucie Rptr Assn *Repeater* regretfully announced that W4RVE became a Silent Key. He was a native of Belgian Congo, Africa & came to the area here 6 yrs ago from Fayetteville, NC. He served with the US Navy during 3 wars. K4CY sent a pkt showing the amount of NTS tfc handled by W4DPH 265, KB4VOL 59, W8DUV 60, K4CY 127, WD4HIM 59, N4GXX 8, K4GBB 42, KØZXF 10, KB4PLH 2 & WB2WPA 70. WB4WDK, Asst SEC, had the following ECs reporting to him this month, as of press time: S Brevard, W4MSQ; Dade, W4IYT, Highlands WB4WDK, Indian R, N4YFX; Lee; WA4PIL, Palm Beach; K4ZRP, Pinellas; N4OBT, Sarasota; N4LML; Monroe W3YWK; Okeechobee, K4INJ. The Florida Keys ARC *Bulletin* stated that KC4JCU has been assigned to investigate obtaining permits & other requirements needed by the club to possibly hold an Indian Key DXpedition. N4SMD, OES, reports he completed 27 phone patches from Navy ships in Region 3 & 1 H&W from Guatemala. Note: The ARRL Info Net will continue to operate on 3940 kHz, but with a time change. We'll meet at 7:30 AM ea Sat.

TUCKER SURPLUS STORE

1717 RESERVE ST.
GARLAND, TX 75042

ALL UNITS GUARANTEED OPERATIONAL WITH MANUAL
ORDER WHILE SUPPLIES LAST!

SSB50 SPECTRUM ANALYZER SYSTEM

This solid state unit is ideal for checking the performance of amateur or commercial radios. The system consists of an MF50 mainframe, a CA5 panalyzor signal indicator, a TTG3 two-tone generator, and an RF8 tuning head. The standard range is 20 MHz to 40 MHz but is usable to 200 MHz at reduced sensitivity. Two-tone generation is from 20 Hz to 20 KHz.

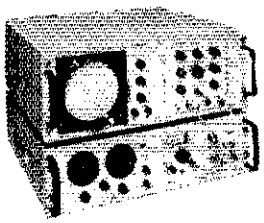
Singer SSB-50 . . . . **$ 795.00**

Add the Singer REC-2 range extending converter to your SSB-50 system and increase your low range coverage from 10 Hz to 2 MHz.

Singer REC-2
Range Extender . . . . **$ 100.00**

SSB50'S MANY USES

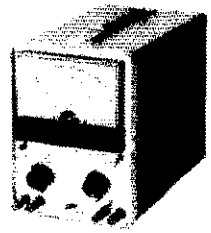
- **SIGNAL ANALYSIS FOR SET-UP, OPERATION AND MAINTENANCE OF SSB, AM, FM, AND MULTIPLEXED COMMUNICATIONS EQUIPMENT**
- **MEASURES TRANSMITTER LINEARITY BY TWO-TONE INTERMODULATION DISTORTION TEST**
- **ANALYZE SIDEBAND HUM**
- **CALIBRATE FM SIGNAL GENERATORS**
- **PERFORM QUANTITATIVE MEASUREMENT OF RF HARMONIC LEVELS**



DUAL-CHANNEL--DUAL READOUT AC VOLTMETER

- **VOLTAGE RANGE FROM 100 μV TO 300 V IN 12 RANGES**
- **dB RANGE FROM -80 TO +50 dB**
- **FREQUENCY RANGE 10 Hz TO 500 kHz**

This unit actually measures two separate inputs at the same time and they are totally independent of each other. It has a black needle for input one and a red needle for input two.

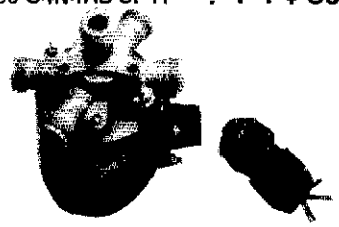


Leader LMV-89 Dual
Channel Voltmeter . . . . **$ 95.00**

COAX SWITCHES

Highest commercial quality! Made by Transco and TRW. Type "N" connectors, 28 VDC. Handle maximum legal power into VHF range, good to 12.4 GHz at reduced power. Use for remote antenna switching, amplifier switching, other applications.

Type C4N4AB SP4T . . . **$ 85.00**



805C00100 SPDT Latching **$ 75.00**
310C00100 Transfer Latching **$ 89.00**
15100-T101 SPDT . . . . **$ 59.00**
810C00100-30 SPDT Failsafe **$ 85.00**

Other Types Available, Please Inquire!

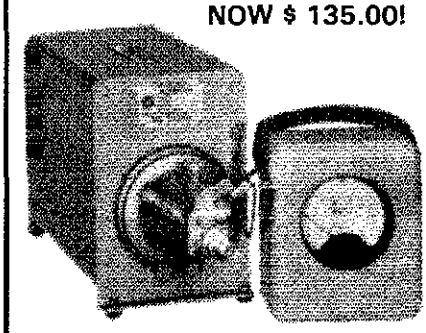
BIRD 67 TERMINATED WATTMETER

(Combination Wattmeter/Dummy Load)

- **500 W POWER RATING**
- **DC-500 MHz FREQUENCY RANGE (LOAD)**
- **±5% WATTMETER (30-500 MHz)**
- **WATTMETER USEFUL TO 14 MHz AT REDUCED ACCURACY**

This excellent Bird Termination has low VSWR (< 1.1) over the rated frequency range and is useful to 1000 MHz at slightly higher VSWR. It has a type "N" input connector and comes with a large 4 1/2 inch wattmeter.

Only . . . . . ~~$ 195.00~~
NOW $ 135.00!

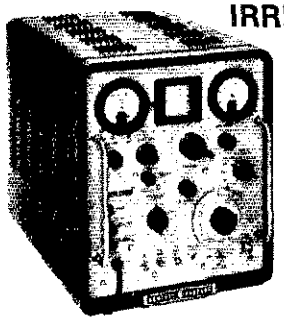


BOONTON 91CA RF MILLIVOLTMETER

Measures small, high frequency signals accurately and easily. Frequency range is from 10 kHz to 600 MHz. Measures from 300 μV to 3 V full scale in eight ranges. The Boonton 91CA comes complete with a high impedance probe.

$ 195.00

LEGENDARY GENERATORS IRRESISTIBLE PRICES



HP 608D . . . . . **ONLY $ 175.00**
(10 MHz to 420 MHz)
HP 608E . . . . . **$ 250.00**
(10 MHz to 480 MHz) Later Model

- **0.1 μV - 0.5 V OUT**
- **0 - 95% AM MOD**
- **CW or PULSE**
- **±0.5% FREQ. ACCURACY**

HP Scope Plug-ins at low prices! Please call with your needs

Used Ham Equipment, Antennas, and Accessories, Test Equipment, Power Supplies, Computer Surplus Parts, Wire and Cable, Unique Electronic Assemblies and Gadgets.

ALL EQUIPMENT F.O.B. GARLAND, TX
VISA & MASTERCARD OK - NO C.O.D.s

HOURS:
T, W, Th, F Noon-6PM
Sat. 8:30 AM-1 PM

Call for a copy of Tucker's Equipment/Manual Listing!

***Ask for Hazen Smith**
in Dallas (214) 340-0631
TX WATTS 1-800-749-4642 ex 135
WATTS 1-800-527-4642 ex 135

If the FPTN runs past 7:30 AM, AIN will start when they finish. 73 de WA4PFK. Tfc: W3CUL 3102, W3VR 1334, K4FQU 368, WA9VND 334 W4NFK 309, WA4EIC 243, KB4WBY 243, K4EUK 240, WA4PFK 215, KD4GR 209, K4ZK 203, WX4J 187, K4SCL 175, AA4HT 151, N4KFU 142, KB4KXV 140, KB6ECH 138, W4DWN 117, W4MEE 100, WT4F 96, KA4FZI 93, WB4WYG 93, WA4RUE 73, K4IA 58, W3TLV 57, AA4BN 54, WD4KBW 53, WA4NBE 52, AA4CH 52, KA4NXF 50, N4YQU 43, N4WAN 38, AB4WQ 34, K4JI 33, WB4GCK 33, N4XZR 26, KN4CM 19, KB4MON 17, K3KT 17, KC4VK 17, W4VQE 16, N4ILN 13, W1KAM 10, W3IJR 9, W4NSY 8, N8ABC 8, W4WYR 7, KA8GYF 7, W4MFD 5, WA4PIL 5, KA4GDU 5, N4PSV 4, N4YWC 3, N4RHJ 3, WA8EXA 2, N4OIA 2, AA4IF 1.

SOUTHWESTERN DIVISION

ARIZONA: SM & Acting SEC, Jim Swafford, W7FF—ASM: Ray Bass, K7OMR. STM: Robert Howe, W7EP. ACC: Robert Drake, N7ECE. BM: Art Marshall, W1FJI. OOC: John Moore, NJ7E. SGL: Jim Bailey, KE7WD. TC: Bill Jorden, K7KI. Still looking for a PIC—any volunteers? Also need replacement SEC, as I'm afraid I haven't done a good job of it because of other demands on my time. While at SW Div convention in San Diego, attended mtgs & exchanged ideas with all SW Div SMs, plus League Pres Larry, W4RA & our own Div Dir WA6WZO. SANDARC, who sponsored the convention did a nice job—congrats. Next yr's Div Conv will be in Scottsdale at the Safari Resort, Oct 11-12, 1991, hosted by Scottsdale ARC. They also plan to sponsor the ARCA Spring Hamfest at Scottsdale Community College, same as this yr; date to be announced. New ARCA officers for 1990-91: Chmn Lee Pemberton, WB7BXB; Vice Chmn: Cliff Hauser, KD6XH; Treas: Jeff Hanna, WB7RFY. No Secy as yet. 73, Jim.
Net, Arizona Tfc & Emerg Net; Abbrev, ATEN; QNI, 627; QNI, 85; QTC, 31; Liaisons, TWN. Tfc: W7EP 224, K7RLL 79, W7OIF 67, K7POF 25, N7ETP 12.

LOS ANGELES: SM, Phineas J. Icenbice Jr, W6BF—The Amateur Radio service in LA does handle tfc! Our tfc champion again is Ted Sharp, K6UYK, with 1127 total. According to Kathleen, N6MAD, the following tfc leaders on W6FNO/R were N6NYK 100, N6TFS 47, KC6BCC 24 & K6IDU 22 (total 263). The latest rumor from the LA City Ordinance is that 3 versions have been submitted up the chain of command with a tower height of 65 feet included (these documents have not been released to the public). Joe Merdler, N6AHU, is responsible for coordinating the passage of the proposed ordinance thru to the Council Chambers. Please be on the lookout for any indication of action & report it to Joe at 818-983-0555. One clause we want to have is the "grandfather clause." Joe is on the Council activity notification list at City Hall. However, anyone who frequents the City Hall area, please call Joe with the latest info. Our intent is to be nice & fill the Council Chambers at the correct time with a unified agenda. (See Sep *QST*, p 43). The Volunteer Counsel members in this area are N6AHU, W6/CE4CR, K06E, KB7FF, KB6FO, KC6I, N6KQM, N6KUB, KY7M, N6MI, WA6MQN, KV7O, W6OQC, WW6P, WA7QBW, WB7RVJ, KB6SI, WA9STI, W6US & WA6UUY. If any of these hams are near you, please call them for legal assistance involving the Amateur Radio service. The ARRL Annual Report for 1989 is on the street. One common-denominator item on many pages is the matter of local towers & antennas. Another high-priority item casually passed over is the preservation of amateur freq allocations. The Nat'l Telecommunications & Info Agency (NTIA), shares responsibility with the FCC for mgmt of the radio spectrum. The *Federal Register* for Dec 8, 1989, carried a Notice of Inquiry inviting comments from the public (taxpayers) on a wide-ranging series of questions. If you missed the notice or the Mar 30, 1990, deadline, you might want to check your library or write to NTIA. This info should also be in the files of your Congressperson. This is also the place to file your complaints in writing if the PUC will not help solve your power-line noise problems. Our TC Edgar, N6OU & I will be glad to set up RFI training & demo sess for your club's RFI committee. 73, Phineas, W6BF.

ORANGE: SM, Joe Brown, W6UBQ—ASMs: Riv Co—Bob, W6LKN, 714-686-3823; Org Co—Ralph, WB6JBI, 714-776-9272; SB Co— Ken, WA6ZEF, 714-983-1272; Inyo Co—Steve, WV6T, 619-872- 1199; PIC—Jerry, AD6A, 714-351-8824. PIO Mark, KC6UB, reports CVARC & Desert RATS clubs are conducting Novice classes this fall. Fred, W6TKV, says that as we move away from the peak of the sunspot cycle, the 10-mtr band will have fewer short-skip openings; a good incentive for Nov/Techs to upgrade so they can use the low bands. Fred also sends along a nice article from the Corona-Norco newspaper showing hams sending free msgs from the Corona/Norco ARC. Also rcvd a letter of appreciation from the Parks & Rec Dept for their comms support during the July Fireworks Spectacular. Karl, WB6YLO, reports that George AFB will be celebrating Armed Forces Day Nov 11 & requested comms support from Tri Co ARA & a booth highlighting ham radio. Chip, K7JA, of the W ARA, enjoyed his participation in the 1st World Radiosport Team Championship in Seattle. WARA has been officially renewed as as ARRL Special Service Club—congrats! The Orange Co Fair radio booth won 2nd place & Loraine McCarthy, N6CIO, did a great job putting it together. Fullerton RC's July T-Hunt turned out to be a short one; N6MI's flea-power rig failed, so he couldn't bury it. He resorted to his mobile & was quickly "nailed" by K6PHE, N6FSL & AA6DD. The Orange Section placed 1st in CA & 6th nationally in the 1989 SET; make plans for SET 1990 Oct 20-21. SEC WA6ZEF chaired a SET planning mtg at the SW Div Conv—a statewide earthquake was decided on with the 1st 2 hours using emer pwr only. Our SM, W6UBQ, chaired his biannual mtg of section officials. STM WF6O reports: The tfc seminar at the SW Div Conv was well-attended & had new people express an interest in tfc handling. NTS will be an active participant in this year's SET. There are 3 digital NTS BBSs in Org Co—WF6O-1, KJ6YT & N6RKY-1. KA6GND is a new PBBS in Moreno Vy. SCNV; 31 sess, QNI 355, QTC 133, PBBS tfc: WF6O-1 158. Ind Tfc: WF6O 417, K6ZCE 162, AD0A 63, N6HIW 61, KA6HJK 56, KA6TND 52, W6RE 46, N6VEV 38, KD6GX 17, KA6GND 17, N6OKS 10, K6PGG 8, KA6JOB 8, KB6YBP 4. Very 73.

SAN DIEGO: SM, Arthur R. Smith, W6INI—TC: N6JZE. SEC: W6INI. DECs: K7DCG NE, AA6JE S, N6NKJ E. STM: N6GW. SCN/1 NM: KI6ZH. K6HAV has been a prime mover in the Palomar ARC as long as I can remember. For 17 yrs, as ed. of the *Scope*, he's produced a most outstanding club newsletter longer than any other San Diego Co club ed. He's been a VE for SANDARC VEC since the program started more than 4 yrs ago. Our loss is Salt Lake City's gain—good luck, Ralph. The N Co ARES Net meets ea Sun at 0830 on 146.73 (-). Managed by W9FQN, he's assisted by WB6HCD, WB6HFE, W6JSP, KB6NMK, KB6NZA, N6NZX, N6QJE, N6UIA, WA6UTQ & N6WTE. At the Aug Palomar ARC picnic, the hidden-transmitter hunt winners were KH6TL, KB5MU, WD8KUR & N6URW. We know the SW Div Conv was a success; whenever we saw W6GIC, she was all smiles. Hats off to her & her dedicated committee. Escondido ARS sponsors a T-hunt on 3rd Sats at 0900. For location & info, call on 146.88 (-). SCN1 29 sess, QNI 242, QTC 198. SDCTN: 30 sess, QNI 309, QTC 109. ARES/CW: 4 sess, QNI 6, QTC 1. Tfc: KI6ZH 384, KT6A 154, WA1ZEN 59, N6RVO 52, N6GW 18, WA6IIK 3.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA— ACC: KB5AH. ASMs: N Ventura N6MA, S Ventura W8AKF, Santa Barbara WB6BYU, San Luis Obispo WB6IIY. BM: N6TNG. STM: N6NLW. OOC: W8AKF. TC: W6KFV. DECs: Ventura WB6RVA, S Santa Barbara KA6KGF, San Luis Obispo W7AZF. SM Tom Geiger, W2KVA, is enjoying a couple of wks vacation back in W2-land. This month's surrogate reporter is Bill Hoover, KB5AH. Exhausted ham emergency communicators all over the SB Section heaved a well-deserved sigh of relief in Aug. With the disastrous Santa Barbara fire now history & no major incidents during the month, we were able to enjoy our late-summer highlight, the SW Div ARRL annual gathering & jolly bash in San Diego. Wonderfully hosted by SANDARC & well-attended by hams from all over the SW US, it was a busy wknd, filled with activities & pleasant memories. Scottsdale, AZ, hosts next yr's event. Earlier in the month, the Santa Barbara ARC celebrated its annual Hamfest, attracting visitors from throughout the Section & featuring appearances by our SM & ARRL SW Div Dir Fried Heyn, WA6WZO, good fellowship, tasty chow & a broad selection of excellent drawing prizes, the day was pronounced a rousing success. While the Section was quiet, the VEs were active with 4 exam sess: Estero ARC (San Luis Obispo) Techs KB6SUM & KB6QMF; VEs W6JU, N6MUS, W7AZF, AA6CT, W7MSW, N6RP, KY6D & W6PA. Paso Robles ARC: Tech KC1MHY; Gens KC6GQN & N6WRV; Adv WB6TAG, N6ZGJ & N6XFO; VEs W6MUS, W7CB & NQ6W. Conejo Valley ARC (Thousand Oaks) Gen N6ZAJ & KC6ENU; Adv N6UNX & N6TZX; VEs W6TC, N6LQ & KK6CY. Congrats to CVARC on their 1st VE sess! Santa Barbara ARC Techs Larry Moore & Hubert Stamps (unl) & KB6CAH; Gens KC6GNF, N6WHZ, KC8LFJ, N6ZKJ & Sherwood Myall (unl); Adv N6HLS; VEs KB5AH, AA6MX, WB6SJV, AA6BD, AA6VH, AA6OT, WR6V, KI6XG, AA6JG, KK6AD & WA6VNO. Being a VE team leader, I am quick to appreciate the time, work & energy given so freely by every ham who serves as a VE. The only payback is the intense pleasure of being a part of someone's success. I commend you who donate your skills so others may upgrade almost whenever they like. If you hold an Adv or Amateur Extra Class license, ask your local VE team leader about becoming a VE—this is an opportunity for you to do for someone else what a VE group may have done for you. 73 de KB5AH. Tfc: W8AKF 6852, N6NOR 98, N6NLW 86.

WEST GULF DIVISION

NORTH TEXAS: SM, Dan Dansby, W5URI—ASMs: W5GPO, W5IWE, KG5SC, K5MXQ, KO5I, WD5IVD, KF5BL. ACC: KA1CWM. STM: W5VMP. SEC: N8AJP. OOC: WA5YKO. TC: K5SXK. PIC: WW5L. (SM Dan Dansby, W5URI, asked me to write his column again this month because of an unexpected trip he had to make to the the E TX area—Don, KA1CWM.) Looks like everyone had a good time & enjoyed the Wichita Falls Hamfest again this yr. Always good to see so much participation & the continued growth of local hamfests. Hope to see you at the Texoma Ham 'O Rama, Campout & hamfest the last wknd of Oct, especially hope you can attend the ARRL Forum & hear the latest on ARRL activities. I know many of you have upgraded recently, however, special congratulations must go to a fine couple, Charlie & Bettie Stevens, who upgraded to Amateur Extra Class. Congratulations to Hall Bond, K5SZB, who also became an Amateur Extra Class. There's a Tri-Co Net in the Cedar Creek area every Thurs at 8 PM on 147.02 MHz. A new amateur equipment-only sale the last Sat ea month, 5 mi N of Athens. Good things are happening in E TX; check them out. Ray Jones, W5IHK & Frank Boudin, W5GAA, recently became Silent Keys. We will miss them & their contributions to amateur activities. Congratulations to the Sabine Valley ARA, which has a new ATV system operational. They do a lot of public service work & have attained extra-good publicity for ham radio. A big congratulations to the Temple ARC for hosting the CW Ham-Jam & especially to Merrill, W5AMK & Madie, W5DQF, for their fine organizational efforts. We welcome the Navarro Co ARC back to active status. We continue to stress the need for more Section appointments, especially as PIOs, OBSs & LGLs—contact your SM to see if you qualify for one of the appointments. Vote & mail in your ballots on all ARRL elections promptly. 73, Don, KA1CWM. Tfc: W5YQZ 379, W5TOO 218, KF5BL 185, WI5J 130, W9OYL 127, NK1N 118, NZ2T 100, KC5NG 61, N5PGZ 54, KD5RC 53, N5KCL 45, AC5Z 40, KB5BNU 14.

OKLAHOMA: SM, Joe Lynch, N6CL— This month I regret to report the passing of Lee Wilder, WD5CLB. Lee was a long-time participant in emergency comms & a regular check-in to such nets as OPEN, STN & OTWN. More on Ham Holiday: The grand prize winner was Bill Pace. Through the efforts of Larry Hazelwood, W5NZS, SGL, the Mayor of Oklahoma City, Ron Norick & Gov Henry Bellman, declared the wk surrounding Ham Holiday "Ham Radio Week." Alan Mitchell, weatherman for KWTV Ch 9, presented the WX seminar Fri night. After he found out about the proclamations, he gave an excellent plug for Ham Holiday & ham radio in general during his 6:00 report Sat night. One of the least-mentioned but hardest-working members of your SM's cabinet is Bill Goswick, K5WG. Bill is the OOC for the state; all the state's appointed OOs report to him. He has several OOs working for him now, but could use more volunteers. Contact him directly if you're interested in that position. That's all the news for another month. See you at the hamfests (Texoma at the end of Oct, about the time you get this issue of *QST* & Enid in early Nov). 73 for now de Joe, N6CL. Tfc: K5CXP 365, N5IKN 172, WA5OUV 141, WA5OGC 42, WA5ZOO 33, NQ5Y 4. PSHR: K5CXP, 1/30, 2/30, 3/12, 5/12, 6/146, T/230.

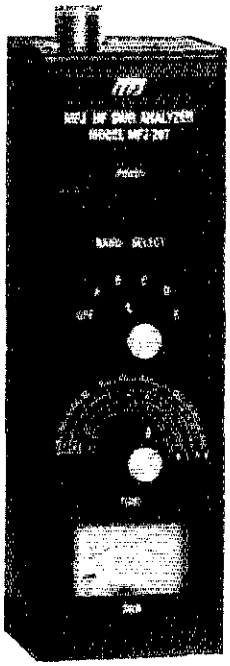
SOUTH TEXAS: SM, Arthur R. Ross, W5KR—SEC: K5DG. STM: WD5GKH. OOC: K5SBU. PIC: WA5UZB. BM: WA5WCY. ACC: WB5YDD. TC: NZ5U. SGL: K5KJN. ASMs, all above & N5TC. LGL W3KO, Bridge City, rprts city council seeks Unified Development Plan; may include antenna res-

MFJ ENTERPRISES, INC.
1991 Ham Catalog

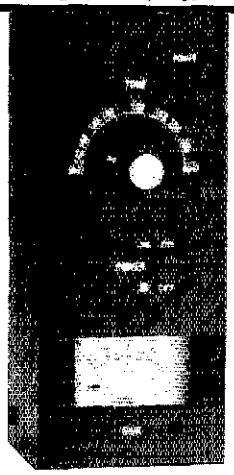
Pull out and Save

. . . your personal copy of this handy full-line MFJ Catalog. Make your station more exciting with these performance accessories from the world's leading manufacturer of amateur radio accessories.

MFJ . . . making quality affordable

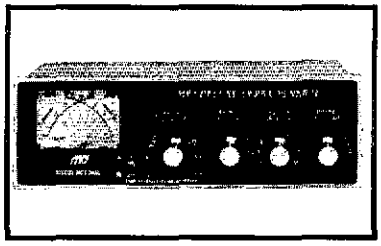


MFJ-207
HF SWR Analyzer

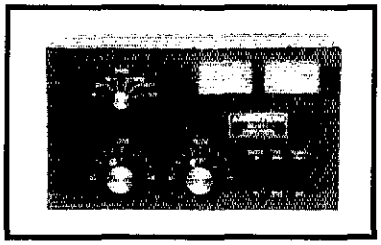


MFJ-208
VHF SWR Analyzer

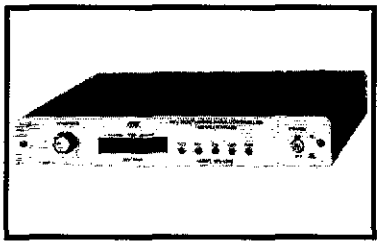
MFJ's innovative new SWR Analyzers instantly give you a ***complete*** picture of your antenna SWR over an entire band -- ***without*** *a transmitter, SWR meter or* ***any*** *other equipment.*



Antenna Tuners



Ameritron Linear Amplifiers



Multi-mode Data Controller

Welcoming AMERITRON into the MFJ family . . .

CO-SPONSOR

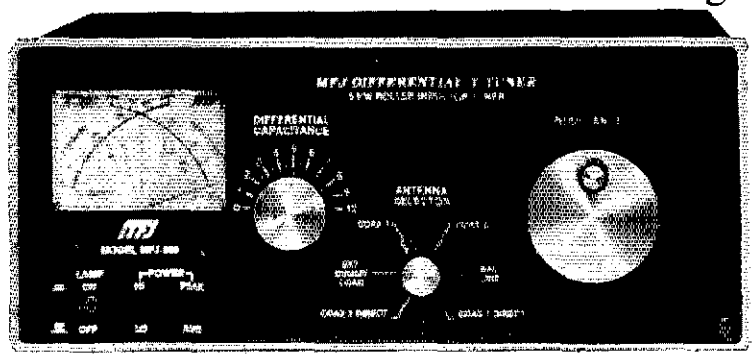
MFJ is proud to have served as a Co-Sponsor of the 1990 World Radiosport Team Championship.

MFJ 3 KW Roller Inductor Tuner

. . . lets you get your SWR down to *absolute* minimum for *maximum* power out -- something a tapped inductor tuner just can't do . . .

. . . plus you get a **peak reading** SWR/Wattmeter, 6-position antenna switch, balun for balanced lines and 1.8-30 MHz coverage . . . $289.95

- *Easy-to-use 2-knob design*
- *Covers 1.8-30 MHz*
- *Peak and average Cross-needle meter*
- *Differential capacitor*
- *Roller inductor with 3-digits turns counter*
- *Directional coupler*
- *Current balun*
- *Handle s 3 KW*



MFJ-986

$289.95

- *Made in U.S.A.*
- *1 year unconditional Guarantee*

MFJ's innovative new Differential-T™ Tuner uses a differential capacitor that makes tuning easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only *one* setting.

The new MFJ-986 is a rugged no-compromise 3 KW PEP roller inductor antenna tuner that covers 1.8-30 MHz continuously, including 160 Meters, MARS and all the WARC bands. **The roller inductor lets you get your SWR down to the absolute minimum** -- something a tapped inductor tuner just can't do.

A 3-digits turns counter plus a spinner knob gives you precise inductance control -- so you can quickly return to your frequency.

You get a lighted *peak* and average reading cross-needle meter that shows you SWR, forward and reflected power at a glance! A new directional coupler gives you even more accurate readings over a wider frequency range.

You get a 6-position antenna switch that lets you select two coax lines and/or random wires (direct or through tuner), balanced line and external dummy load.

A new **current** balun for balanced lines minimizes feedline radiation that causes field pattern distortion, TVI and RF in your shack. Ceramic feedthru insulators for balanced lines withstand high voltages and temperatures.

New Antenna Tuner Technology

MFJ brings you three innovations in antenna tuner technology: a new ***Differential-T***™ circuit simplifies tuning; a new ***directional coupler*** gives you more accurate SWR, *forward and reflected power readings*; and a new ***current balun*** reduces feedline radiation.

Differential-T Tuner™: A New Twist on a Proven Technology

By replacing the two variable capacitors with a single *differential capacitor*, you get a wide range T-network tuner with only *two* controls -- the differential capacitor and a roller inductor.

That's how you get the new MFJ Differential-T Tuner™ that makes tuning easier than ever, gives you minimum SWR at only one setting and has a broadband response that ends constant re-tuning. You'll spend your time QSOing instead of fooling with your tuner.

The compact 10¾ x 4½ x 15 inch cabinet has plenty of room to mount the silver-plated roller inductor away from metal surfaces for *highest Q -- you get high effic-iency and* more power into your antenna.

The wide spaced air gap differential transmitting capacitor lets you run a full 3 KW PEP -- no worries about arcing.

A New Directional Coupler: Accurate SWR and Power Reading

MFJ's Cross-Needle SWR/Wattmeter gives you more accurate SWR and power readings over a wider frequency range with no frequency sensitive adjustments.

That's because MFJ's new directional coupler gives you up to an order of magnitude higher directivity and coupling factor than conventional circuits . . . ***plus*** it gives you a flat frequency response that requires **no** frequency compensation.

The cross-needle meter lets you read forward/reflected power in 2 ranges: 200/50 and 2000/500 watts. The meter lamp is front panel switched and uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

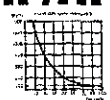
A switch lets you select peak or average power readings.

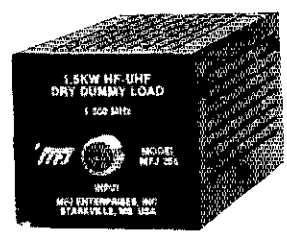
UHF/VHF/HF DUMMY LOAD

MFJ-264

$89.95

Shipping Code A





This versatile new UHF/VHF/HF "Dry" Dummy Load is another MFJ first! It lets you tune up to 650 MHz and get extremely low SWR. You can run 100 watts for 10 minutes, 1500 watts for 10 seconds. SWR 1.1:1 at 30 MHz, *below 1.3:1 to 650 MHz. Measures 3 x 3 x 7 in.*

A New Current Balun: Reduces Feedline Radiation

Nearly all commercially built tuners use a "voltage" balun. A "voltage" balun forces the voltages to be equal on the two antenna halves. It minimizes unbalanced currents ***only*** if the antenna is perfectly balanced -- not the case with practical antennas.

The MFJ-986 uses a true **current balun** to force equal currents into the two antenna halves -- even if your antenna is not perfectly balanced -- so you get minimum unbalanced currents.

The *current* balun gives superior balance over the "voltage" balun.

Minimum unbalanced current reduces field pattern distortion -- which concentrates your power for a stronger signal -- ***plus*** it reduces TVI and RF in your shack caused by feedline radiation.

The MFJ-986 Differential-T Tuner™: Get *absolute minimum* SWR

Get the tuner that incorporates the latest innovations by the world's leader in antenna tuner technology.

See your dealer today for the new MFJ-986 Differential-T™ 3 KW Roller Inductor Tuner. You'll be glad you did! MFJ wnmats to thank Boyce A. Taylor for sharing his idea for using a differential capacitor in a T-network tuner.

For your nearest dealer or to order call 1-800-647-1800

Call (601) 323-5869 inside Mississippi or outside of the continental USA. **FAX:** (601) 323-6551; **TELEX:** 53 4590 MFJ STKV

Mail Orders: Write **MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762.** Include payment and shipping charges (see chart below). **CREDIT CARDS:** Visa, MasterCard or Discover. Include account number and expiration date. **Foreign orders:** US funds only.

Shipping Code	UPS	Parcel Post	Canada	Foreign
A	4.00	6.00	7.00	30.00
B	5.00	8.00	9.00	40.00
C	5.00	9.00	11.50	50.00
D	6.00	11.00	12.50	70.00
E	10.00	17.00	24.00	90.00

ONE YEAR UNCONDITIONAL GUARANTEE: ***All products manufactured by MFJ*** (except as noted) ***have a one year unconditional guarantee.***

NO RISK ORDERING: ***30 day money back return policy*** (except shipping) ***on direct orders from MFJ*** (except software products).

All prices and specifications subject to change without notice or obligation. Catalog 1190

MFJ's *Deluxe* 300 Watt Tuners

. . . gives you ham radio's most popular tuner with *built-in dummy load*, a *peak* reading (and average) Cross-Needle meter, *full* 1.8-30 MHz coverage, antenna switch, balun and a full one-year *unconditional* guarantee for only . . . $149.95

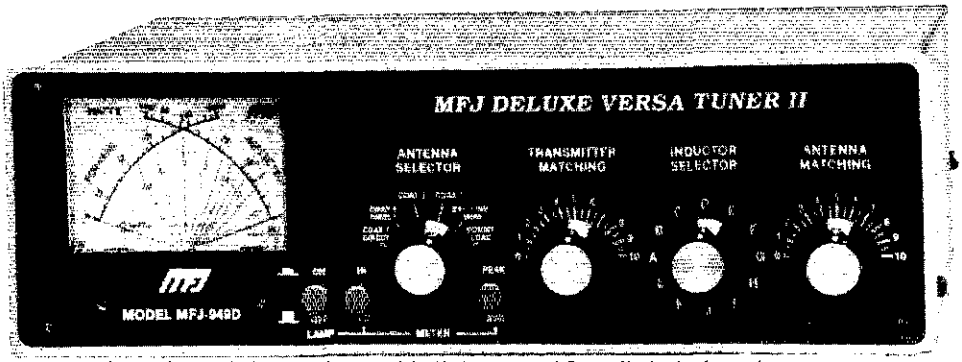
Made in U.S.A.

MFJ-949D

$149.95

Shipping Code B

- ***Peak reading meter***
- ***Built-in dummy load***
- ***Covers 1.8 to 30 MHz***
- ***1 year guarantee***



You won't find all the MFJ-949D features in *any* other 300 watt tuner, not even at twice the price — or twice the size.

Put the most power into your antenna

The MFJ-949D Deluxe 300 watt tuner matches your rig to virtually any antenna from 1.8-30 MHz so you get maximum power out.

It tunes out SWR on verticals, dipoles, inverted vees, random wires, beams and mobile whips fed by coax, balanced lines and wire.

Lighted peak reading meter

MFJ's *peak* (and average) reading Cross-Needle meter shows you SWR, forward and reflected power — all in a glance. Shows peak SSB power.

The meter is illuminated for easy reading in dim light. Has light switch. Lamp requires 12 V.

Built-in dummy load

A built-in 300 watt 50 ohm dummy load makes tuning up your rig soooo easy. It reduces needless QRM and saves your finals.

You'll find it handy for testing and repairing your rig, setting power level, adjusting your mike gain and more.

An external dummy load can cost you ***another $30*** — plus it takes up valuable space at your operating position and requires another cable.

Full 1.8 to 30 MHz coverage

Make sure the tuner you're considering covers *all* the HF bands . . . the MFJ-949D does.

Plus more . . .

You get an antenna switch that lets you select 2 coax lines (direct or thru tuner), random wire or balanced lines and built-in dummy load. You get a 4:1 balun for balanced lines.

Unconditional Guarantee

You get a full one year unconditional guaran-tee. We will repair or replace your MFJ-949D (at our option) *no matter what* for a full year.

Others may give you a 90 day limited warranty. What do you do after 90 days? Or before 90 days if they say, "Sorry, it's your fault"?

Precise control for minimum SWR

The MFJ-949D gives you more precise control for minimum SWR than any tuner that uses two tapped inductors.

Why? Because the two continuously variable capacitors in the MFJ-949D give you infinitely more positions than the limited number on two switched coils.

This gives you precise control to get minimum SWR and maximum power into your antenna.

After all, isn't that why you use a tuner?

High efficiency and a compact size

The MFJ-949D uses a single high-Q airwound coil that takes up a minimum of space without mutual coupling problems.

You get a highly efficient tuner that puts maximum power into your antenna *and* a compact 10x3x7inch size that fits right into your station.

Competing tuners using two tapped coils require a large cabinet — not just to house the coils but also to help reduce detrimental coupling between the inductors. The result? *A tuner that's **bigger** than your radio.*

Easy to tune

With the MFJ-949D once you select the correct inductance, you can turn on your transmitter and tune *both* capacitors for minimum SWR.

Tuners with *two* tapped coils make tuning clumsy, slow and tedious.

You have to turn off your transmitter *each time* you adjust neither of the two inductors. Then turn it back on to readjust the capacitor and to check for acceptable SWR.

MFJ tuners — Made in the USA

You get the most tuner for your money because MFJ tuners go directly from our factory to your dealer. We're not just an importer adding profits, tariffs and import charges.

Get yours today!

Why settle for an imitation when you can own an MFJ original? Get your MFJ-949D today!

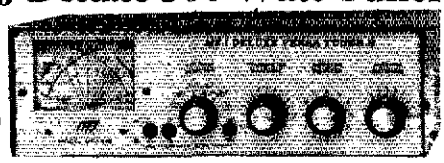
New MFJ Deluxe 300 Watt Tuner

NEW

MFJ-948

$129.95

Shipping Code B



If you don't need a dummy load but want **all** the other features of the MFJ-949D choose the new MFJ-948 for only $129.95.

The MFJ-948 features a **peak** reading **lighted** meter with a built-in lamp switch, a one year unconditional guarantee and is made in the USA.

Remember, with MFJ you're getting proven performance and reliability from the most trusted name in antenna tuners.

Why Choose an MFJ Tuner?

Hard-earned Reputation: There's just no shortcut. *MFJ is a name you can trust* -- more hams trust MFJ Tuners than all other tuners combined.

Proven Reliabliity: *MFJ has made more tuners for more years than anyone else* -- with MFJ tuners you get a highly-developed product with proven reliability.

First Rate Performance: MFJ tuners have earned their reputation for being able to match just about anything -- *anywhere.*

One full year unconditional guarantee: That means we will repair or replace your MFJ tuner (at our option) *no matter what* happens to it for a full year.

Continuing Service: MFJ Customer Service Technicians are available to help you keep your MFJ tuner performing flawlessly -- no matter how long you have it -- just call 601-323-5869.

Your very best value: MFJ tuners give you the most for your money. Not only do you get a *proven* tuner at the lowest cost -- you also get a one year *unconditional* guarantee and *continuing* service. That's how MFJ became the world's leading tuner manufacturer -- by giving *you* your very best *value.*

Choose your MFJ tuner with confidence! You're getting proven performance and reliability from the most trusted name in antenna tuners. Don't settle for less. Get yours today!

MFJ's *world famous* 3 KW Versa Tuner V

If you won't settle for less . . . here is the finest 3 KW tuner money can buy!

MFJ-989C

$349.95

Shipping Code E

Quite frankly, the MFJ-989C is not for everyone -- not everyone can afford it.

However, if you do make the investment, you'll get the finest 3 KW tuner money can buy.

The MFJ-989C is the perfect example of the old adage, "You get what you pay for."

For example, you get two massive transmitting capacitors that can pass amps of RF current. These variable capacitors can withstand 6000 RF volts with ease because they have the smooth polished plates and extra wide air gaps between plates. By beveling both the stator and rotor plates, you get an absolute minimum capacitance when the plates are fully unmeshed. This minimum and 250 pf maximum gives you an extremely wide matching range -- even on 160 and 10 Meters -- so you can match just about any antenna.

A roller inductor lets you tune your SWR down to the absolute minimum -- something a tapped inductor tuner just can't do. A 3 digit turns counter plus a spinner knob gives you precise inductance control -- so you can quickly return to your favorite frequency.

You won't have arcing problems with this roller inductor. That's because firm springs put considerable pressure on a silver plated contact wheel. This gives you excellent electrical contact with the roller inductor wire and eliminates arcing problem. By using more space between turns at low inductance you get smooth inductance control at high frequencies. Wide low inductance straps are used for high current connections. A new core gives you excellent RF properties for minimum loss. Ball bearings on both the front and back shafts give you a velvet smooth vernier feel. Steel end plates, steel shafts and ceramic insulators give you lifetime durability.

This High-Q roller inductor is mounted horizontally and centered vertically away from metal surfaces to maintain highest Q for maximum efficiency so you'll get full power out.

With three continuously variable components -- two variable capacitors and a roller inductor -- you get the widest matching range ***and*** the most precise control over SWR possible. You can tune your SWR down to the absolute minimum from 1.8 to 30 MHz, including MARS and the WARC bands. Plus you have complete control over Q. You can select a low Q when you want convenient broadband coverage or select high Q when you need an extra measure of harmonic attenuation -- it's your choice.

You get a new **peak** and average reading Cross-Needle SWR/Wattmeter with 200 and 2000 watt ranges. It makes tuning quick and easy because you can monitor forward and reflected power nd SWR all in a single glance. Its new directional coupler gives you accurate SWR and power readings over the entire 1.8 through 30 MHz range and there's no frequency sensitive adjustment to get out of whack.

You get a super heavy duty balun for balanced lines. It's made with two giant 2½ inch ferrite toroid cores and wound with teflon wire connected to high voltage ceramic feedthru insulators. It lets you operate high power into balanced feedlines without core saturation and voltage breakdown.

You get a two wafer ceramic antenna switch with extra large switch contacts to eliminate plugging and unplugging. It lets you select two coax antennas direct or through the tuner, balanced line or random wire and dummy load.

You also get a built-in 50 ohm 300 watt dummy load that makes exciter tuning fast and easy.

And there are small touches too. Like high voltage cerramic feedthru insulators for balanced lines and random wires. Aluminim cabinet with sub chassis that adds strength and RFI protection. Brushed aluminum front panel. Beautiful knobs with brushed aluminum inserts. Lighted meter with on/off switch (Light uses 12 VDC or 110 VAC with MFJ-1312, $12.95). A locking compound is used on all nuts and bolts that hold components in place. A flip stand that tilts the tuner for your easy viewing.

It fits right into your station because it's a compact 10¾ x 4½ x 15 inches -- it puts all your operating controls in front of you.

You get a one year unconditional guarantee. That means we will repair or replace your MFJ-989C (at our option) no matter what happens to it for a full year. You can also rely on continuing service from MFJ Customer Service Technicians -- no matter how long you have it.

The MFJ-989C is not for everyone but if you want the finest 3 KW tuner that money can buy -- one that will give you a lifetime of use, one that takes the fear out of high-power operation and one that lets you get your SWR down to the absolute minimum -- then the MFJ-989C ***is*** for you. Don't settle for less . . . get yours today!

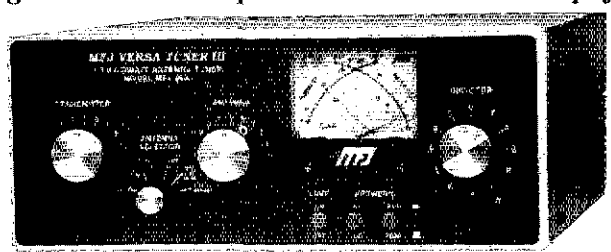
MFJ's *1.5 KW* Versa Tuner III

lets you use your barefoot rig now and add up to a 1.5 KW linear amplifier later

MFJ-962C

$229.95

Shipping Code E



Why settle for a 300 watt tuner when a few extra dollars lets you step up to the more powerful 1500 watt MFJ-962C?

Two continuously variable capacitors give you the precise control you need to get your SWR down to a minimum. Plenty of inductance gives you the widest matching range possible.

A new **peak** and average reading Cross-Needle SWR/Wattmeter makes tuning quick and easy. At one glance you can read SWR, forward and reflected power. A new directional coupler gives you more accurate readings over a wider frequency range and has no frequency sensitive adjustments. Meter light uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

A 6-position ceramic antenna switch lets you select 2 coax lines (direct or through tuner), random wire and balanced lines.

You get a heavy duty 4:1 balun connected to ceramic feedthru insulators -- it lets you operate high power into balanced feedlines.

For highest Q and the most compact size, the wide range airwound inductor is mounted horizontally away from metal surfaces for efficiency and maximum power into your antenna. Measures 10¾ x 4½ x 15 inches.

MFJ W9INN Remote Balun

MFJ-912

$39.95

Shipping Code A

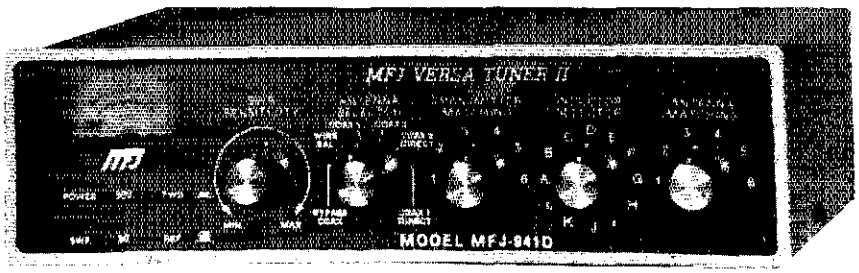
NEW

This new MFJ-912 W9INN Remote Balun lets you repace the messy ladder line installation in your shack with a neat single coax installation Giant two-core balun hanles full legal power with ease. Get the benefits of a ladder line feed without the mess and bother! Mounting holes and a compact size let you install it quickly. Get yours today!

MFJ's *Super Value* Versa Tuner II

Covers 1.8-30 MHz plus you get antenna switch, balun and SWR/Wattmeter for only . . . $109.95

Best Buy!



MFJ-941D

$109.95

Shipping Code B

The MFJ-941D is MFJ's super value 300 Watt PEP antenna tuner. Why? Because it has more features than tuners costing much more and it matranges. Front panel mounted antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass. Efficient

Revolutionary NEW SWR Analyzers

MFJ's innovative new SWR Analyzers instantly give you a **complete** picture of your antenna SWR over an entire band **— without a transmitter, SWR meter or other equipment.**

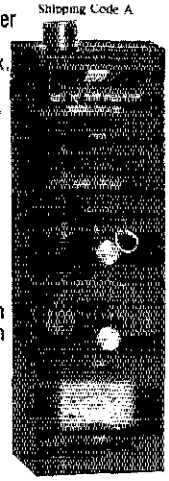
All you do is plug your antenna into the coax connector, set your SWR Analyzer to the frequency you want and read your SWR.

NEW

MFJ-207

$99.95

Shipping Code A



Setting up and trimming your antenna: Super simple and super accurate

You can take your battery operated handheld SWR Analyzer right to your antenna and measure SWR of the antenna directly. It lets you eliminate the distorting effects of the coax.

You can monitor SWR changes as you adjust your beam or vertical — you'll know right away which way to adjust it.

You can shorten or lengthen your dipole and see the effect immediately.

Create your perfect multi-band antenna

You can instantly check multi-band dipoles and trap verticals to see if the low SWR points are where you want them and adjust your antenna until they're right.

Mobile Antennas made easy

You'll find the perfect adjustment for your mobile whip in seconds by actually seeing the SWR as you pull the whip in and out without transmitting.

You can easily find the ideal place on your car for your mobile antenna by checking different spots with the SWR Analyzer.

All kinds of uses

You can see how the SWR varies over your entire band and quickly find your usable 2:1 SWR bandwidth.

You can see your SWR change as you drive under an overpass and see how mobile whip flutter affects SWR.

You can see what happens as you swing your beam toward the power line or away from your tower.

You can see how rain or snow affects your beam.

You can tune up your antenna tuner without transmitting.

You can check the SWR of the input to your amplifier.

You'll find all kinds of uses for this totally self-contained handheld unit that'll revolutionize how SWR is measured.

Super Value: Several Instruments in One

You get a super value because several instruments are combined into a single portable handheld unit.

It has a low distortion RF generator that covers 10 thru 160 meters (142-156 MHz for MFJ-208), an SWR bridge that gives forward and reflected components and a computing circuit that automatically computes the SWR and displays it on the meter.

Everything is automatic. All you do is set the frequency and read SWR. It even has a frquency counter output so you can connect a frequency counter for precise digital readout.

Use 9 volt battery or 110 VAC with MFJ-1312, $12.95. 7½ x 2½ x2¼ inches.

Two models to choose from

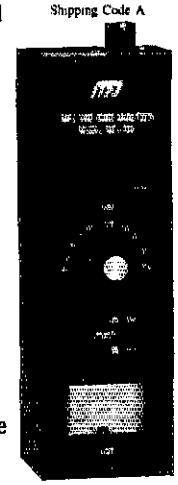
MFJ-207 covers 160 thru 10 meters, $99.95. MFJ-208 covers 142 thru 156 MHz for 2 meters, $89.95. You'll love the convenience of the MFJ SWR Analyzers . . . get them both today.

NEW

MFJ-208

$89.95

Shipping Code A



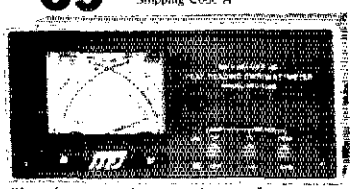
Cross-Needle 144/440 MHz SWR/Wattmeter

$79.95 MFJ-817 Shipping Code A

This new lighted MFJ-817 VHF/UHF Cross-needle SWR/wattmeter shows ***peak*** or average forward and reflected power and SWR -- all at a glance. Reads in two power ranges (200/20 forward and 50/5 watts reflected). Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95. 7¼" x 4½" x 3½".

Cross-Needle 1.8-30 MHz SWR/Wattmeter

$69.95 MFJ-815B Shipping Code A

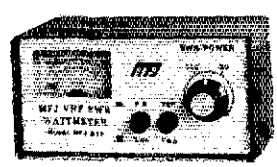


Simultaneously read ***peak*** or average forward and reflected power and SWR with this lighted MFJ-815B meter. Choose from two power ranges (2000/200 forward and 500/50 reflected). Covers 1.8-30 MHz. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95. 7¼" x 4½" x 3½".

VHF SWR/Wattmeter

MFJ-812B

$29.95 Shipping Code A

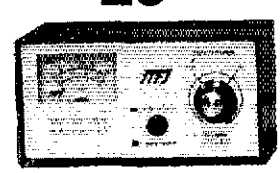


MFJ-812B is the world's most popular (and most affordable) **VHF** SWR/Wattmeter. Covers 144 MHz through the 220 MHz band. Read forward and reflected power in 2 ranges (30 or 300 watts). Also lets you read relative field strength from 1-170 MHz. SWR can be read from 20 meters in HF through the 220 MHz band. Two color meter.

HF SWR/Wattmeter

MFJ-816

$29.95



MFJ-816, $29.95. HF wattmeter lets you read forward and reflected power on 2 scales (30 and 300 watts) and SWR from 1.8-30 MHz with MFJ-816. Easy push-button operation. Has forward/reflected push button. Sturdy eggshell white and black aluminum cabinet. SO-239 connectors. 2-color meter scale. 4½ x 2¼ x 3 inches.

MFJ-701 RFI Free Choke Kit

MFJ-701

Eliminates RFI (Package of 4) Shipping Code A **$14.95**

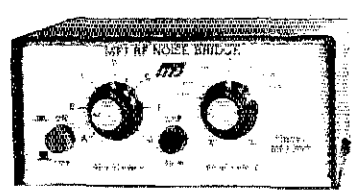
The new MFJ-701 RFI-Free Choke Kit makes it easy to eliminate common RFI problems. You get four square toriods that have the properties for eliminating RFI. Includes **"How to Eliminate RFI"** instructions.

MFJ RX Noise Bridge

MFJ-202B

$59.95

Shipping Code A

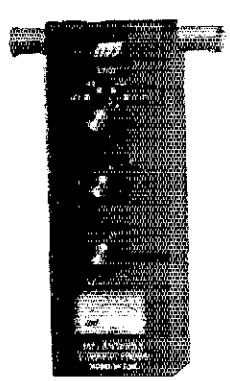


World's finest noise bridge! Hand calibrated resistance scale, expanded capacitance range (± 150 pf), built-in range extender gives accurate measurements and extended measuring range. 1-100 MHz. Easy to use.

Antenna Current Probe

MFJ-206 **$79.95**

Shipping Code A



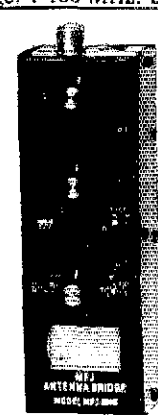
This MFJ Antenna Current Probe lets you monitor RF antenna currents – no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines -- all wiring and enclosures.

Indicate transmission line radiation due *to high SWR, poor shielding or antenna unbalance.* Detect re-radiation. Pinpoint RF leakage in shielded enclosures. Locate the best place for your mobile antenna. Use as field strength meter. 4 x 2 x 2 inches. Sensitivity, Band, Tune controls. Monitors RF current by sensing magnetic field.

MFJ Antenna Bridge

MFJ-204B **$79.95**

Shipping Code A

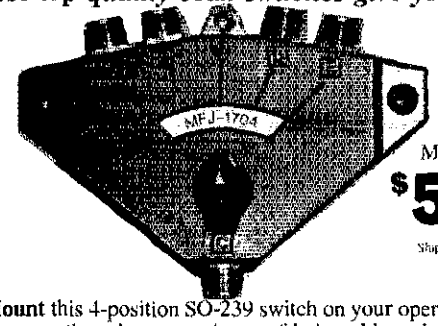


Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge. Coax connector for antenna.

No other equipment needed. Take it to your antenna site. Determine if your antenna is too long or too short, measure its *resonate frequency and antenna resistance* to 500 ohms. It's the easiest, most convenient way to determine antenna performance. Built-in resistance bridge, null meter, tunable oscillator-driver (1.8-30 MHz). Use 9 volt battery or 110 VAC with optional AC adapter, $12.95.

MFJ's Heavy Duty Coax Antenna Switches

These top-quality coax switches give you a center ground position and automatic grounding of unused postions



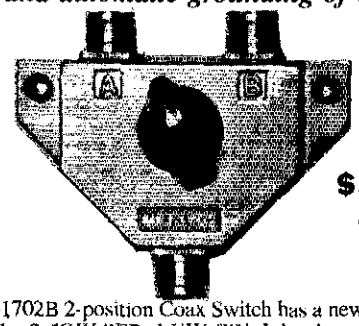
MFJ-1704

$59.95

Shipping Code B

Mount this 4-position SO-239 switch on your operating desk and you'll have more than the convenience of being able to instantly select any of 4 antennas or the center ground position – you'll also get the replacable **lightning surge protection device** that helps protect against distant lightning induced surges and static.It handles a full 2.5 KW PEP. Extremely low SWR. Isolation is rated from better than 60 dB at 30 MHz to better than 50 dB isolation at 500 MHz. Negligible insertion loss. 50 ohm.

New **MFJ-1704N, $69.95.** *Like MFJ-1704 with "N" type connectors.*



MFJ-1702B

$21.95

Shipping Code A

The MFJ-1702B 2-position Coax Switch has a new Center Ground Position! It handles 2.5KW PEP, 1 KW CW. It has better than 60 dB isolation at 300 MHz and better than 50 dB at 450 MHz. 50 ohm.

The unused terminal is automatically grounded for static and RF protection. It has less than 0.2 dB insertion loss and SWR below 1:1.2. The MFJ-1702B has heavy cavity type construction and uses SO-239 connectors. Mounting holes. 3 x 2 x 2 inches.

New **MFJ-1702BN, $39.95.** *"N" connectors, covers DC-1.1 GHz.*

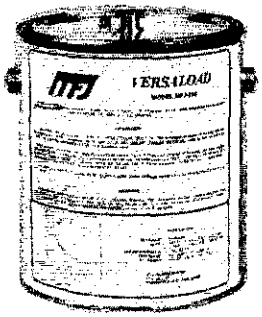
1 KW Dummy Load

MFJ-250X

$29.95

NEW

Shipping Code A



MFJ-250X *VERSALOAD* KW dummy load lets you tune up fast! Extends life of finals! Run 1-KW CW or 2 KW PEP for 10 minutees. ½ KW CW or 1 KW PEP for 20 Minutes. Continuous duty with 200 watts CW or 400 watts PEP. Complete with derating curve. Quality 50 ohm non-inductive resistor. Use transformer oil (not included). Low VSWR to 400 MHz. Under 1.2:1 to 30 MHz 1.5:1 30-300 MHz., 2:1 300-400 MHz. *Ideal for testing both HF and VHF rigs.* SO-239 connector. Vented for safety. Removable vent cap. Carrying handle. 7½ inches high by 6 5/8 diameter.

MFJ-250, $49.95. Includes PCB free transformer oil. Shipping Code D.

MFJ HF Antenna/Transceiver Switches

MFJ-1701

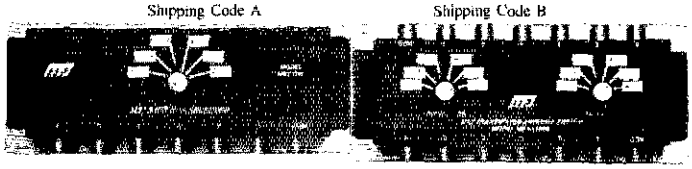
$34.95

Shipping Code A

MFJ-1700B

$64.95

Shipping Code B



This MFJ-1700B has two ceramic rotary switches that let you select *1 of 6 antennas and 1 of 6 transceivers in any combination. You can also* plug in an antenna tuner, wattmeter, linear, etc. so it is always in the circuit. Handles 2KW PEP for 50-75 ohm loads. Unused terminals automatically grounded. SO-239 connectors. 1.8-30 MHz. 10 x 3 x 1½ in.

MFJ-1701, $34.95. Six position switch. 1.8-30 MHz. Unused terminals grounded. SO-239. Handles 2 KW PEP, 1 KW CW. 52-75 ohm loads.

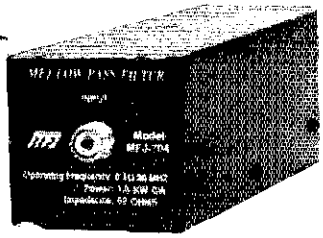
New MFJ Low Pass Filter

MFJ-704

$39.95

NEW

Shipping Code A



New MFJ Low Pass Filter handles full legal power and reduces TVI caused by harmonics in the TV bands. Works over the entire HF operating range from 1.8-30 MHz. 52 ohm. Low insertion loss and high harmonic attenuation give you excellent performance.

Dry 300W VHF/HF and 1KW HF Dummy Loads

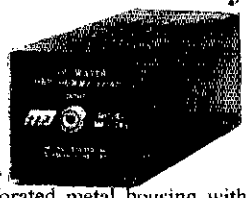
MFJ-260B

$28.95

MFJ-262

$69.95

Shipping Code A



Air cooled, non-inductive resistor in perforated metal housing with SO-239 connectors. Full load for 30 seconds, derating curve to 5 minutes. **MFJ-260B (300 W).** SWR: 1:1.1 to 30 MHz, 1.5:1 30-150 MHz. 2¼ x 2¼ x 7 inches. **MFJ-262 (1 KW).** SWR 1.5:1 to 30 MHz. 3 x 3 x 13 inches.**MFJ-10, $4.95.** 3 foot coax with connectors.

AC Line Monitor

MFJ-850

$19.95

Shipping Code A

Guard *against low voltage* "brown out" conditions and surges that can damage your expensive electrical equipment. Just plug in this MFJ-850 and it shows you your line voltage. Leave it plugged in for constant monitroing. It comes with a one year guarantee. *Color coded* scale reads voltage from 95-135 volts. 2% accuracy. 2¼x2¼x1½ in.

Compact Speaker

MFJ-280

$19.95

Shipping Code A

Enjoy superb audio and convenience with this economical mobile speaker. Just set the magnetic base on a surface, plug in the 3.5 mm phone plug and enjoy. Mounting plates with 2-sided tape allow mounting on non-metal surface. *Screws included. Matches 8 and 4* ohm impedances. handles 3 watts. 30 inch cord. 2½ x 2 x 3 in.

New MFJ Multiple DC Power Outlets

These new MFJ Multiple DC Outlet save you both space and money by giving you seveal pairs of heavy duty binding posts for connecting your accessories.

MFJ-1112

$29.95

Shipping Code A

MFJ-1114

$44.95

Shipping Code A

NEW

This new MFJ-1112 Multiple DC Power Outlet saves you space ***and*** money. Hook it to your 12 VDC power supply and get 6 DC outlets for connecting your accessories. You get 6 pairs of heavy duty binding posts for connecting the accessories in your shack. RF bypassing keeps RF out of power supply from the DC line outlet. 13½ x 2¾ x 2½ in.

MFJ-1114, $44.95. MFJ Deluxe Multiple DC Outlet. Eight pairs of binding posts. Circuit breaker. Power switch. 13 x 2 x 2 inches.

Every ham needs one of these. Get yours today!

MFJ's Eyeball QSL Cards

MFJ-29

NEW

$49.95

Shipping Code A

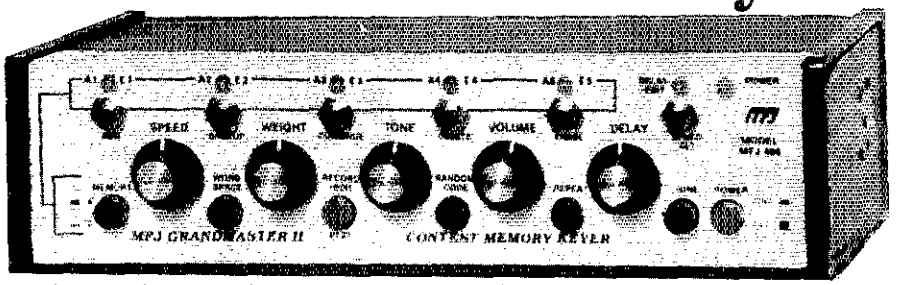
These special red and blue MFJ Eyeball QSL Cards were developed for the hams at MFJ to give patrons at hamfests. We've had so many requests that we will now offer them to you. Box of 500. Specify Call, name, address and phone (up to 4 short lines). **No CODs, returns or warranty!**

MFJ Grandmaster Memory Keyer

MFJ-486

$189.95

Shipping Code B



Simple . . . intuitive . . . you instantly know which knob to turn, what button to press. It's unmistakable. That's the MFJ Grandmaster concept -- more than user-friendly . . . it's really easy to use.

Exclusive CW Word Processor ™

MFJ's exclusive CW Word Processor™ lets you change a message in memory without having to rekey it all in. Special function keys make it simple to move around within any message, insert, delete and change your message until it's just the way you want it.

Combine messages into other messages

The MFJ-486 lets you combine messages into other messages.

You can store QTH, rig/antenna, QSL info and other comments in separate memories. Then you can easily build a new message by keying in memory numbers wherever you want that info in your message.

MFJ's Custom-Speed™ Control

Customize your speed control to fit ***you!***

By pressing the Speed Set button, you can set your slowest speed to start at 4, 5, 6 -- any speed up to 20 WPM -- and your fastest speed is 20 to 100 WPM. Matching CW speed to a QSO is best done by ear adjust a ***knob***. With keypads you have to figure out the exact speed of your contact and then go through an awkward keystroke sequence.

That's why matching speed with a keypad is so demanding.

Without MFJ's Custom-Speed, a wide range speed control is very hard to use because the ***slightest*** touch causes radical speed changes.

Built-in CW Course

The MFJ-486 gives you a well-organized three-step CW course.

The first step gives you random five character groups. After you learn the letters, you can add punctuation.

The second step gives you random 1-8 character groups.

The third step gives you an infinite number of random plain English QSOs in *the same format as FCC ham license tests. When* you can copy these random QSOs, you're ready to pass your test and upgrade!

You also get Farnsworth option, answer-replay to check your copy, punctuation on/off and earphone jack for private practice.

Remote Control . . . for memories *and* function keys

The MFJ-77 remote control lets you control your message memories *and* CW Word Processor™ function keys at your key paddle.

Just $19.95, it's a lot more useful than a remote that gives you *no* editing functions and only lets you control a *few* memories.

MFJ-77

$19.95

Shipping Code A

More for your money

To make it really easy-to-use, it cost more to build the Grandmaster.

It just takes more hardware -- knobs to turn, buttons to press, LEDs to show you what's going on. Plus it takes more labor, more software, more everything. It'a a bargain compared to cheaper-to-build but harder-to-use keypad keyers.

Plus More . . .

You get over 8000 characters in 10 soft-partitioned memories, lithium battery backup, automatic serial numbering, automatic message repeat, beaconing, A or B type iambic keying, manual or automatic word spacing, speaker, earphone jack, tune control, Z-80 plus much more. 9 x 2½ x 6 inches. Use 12-15 VDC or 110 VAC with MFJ-1312, $12.95.

Don't *struggle* with keypads -- *enjoy* the MFJ Grandmaster

Don't struggle with a hard-to-use keypad and complicated keystroke sequences. Choose the memory keyer that's really easy-to-use and has all the features you'll ever need -- the new MFJ-486 Grandmaster.

MFJ's *Original* Grandmaster Memory Keyers

MFJ-482B

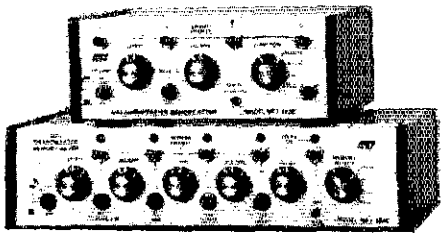
$109.95

Shipping Code A

MFJ-484C

$149.95

Shipping Code A



The MFJ-484C Grandmaster is so easy to use that you can probably utilize all of its many features without reading the instruciton manual.

Store up to twelve 25 character messages plus a 100, 75, 50 or 25 character message (4069 bits total). A switch combines 25 character messages for up to three 50 character messages.

You can repeat any message continuously and even leave a pause between repeats. Insert in playing message by sending. LEDs show which 25 character memory is in use and when it ends. 9 volt battery (not included) memory saver. 8 x 2 x 6 in. 8-50 WPM. Weight, tone control. Speaker. 12-15 VDC or 110 VAC with MFJ-1312, $12.95.

MFJ-75; $19.95. Wired remote control for MFJ-484C.

MFJ-482B, $109.95. A memory keyer for the price of a keyer! Store four 25 character messages or a 50 and two 25 character messages in 1024 bits of memory. Repeat.Memory LED. Speed, volume, weight, tone controls. 8-50 WPM. Speaker. Tune function. 6 x 2 x 6 inches. 12 to 15 VDC or 110 VAC with MFJ-1312, $12.95.

MFJ Repeater Controller with Autopatch

MFJ-2040

$449.95

Shipping Code B

The *new* MFJ-2040 Repeater Controller with built-in Phone Patch gives you high tech features found only in the most expensive systems.

You get programmable Morse code ID (or optional Voice ID, **MFJ-50, $39.95**), ring detection for reverse Autopatch, input and output ports, cross band linking and much more.

Installation is easy. You get standard "D" style connectors for control and audio lines. Step-by-step instructions get you up and running.

The software puts you in complete control. You can choose from toll restriction, no toll-restriction or selected area code dialing.

Input and output ports let you connect a variety of remote devices that you control ***remotely*** via touch tone commands. Transistor drivers are provided on all output ports to allow direct connections or driving relays. Optional 5 second message prom, **MFJ-51, $39.95.**

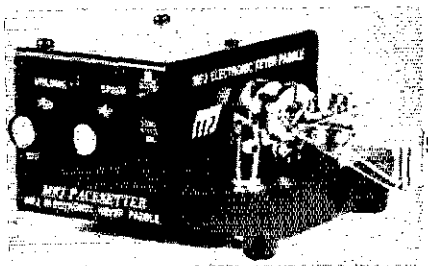
You can program your own private prefix code for controlling your repeater. Select from 0 to 4 touchtone codes.

Touch tone commands and DIP switches control options. Control the courtesy tone, transmitter hang time, time-out timer, toll restriction, autopatch, Morse code ID, repeater on/off, line on/off and more.

Comes in a rack mount aluminum enclosure with "D" style connectors. It uses 12 VDC or 110 VAC with MFJ-1315, $14.95.

MFJ Keyer/Bencher Paddle Combo

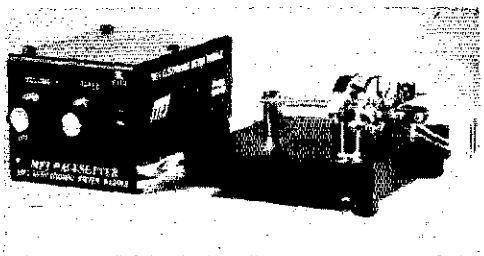
MFJ, Bencher and Curtis team up to bring you America's most popular keyer in a compact package for smooth easy CW . . .



MFJ-422B

$134.95

Shipping Code B



MFJ-422BX

$79.95

Shipping Code A

The best of all CW worlds -- a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! You can buy the combination or just the keyer for your Bencher.

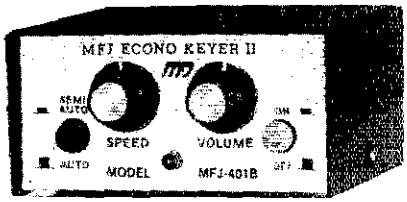
MFJ Keyer is small in size, big in features. It gives you the proven Curtis 8044 ABM IC, is adjustable in weight and tone and has front panel volume and speed controls (8-50 WPM). You also get built-in dot-dash memories, speaker, sidetone and push button selection of semi-automatic/tune or automatic modes. Ultra-reliable solid state keying: grid-block, cathode and solid state transmitter (-300V, 10 mA max, +300V, 100 mA max.). Fully shielded. Use 9 volt battery (not included) or 110 VAC with MFJ-1305, $12.95.

Beautiful functional engineering. The keyer mounts on the paddle base to form a small (4 1/8 x 2 5/8 x 5½ inches) attractive combination that is a pleasure to look at and use. You can buy the combo or just the MFJ Keyer (MFJ-422BX, $79.95) to fit on ***your*** Bencher.

The Bencher paddle is a best seller. Fully adjustable gold-plated silver contacts, lucite paddles, heavy steel base with non-skid feet. **BY-1,** Black Base, **$69.95; BY-2,** Chrome Base, **$84.95.**

MFJ Econo Electronic Keyer II

Economical MFJ keyer lets you send perfect CW with surprisingly good sound.



MFJ-401B

$49.95

Shipping Code A

The MFJ-401B Econo Keyer II is based on the proven Curtis 8044ABM IC Keyer chip. It lets you send iambic, automatic, semi-automatic or manual with your squeeze, single lever or straight key.

You get iambic operation with squeeze key. Dot-dash insertion. Semi-automatic "bug" operation provides automatic dots and manual dashes.

Econo MFJ keyer also features dot-dash memories, self-completing dots and dashes, jam-proof spacing. Instant start. RF proof.

Front panel controls. Smooth linear speed control selects from 8 to 50 WPM. Volume control gives you a wide range. A tune switch lets you key your transmitter for tuning.

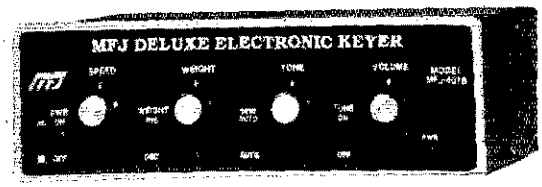
Internal controls: Weight control adjusts dot-dash ratio, makes your signal distinctive to penetrate QRM. Tone control for desired side tone pitch.

Ultra-reliable solid state keying: grid-block, cathode, solid state transmitters (-300V, 10 mA max, +300V, 100 mA max.).

Use 9 volt battery (not included) or 110 VAC with MFJ-1305, $12.95. Measures a compact 4 x 2 x 3½ inches.

MFJ Deluxe Electronic Keyer

Deluxe MFJ Keyer gives you beautiful CW and a full array of front-panel controls



MFJ-407B

$69.95

Shipping Code A

The MFJ-407B Deluxe Electronic Keyer sends iambic, automatic, semi-automatic and manual. You can use squeeze, single lever or straight key to send your signal. The MFJ-407B features iambic operation with squeeze key, dot-dash insertion, semi-automatic dots and manual dashes. It also features dot-dash memory, self-completing dots and dashes, jam-proof spacing and instant start keying. A switch lets you select A or B type keying.

Solid state plus and minus keying is provided for use with tube or solid state transmitters. Front panel controls include linear speed, weight, tone and volume controls as well as on/off, tune and semi-auto/auto switches. Weight control provvides positive weight or negative weight. Adjust the dot-dash space ratio, thus making your signal distinctive to penetrate QRM. Tune switch keys transmitter.

The MFJ-407B is RF proof, has a built-in speaker and uses a 9 volt battery (not included) or 110 VAC with MFJ-1305, $12.95. This hard working unit comes in an attractive black aluminum cabinet with a black front plate. It measures 7 x 2 x 6 inches.

MFJ-557 Deluxe Code Practice Oscillator

Deluxe Morse straight key for code and sending practice features a heavy steel base, tone and volume controls and an earphone jack for just . . . $24.95

The new MFJ-557 Deluxe Code Practice Oscillator features a straight Morse key on a non-skid heavy steel base that stays put on your table. The MFJ-557 lets you practice sending code at home, work, riding in your car -- practically anywhere -- because it's so easy to take it along wherever you go. A volume control lets you adjust it from barely audible to blaring full sound. You can practice without bothering anyone. A tone control gives you a wide adjustment, from high "squeaky" to low "booming" tones. You even get an earphone jack for private listening. Or plug in an external speaker (like MFJ-280) for extra volume in the classroom.

It runs on a 9 volt battery (not included) or an optional AC power supply ($12.95) that plugs into a jack on the side. When you're finished cleaning up your sloppy fists with the MFJ-557 Deluxe Code Practice Oscillator, hook it to your transmitter and go on the air sounding just like you were born working QSOs.

Don't pass up this super buy. Built-in speaker. Adjustable contacts. Solid. 8½ x 2¼ x 3¾ inches. Black. It comes with MFJ's one year unconditional guarantee.

MFJ-557

$24.95

Shipping Code A

MFJ *Compact* Speaker/Mics

For Kenwood, Icom, Yaesu, Santec and others

MFJ-284 or MFJ-286
$24.95
Shipping Code A

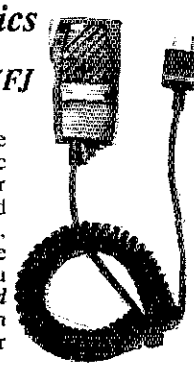
MFJ's Speaker/Mics let you carry your handheld on your belt and never have to remove it to monitor calls or talk.

And you'll never have to turn up your audio annoyingly loud because the handy lapel/pocket clip lets you place it close to your ears for easy listening.

You get a wide range speaker and first-rate electret mic element for superb audio on *both* transmit and receive. Plus . . . earphone jack, PTT, lightweight retractable cord. Gray. **MFJ-284** fits Icom, Yaesu, and Santec; **MFJ-286** fits Kenwood.

MFJ *mini* Speaker/Mics

Choose one of these tiny new handheld mics from MFJ

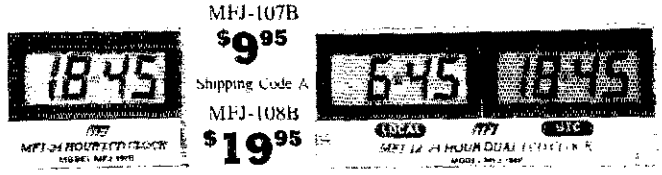


MFJ-285 or MFJ-287
MFJ-285L or MFJ-287L
$24.95
Shipping Code A

These new MFJ speaker/mics give you everything -- first rate electret mic element and wide range speaker for superb audio on ***both*** transmit and receive, earphone jack, PTT, lightweight retractable cord and one year ***unconditional*** guarantee ***plus*** you get a swiveling lapel/pocket clip ***and*** you get ***all*** of these ***superb features*** in a ***tiny*** 2 x 1¼ x ¼ inch package. Order **MFJ-285 or MFJ-285L** for ICOM, Yaesu or Santec; order **MFJ-287 or MFJ-287L** for Kenwood.

L connector also available -- order "L" model!

MFJ 12/24 Hour Clocks



MFJ-107B
$9.95
Shipping Code A

MFJ-108B
$19.95
Shipping Code A

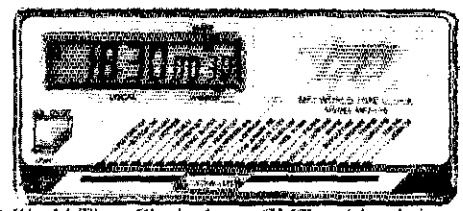
Read both UTC and local time at a glance with the MFJ-108B dual clock that displays 24 and 12 hour time simultaneously. Or choose the MFJ-107B single clock that shows you 24 hour UTC time.

Mounted in a brushed aluminum frame, they feature huge, easy-to-see 5/8 inch LCD numerals and a sloped face for easy across the room reading.

You can synchronize them to WWV for split-second timing. Both are quartz controlled for excellent accuracy.

Long life battery included. *MFJ-108B* measures 4½ x 1 x 2 inches. MFJ-107B measures 2¼ x 1 x 2 inches.

MFJ World Time Clock



MFJ-109
$19.95
Shipping Code A

The new MFJ-109 World Time Clock shows GMT and local time -- and it displays the time for 24 world cities.

Just set the Easy-slide indicator to any of 24 international cities and its dual display instantly shows you both the local time and the city time.

It features international 24 hour display and a local time display with 3/8 inch LCD digits, **GMT pointer,** alarm with snooze, night light, adjustment for daylight savings time, international date change indicators, suede-like carrying case and a flip stand -- *all* in an attractive gift box. Measures 2 x 4½ x ½ inches.

Handheld VHF Converter

MFJ-313
$39.95
Shipping Code A

MFJ-313 turns your synthesized scanning 2 meter handheld into a hot Police/Fire scanner on 154-158 MHz with direct frequency readout. Plus you'll hear NOAA weather, maritime coastal and more on 160-164 MHz.

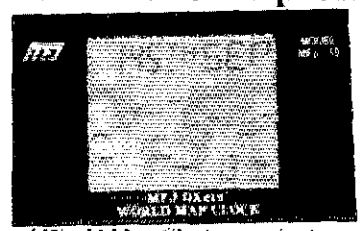
If you have extended coverage the MFJ converter will extend it more: Add 10 and 16 MHz to your handheld band limits to determine your coverage.

Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls.

Highpass input filter and 2.5 GHz transistor give uniform sensitivity over both bands. Crystal controlled. Bypass/Off switch allows transmitting (up to 5 watts) with convert on. Uses AAA battery (not included). 2¼ x 1½ x 1½ inches. BNC connectors.

New MFJ DXers' World Map Clock

NEW
MFJ-110
$24.95
Shipping Code A

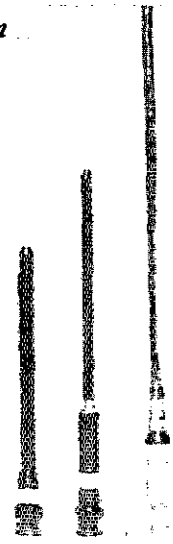


This new **MFJ DXers' World Map Clock** not only shows you the time at any QTH throughout the world -- it also gives you an attractive world map so you can *see the place where your contact is!*. Also shows day of week, month, date and year. It's the ***neatest*** ham logging clock around.

Easy push-buttons let you move the display to a QTH in every time zone. Recall feature instantly moves the display back to local time. Alarm. Tan map on gold background with black border. Attractive unit suitable as gift or use as logging clock. Measures 5¼"W x 3¼"H x ⅝"D.

Telescoping "Pocket Linears"

increase your range with significant gain over a rubber ducky . . . break in from the fringe!



Shipping Code A

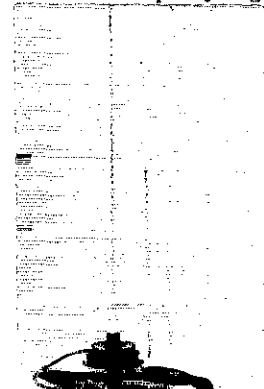
MFJ-1710, $9.95. When you're right on the fringe with a noisy signal, try on the MFJ-1710 "pocket linear". It's a 3/8 wave 2 Meter telescoping antenna. You'll get enough gain over a rubber ducky to bring you to full quieting so you can carry on a QSO. It only cost $9.95, has a convenient pocket clip and when collapsed is the size of a ball point pen -- about 5¼ inches -- and 24½ inches extended.

MFJ-1712, $14.95. This is a very convenient dual band telescoping antenna. It's a 1/4 wave for 2 Meters and a 5/8 wave for 440 MHz. It's 7¼ inches collapsed and 19 inches extended.

MFJ-1714, $16.95. For really long range using a 2 Meter handheld it's hard to beat the MFJ end fed halfwave. It's shorter, lighter has more gain and places less stress on your antenna connector than a 5/8 wave because a 5/8 wave requires a ground plane to function properly. There's no ground plane on a handheld and a 1/2 wave does not require one so it works properly and outperforms a 5/8 wave. When collapsed it performs like a rubber ducky.

New MFJ-1724 Tri-Band Mobile Antenna

Gives you three 200 watt antennas for the price of one with quarter wave elements for 144 MHz, 220 MHz and 440 MHz plus you get magnetic mount, coax and connector



The ***Tri-Band*** NEW MFJ-1724
$19.95
Shipping Code A

MFJ-1724 gives you 3 antennas for the price of one! You get quarter wave whips for 144, 220 and 440 MHz. These broadband low SWR antennas give you a solid signal over your entire operating range. And its robust 200 watt power rating can handle any mobile rig on the market.

You get stainless steel whips that are tough enough for years of constant use. You get a beefy magnetic mount that's strong enough to hold your antenna steady even at high speed. You also get 15 feet of coax cable -- plenty to mount your new MFJ-1724 ***anywhere*** on your car and a standard PL-259 connector that plugs into nearly any rig. You even get a handy allen wrench for changing bands. You get the most for your money when you purchase the MFJ-1724. Get the most for your money. Get your MFJ-1724 today.

MFJ SSB/CW Audio Filters

MFJ-722
$79.95
Shipping Code A

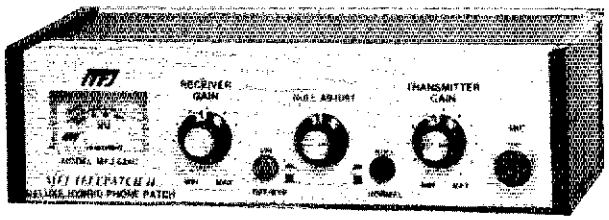
MFJ-752C
$99.95
Shipping Code B

This MFJ-752C **all** mode **dual** tunable filter lets you zero in and pull out your favorite stations and notch out interference at the same time. Two independently tunable filters let you peak, notch, low or high pass signals to eliminate heterodynes and interference -- even on the most crowded bands. Tune both filters from 300 to 3000 Hz. Vary bandwidth from 40 Hz to almost flat. Notch depth to 70 dB. Works with any rig. 2 watts for speaker. Inputs for 2 rigs. Switch selectable. Switchable noise limiter for impulse noise through clipper removes background noise. OFF bypasses filter. Use 9-18 VDC or 110 VAC with MFJ-1312, $12.95. 10 x 2 x 6 in.

MFJ-722, $79.95. The MFJ-722 "Optimizer" switch selectable SSB/CW filter offers razor sharp filtering with switch-selectable bandwidths (80, 110, 150, 180 Hz centered on 750 Hz), steep-skirted SSB filtering. 300-3000 Hz tunable 70 dB notch filter. Plug into phone jack. Speaker, Headphone jack. Use 9-18 VDC or 110 VAC with MFJ-1312, $12.95.

MFJ Deluxe Hybrid Phone Patch

MFJ-624C
Shipping Code A
$69.95



MFJ-624C Deluxe Hybrid Phone Patch gives you crisp, clear, hum-free audio, and that's what phone patching is all about. It's pre-wired for Kenwood and Yaesu rigs with 8 pin mic connectors.

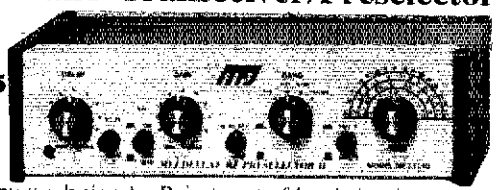
You can use either VOX or push-to-talk. RF pi-filters and PC board construction eliminates RF feedback. Use with virtually any rig.

Built-in VU meter monitors phone line levels to prevent crosstalk. Adjust null depth for maximum isolation between receiver and transmitter. Separate transmitter and receiver gain controls eliminate the need to readjust your rig after patching. Null control. Phone line plugs for easy connection of telephone. Jacks for speaker, audio in and audio out. 8 x 2 x 6 inches. Use 12 VDC, 9 volt battery or 110 VAC with MFJ-1312, $12.95.

This USA made MFJ-624C gives you more quality and more features than competing phone patches that cost much more. Get yours today!

MFJ All Band Transceiver/Preselector

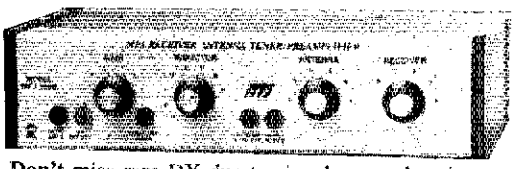
MFJ-1040B
$99.95
Shipping Code A



Lets you copy weak signals. Rejects out-of-band signals, images. 1.8 to 54 MHz. Up to 20 dB gain. Gain control. Dual gate MOSFET, bipolar transistors for low noise, high gain. 20 dB attenuator. Connect 2 antennas, 2 receivers. Coax and phone jacks. Automatic bypass when transmitting to 350 watts. Delay. Jack for PTT. 9-18 VDC or MFJ-1312, $12.95.

MFJ-1045B,$69.95. No attenuator, xcvr auto bypass, delay or PTT.

MFJ Receiver Antenna Tuner/Preamplifier



MFJ-959B
$89.95
Shipping Code B

Don't miss rare DX due to signal power loss between your receiver and antenna. The MFJ-959B provides proper impedance matching so you transfer maximum signal from antenna to receiver. Covers 1.8 to 30 MHz. 20 dB preamp with gain control boosts weak stations. 20 dB attenuator prevents overload. Select from 2 antennas, 2 receivers. 9 x 2 x 6 inches. Use 9-18 VDC or 110 VAC with MFJ-1312, $12.95.

54" Outdoor Active Antenna

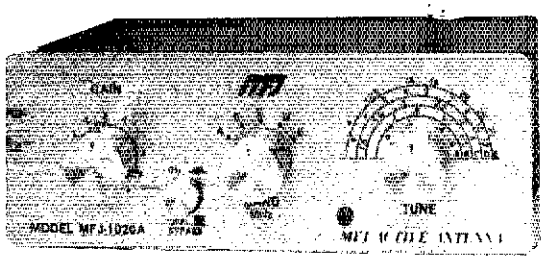
MFJ-1024
$129.95
Shipping Code B

"World Radio TV Handbook" says MFJ-1024 is a "first rate easy-to-operate active antenna . . . quiet . . . excellent dynamic range . . . good gain . . . very low noise factor . . . broad frequency coverage . . . excellent choice." **Mount** it outdoors away from electrical noise for maximum signal, minimum noise. MFJ-1024 covers 50 KHz to 30 MHz.

Receives strong, clear signals. 20 dB attenuator, gain control, ON LED. Switch selects two receivers and auxiliary or active antenna. Control unit is 6 x 3 x 5 inches. Remote unit has 54 inch whip, 50 feet of coax and connector. 3 x 2 x 4 inches. 12 VDC or 110 VAC with MFJ-1312, $12.95.

MFJ Indoor Active SWL Antenna

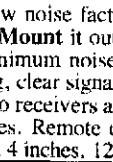
MFJ-1020A
$79.95
Shipping Code A



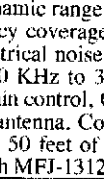
Now you'll rival or exceed the reception of outside long wires with this *tuned* indoor active antenna. **"World Radio TV Handbook"** says MFJ-1020 is a "fine value . . . fair price . . . best offering to date . . . **performs very well indeed."** Tuned circuitry minimizes intermod, improves selectivity, reduces noise outside the tuned band. Use as preselector with external antenna, 0.3 to 30 MHz. Tune, Band, Gain, On-Off/Bypass Controls. Use 9 volt battery (not included), 9-18 VDC or 110 VAC with MFJ-1312, $12.95. 5 x 2 x 6 inches. Telescoping whip.

MFJ 2 Meter Handheld Wattmeters

MFJ-840
$19.95
Shipping Code A



MFJ-841
$39.95
Shipping Code A



MFJ-840. 5 watts full scale. BNC connector. 2 x 2¼ x 1½ inches. Black.

MFJ-841. Connects between HT and antenna. Read SWR and power. 2 x 2¼ x 1½ in. Black. Switch: SWR, SWR set, power, SWR set pot.

MFJ Handy HT Holders

MFJ-24
$9.95
Shipping Code A

MFJ-25
$9.95

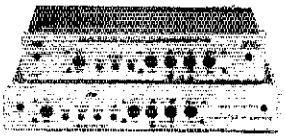
Handy new MFJ HT holders help you make sure your handheld stays where you put it – Mobile MFJ-24, or Desktop unit, MFJ-25, available. In car or on a crowded table or desk. Economical way to prevent costly damage from dropping your rig. Fits compact and full sized HTs. Get yours today.

LW/MW/SW Preselector/Tuner

MFJ-956 **$39.95**
Shipping Code A

MFJ-956 lets you boost your favorite stations while rejecting images, intermod and other phantom signals from 1.5 thru 30 MHz, especially below 2 MHz. Has tuner bypass and ground receiver positions. 2 x 3 x 4 inches.

RTTY/ASCII/CW Computer Interfaces

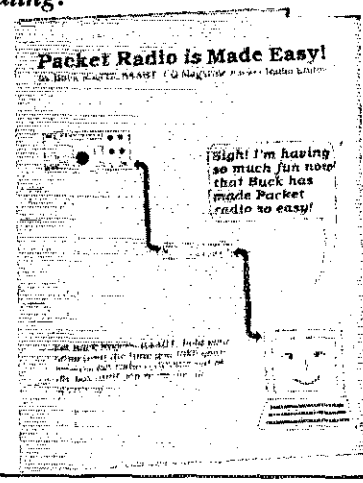


Use your rig and computer with MFJ-1224 to transmit and receive in 3 fun modes. **Software (includes cable):** IBM compatible, MFJ-1285; Commodore 64/128, MFJ-1265, 19.95 each. 8 x 1¼ x 6 in. **MFJ-1225,** receive only. **Software (includes cable):** IBM, MFJ-1285B; Commodore, MFJ- 1265B, $19.95 each. 4½ x 1¼ x 4¼ in. **MFJ-1223, $29.95.** RS-232 Interface.

MFJ-1224 **$99.95**
MFJ-1225 **$69.95**
Shipping Code A

"Packet Radio is Made Easy"

let Buck Rogers, K4ABT, CQ Magazine Packet Radio Editor, hold your hand from the time you take your new packet radio controller out of the box until you're on the air operating!



MFJ-32
$9.95
Shipping Code A

New book by *CQ Magazine Packet Radio Editor* Buck Rogers, K4ABT, gets you on packet fast and easy.

Buck holds your hand from the time you take your new packet radio controller out of the box until you're on the air operating.

He tells you in his easy-to-understand style what packet is and how to get the most out of it.

Buck shows you how to successfully interconnect your transceiver, computer and packet radio controller.

By following Buck's smooth instructions your packet station will work the first time you turn it on.

He discusses packet commands, shows you what they mean and how to use them.

Buck also includes a glossary of packet radio terms and definitions that'll have you talking like a true packeteer.

After Buck gets you on the air, he introduces you to Digipeating, Mailboxes, Networking, Local Area Networks and much more.

In a short evening of relaxed, easy reading, you'll learn enough to impress the experts and get on the air fast!

Take home Buck's latest book and let him get you on packet today!

"Golden Classics of Yesteryear"

by the famous author of over 300 articles and 12 books on ham radio, CQ Magazine columnist Dave Ingram, K4TWJ

MFJ-30
$9.95
Shipping Code A

Remember the 6L6 rigs, Heathkit DX-100, Collins KWM-1, Globe Scout, Hallicrafters, RME, Hammulard, National HROs, Eimac tubes, E.F. Johnson, WWII rigs -- ARC-5, BC-342/348, -- bugs by Vibroplex, McElroy, Dow Key . . .

All these famous names plus many more you'll recognize are in "Golden Classics of Yesteryear". It's all ham radio in content and it's jam packed with real-life tales, transmitters, receivers, favorite circuits, telegraph keys, bugs and other ham radio topics.

Easy-to-build weekend projects -- transmitters, receivers and other projects -- from the 1920s, 30s, 40s, and 50s are included.

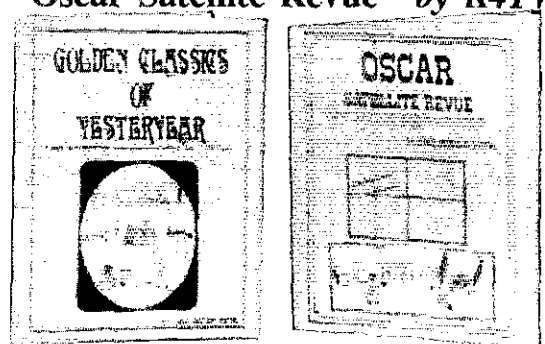
You'll see how you can build a classic "Tailender" -- an early DX memory keyer -- that requires no power supply or other electronic parts and works like a champ.

You'll learn how to collect, restore and operate classic gear.

"Golden Classics of Yesteryear" is written by Dave Ingram, K4TWJ -- one of amateur radio's most recognized and respected authors – especially in classic gear. He has authored over 300 articles and 12 books on ham radio.

It'll be the most enjoyable $9.95 you'll ever spend. Order today!

"Oscar Satellite Revue" *by K4TWJ*



MFJ-31
$7.95
Shipping Code A

"Oscar Satellite Revue" by Dave Ingram, K4TWJ, is an anthology of CQ Magazine articles on setting up various types or OSCAR stations and operating via the amateur radio satellites.

Each article is followed by a new updating addition, then ready-to-use frequency conversion charts for all satellite modes and tracking notes for OSCAR 13, OSCAR 10, Japanese JO-12 and Russian RS-10/RS-11 amateur radio satellites are featured.

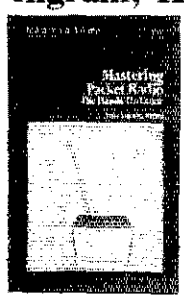
There's also a quick-start guide for newcomers and a large equipment review section. Additionally, up-to-date Keplerian data for computerized satellite tracking programs are included.

This new guide takes you from set-up to success and every part is written in non-technical easy-to-understand language. No confusing calculations or complex descriptions.

See how easy it is to join the fun via amateur radio satellites. Order today!

"Mastering Packet Radio: The Hands-On Guide" by Dave Ingram, K4TWJ

MFJ-34
$12.95
Shipping Code A



"Mastering Packet Radio: The Hands-On Guide" *by K4TWJ is the* all-purpose packet book to keep in your station. This easy-to-understand book puts you on the cutting edge of the packet radio revolution.

In this super hands-on guide you'll discover how packet works, how to set up your own packet station, the computer's role in your packet station, the ins and outs of packet radio operation, including useful tips for the newcomer and tips on how to be a good packet operator.

You also get information on packet networks, bulletin board systems and HF operation plus K4TWJ's insightful look into future directions in packet radio. Added bonuses include an equipment guide, a technical overview and information on networking, bulletin boards, gateways, portable packet and much more. Get yours today. You'll be glad you did!

"The Wonderful World of Ham Radio: An Introduction for Young People" by Richard Skolnik, KB4LCS

MFJ-35
$7.95
Shipping Code A

NEW

Hey Elmer! Buy this fun-to-read book for the potential young ham in your life! Let Richard Skolnik, KB4LCS, help you with everything short of putting up the antenna and pressing in the PTT for that exciting first call.

With an easy-to-understand style "The Wonderful World of Ham Radio" shows young potential hams what ham radio is all about and why it can be a valuable part of their lives. It shows how hams learn through ham radio — neat stuff like electronics, geography, computers and more.

It shows how hams provide valuable communications services during emergencies, and even includes an actual emergency QSO.

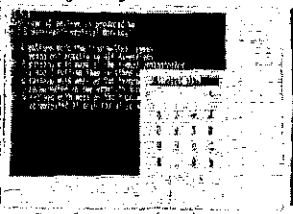
You get interesting photos of students learning about and using ham radio, photos of different kinds of radios, stations, field day and more.

Finally, it shows how to get a ham license and set up a station to talk with hams around the world! "The Wonderful World of Ham Radio" is the best $7.95 you can spend to get a young person on the air! Check it out today . . . you'll be glad you helped.

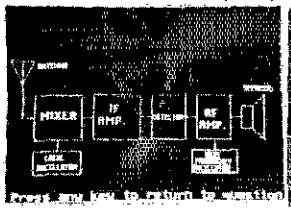
MFJ's new ham license upgrade Theory Tutor

Get your ham license or upgrade with MFJ's new Theory Tutor! This fun new software practically guarantees you'll pass the theory part of any class FCC ham license exam for just . . . $29.95 per license class . . .

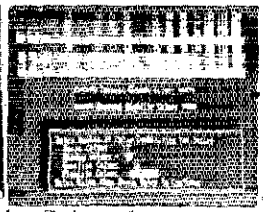
Opening screen



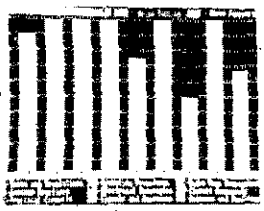
On-line calculator



Test diagrams included



Color change option



Bar Graph Score

Take sample tests or print written tests

Concentrate on any area or entire question pool

Explanations on hard questions

All graphics/diagrams included for color systems

The fun way to study -- a super gift

Get your ham license or upgrade with MFJ's new Theory Tutor! It practically guarantees you'll pass the theory part of any class ham license exam.

Versatile and fun new IBM compatible software is the best computer tutor ever tailor-made for ham radio.

Why? Because you get much more than just the FCC question pool. At any time you can study *either* the entire question pool or selected areas -- or try taking sample tests. Each study session is automatically saved -- and you can return to a previous session at any time. Or print a test (suitable for official testing) on your Epson/IBM compatible printer.

You also get excellent graphics with appropriate questions, explanations on hard questions, complete weighted scoring analysis, color change options, an on-line calculator plus much more.

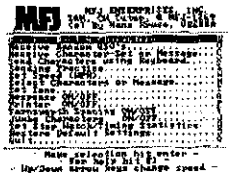
Don't put it off! Get the most from ham radio *and* your computer. Get the new MFJ Theory tutor and upgrade *now!* You'll be glad you did.

IBM® or Compatible		Apple Macintosh®
MFJ-1610-Novice	$29.95 *each*	MFJ-1630-Novice
MFJ-1611-Technician		MFJ-1631-Technician
MFJ-1612-General		MFJ-1632-General
MFJ-1613-Advanced	Shipping Code A	MFJ-1633-Advanced
MFJ-1614-Extra		MFJ-1634-Extra

MFJ Morse Code Computer Tutors

IBM® compatible and Commodore® 64/128 programs available

IBM® compatible MFJ-1269 'SAM' program: Colorful (or monochrome) **"Jumbo" characters option** for a more dynamic Morse code classroom, **"Stop Watch"** to copy code against the clock and **Sending Practice** that grades your sending set SAM apart. Menu driven plus standard code tutor features.



MFJ-1269 **$19.95**

Commodore® 64/128: With the optional **MFJ-76 Keyer Interface, $19.95,** you can plug in an external key paddle and key a transmitter. Code tutor features include: ***Complete Random or Select Random*** that lets you choose the letters you want to study. ***Random QSO*** sends a plain English message exactly as given on an FCC test. ***Message Store*** -- lets you type in a message and store it for sending. ***Direct Keyboard*** -- lets you send code from keyboard. Farnsworth option. Sample test. Cartridge or Disk.

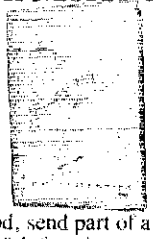
MFJ-1266 (disk) **$19.95**
MFJ-1267 (cartridge) **$29.95**
MFJ-76 (Keyer Interface) **$19.95**
Shipping Code A

MFJ PC Memory Keyer with Morse Tutor

Let this amazing package of IBM compatible software and hardware turn your PC into a memory keyer!

NEW

MFJ-1268 **$49.95** Shipping Code A



You get a total of 100 function key macros that you can program to send whatever you want.

You get special keys to program a message within a message, pause for you to key info in or for a pre-set time period, send part of a message faster or slower and much more. Many useful functions come pre-programmed in the MFJ PC Memory Keyer macros. However, you can easily change or alter them as you want to. Use paddle or keyboard.

You get incrementing serial numbering with easy re-set, speed from 5-40 WPM, variable speaker tone (or speaker off), weight adjustment for a distictive signal and instant access to on-line help, common CW abbreviations, Q-signals, and Official ARRL NTS Traffic codes.

Plus you get a full-featured Morse code tutor with **Test Administrator** that lets you give a FCC type code test -- that can be taken on-screen or MFJ PC Memory Keyer can generate printed test papers for students.

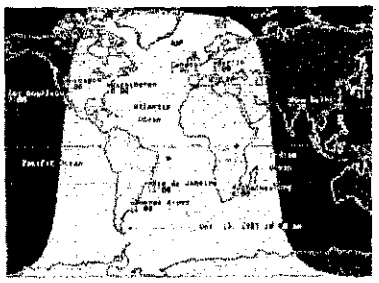
This new MFJ-1268 PC Memory Keyer lets you use your IBM compatible computer into a full-featured Memory Keyer and Morse Code Tutor. At $49.95 for the software and hardware, that's the bargain of the year!

MFJ-1286 Gray Line DX Advantage

super display software shows you when to snag rare DX!

Know when to snag rare DX!

The MFJ-1286 Gray Line DX Advantage is a computerized DXing tool that predicts DX propagation. Now, even the casual DXer can work rare DX by knowing exactly when conditions are best for DX.



You get a high resolution world map that continuously displays the Gray Line as a moving area of day and night that changes with time as it tracks the movement of the earth.

MFJ-1286 **$29.95** Shipping Code A

The Gray Line is the day/night divider line where the most amazing DX happens. Now, you'll know exactly when to take advantage of it.

The MFJ-1286 Gray Line DX Advantage gives you a Geochron® style world map that shows you the moving Gray Line, the position of the sun over the earth, UTC times, time zones and latitude/longitude markers.

You can customize the world map to display time and location for any 24 QTHs in the world. It makes DXing and SKEDs precise and easy.

You can run it by itself or memory resident. It works with all graphics.

You can enter any date after 1980 to set your Skeds for any time in the future. Or you can check solar/Gray Line positions from past QSOs to answer questions about particularly good or bad RST.

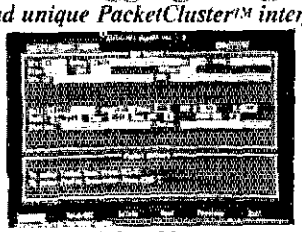
Or get a edge in contests by pre-determining Gray Line times.

Get the most from your station *and* your PC. Get the MFJ Gray Line DX Advantage. You'll be glad you did.

MFJ Easy-DX™ DXCC Logging Program

with packet terminal program and unique PacketCluster™ interface

Get DXCC with this new MFJ software for . . . $39.95.



One review says it "has the potential of being ***the single indispensable program for any DXer with a computer.***"

Why? MFJ Easy-DX instantly organizes all your DXCC activity *plus* you get a packet program and **PacketCluster™** (Pavillion Software) interface so you'll get the *latest DX* information.

MFJ-1281 **$39.95** Shipping Code A

You can enter any call and it tells you at a glance whether you need that country on the band, the mode or both. It tells if you've worked the station before. It gives you a list of contacts with the country, including bands, modes, and QSLs. -- so you can get the station to QSY to the band you need him on. It tells the azimuth and sunset/sunrise times.

You can import logs from the popular CT logging program.

You get a built-in packet terminal program. Easy-DX will monitor the PacketCluster™ DX spotting network, and send "DX" in Morse code through your computer speaker if a country you need is reported.

You get two packet screens. A receive screen lets you monitor a packet channel and a send and receive screen lets you use the terminal program.

Easy-DX also prints QSL labels, keeps up with outstanding QSLs, prints a summary of DXCC activity by band and mode and prints log sheets.

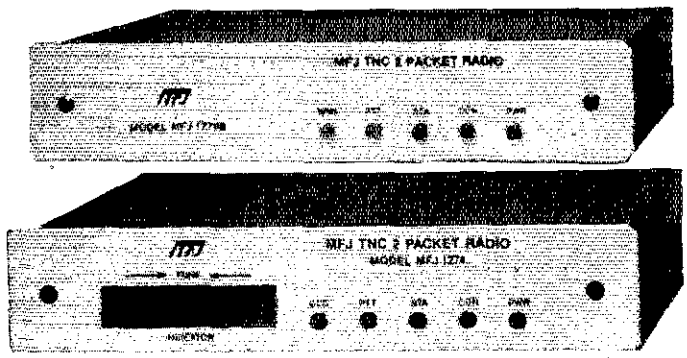
DXCC is within your grasp. Let MFJ's incredible new Easy-DX program help. Easy-DX requires a 100% IBM compatible computer with 512K RAM. Hard disk strongly recommended. Get new MFJ Easy-DX today.

MFJ VHF/HF TAPR Clone Packet Radio Controllers

you get more features than with any other packet controller -- the new Easy Mail Personal Mailbox, HF/VHF Modems, FAX reception, KISS, a one year unconditional guarantee and more for only . . . $139.95

Now with:

- New Turbo models available
- Easy Mail™
- Anti-collision technology
- 32K RAM
- WeFAX
- KISS



MFJ-1270B

$139.95

Shipping Code B

MFJ-1274

$159.95

Shipping Code B

MFJ-1270B super clone of TAPR's TNC-2 gives you more features than any other packet radio controller — for an affordable $139.95.

You can double your fun by operating both VHF and HF packet because you get ***high performance*** switchable VHF/HF modems.

You also get the new Easy-Mail™ Personal Mailbox with soft-partitioned memory so you and your ham buddies can leave messages for each other 24 hours a day.

In MFJ's new WeFAX mode you can print full fledged weather maps to screen or printer and save to disk using an MFJ Starter Pack.

A new KISS interface lets you run TCP/IP and MSYS. They also come Net Rom compatible -- no modification needed.

You also get 32K RAM, socketed ICs, true DCD for HF, 256K EPROM, speaker jack, lithium battery backup, RS-232 and TTL serial ports, a cable to connect your transceiver (you have to add a connector for your particular radio), easy operation, a one year unconditional uarantee plus much more. Use 12 VDC or the included 110 VAC power supply. Measures 9½ x 1½ x 7½ inches.

An MFJ Starter Pack, $24.95, gets you on the air instantly. You get interface cable, software on disk and instructions . . . everything you need. Order MFJ-1282 for Commodore 64/128, MFJ-1287 for Macintosh or MFJ-1284 for IBM or compatibles.

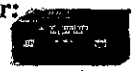
For VGA Picture Passing with your IBM or compatible computer, use MFJ-1289 MultiCom™, $59.95. If you have a VIC-20 or C-64/128 with a tape drive use MFJ-1283, $24.95. For dependable HF packet tuning, MFJ-1274 gives you the proven MFJ 20 LED Precision Tuning Indicator — and it's only $20 more than the MFJ-1270B.

Don't pay more or settle for a limited single function TNC. Choose an MFJ TNC that gives you all the features you need at an affordable price. Choose your MFJ-1270B or 1274 today! You'll be glad you did.

Turbo Models: MFJ-1270BT, $209.95; **MFJ-1274T,** $229.95.

MFJ-1273, $49.95. 20 LED Tuning Indiator:

MFJ clone of TAPR tuning indicator shows you which way to tune. Works with all TNCs that have the TAPR tuning indicator connector.



MFJ-1273 **$49.95**

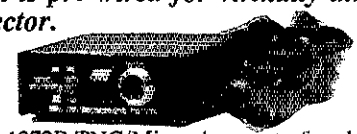
MFJ's *new* TNC/Mic Interface

Simultaneously connects your TNC and microphone! This new model is pre-wired for virtually all rigs with an 8 pin connector.

MFJ-1272B

$34.95

Shipping Code A



NEW

MFJ's new MFJ-1272B TNC/Microphone interface lets you leave your TNC and microphone plugged in simultaeously. Very convenient for the SSTV mode of the MFJ-1278 or if you are tired of plugging and unpigging every time you want to work packet. Affordable and practical at only $34.95. Get yours today!

MFJ's *new* MFJ-2400 Modem

This is the same new packet modem that is built into the MFJ-1278T, MFJ-1274T and MFJ-1270BT. You can install it in most TNC-2s.

MFJ-2400

$69.95

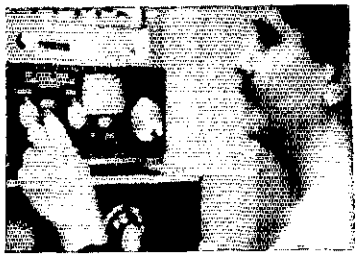
Shipping Code A

NEW

This new MFJ-2400 modem gives you ***fast*** 2400 baud packet. By communicating faster you lessen congestion on crowded frequencies, reduce the chance for errors and more efficiently utilize our ham frequencies. You'll still get 300 and 1200 baud for full compatibility with older TNCs. Get yours today for only . . . $69.95!

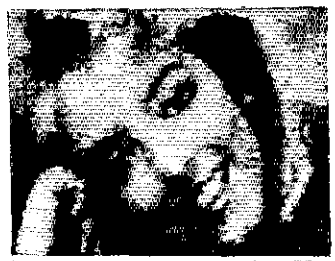
MFJ-1292 "Picture Perfect" Video Digitizer

. . . lets you instantly create fascinating digitized snapshots of anything you can point your camcorder at . . .
you can transmit your pictures to your ham buddies with your MFJ-1278 or any other packet radio controller . . .



Digitized picture converted to FAX mode for transmission by MFJ-1278.

Digitized picture converted to Packet mode for transmission by MFJ-1278.



Digitized picture converted to SSTV mode for transmission by MFJ-1278.

NEW

MFJ-1292

$199.95

Shipping Code A

The above unretouched pictures were shot directly from a VGA monitor. We digitized them with a camcorder, MFJ-1292 "Picture Perfect" Video Digitizer and computer. They were converted with included software.

Create fascinating VGA, EGA, CGA and Hercules digitized snapshots of ***anything*** you can point your camcorder at!

The MFJ-1292 "Picture Perfect" Video Digitizer connects your camcorder to your IBM or compatible computer. It lets you instantly capture fascinating digitized video snapshots on a floppy or hard disk.

Your MFJ-1292 package includes a plug-in card for your computer, complete software package and instructions for only . . . $199.95.

You also get a Contrast and Brightness Control unit that you can conveniently place near your keyboard for fine tuning your pictures.

You get software that lets you convert your digitized snaphshots to **Packet, SSTV or FAX** for transmitting with the MFJ-1278. For ***instant*** picture shoot and transmit, the new **MFJ-1289 MultiCom™** software lets you run your MFJ-1278 with the MFJ-1292 completely intergrated.

You can use your MFJ-1292 pictures in your desktop publishing program that uses the popular PCX format. Add text and colors.

You can create your own ***QSL cards*** -- that you can transmit to your contacts with your MFJ-1278. via packet radio. You can do tons more.

Get yours today. You'll be glad you did.

Ameritron gives you . . .

a full kilowatt OUTPUT from a *quiet desktop* linear . . . for $1095

Ameritron gives you a ***full*** kilowatt ***output*** (nearly the ***input*** of some linears) of peak envelope power for only $1095 -- from a whisper quiet linear that's perfect for your operating desk because it measures just 8¼" H x 14" D x 14¼" W. You also get 850 watts output CW and 500 watts RTTY.

The AL-80A covers 160-15 meters (10 meters with license), including MARS and WARC. You could spend over *twice* the money for a legal limit amplifier *twice* the size -- and all you'll get is an additional 1/3 S-unit -- a difference you won't ever notice.

Tuned Input lets your rig deliver full output

The Ameritron AL-80A uses a direct switched, 100% shielded pi-network tuned input circuit so even the fussiest solid state transmitter works flawlessly with it.

Ameritron AL-80A **$1095** Suggested Retail

result is a clean signal without flat-topping.

Gutsy-Duty Power Supply

The guts of the AL-80A is its heavy ***heavy*** duty power supply. A 22 pound transformer using a high silicone steel core, computer grade capacitors, heavy duty bleeders and ten 3 amp, 1000 V power rectifiers give you a stiff 2700 volts fully loaded. Some amplifiers using **two** 3-500Zs use a light power supply so they can't give much more power output than the AL-80A.

Step-Start Inrush Protection™

The AL-80A special Step-Start Inrush Protection stops damaging inrush current with a start up sequence that's easy on your tube and power supply components.

Multi-Voltage Primary

Too high line voltage stresses components and causes them to wear out. Too low line voltage causes a "soft-tube" effect — low output and signal distortion.

The Multi-Voltage Primary in the AL-80A lets you compensate for too high or too low line voltage so you get the longest component life and peak operating efficiency — regardless of line voltage.

Dual Illuminated Meters

Grid current of the 3-500Z is monitored continuously by one meter. Grid current gives the best indication of overall performance.

Multi-meter measures plate voltage, plate current, peak RF output power and drive power/ALC detector voltage.

Pi-L Output Network

A carefully designed Pi-L output network using the optimum Q for each band gives you exceptionally smooth tuning, extremely wide range load impedance matching and full band coverage. Ball bearing vernier reduction drives on both the plate and load control makes tuning precise and easy.

3-500Z in shielded RF tank gives you nearly 70% efficiency

You get the time proven 3-500Z transmitting tube with an estimated life of 20,000 hours ICAS. The AL-80A is built on a rugged steel chassis. It has a separate RF compartment that's fully shielded to keep RF from leaking out. This keeps RFI and TVI to a minimum.

A superb RF design and layout, a Hi-Q tank circuit and commercially rated power components gives you nearly 70% plate efficiency over the entire operating range. This puts the power into your antenna instead of heating up your amplifier.

A whisper quiet internal fan draws in cool air over the power supply components and the 3-500Z tube to remove heat for longer tube life.

Built-in adjustable ALC circuit makes sure your exciter never overdrives your AL-80A. The

Call your dealer for your best price today!

Bust through QRM with a full kilowatt -- right out of the box. Call your dealer for your best price and order today. Two year limited warranty.

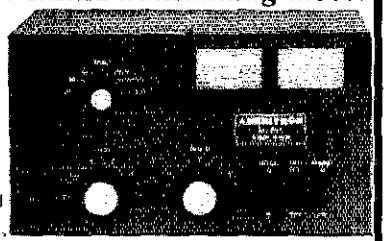
600 WATTS OUT . . . $599

A tough low cost linear with REAL transmitting tubes!

Shades of the legendary Collins 30L1 . . . this new Ameritron AL-811 brings back this rugged tube -- the 811A. It's given thousands of satisfied hams years of "treat it any old way" powerhouse use. And even if you fry these hearty 811As you can replace them for the cost of a few cheap pizzas.

NEW

AL-811 **$599** Suggested Retail



Plus you get dual illuminated meters, 3 second warm up, standby switch, tuned input, pressurized ventilation, multi-voltage primary and heavy duty power supply.

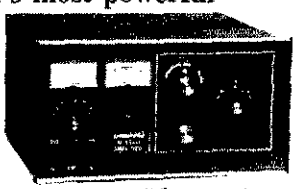
70 watts in gives you 600 watts PEP or 500 watts CW out. It covers all HF amateur frequencies including WARC and MARS. (10 meter modification with license).

AMERITRON offers the best selection of legal limit linears!

These 3 rugged linears all use a super heavy duty hipersil® power supply capable of 2500 watts!

Ameritron's most powerful amplifier

AL-1500 **$2625** Suggested Retail

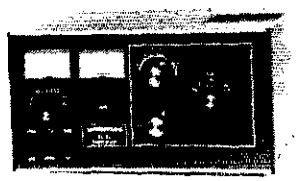


Ameritron super power amplifier uses the ierculean 8877 ceramic tube.

It's so powerful that 65 watts drive gives you ull legal output — and it's just loafing because he power supply is capable of 2500 watts PEP.

Ameritron's Dual 3-500Z linear

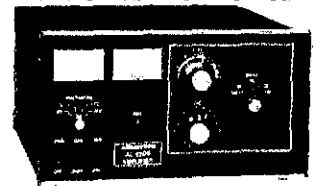
AL-82 **$1995** Suggested Retail



This linear gives you full legal output using a pair of 3-500Zs. Some competing linears using dual 3-500Zs don't give you 1500 watts because their lightweight power supplies can't use the tubes to their full potential.

Ameritron 's 3CX1200A7 linear

AL-1200 **$2045** Suggested Retail

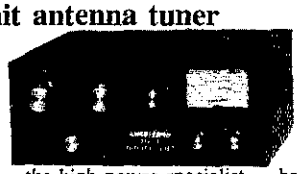


Get ham radio's toughest tube with the Ameritron AL-1200 -- the Eimac 3CX1200A7. It has a 50 watt control grid dissipation rating -- 12 times tougher than the 4 watts of the 3CX800A7 -- yet you get the same full legal output as you get from a pair of 3CX800A7s.

AMERITRON brings you the finest high power accessories!

Legal limit antenna tuner

ATR-15 **$399** Suggested Retail



Ameritron — the high power specialist — brings ou the ATR-15 antenna tuner that's designed for gal limit amplifiers. Heavy duty silver plated ndswitch virtually eliminates switch failure. High ower transmitting capacitors. 1.8-30 MHz. Peak ading SWR/wattmeter. 6 position antenna switch. lectable 1:1 or 4:1 balun. 5¼ x 13¼ x 13½ ches. Meter lamps uses 12 VDC.

meriron Dummy Load ADL-1500 **$59.95** Suggested Retail

ADL-1500 Legal Limit ummy Load, $59.95. Oil cluded. Run 1500 watts for *minutes. 0-400 MHz.*

Remote Coax Switches

RCS-8V **$149** Suggested Retail

RCS-8V, DC-UHF 5 KW Coax Switch. Replace 5 coax feedlines with one with this Ameritron Coax switch. Weatherproof box mounts outdoors on your tower or mast. Attractive control unit sits on your operating desk. Low SWR to 450 MHz. Low loss. Rated at 5 KW to 30 MHz, 1 KW at 150 MHz.

RCS-4, $134.50. 4 position HF switch. Similar to RCS-8V. Requires no control cable Handles 2500 watts PEP.

RCS-4 **$134.50** Suggested Retail

Compact Portable Linear

AL-84 **$549** Suggested Retail

Ham radio's most compact and most inexpensive self contained amplifier. 5x10x11 inch "tote it under your arm" powerhouse gives you 600 watts PEP. 400 watts CW. Four 6MJ6/ 6LQ6. Low SWR input. Good portable amplifier.

AMERITRON

. . . the high power specialist

921 Louisville Rd. • Starkville, MS 39759

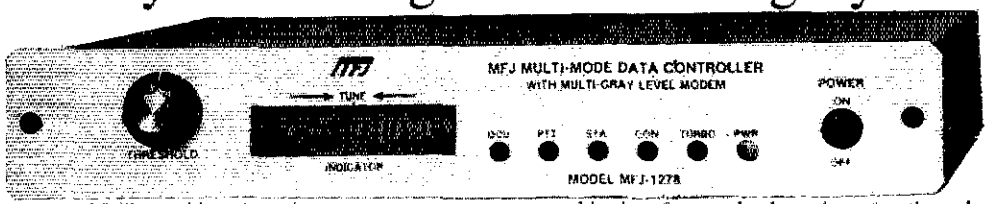
Sales: (601) 323-8211 • **FAX:** (601) 323-6551

Call for a catalog or your nearest dealer!

MFJ gives you *all 9* digital modes
and *keeps on* bringing you state-of-the-art advances
. . . while others offer you *some* digital modes using 3 year old technology!

MFJ-1278

$279.95



No 3 year old technology at MFJ!

Using the latest advances, MFJ brings you 9 exciting digital modes and *keeps on* bringing you state-of-the-art advances like new ASA™.

You get tons of features other multi-modes just don't have.

Only MFJ gives you *all 9* modes

Count 'em -- you get 9 fun modes -- Packet, AMTOR, RTTY, ASCII, CW, FAX, SSTV, Navtex and Contest Memory Keyer.

***You** can't get all 9 modes in any other* multi-mode at *any* price. Nobody gives you modes MFJ-1278 doesn't have.

The best modem you can get

Tests in *Packet Radio Magazine* prove the modem used in the MFJ-1278 copies HF packet more accurately than all other modems tested.

MFJ-1278 is the *only* multi-mode with a *true* DCD circuit. This dramatically reduces sensitivity to noise and dramatically increases completed QSOs.

Exclusive Built in Printer Port

Only the MFJ-1278 has a dedicated printer port that lets you plug in your Epson or IBM compatible printer.

You don't need to buy a silly $40 cable just to plug in your printer.

20 LED Precision Tuning Indicator

MFJ's unequaled tuning indicator makes it really easy to work HF packet. Unlike others, you use it the same for all modes -- not different for each mode. Just tune your radio to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

New Easy Mail™ Personal Mailbox

You get MFJ's new Easy Mail™ Personal Mailbox with soft-partitioned memory so you and your ham buddies can leave messages for each other 24 hours a day.

Multi-Gray Level FAX/SSTV Modem

You'll see tomorrow's news today when you copy outstanding FAX news photos with crisp clear details. MFJ-1278 is the *only* multi-mode with a built-in multi-gray level modem. It lets you transmit and/or receive multi-gray level pictures with an appropriate terminal program.

NEW! **MFJ's new Automatic Signal Analysis™ gives you *exclusive* HF packet idenification!** **MFJ's** new ASA automatically identifies HF packet, RTTY, ASCII and AMTOR signals. A quick "OK" command selects the mode!

One FREE Upgrade!

When *you buy your MFJ-1278 today*, you don't have to miss new modes and features that come out *tommorow*. **Why?** Because your 1278 comes with a coupon good for one *free* eprom upgrade exchange that'll add new features.

Plus More . . .

Plus you get . . . 32K RAM, *free* AC power supply, Host mode that lets MFJ-1278 serve as a kiss interface or dumb modem, fast throughput anti-collision technology, independent transmit level for each radio port, random code generator, lithium battery backup, RS-232 *and* TTL serial ports, socketed ICs, tune up command, peripheral I/O port, automatic serial numbering, programmable message memories, dual radio ports (*each* HF or VHF), CW paddle jack, audio amplifier and speaker jack so you can monitor CW sidetone, transmit and receive audio and packet connect bell, *new* fully intergrated instruction manual with *Fast Start*™ booklet and more. 9½ x 9½ x 1½ inches.

No Matter What™ Guarantee

You get MFJ's one year No Matter What™ Guarantee.

That means we will repair or replace *your MFJ multi-mode (at our option) no matter what* happens to it for a year.

Others give you a *limited* warranty. What if *they* say, "Sorry, your *limited* warranty doesn't cover *that!*"

Get 9 new ways of having fun

Don't settle for 3 year old technology.

Choose the only multi-mode that gives you the latest advances and all 9 modes.

Get 9 new ways of having fun *today!*

New MFJ-1278T *Turbo* with *fast* 2400 baud modem

MFJ-1278T

$359.95

The new MFJ-1278T *Turbo* gives you *fast* 2400 baud packet -- *twice* the baud rate of any other multi-mode. By communicating faster you'll reduce chances for error, lessen congestion and more efficiently utilize our ham frequencies. You'll also get 1200/300 baud for compatibility with older TNCs.

The 2400 baud modem is also available separately. Order MFJ-2400, $69.95, for any MFJ and most other TNCs.

Software Pack gets you on the air *instantly!*

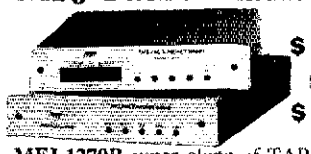
MFJ software packs with interface cable get *you on the air instantly if you use an IBM compatible, Commodore or Macintosh computer.* Here are some of the programs available:

MFJ-1289, $59.95. Menu driven. Super IBM compatible program. See ad below for details.

MFJ-1282B, $39.95. New with multi-gray receive for Commodore 64/128. Menu driven.

MFJ-1287, $24.95. Macintosh starter pack.

MFJ Packet Radio



MFJ-1274 **$159.95**

MFJ-1270B **$139.95**

MFJ-1270B super clone of TAPR's TNC-2 gives you more features than *any* other packet controller -- for $139.95

You can double your fun by operating VHF and HF because you get ***high performance*** *switchable VHF/HF modems.*

You get the Easy Mail™ Personal Mailbox with soft-partitioned memory so you and your buddies can leave messages 24 hours a day.

In MFJ's new **WeFAX** mode you can print full-fledged weather maps to screen or printer and save to disk using most computers.

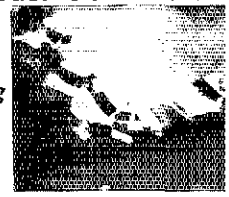
A new KISS interface lets you run TCP/IP and MSYS. *NET ROM compatible.*

You also get 32K RAM and a free 110 VAC power supply (or use 12 VDC).

For dependable HF packet tuning, the MFJ-1274 gives you a high resolution tuning indicator -- and it's only $20 more.

New 2400 baud ***Turbo*** models available: **MFJ-1270BT,** $209.95; **MFJ-1274T,** $229.95.

New MFJ MultiCom™ . . . exciting new 1278 software



High resolution AP news photo received on 20.738 MHz using MFJ MultiCom and MFJ-1278 with multi-gray modem.

MFJ-1289 **$59.95**

New menu-driven MultiCom™ brings out the full power of your MFJ-1278 with multi-gray modem. No set-up required — just load and use. You get incredible high resolution WeFAX maps and AP news photos right off HF. You also get color packet pictures and multi-gray SSTV.

Bursting with features . . . One-Key Macros™ combine multiple keystrokes into a single touch, Call-Alert™ sounds an alarm when any characters you tell it to watch for come in, Auto-Set™ instantly switches entire stored sets of parameters, Auto-Router™ stores digipeater node routes for instant use, Packet Multi-Plex™ lets you transmit or receive a binary file and continue your QSO, Multi-Word™ gives a powerful word processor that is tailor-made for multi-mode communications.

Custom QSL created with paint program

Multi-Gray WeFAX weather map received on 16.410 MHz using MFJ MultiCom and MFJ-1278 with multi-gray modem.

can be transmitted by FAX, SSTV or Packet. Online help. RS-232 cable. Tons more. Call for *free* MFJ catalog for full information: **800-647-1800.**

Optional MFJ-1292 digitizer, $199.95

. . . lets you instantly point, shoot and transmit a video picture -- all in one smooth sequence

Transmit your very own digitized pictures all over the world by packet, FAX or SSTV. MFJ MultiCom™ lets you integrate the MFJ-1292 "Picture Perfect" Video Digitizer, $199.95 with your MFJ-1278 for shooting and transmitting your pictures in one smooth sequence.

Nearest Dealer/Orders: 800-647-1800

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; TELEX: 53 4590
FAX: (601) 323-6551; Include s/h.

MFJ . . . making quality affordable

R&L ELECTRONICS 1315 Maple Ave.

HAMILTON! OHIO 45011

Large Stock

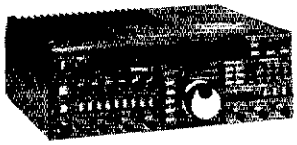
STORE HOURS:
Monday-Friday
10:00 A.M. to 6:00 P.M.
Saturday 10:00 A.M. to
3:00 P.M.

1-800•221•7735

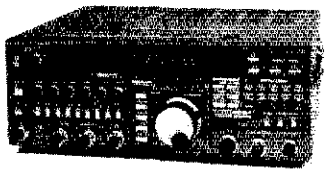
CALL OR WRITE FOR OUR **FREE** CATALOG

TECHNICAL OR IN OHIO CALL (513) 868-6399
FAX (513) 868-6574

YAESU

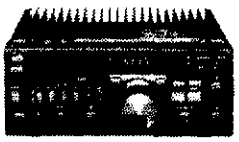


FT-767GX HF/VHF/UHF



FT-736R

FT-757GX/II



FT-470

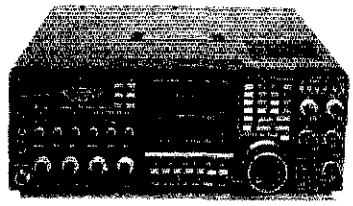
FT-212RH/712RH

FT-23R

FT-411

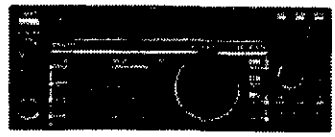
ICOM

IC-781



IC-765

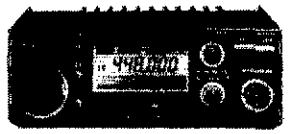
IC-735



IC-725

IC-2SAT
IC-3SAT
IC-4SAT
IC-24AT

IC-28A/28H

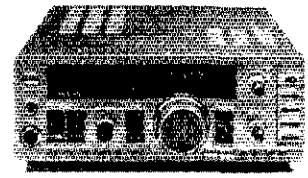


IC-2GAT
IC-4GAT

IC-448A IC-228A/H

KENWOOD

TS-440S TS-140S

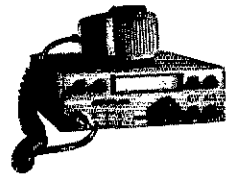


Heath

Kit SB-1000

Get high performance from the Heathkit 1000W linear amplifier

uniden

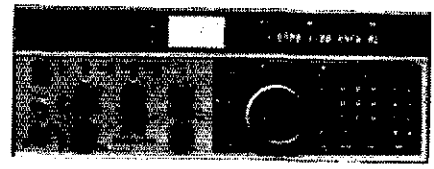


HR2510
HR2600

MFJ

MFJ989C

TEN-TEC



PARAGON OMNI V CORSAIR II

COD'S WELCOME!

VISA MasterCard

WE **STOCK** ALL MAJOR LINES OF AMATEUR RADIO EQUIPMENT, ANTENNAS, TOWER, AND RADIO ACCESSORIES.

Tech Talk from ICOM

GETTING TOP RESULTS FROM YOUR HF MOBILE

Thanks to high sunspot activity and outstanding radio conditions, an increasing number of amateurs are expanding their horizons with multiband HF mobiling. Operators are having a ball on the WARC bands by using HF to stay in touch with around-the-country friends while commuting or traveling. Increased interest in HF mobiling is apparent on-the-air and at hamfests, where friendly discussions quickly turn to talk of getting maximum performance from the mobile setup and antenna system. In light of that fact, this month's Tech Talk shares some noteworthy points for great HF mobiling.

Generally, an HF mobile setup radiates a slightly weaker signal than a home station, because it utilizes a short vertical antenna and the auto's metal body as a moving/quasi ground system. On lower frequency bands, low mobile signal strength is mainly due to three factors: loading coil losses, ground losses and feedpoint mismatches. Improving one or more of those areas noticeably improves your mobile's signal strength.

Loading coil loss and heating is a natural part of mobiling, but it can be minimized by substituting larger diameter coils wound with heavier wire. Using less coil and a longer top whip or "stinger", like a 15 meter coil and 3 or 4 foot whip extension for 20 meters reduces coil loss and boosts your signal.

Ground losses can be minimized by connecting both your transceiver's metal cabinet and antenna tuning unit directly to the auto's metal frame with wide strapping or braid. After locating good grounding points, make liberal use of sandpaper and star washers to ensure good connections. Double-check your installed straps with a low resistance ohmmeter. The resistance between your rig's cabinet, the tuner's ground lug, the coax shield and the auto body should always be less than one ohm.

The reduced size of mobile antenna systems lowers their impedance to only a few ohms, thus some type of base/feedpoint matching is recommended for low SWR and maximum power transfer. Single capacitors or coils for each band are popular compromises here, but a dedicated tuning unit at the antenna's base is optimum. Two points warrant mentioning. Unmatched mobile antenna systems with low SWR usually indicate high resistance loading coils and/or poor grounding. Also, matching low impedance antennas to 50 ohm coax is most effective at their point of mismatch (the antenna's base) rather than in your transceiver.

Now let's consider the fun side of HF mobiling. Visualize a setup that operates 10 through 80 meters with automatic bandswitching and remote SWR tuning right from your transceiver. Compliment it with a tall steel whip antenna to radiate a good signal, a visor-mounted speaker for easy copy, and a boom microphone for safe hands-free operation. No stopping the auto or moving from the rig to switch coils for DXing or net skeds. Everything tracks with your rig-selected frequency; you just switch on the rig, press a button and talk.

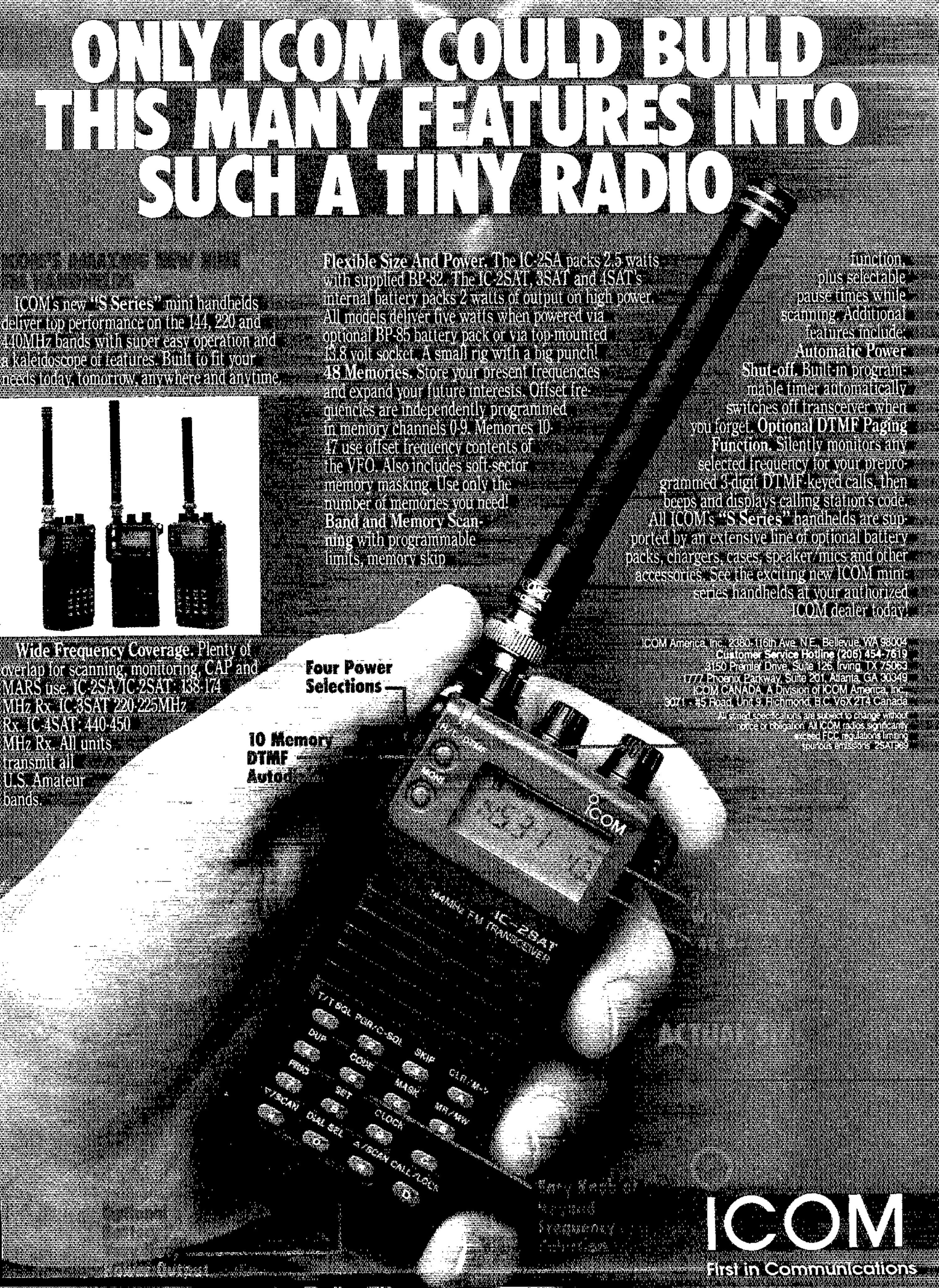
This is mobiling ICOM style, and incorporating that deluxe system in your own auto is a snap. The setup begins with an ICOM IC-751A (a complete station in one cabinet), IC-735 (world famous for superb performance), IC-725 (very popular for easy operation and high reliability), or IC-726 (same as IC-725, but includes 6 meters) transceiver. Then add one of ICOM's optional AH-2 or AH-3 automatic antenna tuners.

Next, connect both the tuner's ground lug and your transceiver's ground terminal to the auto's metal frame using short straps and washers. ICOM's exceptionally rugged AH-2b antenna mount is then bolted to an existing hole in your auto's frame. Attach an 8.5 foot steel whip to the tuner via a supplied cable. Since that cable is on the tuner's output, keep it short and positioned away from metal for best results. Top off your mobile dream rig with ICOM's ultra-thin SP-12 speaker and HS-15 boom microphone.

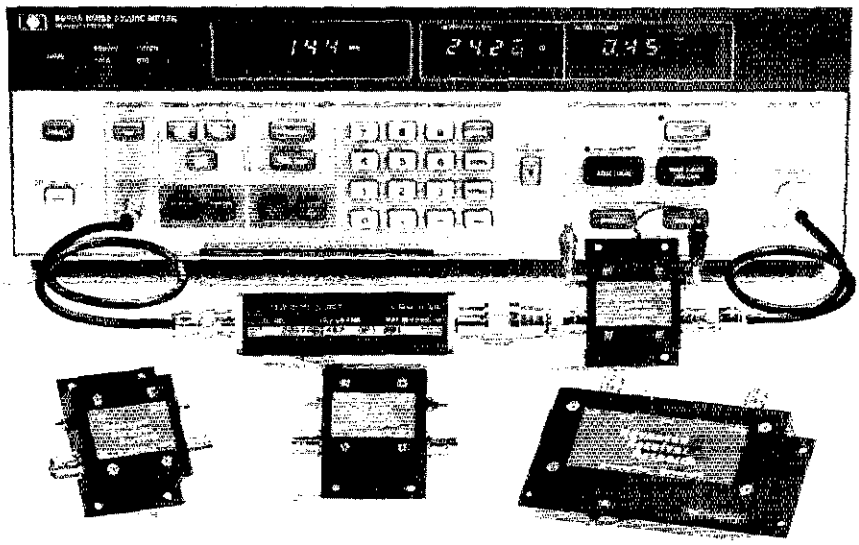
When stopped for the evening toss a 45 foot wire over a tree limb, connect it to the whip or tuner, and work 160 through 10 meters with no tinkering and an impressive mobile signal. Ready to move out with the best mobile system going? Visit your ICOM dealer or **call our toll-free literature request hotline at 1-800-999-9877** and put some real enjoyment in your open-road travel!

What topics would you like to see discussed in ICOM's Tech Talk Series?
Send your request to:
ICOM America, Inc.
2380 116th Avenue N.E.
Seattle, WA 98004

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 **Customer Service Hotline (206)454-7619**
3150 Premier Drive, Suite 126, Irving, TX 75063/ 1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc., 3071-#5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada


ONLY ICOM COULD BUILD THIS MANY FEATURES INTO SUCH A TINY RADIO
ICOM's new "S Series" mini handhelds deliver top performance on the 144, 220 and 440MHz bands with super easy operation and a kaleidoscope of features. Built to fit your needs today, tomorrow, anywhere and anytime.
Wide Frequency Coverage. Plenty of overlap for scanning, monitoring, CAP and MARS use. IC-2SA/IC-2SAT: 138-174 MHz Rx. IC-3SAT: 220-225MHz Rx. IC-4SAT: 440-450 MHz Rx. All units transmit all U.S. Amateur bands.
Flexible Size And Power. The IC-2SA packs 2.5 watts with supplied BP-82. The IC-2SAT, 3SAT and 4SAT's internal battery packs 2 watts of output on high power. All models deliver five watts when powered via optional BP-85 battery pack or via top-mounted 13.8 volt socket. A small rig with a big punch!
48 Memories. Store your present frequencies and expand your future interests. Offset frequencies are independently programmed in memory channels 0-9. Memories 10-47 use offset frequency contents of the VFO. Also includes soft-sector memory masking. Use only the number of memories you need!
Band and Memory Scanning with programmable limits, memory skip function, plus selectable pause times while scanning. Additional features include: Automatic Power Shut-off. Built-in programmable timer automatically switches off transceiver when you forget. Optional DTMF Paging Function. Silently monitors any selected frequency for your preprogrammed 3-digit DTMF-keyed calls, then beeps and displays calling station's code.
All ICOM's "S Series" handhelds are supported by an extensive line of optional battery packs, chargers, cases, speaker/mics and other accessories. See the exciting new ICOM mini-series handhelds at your authorized ICOM dealer today!
ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004
Customer Service Hotline (206) 454-7619
3150 Premier Drive, Suite 126, Irving, TX 75063
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc.
3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada
All stated specifications are subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 2SAT989
Four Power Selections
10 Memory DTMF Autod
ICOM
IC-2SAT
144MHz FM TRANSCEIVER
ICOM
First in Communications

High Performance vhf/uhf preamps



Receive Only	Freq. Range (MHz)	N.F. (dB)	Gain (dB)	1 dB Comp. (dBm)	Device Type	Price
P28VD	28-30	<1.1	15	0	DGFET	$29.95
P50VD	50-54	<1.3	15	0	DGFET	$29.95
P50VDG	50-54	<0.5	24	+12	GaAsFET	$79.95
P144VD	144-148	<1.5	15	0	DGFET	$29.95
P144VDA	144-148	<1.0	15	0	DGFET	$37.95
P144VDG	144-148	<0.5	24	+12	GaAsFET	$79.95
P220VD	220-225	<1.8	15	0	DGFET	$29.95
P220VDA	220-225	<1.2	15	0	DGFET	$37.95
P220VDG	220-225	<0.5	20	+12	GaAsFET	$79.95
P432VD	420-450	<1.8	15	−20	Bipolar	$32.95
P432VDA	420-450	<1.1	17	−20	Bipolar	$49.95
P432VDG	420-450	<0.5	16	+12	GaAsFET	$79.95
Inline (rf switched)						
SP28VD	28-30	<1.2	15	0	DGFET	$59.95
SP50VD	50-54	<1.4	15	0	DGFET	$59.95
SP50VDG	50-54	<0.55	24	+12	GaAsFET	$109.95
SP144VD	144-148	<1.6	15	0	DGFET	$59.95
SP144VDA	144-148	<1.1	15	0	DGFET	$67.95
SP144VDG	144-148	<0.55	24	+12	GaAsFET	$109.95
SP220VD	220-225	<1.9	15	0	DGFET	$59.95
SP220VDA	220-225	<1.3	15	0	DGFET	$67.95
SP220VDG	220-225	<0.55	20	+12	GaAsFET	$109.95
SP432VD	420-450	<1.9	15	−20	Bipolar	$62.95
SP432VDA	420-450	<1.2	17	−20	Bipolar	$79.95
SP432VDG	420-450	<0.55	16	+12	GaAsFET	$109.95

Every preamplifier is precision aligned on ARR's Hewlett Packard HP8970A/HP346A state-of-the-art noise figure meter. RX only preamplifiers are for receive applications only. Inline preamplifiers are rf switched (for use with transceivers) and handle 25 watts transmitter power. Mount inline preamplifiers between transceiver and power amplifier for high power applications. Other amateur, commercial and special preamplifiers available in the 1-1000 MHz range. Please include $2 shipping in U.S. and Canada. Connecticut residents add 7-½% sales tax. C.O.D. orders add $2. Air mail to foreign countries add 10%. Order your ARR Rx only or inline preamplifier today and start hearing like never before!

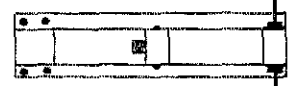
Advanced Receiver Research

Box 1242 • Burlington, CT 06013 • 203 582-9409

AA1A SIDEKICK ANTENNAS

- 144 - 220 - 440 Mhz. Models
- Dual Extended Collinear Elements
- Stainless Elements and Hardware
- Side/Top Mount Tower or Mast
- Excellent Gain and Quality
- Easily Stacked
- Broadband - Tunable
- SO-239 Feed
- New Design and High Efficiency

$79.95



- With 'N' Connector and Silver Plated Feed Probe

$89.95

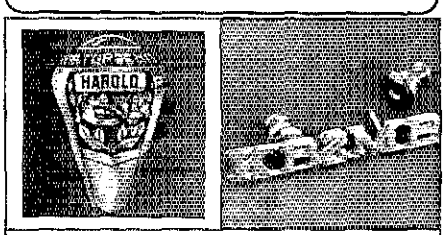
Broadcast Tech. Services
11 Walnut St.
Marshfield, Mass. 02050

617-837-2880
800-874-2880 Order

No Extra Charge for VISA-MC
Shipping Handling add $4.00
Mass. Residents add 5%

WRITE YOUR OWN COMPUTER PROGRAMS

with EngLan
the easy-to-learn computer language
for IBM™ compatible computers
Version 2.. $49. Version 1.. $19.00
Written by Jerry Gentry WA9H
Gentry Software, P.O. Box 4485, Springfield, MO 65808
VISA 800-346-9475 MasterCard



Call Sign Jewelry Shows Your Pride

14 Karat Gold jewelry with your Call Sign. Collar pins, necklaces, tie pins, lavalieres, charms, Operator Rings, Call Sign Watches, Look great! Quality craftsmanship. Send for free information:

KB2MB, H&M Jewelry Company
26 Edgecomb Road, Binghamton, NY 13905-4017
or Call (607) 797-5458

ASSOCIATED RADIO

8012 CONSER BOX 4327
OVERLAND PARK, KANSAS 66204

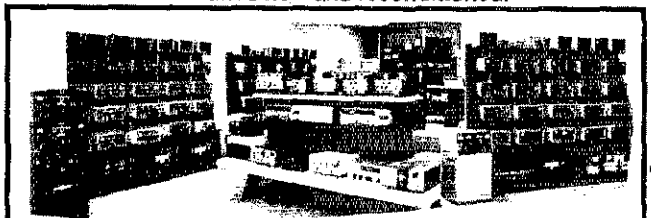
CALL 913-381-5900
FAX 913-648-3020

BUY—SELL—TRADE

All Brands new and reconditioned.

EVERY DAY A HAMFEST

WE'LL BUY YOUR EXTRA RIG STATIONS - ESTATES ETC.



Send $3.00 for our current catalog and wholesale sheet.

"ONLINE" U.S. CALL DIRECTORY

Hamcall service gives you ALL hams via your computer & modem. Updated each month! Only $29.95 per year. Unlimited use — you pay for phone call.

BUCKMASTER PUBLISHING
Route 3, Box 56
Mineral, Virginia 23117
703: 894-5777 visa/mc 800: 282-5628

ROCK SOLID

"The seven IC-735's used at P4OV performed well. Their excellent dynamic range contributed to our victory at P4OV. The IC-735 is a true champion!" Dale Green, VE7SV

ICOM's IC-735 is the world's most popular HF transceiver for three simple reasons: **Performance, Size and Reliability.** With the highest performance, smallest size, and best customer satisfaction of any HF transceiver, the IC-735 is the undisputed champion for fixed, portable or mobile operations.

- **Field Proven 100W Transmitter** with 100% duty cycle. Proudly backed with ICOM's full one-year warranty.
- **105dB Dynamic Range Receiver** includes passband tuning, IF notch, adjustable noise blanker, and semi or full CW QSK.

- **Conveniently Designed.** Measures only 3.7"H by 9.5"W by 9"D. Great for mobiling or portable operation!
- **Optional AH-2 Automatic Tuning Mobile Antenna System** covers 3.5MHz-30MHz.
- **All HF Amateur Bands and Modes** transmits all U.S. HF amateur bands. General coverage receiver.
- **12 Tunable Memories** operate and reprogram like 12 separate VFO's. Supreme flexibility!

Additional Options: SM-8 or SM-6 desk mic, PS-55 AC power supply, AT-150 automatic antenna tuner for base operation.

ICOM's IC-735. . . the radio with the rock solid reputation! See it today at your local ICOM dealer.

ICOM America, Inc.,
2380 116th Avenue N.E., Bellevue, WA 98004
Customer Service Hotline (206) 454-7619
3150 Premier Drive, Suite 126, Irving, TX 75063
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc.,
3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4

ICOM
First in Communications

IT'S HERE

WEATHER SATELLITE HANDBOOK

By Dr. Ralph Taggart, WB8DQT

IT'S

- ★ Expanded and revised to reflect today's weather-fax satellite technology
- ★ For anyone with an interest in electronics, meteorology, earth science and computer science
- ★ Packed with digital display projects and information

New technology contained in this fourth edition will allow you to track one of the most unpredictable forces in the world—WEATHER—more accurately than ever before.

IT'S WAITING

$20.00 plus $3.50/UPS shipping and handling
Check or MO/AMEX/VISA/MasterCard/Discover accepted

Order today from: **The American Radio Relay League**

225 Main Street
Newington, CT 06111
203-666-1541

NOTHING COMPARES TO AN ICOM 2-METER...

...EXCEPT ANOTHER ICOM 2-METER

	Power Output	Rx Range	Tx Range	Memories	Memories Storing any Tx Offset, DTMF, Autodialer Memories	CTCSS Encoder	CTCSS Decoder/Pager	6-Digit DTMF Pager	Cross Band Repeat	Automatic Power Shutoff	Automatic Power On/Time Clock	Direct Keyboard Freq. Entry	AM/Extended Rcv Coverage	Multiband Units
BASE														
IC-970 A/H	A: 25 w.All Mode 2m/70cm H: 45 w./2m; 40 w./70 cm*	Optional 50-905	140-150 430-450	99+	99+	No	Yes	Optional UT-34	Yes				Yes		Yes
IC-275 A/H	25 w./A; 100 w./H	138-174	140-150	99		No	Yes	Optional UT-34	No						
MOBILES														
IC-228H	45 w.	138-174	140-150	20	20	No	Yes	Optional UT-40	No					No	
IC-229 A/H	25 w./A; 50 w./H	136-174	140-150	20	20	14	Yes	Optional UT-50	Optional UT-55					Yes	
IC-2400	45 w./2m; 35 w/70 cm	138-174 440-450	140-150 440-450	40	40	No	Yes	Optional UT-40	No	Yes				No	
IC-3220 A/H	A: 25 w./2m; 25 w./70 cm H: 45 w./2m; 35 w./70 cm	136-174 440-450	140-150 440-450	36	36	No	Optional UT-51	Optional UT-50	Optional UT-55	Yes	No	No	No	No	
IC-901	50 w./2m, 35 w./70 cm	136-174 440-450	140-150 440-450	24	24	No	Yes	Optional UT-40	Optional UT-48	Yes					Yes
HANDHELDS														
IC-2SAT	1.5 w. std.; 5 w. optl.	136-174	140-150	48	48	10	Optional UT-51	Optional UT-50	Optional UT-49		Yes	Yes	Yes	Yes	
IC-2SA	1.5 w. std.; 5 w. optl.	136-174	140-150	48	48	No	Optional UT-51	Optional UT-50	Optional UT-49		Yes	Yes	No	Yes	
IC-24AT	1.5 w. std.; 5 w. optl.	136-174 440-450	140-150 440-450	40	40	4	Optional UT-51	Optional UT-50	No	Yes	Yes	Yes	Yes	Yes	Yes
IC-2GAT	7 w.	136-174	140-150	20		No	Yes	Optional UT-40	No		No	No	No	No	
IC-02AT	5 w.	140-150	140-150	10	4	No	Yes	No	No		No	No	Yes	No	
IC-32AT	5.5 w. std.	138-174 440-450	140-150 440-450	20	20	No	Yes	Optional UT-40	No	Yes	No	No	Yes	No	Yes

*SSB/CW 35 w/2m; 30 w/70 cm

How does your 2-meter stack up? Use the chart above to compare. You may find a visit to your local ICOM Amateur dealer is just what you need.

Additional information on all ICOM equipment is available right at your fingertips. Simply call the ICOM literature request hotline toll-free at 1-800-999-9877.

Are you receiving ICOM's RADIO NEWS? It's loaded with great information on new rigs, special tips on mobiling, satellites, packeting, contesting and much more. For a free copy, send your name and address to ICOM.

ICOM

First in Communications

CORPORATE HEADQUARTERS ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 (206)454-8155
CUSTOMER SERVICE HOTLINE (206) 454-7619 / CUSTOMER SERVICE CENTERS 3150 Premier Drive, Suite 126, Irving, TX 75063 / 1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada / 2380-116th Ave. N.E., Bellevue, WA 98004 2M990

ICOM

IC-726 HF Transceiver

NEW TECHNOLOGY AND SOPHISTICATION IN ONE SMALL PACKAGE

ALL HF PLUS SIX METERS!

ICOM does it again by combining top performance on all HF bands with deluxe six-meter operation in an ultra-compact and easy-to-operate transceiver! Six-meter DXing is terrific and the IC-726 is your key to great all mode action fixed, mobile or portable.

UNCOMPROMISING FEATURES include: • All mode operation from 160 through six-meters • Shortwave reception from 500KHz to 33MHz plus 46.2 to 61.1MHz • 100 watts SSB and CW • 10Hz digital frequency display • 26 memories tune full range and reprogram independent of VFO use • Three scan modes • Noise blanker.

ADVANCED CIRCUIT DESIGNS feature: • Direct digital synthesizer (DDS) • Dual VFOs • Band stacking registers • Sensitive 105db dynamic range receiver • Panel-selectable RF preamp and attenuator • Built-in controller for optional AH-3 remote antenna tuner for HF operation.

The outstanding IC-726 puts all the exciting DX action of sunspot cycle 22 right at your fingertips, and it is confidently backed with ICOM's no-compromise one year warranty. See this amazing unit at your local ICOM dealer.

ICOM

First in Communications

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 Customer Service Hotline (206) 454-7619
3150 Premier Drive, Suite 126 Irving, TX 75063 / 1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

Introducing the only HF amateur radio transceiver built to true professional standards

Since 1915, Japan Radio Company has been dedicated to producing the world's finest radio communications equipment.

The same design quality that is incorporated into our marine, satellite, broadcast and commercial systems can also be found in our amateur radio equipment, including the new JST-135HP high frequency amateur radio transceiver

Discover what professionals have known for 75 years. Look to Japan Radio Company if you demand the highest quality radio equipment.

For a full color brochure and current lists of prices and dealers, call JRC at (212) 355-1180. Or write to the address listed below.

JRC
Since 1915

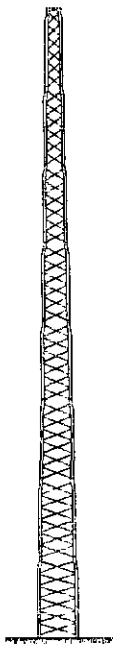
Japan Radio Co., Ltd.

430 Park Ave, 2nd Floor New York, NY 10022
Phone: (212)355-1180 Fax: (212)319-5227
Telex: 961114 JAPAN RADIO NYK

rf enterprises

More than a source ..... a solution!

ANTENNAS, TOWERS, & ACCESSORIES



ROHN TOWERS:

SELF-SUPPORTING

(6 sq. ft. model)

BX64 — 64 ft ..... $CALL

(10 sq. ft. models)

HBX40 — 40 ft. ..... $CALL
HBX48 — 48 ft. ..... $CALL
HBX56 — 56 ft. ..... $CALL

(18 sq. ft. models)

HDBX40 — 40 ft. ..... $CALL
HDBX48 — 48 ft. ..... $CALL

(Ratings based on 10 ft. boom.)

GUYED TOWER SECTIONS

25G, 45G, 55G & accessories
Call for current prices.

New! 7 ft. UPS shippable 25G sections

FOLD-OVER TOWERS

FK 2548	CALL	FK4544
FK2558	FOR	FK4554
FK2568	PRICES	FK4564

Rohn fold-over towers are shipped freight prepaid from the factory. Freight additional on other towers.

TOWER HARDWARE

3/16 EHS Guywire ..... $CALL
1/4 EHS Guywire ..... $CALL
CCM clamps 3/16 " ..... $CALL
1/4 " ..... $CALL
Thimbles; 1/4TH ..... $CALL
Turnbuckles:
3/8 E&E; E&J ..... $CALL
1/2E&E; E&J .. $CALL
Rohn TB-3 Thrust bearing .... $CALL
Pretormed **"Big Grips"**
3/16" & 1/4" ..... $CALL
Guy Insulators
500D & 502 ..... $CALL
Earth Anchor; 4 ft. screw-in .. $CALL

Phillystran Guy Systems:

Complete inventory of the latest cable and accessories!

ROTATORS

TELEX/hy-gain
HDR-300
T2X
HAM IV
CD 45 II

YAESU
G600RC G1000SDX
G800SDX G500A
G5400B

ALLIANCE **M²**
HF, VHF, OSCAR, & EME

ORION

HY-GAIN TOWERS:

CRANK-UPS

16 Sq. Ft. Models:
HG-70HD 70 ft., 4 sections
HG-54HD 54 ft., 3 sections

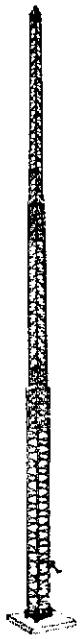
9.5 Sq. Ft. Models:
HG-52SS 52 ft., 3 sections
HG-37SS 37 ft., 2 sections

ACCESSORIES

HG-COA Coax Arms
HG-TBT Thrust Bearing
HG-GP Gin pole
HG-5, HG-10, & HG-15 Masts.

Hy-gain crank-up towers let you raise the antenna for optimum performance and retract it for service and for security in severe weather.

Order your hy-gain antenna/tower package from *rf enterprises* and save!



HUSTLER

6BTV 80-10 mtr vertical.
5BTV 80-10 mtr vertical.
G7-220
G7-144 2 mtr base antenna

Complete mobile systems.

BUTTERNUT

HF6VX Vertical, 80-10M.
HF2V Vertical, 80 & 40M.
RMK II roof mount kit
STR II radial kit
TBR-160, coil kit for 160M
WARC resonators
HF5B Compact beam, 20-10M

ALPHA-DELTA

DX-A Sloper $46.95
DX-CC 79.95
DX-DD 65.95
Transi-Trap Surge Portectors for coax lines and rotor control cables.

DIAMOND

Base/Repeater Antennas:
X-500MA, X500A, & X-300A
X-200A, X-50A
F-22A, F-23A

Dual-Band Mobile Antennas:
NR-770HA, NR-790A, NR-770SA

SX-Series Power/SWR Meters
Choose from five models -- 1.8 - 1300MHz

NEW! U-5000 TRIBAND ANTENNA FOR 2 M, 440MHz, & 1.2GHz.

TELEX/hy-gain

TH7DXS: 7-el. tribander; Our best selling large tribander.
TH5Mk2S: 5-el. tribander. 19 ft. boom.
Explorer-14: 4 elements on a 14.1 ft. boom. Great performance for its size!
205CA: 20 meter monobander. 5 elements on a 34 ft. boom.
204BAS: 20 meter monobander. 4 elements on a 26 ft. boom.
115BAS: 15 meter monobander. 5 elements on a 26 ft. boom.
105BAS: 10 meter monobander. 5 elements on a 24 ft. boom.
18HTS: "Hy-Tower." The "gold-standard" 80-10 meter vertical.
18AVT/WBS: *80 - 10 meter vertical.*
64BS & 66BS: 4 element and 6 element beams for 6 meters.
V2S;V3S;V4S: Verticals for 2 meters, 220 MHz, and 440 MHz.
OSCAR Link: A ***COMPLETE*** 435 - 145.5 MHz OSCAR antenna system.

NEW FOR THE HF BANDS!! **Hy-gain's DX-88 vertical antenna.**

WIRE & CABLE

BELDEN COAX: (Performance ... not problems)

9913 low loss; 50 ohm.
RG-213U (8267) 50 ohm. Mil-spec.
RG-8/U (8237) 50 ohm.
RG-8/U (8214) 50 ohm. Foam.
RG-8X(9258) 50 ohm; foam.
RG-11A/U (8261) 75 ohm.
RG-58A/U (8259) 50 ohm.
RG-59/U (8241) 75 ohm.
RG-214/U (8268) 50 ohm, double shield.

Don't settle for less than the best. Call us for Belden.

COPPERWELD ANTENNA WIRE:

Solid: 12 ga...$0.12/ft.; Solid: 14 ga...$0.09/ft.; Stranded 14 ga...$0.10/ft.

ROTOR CABLE:

Standard(6-22, 2-18).....$0.23 Heavy Duty(6-18,2-16).....$0.39/ft.

Call for jumpers and custom cable assemblies.
We stock Amphenol connectors and Andrew Heliax.

CUSHCRAFT

A3S: Tribander.
A743: 30 or 40 M add-on for A3S.
A4S: Tribander.
A744: 30 or 40 M add-on for A4S.
R5: 10,12,15,17,20. ***SPECIAL!!***
AP8: 80 - 10 Vertical.
APR18: 8-band radial kit for AP8.
AV5. 80 - 10 Vertical.
A3WS: 3-el WARC beam (18 & 24 MHz)**
D3W: 10, 12, & 17 meter dipole.
D4: 7, 14,21,28 MHz dipole.
40-2CD: 2-el 40M. beam
A50-6: 6-el. 6M beam.
A50-5 5-el 6M beam.
A50-3: 3-el. 6M beam.
617-6B: 6 Mtr. Boomer.
AR-6: Ringo for 6 meters.
ARX-2B: Ringo Ranger II.
ARX-220B: Ringo Ranger II.
ARX-450B: Ringo Ranger II.
AR-270 2M & 440MHz Ringo Ranger**
A147-11: 11-el 146-148MHz.
215WB: 15-el wide band 2M.
32-19: 19-el. 2M beam.
4218XL: 18-el 2M Boomer.
424B: 24-el 432MHz Boomer.
AOP-1: OSCAR pack.

Call for prices on the entire line!

KLM

KT34A	$CALL
KT34XA	$CALL
2M-16LBX	$CALL
2M-22C	$CALL
432-30LBX	$CALL
435-40CX	$CALL

HF Monobanders, VHF, UHF, & OSCAR antennas in stock.

HEIL SOUND

IIX
Tower equipment

Antennas and towers are our specialty.
Call us ..... for solutions.

M² ANTENNAS, UNADILLA, ANTENNA SPECIALISTS, B & W, AMECO, OPTO KEYERS, ASTATIC, SHURE

rf enterprises

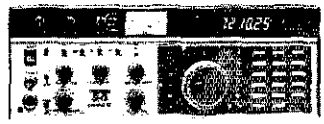
Call us for all your amateur needs.
We ship worldwide. We service amateur equipment.

YAESU

FT-1000D

FT-767GX	160-10M Transceiver 50, 144, 432 MHz with optional mods.
FT-747GX	Economy HF Transceiver
FT-757 GX-II	All mode HF Transceiver
FT-736R	144/432 duplex Transceiver
FEX-736	Add modules for 50, 220, or 1296.
FT-411	New 2M HT
FT-212RH	45W 2M FM Transceiver
FT-712RH	35W 440 FM Transceiver
FT-709R	4W, 440 FM HT
FT-4700RH	2M/440 Dual band mobile
FGR-8800	150KHZ - 30MHZ Receiver
FGR-9600	60-902MHZ Receiver

TEN-TEC



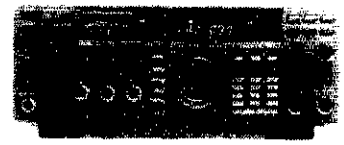
OMNI V

Features a 12 band crystal mixed local oscillator for the ultimate in receiver cleanliness. Dual VFO's, 25 tunable memories, full QSK, optional FM board, crystal filters selected independent of mode, output adjustable from 20 to 100 watts. A GREAT RIG!

OTHER TEN-TEC PRODUCTS:

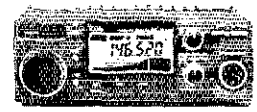
Model 561	Corsair II HF Transceiver
Model 585	Paragon
Model 425	Titan Linear Amplifier
Model 420	Hercules Solid State HF Amplifier
Model 238	Antenna Tuner
Model 253	2KW 1.8 - 30MHz Automatic Tuner
Mobile Antennas	80 - 10 Meters

ICOM



IC-765

Call us for ICOM SPECIALS!



IC-228A/H

We have specials on ICOM mobile FM transceivers.

Call us for all your ICOM needs!

PK-232

Morse, Baudot, ASCII, AMTOR, Packet, Facsimile, & Navtex

AT-300 Tuner SPECIAL!

KANTRONICS

KAM All mode terminal unit

ALINCO

DR-570T

Compact, dual band transceiver with 45W on 2M and 35W on 70 cm.. Full duplex cross band operation, 20 memories, 4 scanning modes, 16 key DTMF mic, extended receiver coverage.

DJ-500T Dual Band Handheld

144.000-147.995 / 440 - 450 MHz
Cross Band Full Duplex
2.5W VHF & 2.0W UHF
(6 watts & 5 watts with optional battery)
16 Digit Auto Dialer
20 Memory Channels
Programmable Odd Offsets
CAP and MARS Modifiable
2 Year Limited Factory Warranty

MFJ

METERS KEYERS TUNERS
ACCESSORIES SWITCHES

Special!

949D TUNER

TNC UNITS DUMMY LOADS
ANTENNA BRIDGES CLOCKS

HEATH

SB-1000 Linear Amplifier Kit

Dual Band Handhelds & Mobile Transceivers
SA-2060 Delux Antenna Tuner Kit
HK-232-A Pack-Kit Controller
HN-31-A Cantenna Dummy Load Kit
And more .. make "rfe " your HEATH Headquarters!

AMPS, TUNERS & ACCESSORIES

AMERITRON AL-80A

AL-84:	600W PEP
AL-80A:	1000W PEP
AL-82:	1500W out
AL-1200:	1500W out
AL-1500:	1500W out
RCS-4 & RCS-8V	Remote coax switches

NYE VIKING MBV-A

rf concepts amps

Alpha-Delta, B&W, & MFJ Coaxial Switches

MIRAGE AMPS

ASTRON

POWER SUPPLIES

RS-4A	$ 39.95	RS-7A	$ 49.95	RS-12A	$ 69.95
RS-20A	88.95	RS-35A	139.95	RS-50A	199.95
RS-20M	109.95	RS-35M	159.95	RS-50M	219.95
VS-20M	124.95	VS-35M	174.95	VS-50M	232.95

VISA **Mastercard**

Personal checks verified with
Telecheck

Prices subject to change without notice.
Shipping additional except as noted.
Returns subject to 15% restocking fee.

ORDER TOLL FREE

1-800-233-2482

Shipping info., Technical, Inside Minnesota, & DX
218-765-3254
FAX: 218-765-3308

rf enterprises
HCR Box 43
Merrifield, MN 56465

More than a source .....a solution.

trictions; he caught it early; more LGLs needed! Johnson Space Ctr ARC conducts HF equipment training sess; includes HF TNC & slow-scan TV gear. *Mic 'N Key*, Port Arthur ARC bulletin, rprts club dates back to 1939; has 100% records of mtgs since 1947. Matagorda Co ARC bulletin rprts N5NDL & KB5LPA conduct on-air code Tues, 8 PM CDT, 28.450 MHz; upgrades: KB8CAK to Adv, N5QKJ to Gen, K5IDS to Amateur Extra Class; FB! Houston's NW ARS bulletin rprts Economic Summit special-event station busy July 5-11, 24 hrs dy at 7 optg positions; more than 160 hams took part; had 3790 cncts, 56 countries; N5QVT upgraded to Gen; 1 unlicensed passed to Tech; very good. 7290 Tfc Net Secy NF5F rprts 374 msgs in 50 Aug sess; 3371 QNI; NTS liaison 2 per sess; NM KD5RC. Brazosport ARC provided comms for annual Brazosport Triathlon; WB8PHO coordinated; KB5AJS, KA5IDC, KA5SYW, NV5L, KA5BNR, KA5KRI, WB5I, WB5J, W5SYN, K5QQI, N5KV, WD5GKH, KA5VZM, KA5UVL, N5HBI helped. Ham 'N Eggs Society', La Grange, rprts KB5MSG (age 12), KB5MSE (12-yr-old's Dad), KB5MRP, KB5MRZ upgraded to Tech; 10-yr-old twin brothers passed Novice. PIO N5KAO, Brady, rprts World Championship BBQ cook-off among Brady, San Angelo, Abilene & Brownwood clubs a finger-lickin' good success. Brazos Valley ARC (Ft Bend & Harris Cos) rprts 1st annual Ice Cream Fest & Kiddies' Toys Nite; 77 members & guests enjoyed 10 gals of ice cream, viewing model aircraft & videos of a model airplane meet; July test sess upgrades: WD5DZC & 1 unlicensed to Gen; KB5LXG, N5PJI, N5PRP to Adv; N5JNN, N5QQJ, KI5HC to Amateur Extra Class; Great! Houston ECHO Society bulletin rprts 148 ops signed up for Economic Summit special-event station; Society helped with successful "Clean Houston" program; ECHO members N5NPR, KE5CP, WA5QXE, KG5YF, WX5X, KD5AS, KA5RIZ, WB5YWS, N5EJX, KA5YDS, KF5ZW, N5QES, W5TXV, KG5HQ, KB5EEG, N5PTP, N5NXS, WA5LNG, N5OHN, WB5MUI, WA5GZX helped; Corresponding Secy N5OHN rprts 3 unlicensed passed Tech exam in latest VE sess; ECHO provided comms for Katy Flatland Century Bicycle ride; ops were KD5AS, KB5DNT, KA5GHI, N5GQS, AA5JW, WB5MUI, N5JNC, WA3PMT, N5QCE, W5RIY, WB5SRN, KB5UC, KA5USF, KA5VBK, KD5YA, KA5YDS, KG5YF, WB5YWS; KK5W of M D Anderson Cancer Ctr, presented program on relationship between power lines & leukemia; ECHO presented KK5W with a plaque for his work at special-event station. Austin ARC bulletin, *AARC-OVER*, won "Good" rating in Amateur Radio News Service club bulletin contest; they earned it— congratulations. DTTN NM K5UPN rprts 268 msgs in 31 Aug sess; 593 QNI. DRN5 NM WB5YDD rprts 714 msgs in 50 Aug sess; TTN NM K5UPN rprts 129 msgs in 31 Aug sess; 894 QNI. STX represented 100% by W5CTZ, KE5ZV, N5NAV, KG5TL, N5ILI, W5SHN, WB5YDD.

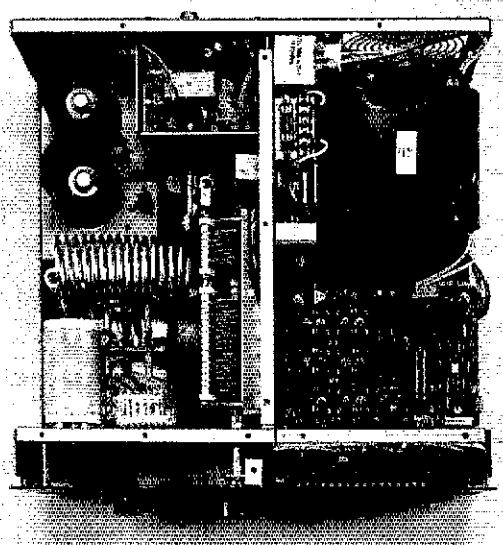
WEST TEXAS: SM, Milly Wise, W5OVH—Congratulations to the San Angelo ARC, which has been officially renewed as an ARRL Special Service Club. Recently, the W5ES clubhouse was the site of a training class in hunter ed. Bill Deragisch, N5OGJ, is chief instructor for trans-Pecos area & advises that it's now mandatory that hunters attend hunter ed classes in all but 5 states. WB5VIH advises that the world champion goat cook-off of the Key City ARC at Brady, TX, with Dee, W5VRE; Bill, WB5OYC; Steve, KG5QH; Dave, WB5VIH, & Randy N5JZH, participated & Peg, KA4UPA. Charles Abermethy, WB5VHZ, is a graduate student in electrical & computer eng, at U of AZ. Tex Burdick, W5BQU, will be 90 (ninety) yrs old Sept 25. Enjoyed the Abilene hamfest; appreciated the warm hospitality shown Larry & me. Wish to thank the Amarillo hams on an excellent hamfest & for showing what can be done to make a hamfest a success. Hotel accoms, etc & the facility showed a lot of work went into it. Nov 3-4 will be the Odessa hamfest. Congrats to Brenda, N5LEU & Terry, WB5WXI, for giving hamdom one of the youngest hams in W TX. 6-yr-old Terry Vansickle passed his Novice exam at Plano Aug 4. He starts 1st grade this Sept. In Big Spring ARC, KB5ECT, John, was selected "Ham of the Month." WD5EFJ Radford will fill the position of Big Spring Club pres, as KA5AAR is moving out of town. 73, Milly, W5OVH. Tfc: AE5I 73, N5DKW 2.

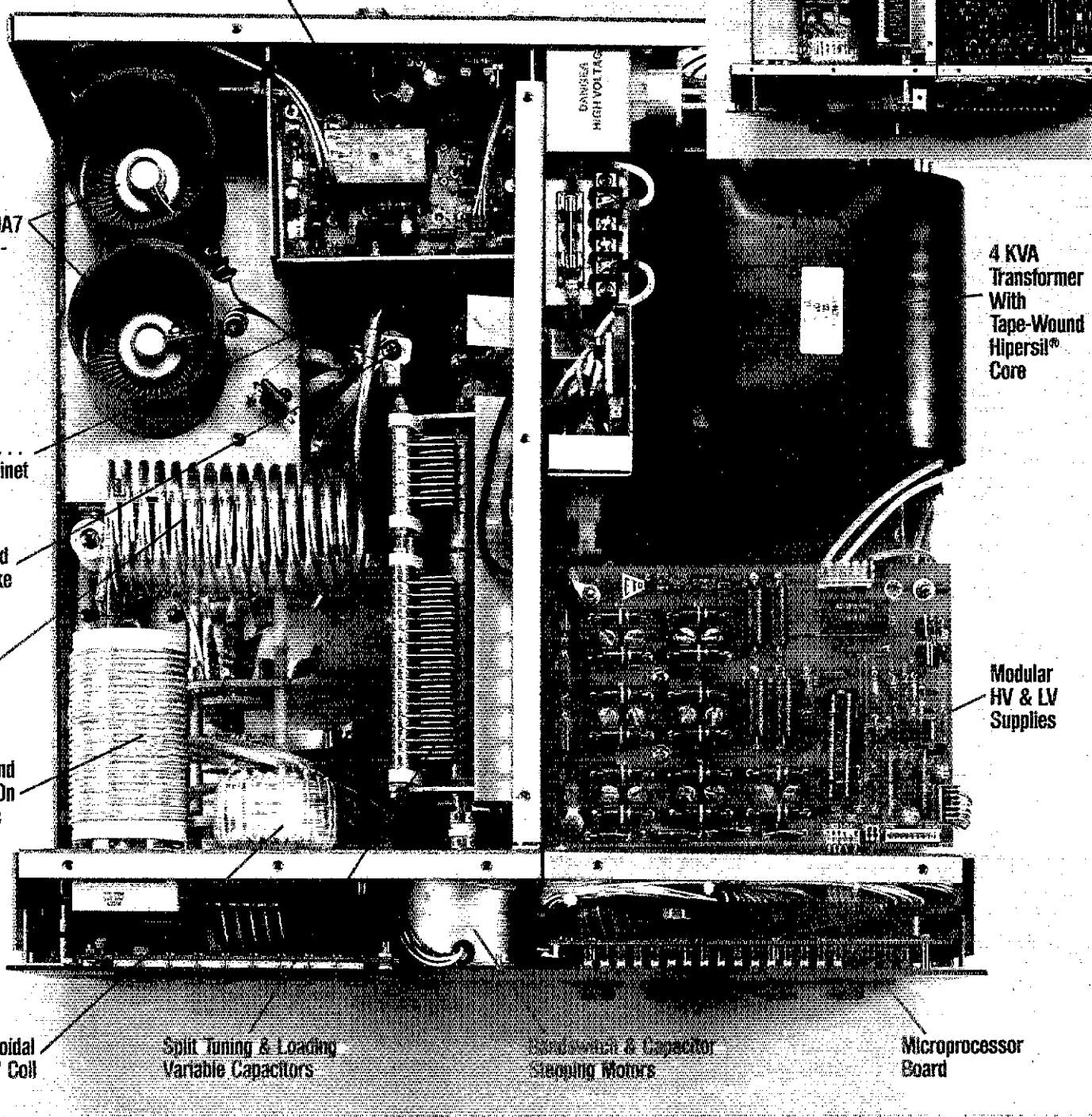
Standards of Excellence

The Inside Story...

LPHA 87A

ALPHA 86A





Contact Ray Heaton or Alysa Drew for detailed information.

***ALPHA**: Twenty years' unchallenged leadership in RF power*

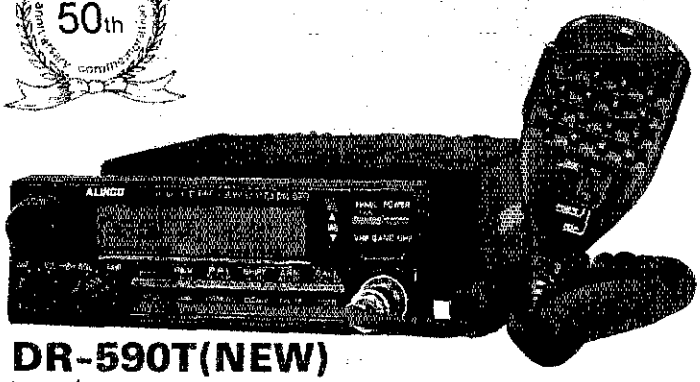
ETO EHRHORN TECHNOLOGICAL OPERATIONS, INC.

4975 North 30th Street ■ Colorado Springs, CO 80919 ■ (719) 260-1191 ■ FAX (719) 260-1106

ALINCO ELECTRONICS

ALINCO ELECTRONICS INC.

The 50th anniversary commemorative



DR-590T(NEW)

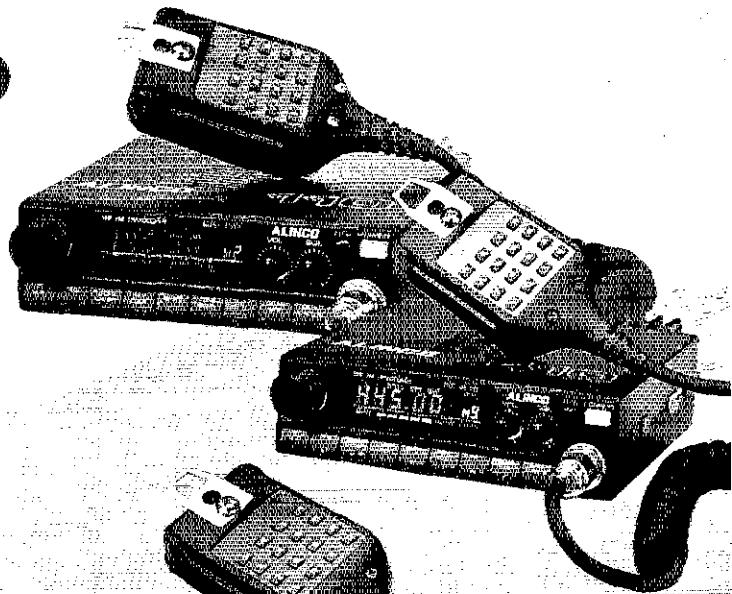
VHF/UHF Twin Band Mobile

144-147. 995Mhz(RX137—173. 995Mhz)
440-449. 995Mhz(RX410—469. 995Mhz)
45W Hi. 10W Mid., 5W Low on VHF
35W Hi, 8W Mid., 5W Low on UHF
Cross Band Repeater Function Simultaneous Receiving and Scanning on both Band
Front Control Panel is detachable. Remote Control will be available (Option)
MARS and CAP Modifiable (permit required)

DR-110T & DR-410T

Tiny 2M Power From Alinco!

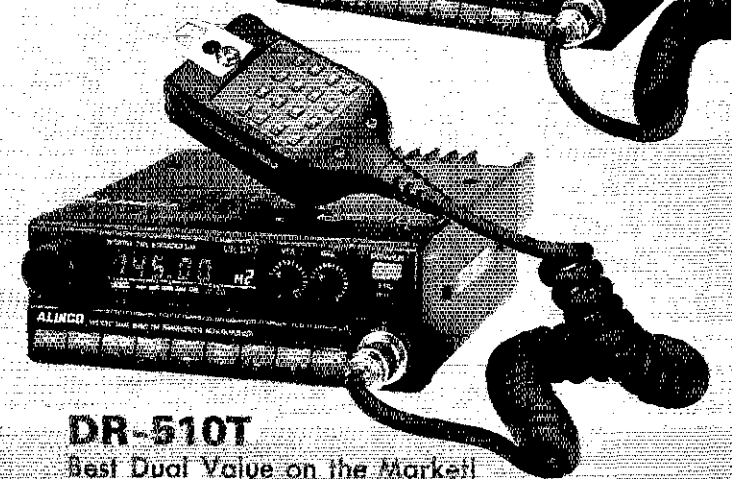
DR-110T, this 2M Alinco, enters the nineties a proven winne with the "reputation" of best value. The DR-110T packs powerful 45W on 2M and sports all the features you expect i todays transceivers. Tuning is a snap with the multi-functione easy-to-see keyboard, 14 memory channels, subtones, scan multi-colored LCD readout, reverse, are a few of the many fea tures of the DR-110T. The mobile of the future-today! DR-410 available for 70 cm.



DR-570T

Set your sights for dual!

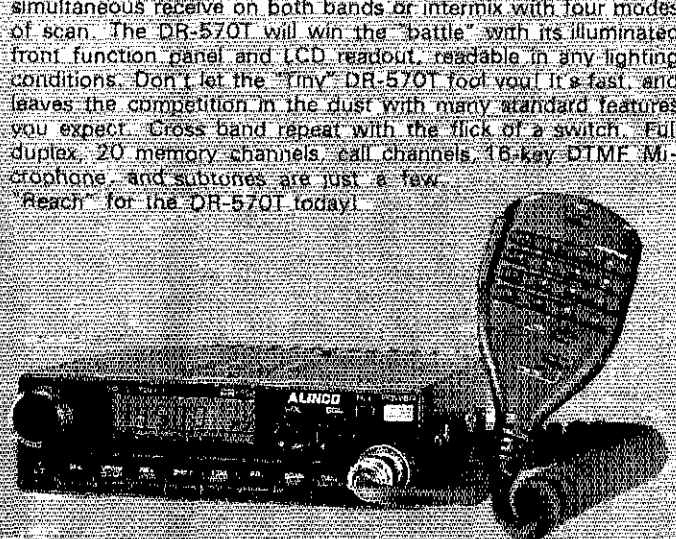
The Alinco DR-570T "Twin Bander" has dual LCD readout, volume, squelch and tuning controls. Double barrelled power with 45W on 2M and 35W on 70 cm, plus simultaneous receive on both bands or intermix with four modes of scan. The DR-570T will win the "battle" with its illuminated front function panel and LCD readout, readable in any lighting conditions. Don't let the "Tiny" DR-570T fool you! It's fast, and leaves the competition in the dust with many standard features you expect. Cross band repeat with the flick of a switch. Full duplex, 20 memory channels, call channels, 16-key DTMF Microphone, and subtones are just a few. "Reach" for the DR-570T today!



DR-510T

Best Dual Value on the Market!

The Alinco DR-510T has most of the outstanding features of it's sister the DR-570T, including 14 memory channels, cross band duplex and cross band repeat. The multi color LCD display, and simple tune control panel makes simplicity the key word. The DR-510T with 45/35 watts is the best, featurepacked dual bander on the Amateur market today. See the DR-510T along with the other Alinco "Magnificent" ones at your favorite dealer today!



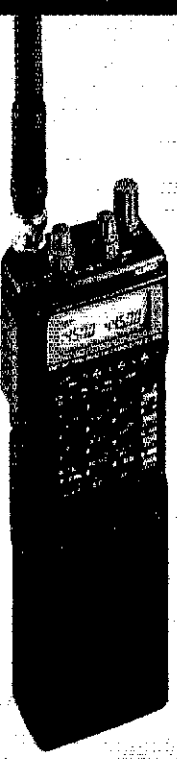
DR-112T(NEW)

Full Featured 2M Power Pack

The DR-112T is a "True FM" full-power (45 watts) transceiver. The back-lit LCD display is ideal for bright or dim lit conditions. And, as with most Alinco products, the control panel is engineered to be "User friendly" and still offer a full range of features.

ALINCO ELECTRONICS

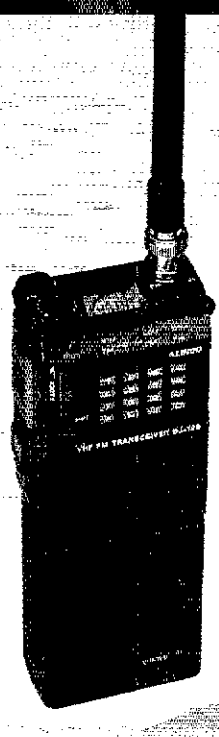
ALINCO ELECTRONICS INC.



DJ-560T (NEW)

Full Featured Twin Band Handy

We packed almost all of the features you would find in a full sized mobile Twin Bander into this compact HT. The DJ-560T has key board entry, CTCSS encode built in, several scanning modes, 40 memories, fully programmable, Autodialer, Dual Display (2 Meter & 70 Cm). The DJ-560T is sitting on top of the mountain.



DJ-100T & DJ-120T & DJ-200T

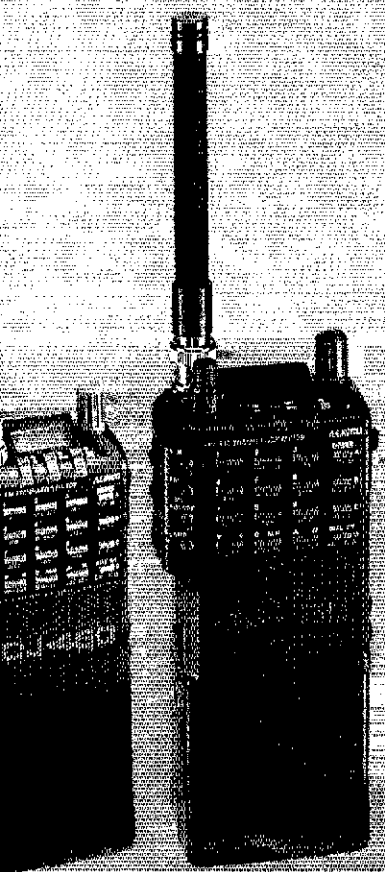
Best 2M Micro Value

The Alinco DJ-100T/DJ-120T is "Magnificent" for its tiny size, but stands up to the competition with power and capability. 10 memory channels store offsets and subtones. Has LCD readout with call channels and reverse at your fingertips. 500 mah battery with direct DC to DC is standard. 3W on standard battery, 6W on optional battery leaves the competition in the dust! DJ-200T for 220 MHz.

DJ-500T

Power-Packed Dual Handi

20 Memory channels, subtones, built-in DC to DC, 700 mah ricad battery, LCD readout with 6W on 2M and 5W on 70cm (with optional battery) call channels, DTMF Touchtone, and direct keyboard entry, are just the few winning features of the Alinco DJ-500T Dual Band Handheld. Easy to use, and Value Priced at your Alinco Dealer.



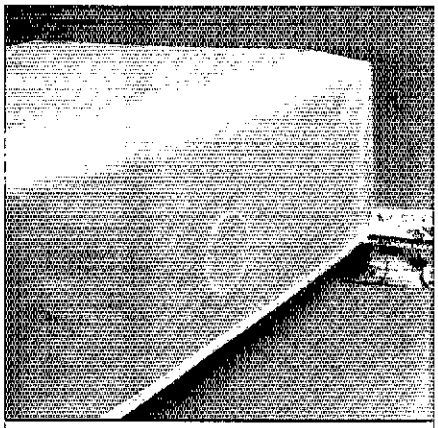
DJ-160T & DJ-460T

2M H/T is here! And wow!

"Bells & Whistles" is a tame word to use for the new DJ-160T, newest "Magnificent" one from Alinco. Keyboard entry is just one of four ways to enter a frequency in the extended receivor (137-173.995 Mhz) of the DJ-160T. You can store duplex "simplex pairs in any of 20 Memories, or Call Channel, with offsets, and any of 38 encoding subtones. Choose one of 3 scan modes, "Band" "Program" or "Memory" and one of five step ranges in VFO. Priority mode can be used in VFO, Memory or Call. "Dual Watch" allows the DJ-160T to scan 3 seconds alternately on CALL, VFO or one MEMORY. "Page" is for group or single person alert. Other features include: Auto "Battery Save", Auto "Power Off", and 2 Memory Autodialer. Get 3-watts on standard 700 mah battery, or increased power from built-in DC to DC, or optional 12V battery. The Alinco DJ-160T, now the "Top Gun" with the competition today! DJ-460T for 70 cm.

CIRCLE 160 ON READER SERVICE CARD

ALINCO ELECTRONICS INC.
438 AMAPOLA AVE., LOT 130, TORRANCE, CALIFORNIA 90501
TEL.: (213) 618-8616 • FAX: (213) 618-8758



Dust Covers

Handsome, custom designed Dust Covers keep your equipment looking and performing better. Protects from dust, dirt, spills.

- Anti-Static Vinyl
- Machine Stitched
- Textured Finish
- Saves Money
- Years of Service
- All Popular Models

Sizes for:

ALPHA 76, 76A, 78
ICOM 271, 275, 471, 475, 551D, 735, 740, 745, 751, 761, 765, 781, 1271, AT150, PS20, PS30, PS55
KENWOOD 120, 130, 140, 430, 440, 680, 711, 930, 940, 950, SM220, TL922
YAESU 736R, 747, 757, 767
HEATH SB220, 221

Other sizes plus computer covers available at some dealers.

PRICE $8.95

DEALERS:

GAUTHIER COVERS
PO Box 495 Prescott, AZ
602-776-9711

DELAWARE RADIO
New Castle, DE
302-328-7728

MICHIGAN RADIO
E. Detroit, MI
313-771-4711

GILFER RADIO
Park Ridge, NJ
201-391-7887

THE RADIO PLACE
Sacramento, CA
916-441-7388

SURPLUS SALES OF NEB
Omaha, NE
402-346-4750

VHF COMMUNICATIONS
Jamestown, NY
800-752-8813

UNIVERSAL AMATEUR RADIO
Reynoldsburg, OH
800-431-3939

JUNS ELECTRONICS
Culver City, CA
213-390-8003

MARYLAND RADIO CTR
Laurel, MD
800-447-7489

HAM RADIO OUTLET
Salem, NH
800-444-0047

HAM RADIO OUTLET
Woodbridge, VA
800-444-4799

Cover Craft

AMHERST INTERNATIONAL CORP.
540 No. Commercial Street
Manchester, NH 03101

MININEC $35

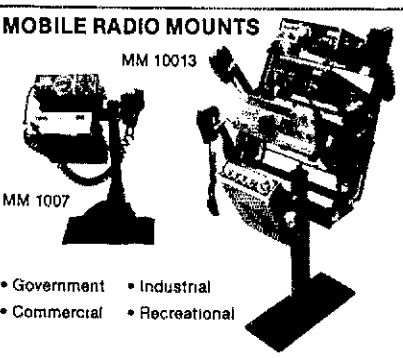
MNjr 1.5 offers fast, powerful, inexpensive antenna analysis. MNjr models antennas in free space or over ground, uses 3-times faster FSS analysis, has automatic frequency sweep, simple definition of feeds and loads, and displays & prints standard ARRL polar plots. MNjr has everything you need for most antennas. 8087 and extra-fast no-8087 versions both included. MNjr 1.5, $35. Full credit towards MN 3.5.

MN 3.5 is the fastest, most powerful, and most advanced MININEC program available. MN 3.5 displays 3-D views of antenna geometry & phasor wire currents, does sophisticated polar & rectangular plots of H, V, RCirc, LCirc, MaxLin, MinLin, & Max polarization components, uses up to 254 pulses for complex antennas, calculates near-fields for TVI & RF-hazard analysis, computes far-fields for repeater coverage, does current feed for phased arrays, has automatic frequency sweep, and simple definition of feeds & loads. 8087 or extra-fast no-8087 version. MN 3.5, $85. 500-pulse option, $25.

MN & MNjr are up to 10 times faster than standard MININEC implementations. Comprehensive antenna design library, easy-to-use full-screen editor, and extensive documentation included. Add 6.25% CA, $5 overseas. U.S. check, cash, or money order. For IBM PC, 3.5" or 5.25" disk.

Brian Beezley, K6STI, 507-1/2 Taylor, Vista, CA 92084

MOBILE RADIO MOUNTS



- Government
- Industrial
- Commercial
- Recreational

IIX *Get Our FREE Catalog.*

IIX Equipment Ltd.
P.O. Box 9 Oaklawn, IL 60454
(708) 423-0605 FAX 708-423-1691

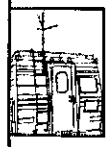
Spider Antenna™

U.S. Patents 4349825, 4460896 Made in U.S.A.

Presenting the family of Spider™ Multi-Band Antennas

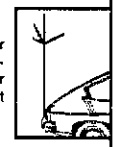
Four amateur bands (10, 15, 20, and 40 meters) at your command without having to change resonators or retune — just band switch your rig. Also available are the 75, 12, 17 and 30 meter bands. Needs no antenna tuner. Custom made with highest quality workmanship and materials.

Wherever you roam, on Land or Sea . . . or even at Home



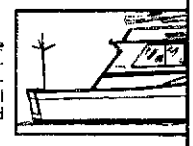
On Land

Suitable for use on any motor vehicle from a compact automobile to a motor home or trailer. Work four bands without stopping to change resonators.



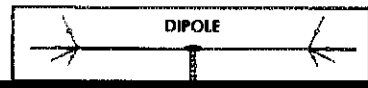
Or Sea

The Spider™ Mantimer is for use on or near the ocean. Highly polished stainless steel and nickel-chrome plated brass. Commercial marine frequencies (8, 12, 16 and 22 MHz) are also available.



At Home

If you live in an apartment, condominium or restricted area, the Spider™ may well be the answer to your antenna problems.



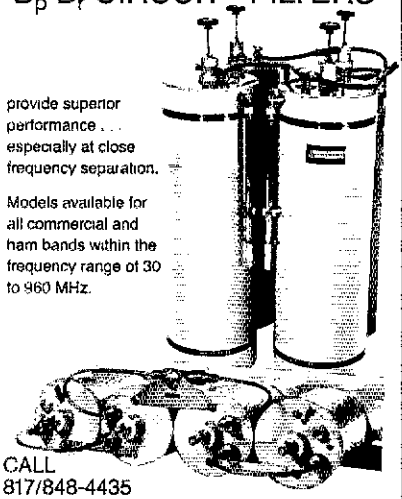
MULTI-BAND ANTENNAS

7131 OWENSMOUTH AVENUE SUITE 363C
CANOGA PARK, CALIFORNIA 91303
TELEPHONE (818) 341 5460

WACOM DUPLEXERS

Our Exclusive Bandpass-Reject Duplexers With Our Patented

B_p B_r CIRCUIT® FILTERS



provide superior performance . . . especially at close frequency separation.

Models available for all commercial and ham bands within the frequency range of 30 to 960 MHz.

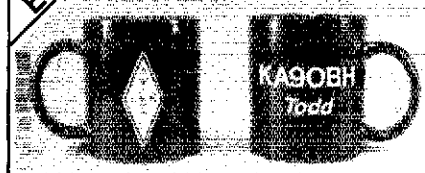
CALL
817/848-4435

WACOM PRODUCTS, INC.

P.O. BOX 21145
WACO, TEXAS 76702 • 817/848-4435

NEW ETCHED

COFFEE CUPS !!



$9.95 Each Black or Blue Coffee CUP or 13OZ. Glass MUG
ARRL LOGO Add $2.50
ARES LOGO Add $3.50

Checks Payable To:
TODD SKOGEN
P.O. Box 3025
Fox Valley Station
Aurora, IL 60504
(312) 805-5972

Company LOGO's and Custom Orders Welcome. Write or Call for Quote. Add $2.95 Ship. & Hand. IL RES. ADD 6.75% TAX Allow 2-4 Weeks Delivery

ATV CONVERTERS • HF LINEAR AMPLIFIERS

DISCOVER THE WORLD OF FAST SCAN TELEVISION

AMATEUR TELEVISION CONVERTERS
ATV2 420–450 ..... $ 44.95 Kit
ATV3 420–450 (GaAs–FET) ..... $ 49.95 Kit
ATV4 902–928 (GaAs–FET) ..... $ 59.95 Kit

AUDIO SQUELCH CONTROL for ATV
SIL ..... $ 39.95 Kit

2 METER VHF AMPLIFIERS
35 Watt Model 335A ..... $ 79.95 Kit
75 Watt Model 875A ..... $119.95 Kit
Available in kit or wired/tested

HF AMPLIFIERS per MOTOROLA BULLETINS
Complete Parts List for HF Amplifiers Described in the MOTOROLA Bulletins.

AN758 300W $160.70
AN762 140W $ 93.25
AN779L 20W $ 83.70
AN779H 20W $ 93.10
AR313 300W $403.00
EB63 140W $ 88.65
EB27A 300W $139.20
EB106 600W $448.15
AR305 300W $383.52

NEW!! 1K WATT 2–50 MHz Amplifier

POWER SPLITTERS and COMBINERS
2–30MHz
600 Watt PEP 2–Port ..... $ 69.95
1000 Watt PEP 2–Port ..... $ 79.95
1200 Watt PEP 4–Port ..... $ 89.95

100 WATT 420–450 MHz PUSH–PULL LINEAR AMPLIFIER — SSB–FM–ATV
KEB67–PK (Kit) $220.25
KEB67–PCB (PC Board) ..... $ 18.00
KEB67–I (Manual) ..... $ 5.00

UNIVERSAL DIGITAL FREQUENCY READOUT
TK–1 (Wired/tested) $249.95

HEAT SINK MATERIAL
Model 99 Heat Sink(6.5x12x1.6) ..... $ 22.00
CHS–6 Copper Spreader(6x6x1/4) ..... $ 18.00

We also stock Hard–to–Find parts

CHIP CAPS–Kemet/ATC
METALCLAD MICA CAPS–Unelco/Semco
RF POWER TRANSISTORS
MINI–CIRCUIT MIXERS
SBL–1 (1–500Mz) ..... $ 6.50
SBL–1X (10–1000Mz) ..... $ 7.95
ARCO TRIMMER CAPACITORS
VK200–20/4B RF Choke ..... $ 1.20
56–590–65–3B Ferrite Bead ..... $ .20
Broadband HF Transformers

Add $ 3.50 for shipping and handling.

For detailed information and prices, call or write for our free catalog.

We ship worldwide. VISA

CCI Communication Concepts Inc.

508 Millstone Drive • Xenia, Ohio 45385 • (513) 426-8600
FAX (513) 429-3811

master charge

WE SHIP WORLDWIDE

98% IS A DIAMOND. THAT'S
SOPHISTICATED ANTENNAS FOR THE NEW DIGITAL AGE

DIAMOND ANTENNA

X SERIES BASE/REPEATER ANTENNA

X-500A Dual-Band: 2m 3-5/8λ elements,70cm 8-5/8λ elements
●Power rating : 200W ●Weight : 5lbs. ●Length : 205in. ●Wind rating : 90MPH. ●Connector : N

X-200A Dual-Band: 2m 2-5/8λ elements,70cm 5-5/8λ elements
●Power rating : 200W ●Weight : 4lbs. ●Length : 88in. ●Wind rating : 112.5MPH. ●Connector : UHF

X-50A Dual-Band: 2m 6/8λ elements,70cm 3-5/8λ elements
●Power rating : 200W ●Weight : 3lbs. ●Length : 67in. ●Wind rating : 135MPH. ●Connector : UHF

F SERIES

F-22A 2m 2-7/8λ elements
●Power rating : 200W ●Weight : 5lbs. ●Length : 128in. ●Wind rating : 112.5MPH. ●Connector : UHF

F-23A 2m 3-5/8λ elements
●Power rating : 200W ●Weight : 8lbs. ●Length : 178in. ●Wind rating : 90MPH. ●Connector : UHF

F-718A 70cm 18-1/2λ elements
●Power rating : 250W ●Weight : 3.7lbs. ●Length : 178in. ●Wind rating : 90MPH. ●Connector : N

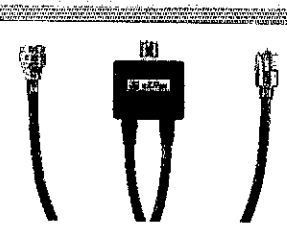
F-1230A 23cm 25-1/2λ elements
●Power rating : 100W ●Weight : 2.5lbs. ●Length : 120in. ●Wind rating : 90MPH. ●Connector : N

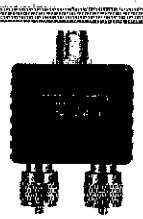
U SERIES

U-300A Dual-Band : 70cm 4-5/8λ elements, 23cm 10-5/8λ elements
●Power rating : 100W ●Weight : 2.4lbs. ●Length : 98in. ●Wind rating : 112.5MPH. ●Connector : N

U-5000A Tri-Band : 2m 6/8λ, 70cm 3-5/8λ elements, 23cm 7-5/8λ elements
●Power rating : 100W ●Weight : 2lbs. ●Length : 71in. ●Wind rating : 135MPH. ●Connector : N

Diamond Antennas are built to Commercial Two-Way Standards. A Special weatherproof fiberglass shell, with plated brass and stainless steel hardware gives these antennas long life in harsh envieronments. All antennas are factory adjusted for U.S. Amateur bands and require no further tuning.





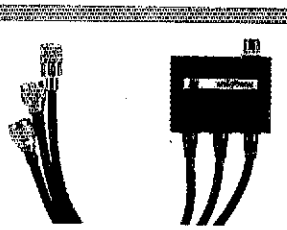
MX-72N Duplexer with UHF connectors and N connector for HF, 2m and 70cm bands
●Coaxial cable : 5D2VS 35cm

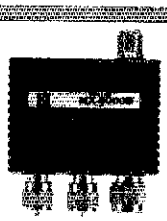
MX SERIES DUPLEXERS AND TRIPLEXERS

MX-72D Direct connection type Duplexer with UHF connectors for HF, 2m and 70cm bands
●Coaxial cable : None

MX-72H Duplexer with UHF connectors for HF, 2m and 70cm bands
●Coaxial cable : 5D2VS 35cm

MX-72DN Direct connection type Duplexer with UHF connectors and N connector for HF, 2m and 70cm bands
●Coaxial cable : None





MX-3000N Triplexer with N connectors and UHF connector for HF, 2m, 70cm and 23cm bands
●Coaxial cable : 5D2VS 35cm

MX-3000DN Direct connection type Triplexer with N connectors and UHF connector for HF, 2m, 70cm and 23cm bands
●Coaxial cable : None

MX-3000 Triplexer with N connectors and UHF connectors for HF, 2m, 70cm and 23cm bands
●Coaxial cable : 5D2VS 35cm

MX-3000D Direct connection type Triplexer with N connectors and UHF connectors for HF, 2m, 70cm and 23cm bands
●Coaxial cable : None

For additional information, or the name of nearest Authorized Diamond Dealer, call:
(619)744-0700

RF PARTS
1320-16 Grand Avenue
San Marcos, CA 92069

...Brings You A

Keyers

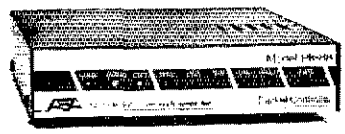
The Morse Machine MM-3 Keyer

The Morse Machine has all the features you need in a memory keyer, including 2 to 99 WPM speed selection and over 8,000 characters of soft-partitioned memory. Twenty memories store your messages...as short or as long as you like. Memory can be expanded to 36,000 characters. All memory is backed up by an internal lithium battery.

Comprehensive Morse training facilities are built-in. **A Proficiency Trainer** for random code group practice. **A Random Word Generator** which generates four-letter words and **A QSO Simulator** which allows you to call stations, answer a CQ or listen to realistic on-the-air QSO's.

The MM-3 also features automatic serial number insertion and incrementing in any memory message. Use the front panel knob to adjust your sending speed or enter a precise speed with the keypad, toggling between the two at any time. Exchanges can be expedited by *having parts of your message sent at a* higher speed. You can even add remote switches for four of the memories to send your response or call CQ. The MM-3 can also be programmed for automatic beacon use. The RS-232 compatible serial I/O port provides computer control of the MM-3 and monitoring of the Morse training features.

Packet

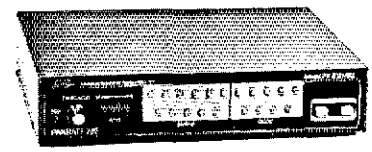


PK-88 Packet Radio TNC

Unique operating features with a proven hardware and software design make AEA's PK-88 your best choice in packet radio--now with MailDrop, an 8KByte efficient personal Mailbox. The PK-88 also allows multiple single frequency QSO's, digipeating and networking. It's a superb value, packed with all the most needed packet radio features such as direct interface capability with NET/ROM and TCP/IP. In addition to all the features of a "standard" TNC, the PK-88 offers features not found in any other TNC:

- WHYNOT command - Shows reasons why some received packets are not displayed.
- "Packet Dump Suppression" - Prevents dumping unsent packets on the radio channel when the link fails.
- CUSTOM Command - Allows limited PK-88 customization for non-standard applications.
- Enhanced MBX command- Permits display of the data in I- and UI-frames, without packet headers and without packet headers or retried frames.
- Enhanced MPROTO command - Suppresses display of non- ASCII packets from Level Three switches and network nodes.

Multi-Mode



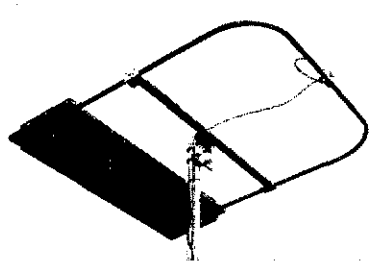
PK-232MBX Multi-Mode Data Controller

With over 40,000 units sold worldwide, *the PK-232MBX is the world's leading* multi-mode data controller. Combining all amateur data communication modes in one comprehensive unit, the PK-232MBX offers Morse Code, Baudot, ASCII, AMTOR/SITOR 476 and 625, HF and VHF Packet, WEFAX receive and transmit, TDM, as well as commercial standard NAVTEX automated marine information services.

All software is on ROM.

- 20 front panel status and mode LED indicators
- RS-232 compatible
- Exclusive SIAM™ Signal Identification and Acquisition Mode
- TDM Time Division Multiplex decoding
- PakMail™ mailbox with selective control of third-party traffic
- FAX printing - supports most printers
- Two radio ports
- Host mode for efficient program control of the PK-232MBX
- KISS mode for TCP/IP networking protocol compatibility
- 32K RAM lithium battery-backed
- Many features for the digital SWL

Antennas



IsoLoop™ 14-30 MHz Compact HF Antenna

AEA brings you the breakthrough in compact HF antenna design with its high-performance, low-profile IsoLoop HF antenna. Designed specifically for hams with limited space or antenna restrictions, the 32"-square IsoLoop covers all frequencies from 14 to 30 MHz, at up to 150 watts continuous.

No ground radials are needed and its balanced, shielded feed-loop isolates the antenna from the feedline. This ensures that your signal is radiated by the antenna, not the feedline, which helps eliminate TVI and stray RF in the shack.

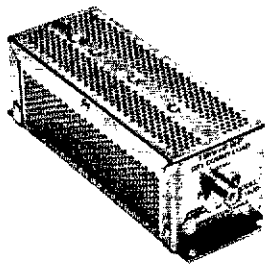
The inherent hi-Q of the IsoLoop makes it like a very sharp tunable filter that radiates. The narrow bandwidth suppresses harmonics from your transmitter, and also attenuates out-of-band signals that could overload your receiver.

The omni-directional IsoLoop makes an excellent attic or balcony antenna, and because it weighs only 12 pounds is also perfect for portable use.

Advanced Electronic Applications, Inc. 2006-196th St. SW/P.O. Box 2160 Lynnwood, WA 98036 206-775-7373

Better Experience

Dummy Load

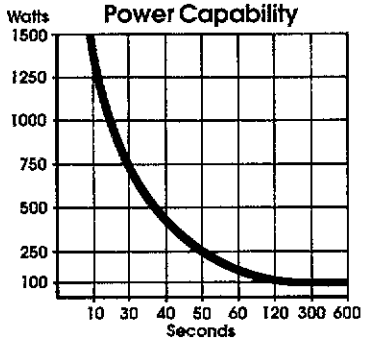


DL-1500

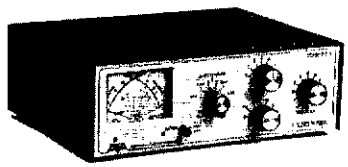
DC-650 MHz Up to 1500 Watts

AEA's dry dummy load simulates a perfect 50 ohm antenna up to 650 MHz so you can test your transmitter without radiating a signal on the air.

- DC-650 MHz
- Simulates matched 50 ohm transmission line to test your transmitter
- Handles short-term RF power up to 1500 watts
- VSWR of less than 1.3:1 at 650 MHz
- Compact and lightweight
- Air cooled dry load



Econo Tuner



ET-1 Antenna Tuner

300 Watts of All-Band Tuning

Meet your match with AEA's new ET-1 Econo-Tuner™. A quality, economical antenna tuner for under $150, the ET-1 Econo-Tuner is designed to match virtually any receiver, transmitter or transceiver from 1.8 to 30 MHz with up to 300 watts of RF power.

Compatible with almost ANY antenna including verticals, dipoles, inverted vees, beams and mobile whips that are fed by coax cable, balanced lines or a single wire. For easy connection to balanced lines, a 4:1 balun is built-in.

A front panel switch control allows you to switch between two coax-fed antennas (direct or through the tuner). You can also switch to a balanced line or wire antenna. The BYPASS position allows you to switch to a dummy load (such as AEA's DL-1500 dry dummy load) or a direct connected coax antenna. In the BYPASS position, COAX 1 OUT or COAX 2 OUT can be selected so that the tuner is bypassed, but not the meter circuit.

The ET-1 features a precision dual-movement meter to simultaneously monitor power and SWR.

Unique engineering designs have made AEA one of the leading innovators in the amateur radio industry. That same quality and superior technical support make the ET-1 your best deal for an antenna tuner.

Antennas

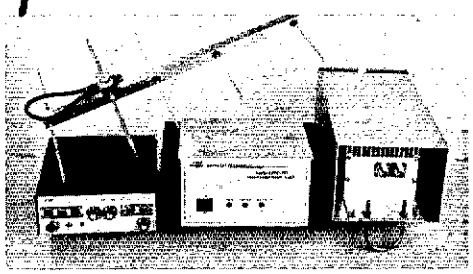
IsoPole™ Omni-Directional VHF and UHF Base Station Antennas

An outstanding mechanical and electrical design make the IsoPole the best choice for an economical omni-directional VHF or UHF base station antenna. All IsoPole antennas yield the maximum gain attainable for their respective lengths and a zero degree angle of radiation which puts the most signal on the horizon. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. Decoupling cones offer great efficiency over obsolete radials which radiate in the horizontal plane. The IsoPoles also have a broader frequency coverage than any comparable antennas. Typical SWR is 1.4 to 1 or better across the entire band!

All mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion-resistant aluminum alloys. Aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast, not supplied).

IsoPoles are ideal for packet radio. The decoupling cones stop computer hash picked up by the outer shield of the coaxial cable from being passed to the receiver.

Amateur TV



AEA's New ATV System

Add a new dimension to your amateur radio communications with AEA's Amateur Television (ATV) system. If you hold at least a technician-class license, you can transmit and receive live or taped audio and video Fast-Scan TV (FSTV) information that rivals broadcast quality. Now you can share more than conversation over the air with this new mode of "personal communications."

It's Easy and Inexpensive. If you have a video camera or camcorder and a standard TV set, you may already own the most expensive components of an ATV system. AEA's ATV system includes a transceiver and antenna. Simply connect the camera, TV and the antenna to the transceiver, and you're on the air LIVE with one watt P.E.P.! If you want to broadcast with more power, AEA also offers a 50 watt mast-mounted linear amplifier and GaAsFET preamp with power supply. Your TV set will monitor your transmitted and received pictures.

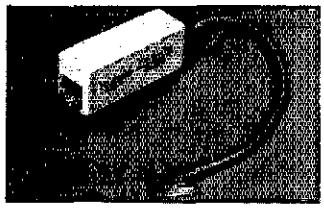
Amplifier Now Available.

Stop Telephone RFI Forever

With K-COM Telephone Interference Filters

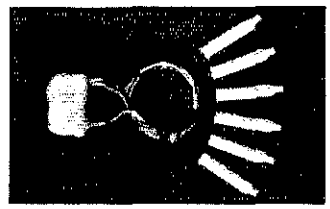
K-COM filters stop telephone interference resulting from close proximity to radio transmitting sources in the .5 to 30 MHZ range.

K-COM Models RF-1 and RF-2 are electrically effective, mechanically sturdy brute-force RF filters for use in single line telephone systems. Designed by Pete Krieger, WA8KZH, an active ham with over 25 years experience in the telephone industry. Each filter comes with complete installation instructions and informative technical bulletin.



RF-1 installs in 10 seconds!

Model RF-1. Modular version for desk telephones, answering machines, cordless phones. Impact resistant case, 6" cord.
Reg. $16.95 Sale $14.95



RF-2 with connectors.

Model RF-2. Hard-wired version for insertion inside phone jacks and throughout telephone wiring. No soldering required. **Reg. $10.95 Sale $8.95**

See your dealer or order from K-COM, Box 82, Randolph, Ohio 44265.
Add $1.00 S&H per filter. Ohio res. add tax. Made in U.S.A.

Houston Com-Vention '90

&

The ARRL South Texas Section Convention

The Sheraton Crown Hotel - Intercontinental Airport

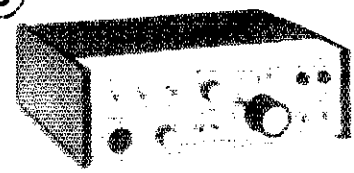
November 9-11, 1990

Commercial Exhibits
Swap Fest
ARRL VEC Exams
Seminars
Friday Night Auction
Family Activities

For information write.
Com-Vention '90
P.O. Box 742183
Houston, TX 77274-2183

AMATEUR TELEVISION

SMILE! YOU'RE ON TV



With our TC70-1d 70 CM ATV Transceiver you can easily transmit live action color video and audio from your camcorder, home TV camera or VCR by simply plugging the composite video and line audio into the front panel 10 pin VHS connector or rear panel phono jacks. Add 70 CM antenna, coax, 13.8Vdc and TV set and you are on the air...it's that easy!

The TC70-1d typ. 1.5 W p.e.p. output properly matches the Mirage D15, D26, D1010-ATV, & D100 amps linear range for 15, 50 or 70 W. Also matches RFConcepts 4-110 for 50 W. These amps are available from us along with KLM broadband antennas.

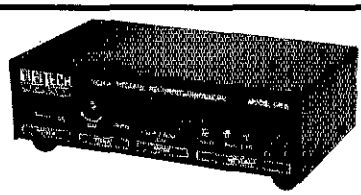
* GaAsfet converter varicap tunes 420-450 MHz down to your TV on ch 2, 3 or 4. Shielded cabinet 7x7x2.5"
* One xmit xtal incl., 2nd freq. add $15
* Price...**$329** delivered cont. USA via UPS surface. Visa - MasterCard OK

Sold only to tech class or higher verified in latest Callbook or send copy of license.

CALL (818) 447-4565 m-f 8-5 pst or write for our complete catalog of ATV gear for 70, 33 and 23cm.
**Value plus quality from over 25 years in ATV. W6ORG

P.C. ELECTRONICS
2522-Q Paxson Lane
Arcadia CA 91007

ONLY 159.95
+4.00 S/H



DIGITAL RECORDER/ANNOUNCER
Instantly Xmit Your Natural Voice Messages With A Push Of A Button • Contesting Call CQ • Off Air Recording • Working DX Identifying • Speaker • Auto PTT Keying AUX In/Out Jacks • DC Adaptor Included

DIGITECH CONCEPTS
200 W. Main, Roberts, WI 54023
(715) 749-3960

CALL TOLL FREE 1-800-736-3960

QSL CUSTOM FULL COLOR CARDS

$69.95 Actual size 3 1/2"x5 1/2"
500 COLOR QSLs
Quantity discounts are also available!
CALL TOLL FREE 1-800-869-7527
or write for info. kit
Color cards guarantee more returns!
VISUAL CONCEPTS
7715 W. 63rd st.• Overland Park, KS 66202

The New Commander™ HF-2500 Is More Than Just A Pretty Face

t's everything you've wanted in a Linear for only $2295.
mpare the HF-2500 features, construction, design, performance, d price. You'll be convinced it offers the best linear value.

Effortless 1500 watt output.

00 watts key-down, continuous carrier – not PEP like some manufac-ers state (on their basis, the HF-2500 has 3000 watts power).

Two Eimac 3CX800A7 Ceramic Metal Triodes.

gged, durable, more technically advanced – higher power without high levels of intermod. distortion in popular glass tubes. Our *two* es deliver almost the same power as *four* 3-500Zs – almost twice power of a *pair* of 3-500Zs for only a few hundred dollars more!

Effective tube protection.

sistors in the B + and B – protect against internal tube arcs and B + rt circuits, the tubes' cathode circuit is fused, and ALC prevents the -2500 from being overdriven.

Low drive power.

ly a nominal 50-80 watts is needed to drive the HF-2500 (your nsceiver can "loaf," too). Compatible with popular transceivers.

Dual front panel meters.

eparate grid current meter and a switchable plate voltage/current meter.

State-of-the-Art power supply.

e 200/220 VAC power supply has a 35 lb. continuous commercial CS) rated custom high voltage transformer that delivers *2500 watts ut power continuously, no time limit!* (An extra cost optional persil® transformer is available if you prefer.) Eight 220 μf, 450 v. h technology filter capacitors provide dramatic size reduction with performance of old, large "computer grade" caps.

Soft-Start inrush protection.

lid state relays (featuring inverse-parallel dual SCR's which fire at 0 ts a.c.) sample the line voltage and allow it to enter the power supply zero voltage point (zero degree phase angle) – no inrush stress.

All HF bands, all modes.

0-10 meters (show us your amateur license and we'll show you how activate 12 and 10 meters – export models have these bands ready to e). Also operates on WARC bands. And in all modes.

Exclusive heavy-duty bandswitch.

stom made to our standards and rated at 7000 volts with double ed solid coin silver contacts, there's none other like it.

Quiet, pressurized forced air.

ugged, quiet Dayton blower delivers 50 CFM of cooling air to all ical components to assure long life.

Exclusive GE Lexan® front surface.

two-tone gray complements other amateur equipment colors. And Lexan is tough, resists abrasion, wipes clean – colors and graphics applied behind the front surface so *they will never wear off.* The tured dark gray cabinet measures just 18"w x 16"d x 7¾"h (less bail).

Three-year warranty.

protect your HF-2500 investment with a three-year limited warranty all parts and labor (tubes are covered by their manufacturer).

Read what editors say.

GE, *Dave Buren, in 73:* "fits squarely alongside the Titan and Alpha power and size...responsive...splatter-free and clean."

ICP, *Lew McCoy, in CQ:* "If I ever reviewed a piece of equipment that his word (rugged), it is the Commander HF-2500...1500 watts out-, key down, as long as you desire...quality is really first class."

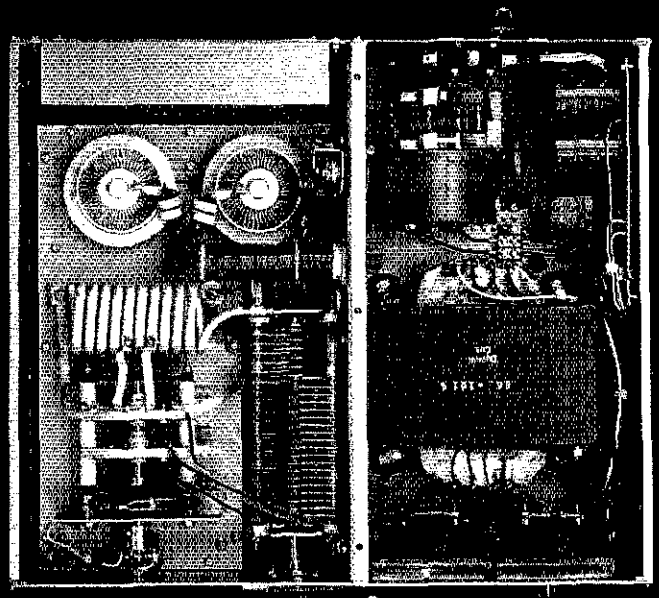
Factory Direct Price: $2295.

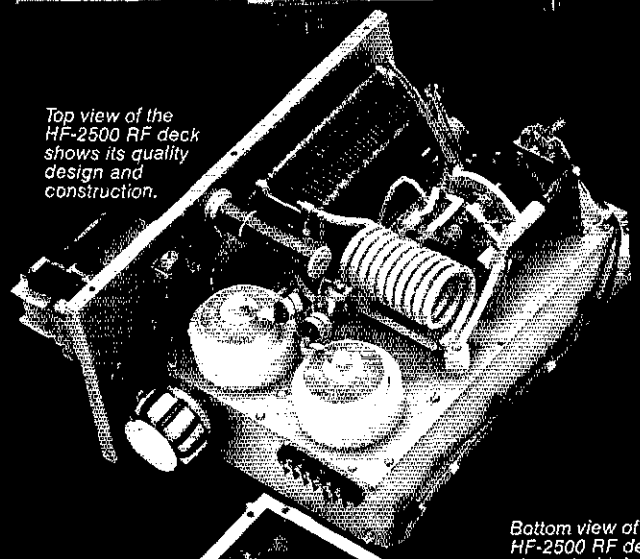
HF-2500 is made in the USA by hams for hams. And no middle n...just the biggest bargain in linears...more quality and perform-ce per dollar than any other...everything except the high price.

tional Hypersil transformer: $100. Optional QSK with vacuum relay 00. Federal Express Second Day Air shipping: $96 (transformer talled). UPS Ground, two cartons 40 lbs. ea., you install transformer.

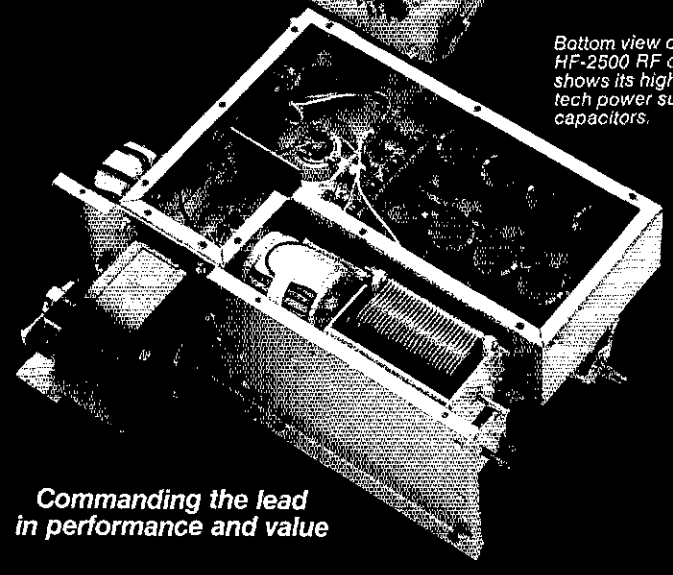
To order, call toll-free 1-800-736-0443.

SA, MasterCard, Discover, American Express, Diners Club credit d orders accepted by telephone from 8:30 AM to 5:30 PM ET Mon-through Friday. Or order by mail, enclose check or money order



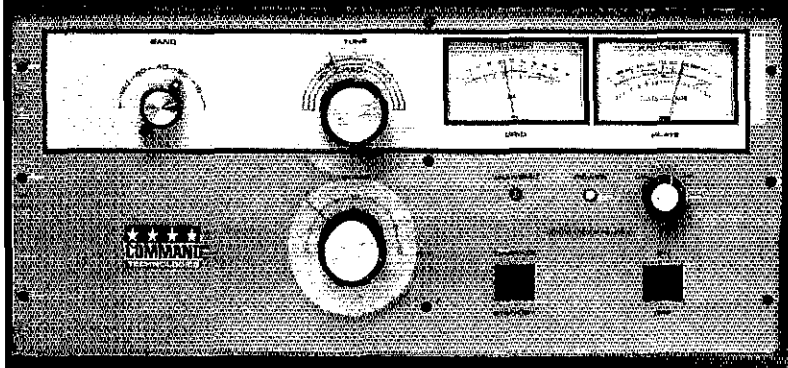


Top view of the HF-2500 RF deck shows its quality design and construction.



Bottom view of the HF-2500 RF deck shows its high tech power supply capacitors.

Commanding the lead in performance and value



Command Technologies, Inc.
1117 W. High St., P.O. Box 939
Bryan, OH 43506
1-800-736-0443; Ohio (419) 636-0443;
FAX (419) 636-2269

KENWOOD Newsletter

KENWOOD U.S.A. CORPORATION Vol. 1 Issue No. 4

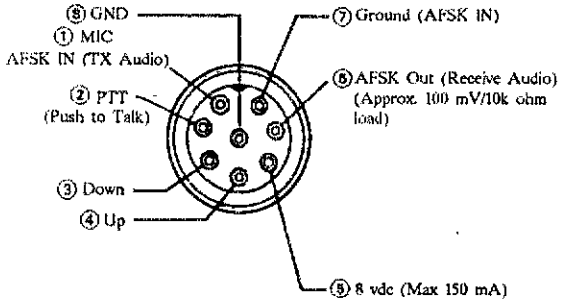
Accurate and timely information for the active Amateur Radio Operator from Kenwood U.S.A.

Interfacing Digital Communications Equipment (Part 2)

In the last issue of the Kenwood Newsletter we began a 3 part article on interfacing Data Communication devices to your transceiver. This month we will discuss some alternatives to using the ACCY 2 Connector.

Alternative Hookup Methods for Terminal Units.

One of the easiest ways to hookup your terminal unit, other than the ACCY 2 connector, is to use the microphone connector on the front panel of the transceiver and the External Speaker Jack on the rear of the transceiver. Connect your transmit audio signal from the terminal unit to pin number 1 of the microphone connector. Connect your PTT line to pin number 2 of the microphone connector. The shield of the microphone audio line should be connected to pin number 7, and the PTT return line should be connected to pin number 8. All 8 pin connectors on Kenwood radios have this same basic pin arrangement, so it should not make any difference if you are hooking up your terminal to an HF, VHF, or UHF transceiver.



Some Kenwood transceivers provide an unsquelched audio signal on pin number 6 of the microphone connector. If your terminal unit is looking for UNSQUELCHED audio you should connect to this pin. Most other terminal units are looking for SQUELCHED audio. This is available from the external speaker jack on the rear of the transceiver.

Connecting to the microphone jack and the external speaker jack have the advantage of simple hookup, but do require you to disconnect the microphone from the transceiver.

PHONE PATCH IN/OUT Connections

Some Kenwood transceivers provide a Phone Patch IN and OUT terminal on the rear panel. These terminals can also be used to hook up terminal devices. These terminals are simple RCA type jacks with an input and output impedance of 600 ohms. You might need to make use of an impedance matching transformer for these connections. The Phone Patch IN jack would be used for your transmit audio connection, and the Phone Patch Out jack would be for your receive audio connections. PTT would need to be connected to the ACCY 2 connector, to the Microphone connector, or to the Remote connnector (when available). Some Kenwood transceivers provide a VOX (Voice Operated Keying) circuit that may make connection of a separate PTT line unnecessary. Try keying the radio with VOX. If your terminal unit operates properly you can avoid the PTT connections.

Coming Next Month

Next Month: Part 3 of Interfacing Packet TNC's, etc. to Kenwood Equipment.

If you have a comment about a column, or have a question about any ham radio subject please let us know. We will select topics for the newsletter that have the widest appeal.

That's all we have room for now. Next month we will conclude with connections for Modern Handheld transceivers.

73 Craig (KR6T)

Kenwood U.S.A. Corporation
Amateur Radio Customer Service
P.O. Box 22745
Long Beach, CA 90801-5745

Bulletin Board: (213) 761-8284
(213) 761-8292
On line 24 hours a day, 7 days a week.
Customer Service: (213)639-7140
Press 9 during the recording.
8:30 AM-5:00 PM Pacific time Mon-Fri.
Parts: (800) 637-0388
9:00 AM-6:30 PM Eastern time Mon-Fri.
Sales Department: (213) 639-4200
8:30 AM-5:00 PM Pacific time Mon-Fri.

KENWOOD

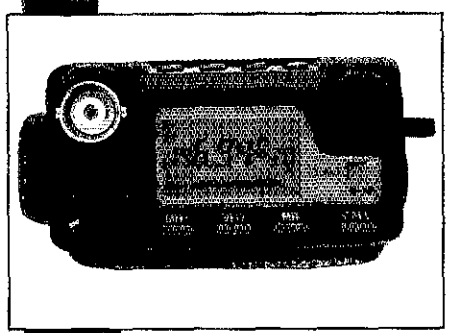
Prefer-ability!

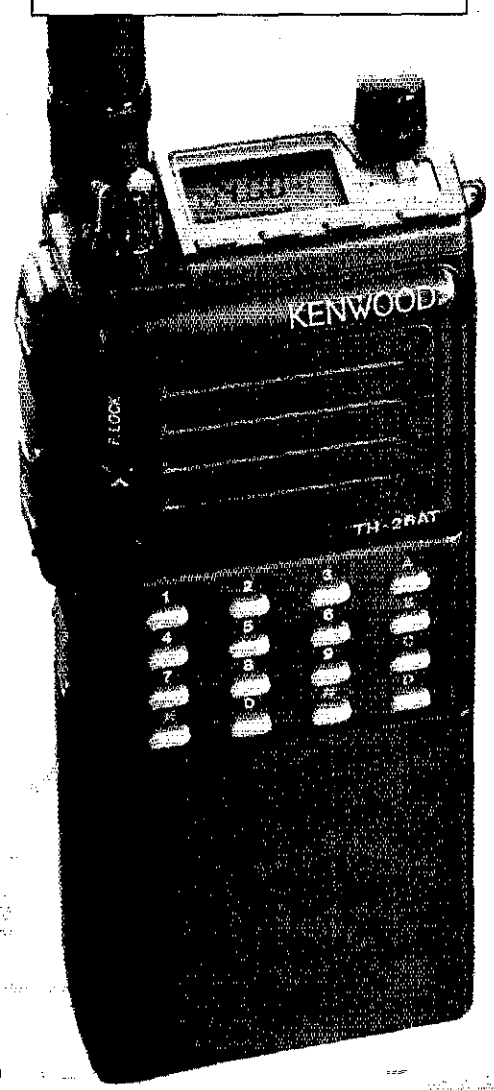
TH-26AT/46AT

144 MHz/450 MHz

Compact Portable FM transceivers

Select the radio that lets you choose who can call *you*. The new DTMF encode/decode squelch system (DTSS) gives you selective calling—either "single page" or "group call". You also get a four 15 digit auto-dialer, DC direct-in capability (with optional PG-3F or PG-2W), versatile scanning functions, wide-range of DC power sources, 5 W capability, and an extensive list of exciting accessories!





- **Frequency coverage:**
  TH-26AT: 136–173.995 MHz;
  TH-46: 438–449.995 MHz.
  (TH-26AT modifiable for MARS/CAP. Permits required.) TX on Amateur band only.
- **NEW! Dual Tone Squelch System (DTSS)**
  Enables selective calling with 3-digit DTMF codes! The DTSS codes can be stored in channels 1–3.
- **Multi-function scanning.**
  Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **21 memory channels.**
  Store everything you need, including CTCSS and DTSS codes. Ten channels can store RX and TX frequencies independently for odd split operations.
- **Auto-dialer function.**
  Four 15-digit DTMF codes can be stored for auto-patch use.
- **Frequency step selectable for quick QSY.**
  Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- Five watts output when operated with PB-8 battery pack or 13.8 volts.
- Large top mounted LCD display, with night-light.
- Automatic repeater offset.
- **T-ALERT for quiet monitoring.**
  Tone Alert beeps when squelch is opened.
- Auto battery saver, and economy power mode to extend battery life.

- **Supplied Accessories:**
  Flex antenna, PB-10 battery pack (7.2 V, 600mAH), wall charger, belt hook, wrist strap, bottom cover.

Optional Accessories:

- **PB-5** 7.2 V, 200 mAh NiCd pack for 2.5 W output
- **PB-6** 7.2 V, 600 mAH NiCd pack
- **PB-7** 7.2 V, 1100 mAH NiCd pack
- **PB-8** 12 V, 600 mAh NiCd for 5 W output
- **PB-9** 7.2 V, 600 mAh NiCd with built-in charger
- **PB-10** 7.2 V, 600 mAh (works with BC-2 wall charger)
- **PB-11** 12 V, 600 mAh **OR** 6 V, 1200 mAh, for 5 W **OR** 2 W
- **BC-10** Compact charger
- **BC-11** Rapid charger
- **BT-6** AAA battery case
- **BT-7** AA battery case
- **DC-1/PG-2V** DC adapter
- **HMC-2** Headset with VOX and PTT
- **SC-24, 25, 26** Soft cases
- **SMC-31** Speaker mic.
- **SMC-33** Speaker mic. w/remote control
- **TSU-7** CTCSS encode/decode unit
- **PG-2W** DC cable w/fuse
- **PG-3F** DC cable with filter and cigarette lighter plug
- **WR-1** Water resistant bag

NOTE: The BC-11 and BC-10 stand chargers can charge all NiCd packs except the PB-10.

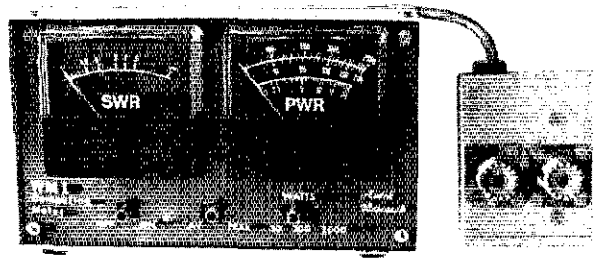
KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

KENWOOD

...pacesetter in Amateur Radio

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications, features and prices subject to change without notice or obligation.

COMPUTING SWR & WATTMETER



NEW! Model WM1 $109.00 (Includes AC Supply)

- **AUTOMATICALLY COMPUTES SWR.** No adjustments needed!
- **READS SWR DIRECTLY.** Even when you're talking on SSB!
- **GREATLY SIMPLIFIES TUNER ADJUSTMENT.** SWR reading not affected by forward power. No confusing readings.
- **REMOTE RF HEAD.** A must! Up to four feet from meter. Coax can't pull meter off table.
- **AVERAGE & PEP READING.** Allows compliance with latest FCC rules.
- **THREE RANGE SCALES.** 2000, 200, 20 watts. Usable to less than 1 watt.
- **TWO TOP-QUALITY METERS.** *Large 2⅜" meters.*

1.5-30 MHz 5% F.S. Accuracy. Uses 8-18 VDC or 115 VAC. 5¼"x3½"x2¾". Attractive light/dark grey styling.

WHY PUT UP WITH AN INFERIOR METER OURS DOES IT ALL — AUTOMATICALLY!

THE AUTEK "QRM ELIMINATOR"

Also reduces errors in computer CW/RTTY copy!

Model QF-1A For SSB/CW/AM $89.00

115 VAC supply built-in. Filter by-passed when off.

Auxiliary Notch rejects 80 to 11,000 Hz! Covers signals other notches can't touch.

Four main filter modes for any QRM situation.

Continuously variable main selectivity (to an incredible 20 Hz!)

Continuously variable main frequency. (250 to 2500 Hz)

AUTEK pioneered the ACTIVE AUDIO FILTER back in 1972. Today, we're still the engineering leader. Our new QF-1A is the latest example. It's INFINITELY VARIABLE. You vary selectivity 100:1 and frequency over the entire usable audio range. This lets you reject whistles with dual notches (to 70 dB), or reject SSB hiss and splatter with a fully adjustable lowpass plus aux. notch. Imagine what the NARROWEST CW FILTER MADE will due to QRM! HP rejects low frequencies. Skirts exceed 80 dB. 1 watt speaker amp.

Built-in 115 VAC supply 6½x5x2½. Two-tone grey styling. Even latest rigs include only a fraction of the QF-1A selectivity. Yet it hooks up in minutes to ANY rig--Yaesu, Kenwood, Drake, Swan, Atlas, Tempo, Heath, Collins, Ten-Tec, etc. Just plug it into your phone jack and connect spkr. or phones to the output. Join the thousands of owners who now hear stations they couldn't copy without a QF-1A! It really works! If it can't pull him out, nothing can.

Autek Research
Box 302, Dept. J
Odessa, FL 33556
813-920-5810

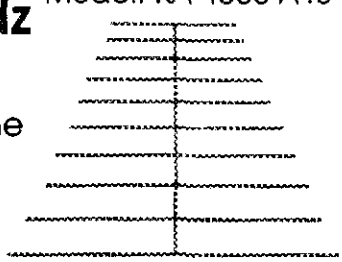
We sell only factory direct. No dealer markup in our price. Order with check, M.O., VISA, MC. We pay shipping in 48 states. Add 6% tax in Fla. Add $5 to Canada, Hi., Ak. Add $25 each elsewhere. (Shipped air.)

THE EAGLE BY TENNADYNE

a LOG-PERIODIC dipole array
Model: KA 1300-A10

***14-30 MHz**

- 24' Boom
- One Feedline
- 10 Elements



TENNADYNE
1361 Kennedy Drive
Denver, Colorado 80234
a C-TECH company

$499.00
Add $25.00 for shipping and handling.
(303) 451-7100

GORDON WEST RADIO SCHOOL

#04 21-DAY NOVICE $22.95

- 112-page textbook
- two stereo code learning tapes
- sample 5 wpm Novice code test
- over $50 in radio manufacturers' discount coupons.

#01 COMPLETE NOVICE . . . $62.95
2 theory tapes, 2 textbooks, FCC Rule Book, 4 code tapes, code oscillator set, examiner test packet, and over $50 in radio discount coupons.

#02 NOVICE CODE COURSE $32.95
6 cassette tapes make it easy to learn the code from scratch.

#07A 2-WEEK TECH $22.95
This Technician course includes 2 theory tapes and 1 illustrated textbook.

#05 COMPLETE GENERAL. . $62.95
6 code tapes, 4 theory tapes, and 2 textbooks. Ideal for upgrade from Novice to General.

#06 GEN. CODE COURSE . . $32.95
This General course includes 6 tapes for speed building from 5 to 13 wpm.

#08B COMPLETE ADVANCED $62.95
This Advanced course includes 4 theory tapes, 1 textbook, and 6 code tapes (13 to 22 wpm).

#09 ADV. THEORY COURSE $32.95
4 tapes and 1 illustrated textbook

#10 COMPLETE EXTRA. . . . $62.95
4 theory tapes, 1 textbook, and 6 code tapes (13 to 22 wpm)

#12 EXTRA THEORY COURSE $32.95
4 theory tapes and 1 illustrated textbook for Extra class theory.

#11 EXTRA CODE COURSE $32.95
6 tapes for speed building from 13 to 22 wpm for the Extra code exam.

#13 BRASS KEY & OSC. . . . $25.95

#15 PLASTIC KEY & OSC. . . $21.95

SINGLE CODE TAPES
$10.95 each including shipping

#19	5 wpm Novice QSO tests
#20	5 wpm Random Code
#21	5-7 wpm Speed Builder
#22	7-10 wpm Speed Builder
#23	10 wpm Plateau Breaker
#24	10-12 wpm Speed Builder
#25	12-15 wpm Calls & Numbers
#26	13 wpm Random Code
#27	13 wpm Test Preparation
#28	13 wpm Car Code
#29	13-15 wpm Speed Builder
#30	15-17 wpm Speed Builder
#31	17-19 wpm Speed Builder
#32	20 wpm Random Code
#33	20 wpm Test Preparation
#34	20 wpm Car Code
#43	3-15 wpm Code Review
#40	12-21 wpm Code Review

Prices include shipping & handling IL residents add 6½% VISA MasterCard

RADIO AMATEUR CALLBOOK INC.
925 Sherwood Dr., Lake Bluff, IL 60044
Mon.-Fri. 8-4pm (708) 234-6600

KENWOOD

The DXpeditioner!

TS-440S

Compact high performance HF transceiver with general coverage receiver

Portable reliable performance and ease of use makes the TS-440S your obvious "low bands" choice. It is "Every Ham's" rig to go – ham shack, portable or mobile. But don't let the small size fool you – there's lots of "big rig" performance packed into this package. Built-in antenna tuner option. Continuous duty transmitter. Super DynaMix™ front end. Five filter functions. The TS-440S is at your service wherever you wish to operate.

- **Covers all Amateur bands** General coverage receiver tunes from 100 kHz–30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in** USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **VS-1 voice synthesizer (optional)**
- **Built-in automatic antenna tuner (optional).** Covers 80–10 meters.
- **5 IF filter functions**
- **Superior receiver dynamic range** Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m.)
- **100% duty cycle transmitter** Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB, 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The PS-50 power supply is needed for continuous duty.)
- **Computer interface port**
- **Adjustable dial torque**
- **100 memory channels** Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
- **TU-8 CTCSS unit (optional)**

- **MC-43S UP/DOWN mic. included**
- **Superb interference reduction** IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and opt. filters fight QRM.
- **Dual SSB IF filtering** A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, **dual** filtering is provided.
- **VOX, full or semi break-in CW**
- **AMTOR compatible**

Optional accessories:

• **AT-440** internal auto. antenna tuner (80 m – 10 m) • **AT-250** external auto. tuner (160 m – 10 m) • **AT-130** compact mobile antenna tuner (160 m – 10 m) • **IF-232C/IC-10** level translator and modem IC kit • **PS-50** heavy duty power supply • **PS-430** DC power supply • **SP-430** external speaker • **MB-430** mobile mounting bracket • **YK-88C/88CN** 500 HZ/270 Hz CW filters • **YK-88S-88SN** 2.4 kHz/1.8 kHz SSB filters • **MC-60A/80/85** desk microphones • **MC-55** (8P) mobile microphone • **HS-4/5/6/7** headphones • **SP-41/50B** mobile speakers • **MA-5/VP-1 HF** 5 band mobile helical antenna and bumper mount • **TL-922A** 2 kw PEP linear amplifier • **SM-220** station monitor (no pan display) • **VS-1** voice synthesizer • **TU-8** CTCSS tone unit • **PG-2C** 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

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

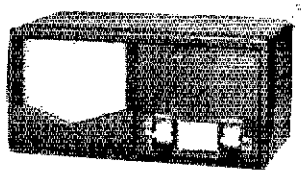
EDCO

ELECTRONIC DISTRIBUTORS CORPORATION

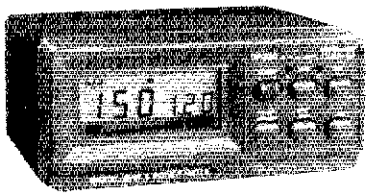
325 Mill Street • Vienna • VA 22180 • (703) 938-8105 • FAX 703-938-6911

CN101

- **Cross Needle Meter Able To Read Forward Power, Reflected Power & VSWR Simultaneously**
- **PEP Monitor Function**
- **High Performance-Low Cost**



Frequency	1.8-150 MHz
Pwr Range: Forward	15/150/1.5 kW
Pwr Rating	1.5 kW (1.8-60 MHz) 1 kW (144 MHz)
Tolerance	± 10% (of full scale)
SWR Detection Sensitivity	4 W minimum
Input/Output Connectors	M (SO-239)
Dimension (W × H × D mm)	155 × 80 × 100 mm
Weight	1.5 lbs.



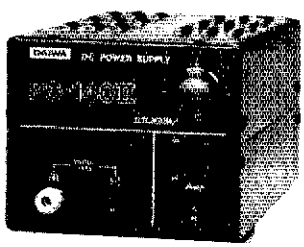
DP830

- **Digital VSWR/Pwr Meter**
- **Select Forward Pwr/SWR By Bar Graph**
- **Beep Tones To Confirm SWR**
- **Clock Function-Displays 4 Different Times**

Frequency	1.8-150 MHz & 140-525 MHz
Power Range	0-1.5 kW & 0-150W
Input/Output Connectors	SO-239/N or N/N
Dimensions (W × H × D mm)	150 × 65 × 110 mm
Weight	2.3 lbs.
Batteries Supplied*	Yes *No. 810, 820

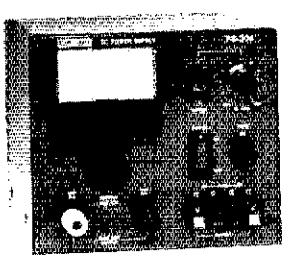
PS140II

- **DAIWA Power Supplies Consist Of Quality ICs, Transistors & Diodes**
- **Each Model Contains A Over-Current Limiting Protection Circuit. This Protects The Power Supply Circuitry When Shorting Positive & Negative Line Or When Over-Current Flows Through The Power Supply Circuitry.**



Input Voltage	117 V AC ± 10%*
Output Voltage	13.8 V
Output Current	12 A
Volt. Fluctuation	Less Than 1%
Ripple Voltage	Less Than 3 mV
Protection Circuit	When 14.2 A
Pwr Consumption	350 W max.
Dimensions (W × H × D mm)	128 × 104 × 225 mm
Weight	11 lbs.

*230 V AC Available For Special Orders Only 2-3 Month Delivery



NEW!

PS304

- **Compact And Lightweight Designed For Efficiency**
- **Maximum Output Current 30A**
- **Volt/Amp Meter**
- **Cigarette Lighter Socket**
- **Quality ICs, Transistors And Diodes**

Output Voltage	1-15 V DC Variable
Output Current	24 A
Protection Circuit	When 32 A
Pwr Consumption	600 W max.
Dimensions (W × H × D mm)	175 × 150 × 225 mm
Weight	17.5 lbs.

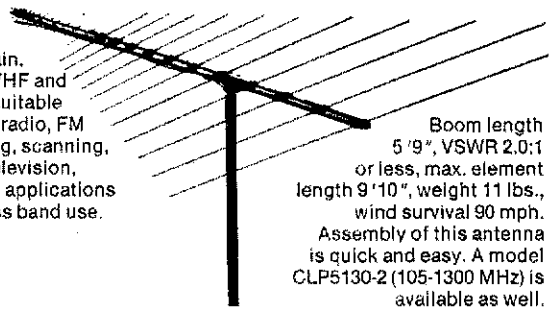
CREATE

High Grade Aluminum Roof Towers For Your Antenna Requirements. Available In Three Heights To Maximize Your Installation. Guying Is Required To Insure Safety.

Model	Height	Base Width	Max. Wind Load FT²	Max Vert. Load Lbs.	Weight
CR18	5'10"	31⅛"	21 @ 90 mph	440	18
CR30	9'10"	39"	27 @ 90 mph	1,322	33
CR45	14'9"	39"	23 @ 90 mph	881	57

CLP5130-1 Log Periodic 50-1300 MHz

This high gain, wide-band VHF and antenna is suitable for amateur radio, FM broadcasting, scanning, VHF/UHF television, government applications and business band use.

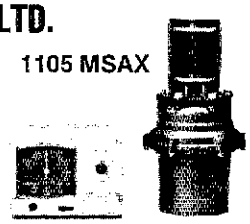


Boom length 5'9", VSWR 2.0:1 or less, max. element length 9'10", weight 11 lbs., wind survival 90 mph. Assembly of this antenna is quick and easy. A model CLP5130-2 (105-1300 MHz) is available as well.

EMOTO ANTENNA.CO,LTD.

Model	Wind Load	Max. Load	Stat. Torq.
201SAX	7.6	660	108
105TSX	10.9	660	215
747SRX	21.8	1100	502
1105MSAX	27.3	880	717
1200FXX	27.3	1760	1290
1300MSAX	32.7	1760	1792
1800FSX	38.2	2200	2150

1105 MSAX

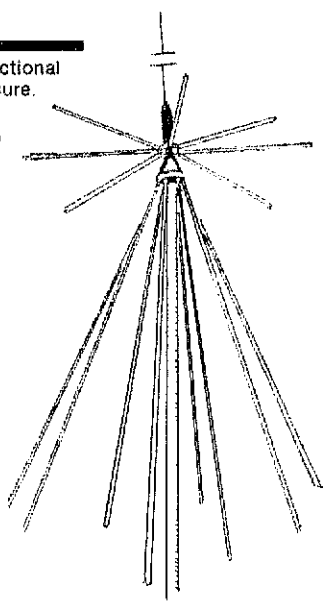


DATONG ELECTRONICS LIMITED

FL3-Multi Mode Audio Filter With Auto-Notch
FL2-Multi Mode Audio Filter (Same As FL3 w/o Auto-Notch)
ANF-Automatic Notch Filter
AD270-Indoor Active Antenna, 200 KHz-30 MHz
AD370-Outdoor Active Antenna, 200 KHz-30 MHz

NEVADA

The ultimate wide-band omnidirectional antenna for hours of listening pleasure. Not only a great receiving antenna, it can transmit on 50 MHz, 144 MHz, 430 MHz, 900 MHz and 1200 MHz. Stainless steel materials complete with mounting hardware and short mast section. Only 5'6" tall which enables indoor installations for apartment dwellers.



Frequency:
Receive—25-1300 MHz
Transmit—50, 144, 430, 900 & 1200 MHz
Max. Pwr: 200 W
Length: 5'6"
Connector: "N" Type
Mast Dia.: .98"-2"
Weight: 2.2 lbs.

Call Your Favorite Dealer To Place Your Order Today—Happy Holidays

RF POWER TRANSISTORS

We stock a full line of Transistors & Tubes for amateur, marine, and business radio servicing

Partial Listing of Popular Transistors in Stock

P/N	Net Ea	P/N	Net Ea	P/N	Net Ea
BFR96	$ 2.75	MRF1946A	$17.00	*LOW NOISE FIGURE*	
CD2664A	24.00	PT6619	19.75	MGF1402	$17.95
Set/4 Matched	110.00	PT9847	22.75	MRF901	1.50
ECG340	3.40	RF120	21.00	MRF911 & 966	2.50
MRF134	16.00	SD1229	12.00	NE25137/2SK205	3.25
MRF136	21.00	SD1272	12.00	NE41137/3SK124	3.25
MRF136Y	47.00	SD1278-1	13.75	U309 & U310	1.75
MRF137	24.00	SD1405	16.00	2N4416 & J310	1.50
MRF138	35.00	SD1407	25.00	3N204 & 3N211	2.50
MRF141G	190.00	SD1428	29.50	*OUTPUT MODULES*	
MRF148	34.00	SD1429-3	16.00	(Partial listing only - call for numbers not listed)	
MRF150	79.50	SRF2072	12.75		
MRF151G	179.50	SRF3662	29.50	SAU4 440 LIN	49.50
MRF153	395.00	SRF3775	13.00	SAV6 150	42.50
MRF156	537.00	SRF3800	17.50	SAV7 144	42.50
MRF171	34.50	2N1522	11.95	SAV12 144 HT	23.50
MRF172	58.75	2N3553	3.00	SAV15 222	58.75
MRF174	80.00	2N3771	3.50	SAV17 144 50W	66.50
MRF208	16.50	2N3866	1.25	M57713 144 LIN	49.50
MRF212	19.50	2N4048	11.95	M57726 144	59.95
MRF221	12.00	2N4427	1.25	M47727 144	69.50
MRF224	16.00	2N5109	1.75	M57729 440	69.95
MRF237	2.00	2N5179	1.00	M57732L	33.00
MRF238	16.00	2N5589	13.00	M57737 144	48.50
MRF239	17.00	2N5591	14.50	M57741L/M/H	57.00
MRF240/A	18.50	2N5641	16.00	M57745 430	89.95
MRF245	32.00	2N5642	16.50	M57755 806	78.75
MRF247	24.75	2N5643	19.00	M57762 1296	69.75
MRF248	35.00	2N5944	11.00	M57764 806	74.00
MRF250	10.00	2N5945	10.00	M57712,M57733	use SAV8
MRF251	10.50	2N5946	12.50	M57737,SC1019	SAV7
MRF262	10.50	2N6080	9.00	SC1027	use SAU4
MRF264	12.50	2N6081	11.00	MHW591	42.00
MRF309	60.00	2N6082,3,4	14.75	MHW710-1,2,3	61.00
MRF314A	33.00	2N6097	20.00	MHW820-1	76.00
MRF315A	32.50	2N6255	2.50	MHW820-2	82.00
MRF316	64.50	2SB754	2.50	*SPECIAL TUBES*	
MRF317	63.00	2SC730	4.50	6CA7/EL34	13.95
MRF327	62.00	2SC1307	4.75	6CL6	11.75
MRF406	13.50	2SC1729	16.25	6GK6	9.95
MRF412	22.00	2SC1945	5.75	6HF5 GE	14.95
MRF421	26.50	2SC1946	18.75	6JB6 GE	15.95
MRF422	36.00	2SC1946A	18.75	6JS6C GE	16.95
MRF427	17.00	2SC1947	9.75	6KD6 GE	18.95
MRF428	50.00	2SC1955	9.00	6L6GC	11.95
MRF429	39.00	2SC1957	1.00	6LF6 GE	16.95
MRF433	11.00	2SC1969	2.50	6LQ6/6MJ6	16.95
MRF448	73.50	2SC1971	4.50	12BY7A	11.75
MRF449A	18.25	2SC2028	1.95	572B/T160L	69.95
MRF450	13.50	2SC2029	2.50	Match Set/2	149.75
MRF450A	14.25	2SC2075	1.75	Match Set/4	299.50
MRF453	17.00	2SC2094	18.50	7581A/KT66	16.95
MRF454	14.00	2SC2097	26.00	811A	16.95
MRF454A	17.00	2SC2097MP	62.00	Match Set/2	37.90
MRF455	11.25	2SC2099	29.50	Match Set/4	75.80
MRF455A	12.75	2SC2166C	2.00	813	44.75
MRF458	20.00	2SC2221	8.25	833A	89.75
MRF475	6.75	2SC2237	7.00	833C	99.75
MRF476	4.00	2SC2284A	24.75	845	58.90
MRF477	13.75	2SC2289	13.75	M2057 GE	24.75
MRF479	13.75	2SC2290	14.75	5894	44.95
MRF485MP	19.75	2SC2290MP	39.50	6146B	14.95
MRF492	14.75	2SC2783	28.50	6550A	16.95
MRF497	18.75	2SC3101	12.25	8950	20.75
MRF515	2.50	2SC2312C	4.75	3-500Z	114.75
MRF555	3.00	2SC2379	31.25	4CX250B	79.95
MRF557	5.25	2SC2509	9.00	4CX300A	142.25
MRF559	2.25	2SC2539	19.75	4CX1000A	459.95
MRF607	2.50	2SC2558	28.25	8877	599.50
MRF629	3.25	2SC2630	23.00	*EIMAC TUBES*	
MRF630	3.75	2SC2640	15.00	8874	359.50
MRF641	20.50	2SC2641	16.00	8875	399.95
MRF644	23.00	2SC2642	28.25	3CX800A7	339.95
MRF646	26.00	2SC2694	46.75	3CX1200A7	469.00
MRF648	31.00	2SC2695	31.75	3CX1500A7	699.50
MRF660	13.25	2SC2782	32.75	3CX3000A7	719.95
MRF843,F	21.00	2SC2879	21.00	4CX250B	99.95
MRF846	37.75	2SC2904	32.50	4CX350A	199.50
MRF873	29.75	2SC2905	34.50	3-500Z	134.75
MRF1946	15.00	40582	9.50	4-400C	159.95

Prices Subject To Change Without Notice
MATCHED & SELECTED TUBE AND TRANSISTOR FINALS IN STOCK FOR AMATEUR AND COMMERCIAL EQUIPMENT
Orders received by 1 PM PST shipped UPS same day.
Next day UPS delivery available • We Export
No extra charge for C.O.D. (cash) or VISA/MC Orders
Ship Hand. 1 lb. U.S. or Foreign Sm Pkt Air 8 oz. $5.00
Minimum Order $20 Quantity Pricing Available

ORDERS ONLY - **(800) 854-1927** - NO TECHNICAL

ORDER LINE • INFORMATION • TECH HELP
(619) 744-0728
FAX 619-744-1943

RF PARTS
1320 Grand Avenue
San Marcos, CA 92069

HI-Q BALUN

- For dipoles, yagis, inverted vees and doublets
- Replaces center insulator
- Puts power in antenna
- Broadbanded 3-40 MHz.
- Small, lightweight and weatherproof
- 1:1 Impedance ratio
- For full legal power and more
- Helps eliminate TVI
- With SO 239 connector
- Built-in DC ground helps protect against lightning

HI-Q Balun

Only $14.95

HI-Q ANTENNA CENTER INSULATOR

- Small, rugged, light-weight, weatherproof
- Replaces center insulator
- Handles full legal power and more
- With SO 239 connector

$6.95

THE ALL-BANDER DIPOLE

THE PERFECT MATCH FOR ANTENNA TUNERS WITH A BALANCED OUTPUT

- Completely factory assembled ready to use
- Heavy 14 (7/22) gauge stranded copper antenna wire to survive those severe storms
- Center fed with 100 feet of low loss PVC covered 450 ohm balanced transmission line
- Includes center insulator with an eye hook for center support
- Includes custom molded insulators molded of top quality material with high dielectric qualities and excellent weatherability
- Complete installation instructions included
- Overall length 135 feet, less when erected as an inverted vee or sloper
- Handles 2 kw PEP & covers 160 through 10 meters
- May be trimmed to fit small city lots

Only $29.95

DIPOLES

MODEL	BANDS	LENGTH	PRICE
Dipoles			
D-80	80/75	130'	$41.95
D-40	40/15	66'	26.95
D-20	20	33'	27.95
D-15	15	22'	26.95
D-10	10	16'	25.95
Shortened dipoles			
SD-80	80/75	90'	35.95
SD-40	40	45'	33.95
Parallel dipoles			
PD-8010	80 40 20 10/15	130'	43.95
PD-4010	40,20,10/15	66'	37.95
PD-8040	80 40/15	130'	39.95
PD-4020	40,20/15	66'	33.95
Dipole shorteners — only, same as included in SD models			
S-80	80/75		$14.95/pr.
S-40	40		12.95/pr.

All antennas are complete with a HI-Q Balun, No. 14 antenna wire, insulators, 100' nylon antenna support rope (SD models only 50'), rated for full legal power. Antennas may be used as an inverted V, and may also be used by MARS or SVOLS

Antenna accessories — available with antenna orders	
Nylon guy rope, 450 lb. test 100 feet	$4.49
Molded Doghone Type antenna insulators	1.00/pr
SO-239 coax connectors	55
No. 14 7/22 Stranded hard drawn copper antenna wire	69/ft.

ALL PRICES ARE UPS PAID CONTINENTAL USA

Available at your favorite dealer or order direct from

Van Gorden Engineering
P.O. Box 21305 • South Euclid, Ohio 44121
Dealer Inquiries Invited

U.S. AMATEUR RADIO MAIL LISTS
Labels, floppy disks, CD-ROM, mag tape...
*NEWLY LICENSED HAMS
*ALL UPGRADES
*UPDATED EACH WEEK
BUCKMASTER PUBLISHING
Route 3, Box 56
Mineral, Virginia 23117
703: 894-5777 visa/mc 800: 282-5628

IONSOUND™ by W1FM

State-of-the-art skywave prediction software covers 1.8-54 MHz for Amateur, Military, SWL. Computes Signal/Noise Ratio, Receive Power, Receive Microvolts, Signal-to-Noise and Path Availabilities, Total End-to-End Link Reliability, Antenna Takeoff Angles, E and F Layer Hops, Propagation Delay, Path Distances and Beam Headings. Select Independent TX and RX antennas, Frequencies, TX power, Sunspots or Solar Flux, Latitude/Longitude, Short/Long path, Local Noise Level, Bandwidth. Menu prompts and selectable color. Comprehensive Tabular Summary and 3 Simulated Chirp Sounder plots (IONOGRAMS) show LUF, MUF and band openings. Includes 26 page printable manual on 5-1/4" DSDD, for IBM PC's and compatibles, 320K RAM minimum, CGA/EGA/VGA. Coprocessor not required. NOT COPY PROTECTED. Info 617-862-6742. $29.95 + $3.00 Shipping /Handling in North America ($5.00 Elsewhere). MA residents add 5% tax. US Check/International Money Order only. See JULY 1990 CQ MAGAZINE review.

Jacob Handwerker / W1FM
17 Pine Knoll Road, Lexington, MA 02173 USA

ROTORS

C.A.T.S.
Rotors, Parts and Repair Service
Reconditioning Large or Small
American Made Rotors
Repairs - $15.00*
Rebuilds - $35.00*
MasterCard VISA
All parts in stock for immediate delivery.
New units for sale. Trade-ins welcome.
C.A.T.S.
7368 S.R. 105 Pemberville, OH 43450
Call N8DJB at (419) 352-4465 11:00-7:00
**LABOR ONLY - PARTS & SHIPPING ADDITIONAL*

PARTS

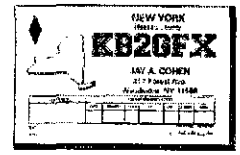
Budget QSLs

$38/1000
plus $2.00 Shipping

★RAISED PRINTED★
BEAUTIFUL, GLOSSY INK!

Thought you couldn't afford really good QSLs? These high quality RAISED PRINTED cards can be in your hands for only **4¢** each! Your choice of 4 colors of 67 lb. bristol stock: Gray, Yellow, Blue, Ivory. We print in blue ink in the format shown. If you don't want the state outline, we can remove it and make the callsign larger to balance the card. NO EXTRA CHARGE for ARRL logo, or extra wording if we have the room. Order with confidence; these are the best value in Ham Radio today! Your satisfaction is guaranteed. Send your check or call us TOLL FREE if you have MasterCard or Visa. Need a custom card? Call (318) 443-7261. Please, for

ORDERS ONLY CALL 1-800-256-2104



DENNIS
WA5QMM
NETWORK
QSL
CARDS

P.O. Box 13200 - Alexandria, LA 71315-3200 - (318) 443-7261
or FAX your order to: (318) 445-9940

WRIGHTAPES: (Since 1976) Unconditionally guaranteed Morse Code Practice on 60 min. cassette tapes. Beginners 2-tape set 5 WPM $7.90. Also 3, 4, 5, 5-8, 10, 9-11, 12-14, 14, 16-20, 22, 24-28 WPM. Specify Plain Language or Code Groups. Also plain lang. only 30-35, 35-40, 45-60. FCC type tests: 5-5, 11-12, 11-17, 13-14, 20-24. Call signs: 12-15, 20-24. Nos.: 5-22, 13-18, 18-24. Check, M/C, Visa $3.95 ea. PPD 1st class USA, Can. Printed texts add $.50 per tape. **Call anytime.** 3.95 3.95

Instant Service
WB9VAS PH: 517-484-9794 WRIGHTAPES W8QN
235 E. Jackson S-1 • Lansing, MI 48906

ANTIQUE RADIO CLASSIFIED
Free Sample!

Antique Radio's Largest Circulation Monthly. Articles, Ads & Classifieds. Also: 40's & 50's Radios, Ham Equip., Early TV, Books & more. *Free 20-word ad each month.*
6-Month Trial: $13. 1-Yr: $24 ($36-1st Class).
A.R.C., P.O. Box 802-B7, Carlisle, MA 01741

Protect Your Investment with The Pouch

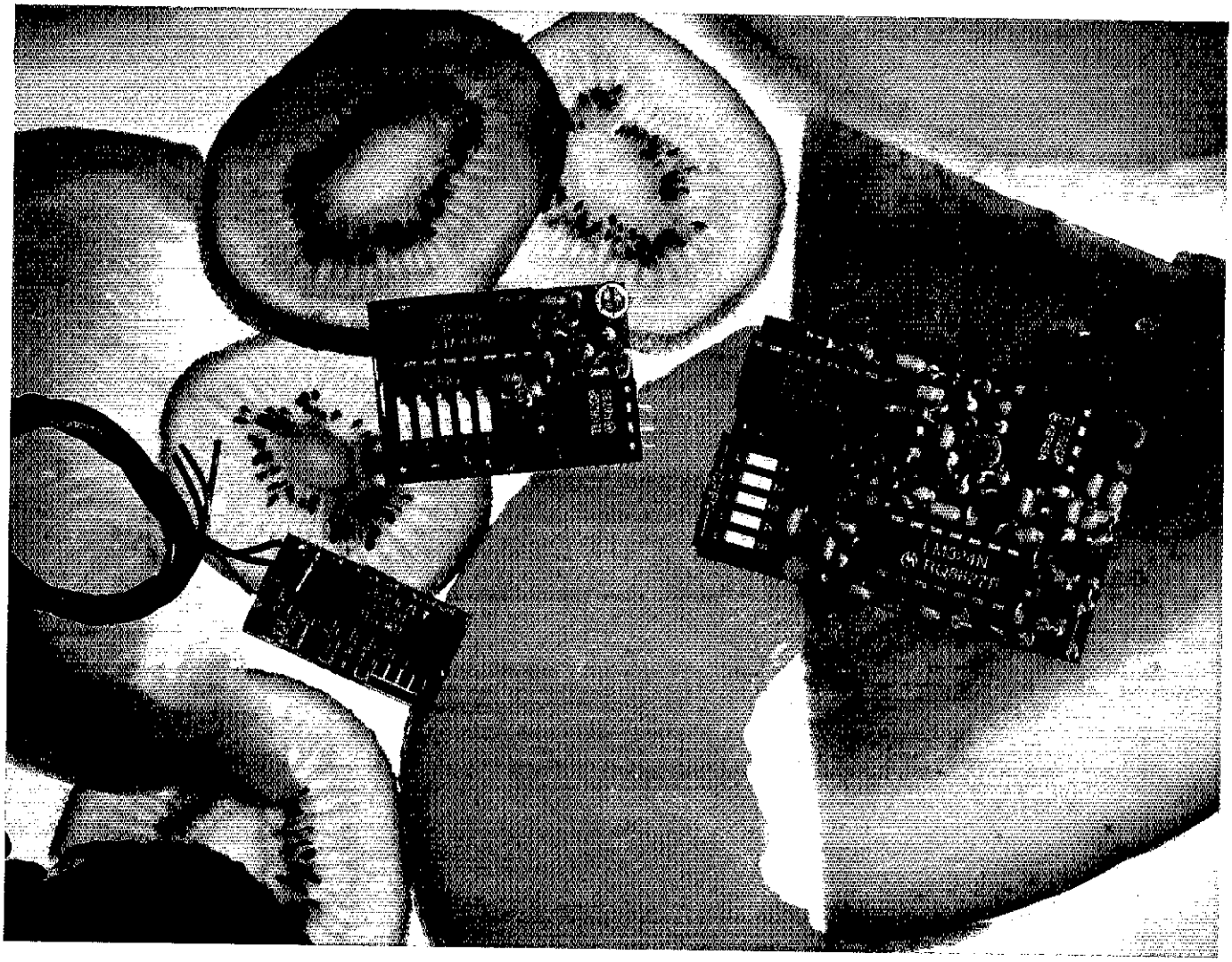
Tough..... resilient..... black neoprene

For Every Portable Every Battery

A sturdy web belt-loop sewn on the back extends over the top and is secured on the front with a velcro tab.

5 Sizes
- *SUPER-SMALL* for IC-2Sat
- *SHORT* for other Mini H.T.s
- *SLIM* (7")- FT411, IC-24at, etc.
- *C* - Fits full-size handhelds
- *LONG* (9)-THF7s & *Bricks*!

The Pouch it's Washable!
1-800-72-Pouch (Dealer Information)



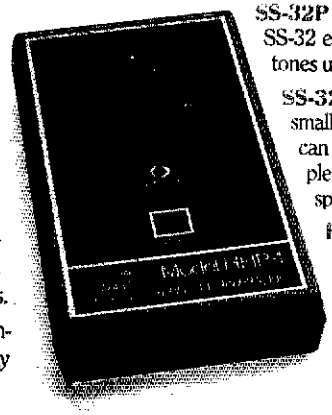
Choice Selection.

Now you can have it all! Take all the qualities you've come to depend on in our programmable CTCSS tone equipment: Astonishing Accuracy, Instant Programming, Unequaled Reliability; and add full spectrum tone versatility, multi-tone capability without diodes, a reprogrammable memory... It's our new harvest of CTCSS tone equipment.

The choice is yours! If standard CTCSS EIA tones do not suit your taste, select any 32 tones of your liking from 15.0Hz to 255.0Hz. And if you change your mind, no problem; the memory can be changed in your shop with our HHP-1 programmer, or at our factory for free. Your working tone is accessed by a simple DIP switch, so there's no fussing with counters or other test equipment.

Call today toll-free and find out more about this fresh new flexibility in tone signalling, and don't forget to ask about multi-tone switching without cumbersome diode networks or binary switches.

It's all brought to market by the people who introduce the freshest ideas in tone signalling, and of course our customary same day shipping and one year warranty apply.



TS-32P CTCSS ENCODER-DECODER Based on the time proven TS-32, the industry standard for over a decade. The TS-32P gives you the added versatility of a custom, changeable memory base. A low price of $57.95 makes it an even sweeter deal.

SS-32P ENCODER Based on the equally popular SS-32 encoder. Available for CTCSS, or audible burst tones up to 6550.0Hz. Price is $28.95.

SS-32SMP SUB-MINIATURE ENCODER Our smallest encoder for handheld applications. Now you can satisfy that customer that needs to access multiple repeater sites with a radio that has precious little space inside. At $27.95, the price is small too.

HHP-1 HANDHELD PROGRAMMER For programming the 32 memory locations in any of our new programmable products, including our SD-1000 Two-Tone Sequential decoder. The HHP-1 is battery operated for field use, and will program ANY 32 tones from 15.0 to 6550.0Hz in .1Hz. increments. Price is $199.95.

MasterCard VISA

COMMUNICATIONS SPECIALISTS, INC.

426 West Taft Avenue • Orange, CA 92665-4296

Local (714) 998-3021 • FAX (714) 974-3420 • **Entire U.S.A. 1-800-854-0547**

THE *New* PCS-6000

BOLDLY GOES WHERE NO OTHER TRANSCEIVER HAS GONE BEFORE!!

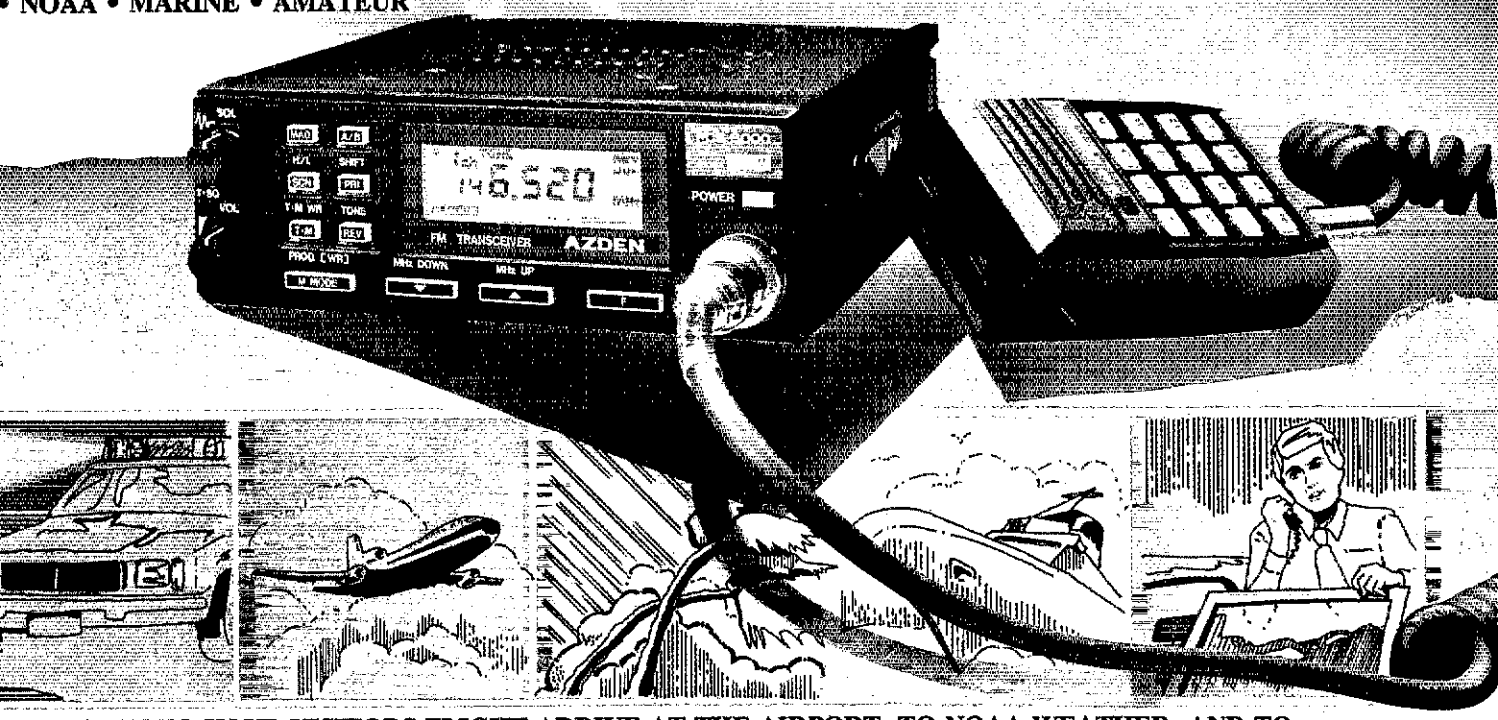
AZDEN

While the response to the PCS-6000 has been overwhelming, we at **Amateur-Wholesale Electronics** hear that some people are still undecided. So to help you decide, we now have a special price that will probably knock you off frequency. **CALL TODAY AND DON'T DELAY!!!**

RECEIVE 118 TO 173.995 MHZ.

AM AIRCRAFT • PUBLIC SERVICE • NOAA • MARINE • AMATEUR

SALE!



LISTEN TO YOUR VISITORS FLIGHT ARRIVE AT THE AIRPORT, TO NOAA WEATHER, AND TO PUBLIC SERVICE, POLICE, FIRE, FORESTRY AND MARINE FREQUENCIES

MODELS: PCS-6000H 50 WATTS!! *Also coming soon PCS-6200 220MHZ, PCS-6300 70CM and PC-10 10 Meter FM Handheld.* **CMOS AND ADVANCED SURFACE MOUNT TECHNOLOGY PROVIDE UNPRECEDENTED COMMERCIAL QUALITY AND RELIABILITY.**

UNPRECEDENTED WIDE FREQUENCY COVERAGE: The PCS-6000 receives 118.00 to 135.995 MHZ AM Aircraft/136-173.995 MHZ FM and transmits 140.100 to 150.000 MHZ. Modifiable to **ALL MARS** and **CAP** frequencies (proof of authorization/license required)

TINY SIZE: Only 2 inches high, 5¼ inches wide and 7¼ inches deep!! Easily fits anywhere, even in the smallest car!

20 CHANNEL MEMORY IN TWO BANKS PLUS 1 TEMPORARY CHANNEL (TM): Two memory banks, A and B have 10 memory channels each. The memories store frequency, shift width, offset information, and PL tone frequency as programmed. *An extra memory channel (that we call TM-temporary memory) is provided to allow you to store any operating condition instantly again and again!!*

UP TO 21 NONSTANDARD SPLITS: Program any split in any channel.

VERSATILE SCANNING FUNCTIONS: Dual memory scan, programmable band scanning, hold scan and delay scan functions are provided, with selectable delay time. **ALL** memory channels are tunable independently.

PRIORITY CHANNEL MONITORING: Memory Channel B0(the first channel in memory bank B) is monitored every four seconds regardless of any operating condition. When a signal is received, a beep is heard.

DISCRIMINATOR CENTERING (AZDEN EXCLUSIVE PATENT): Always stops on frequency desired when scanning.

PROGRAMMABLE FREQUENCY STEPS: In memory, frequency steps can be set at 5KHZ to 20KHZ in any increment.

BUILT-IN PROGRAMMABLE TONE ENCODER: 57 different tones are built in for instant programming of PL tones into memory channels and microcomputer. Tone frequency can be entered independently in RX and TX. A tone decoder is available as an option.

LITHIUM BATTERY BACKUP: Memory information can be stored for up to 5 years even if power is removed.

FREQUENCY REVERSE: Allows you to listen to repeater input frequency.

FEATHER-TOUCH TUNING CONTROL KEYBOARD: The LED backlighted light touch keyboard performs all tuning operations simply by pushing the key(s) and key actuation is audibly verified.

LARGE LCD (LIQUID CRYSTAL DISPLAY): The LCD display shows the operating frequency, S/RF, memory channel in use and various other operating functions. The LCD is back-lighted by green LEDs, making it possible for you to read the display even in total darkness.

FULL 16 KEY TOUCHTONE PAD MICROPHONE: DTMF Microphone functions as auto-patch when transmitting.

DIGITAL S/RF METER: Shows incoming signal strength and relative transmitter power.

MICROPHONE CONTROLS: Up/Down memory and frequency control.

TRUE FM, NOT PHASE MODULATION: Unsurpassed intelligibility and audio fidelity. High/Low Power: 25W/45W or 5W/10W (6000/6000H). Output-Fully adjustable.

SUPERIOR RECEIVER: Sensitivity is better than 0.15 Microvolt for 20-DB quieting. Commercial-Grade design assures optimum dynamic range and noise suppression.

AUDIO OUTPUT: 2 Watts or more.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

OTHER FEATURES: Rugged dynamic touchtone DTMF microphone, built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses and hardware are included.

WARRRANTY: 1 YEAR LIMITED.

EXCLUSIVE DISTRIBUTOR:

FOR YOUR NEAREST DEALER OR TO ORDER:

AMATEUR-WHOLESALE ELECTRONICS

TOLL FREE 1-800-451-2397

1040 Industrial Drive, Box 224, Watkinsville, Georgia 30677 Telephone (404) 769-8706 FAX (404) 769-7970 (7pm-10am) Telex: 4930709 ITT

Repair Service: (404) 769-8706—2:00 PM - 4:00 PM Hours: 8:30 AM - 4:30 PM Mon.-Fri.

MANUFACTURER: JAPAN PIEZO CO., LTD.

MasterCard VISA

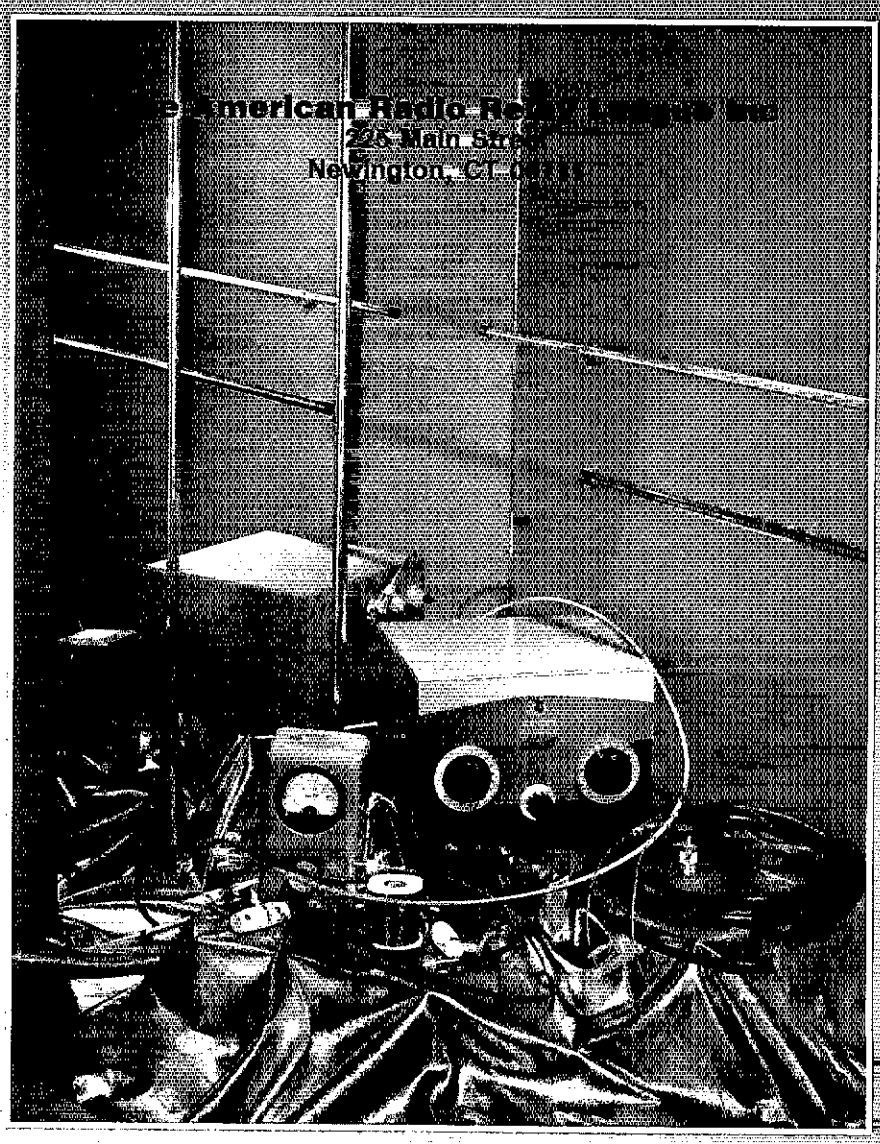
REFLECTIONS —Transmission Lines and Antennas

by M. Walter Maxwell, W2DU

A Book that puts "King SWR" in perspective

Reflections is written to clear the air of the half-truths and outright myths we hear these days about transmission lines, standing waves, antenna matching, reflected power and antenna tuners. The first seven chapters are based on "Another Look at Reflections"—one of the most popular series ever published in **QST**. The remaining seventeen chapters contain new and previously unpublished material which concludes the series. Besides giving "King SWR" a serious re-examination, the book has a wealth of information on matching networks, antennas, and use of the Smith Chart. Software described in Chapter 18, is available separately.

In order to improve knowledge of reflection mechanics and transmission-line propagation, Maxwell explains: Why reflected power by itself is an unimportant factor in determining how efficiently power is being delivered to the antenna. The effect of line attenuation to discover why it is the key factor which tells us when and how much to be concerned with reflected power. Why all power fed into the line, minus the amount lost in line attenuation, is absorbed in the load regardless of the mismatch at the antenna terminals. Why reflection loss (mismatch loss) is canceled at the input of the line by reflection gain. Why a low SWR reading by itself is no more a guarantee that power is being radiated efficiently than a high SWR reading guarantees it is being wasted. Why SWR is not the culprit in transmitter-loading problems—why the real culprit is the change in line-input impedance resulting from the SWR and why we have complete control over the impedance without necessarily being concerned with the SWR. The importance of thinking in terms of resistive and reactive components of impedance instead of SWR alone, and why SWR by itself is ambiguous, especially from the viewpoint of the selection and adjustment of the coupling and matching circuitry of an external line-matching network.



Reflections—Transmission Lines and Antennas was written by Walt Maxwell, W2DU, a noted antenna designer for RCA Laboratories. From 1960 until retirement in 1980, Walt was in charge of the Astro-Electronics Division Space Center Antenna Laboratory and Test Range.

This book is available in hardcover, Over 384 pages, $20 at your dealer or from ARRL. Order no. 2995. A companion 5-1/4 inch diskette is available for use on IBM® PCs and compatibles for $10 Order no. 3118. Add $2.50 ($3.50 for UPS) for shipping and handling.

hy-gain®

A FREE HF BEAM ANTENNA

WITH PURCHASE OF COMPLETE TOWER & ROTATOR OR TOWER ONLY PACKAGE

Select your own HF beam antenna up to the value designated for each package. Only one antenna may be selected. The value of the antenna is the suggested amateur net price published by Telex—see box below.

Order the selected package and beam antenna from your authorized Hy-Gain dealer. The entire package will be shipped, freight prepaid, directly from the factory to you.

Complete Tower & Rotator Promo Packages • Contact your dealer for package pricing

PACKAGE NO.1
HG 37SS Tower
Coax arms (2), Thrust bearing (1), Mast (1)
HAM IV rotator
FREE One HF Beam
Antenna of your choice up to a maximum value of **$637.00***

PACKAGE NO.2
HG 52SS Tower
Coax arms (2), Thrust bearing (1), Mast (1)
HAM IV
FREE One HF Beam
Antenna of your choice up to a maximum value of **$637.00***

PACKAGE NO. 3
HG 54HD Tower
Coax arms (3), Thrust bearing (1), Mast (1)
T²X or HAM IV or HDR 300 rotator
FREE One HF Beam
Antenna of your choice up to a maximum value of **$805.00***

PACKAGE NO. 4
HG 70HD Tower
Coax arms (4), Thrust bearing (1), Mast (1)
T²X or HAM IV or HDR 300 rotator
FREE One HF Beam
Antenna of your choice up to a maximum value of **$936.00***

Tower-Only Promo Packages • Contact your dealer for package pricing

PACKAGE NO. 5
HG 37SS Tower
FREE One HF Beam
Antenna of your choice up to a maximum value of **$144.00***

PACKAGE NO. 6
HG 52SS Tower
FREE One HF Beam
Antenna of your choice up to a maximum value of **$200.00***

PACKAGE NO. 7
HG 54HD Tower
FREE One HF Beam
Antenna of your choice up to a maximum value of **$325.00***

PACKAGE NO. 8
HG 70HD Tower
FREE One HF Beam
Antenna of your choice up to a maximum value of **$539.00***

***Suggested Amateur Net Price of HF Beam Antennas**

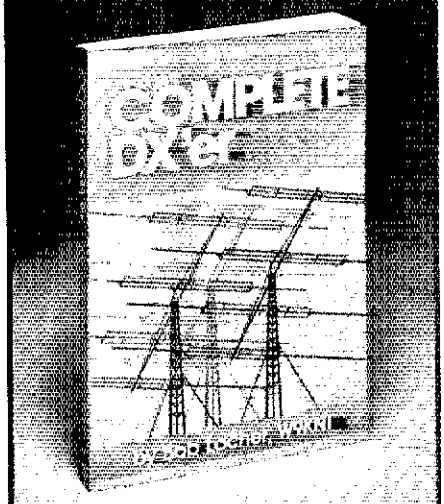
MODEL	TRIBAND BEAM	AMATEUR NET
391S	TH7DXS Thunderbird, 7 elements	$936.00
393S	TH5MK2S Thunderbird, 5 elements	805.00
395S	Explorer 14 Broad Band	637.00
221S-1	TH3JRS Thunderbird, 750W PEP	403.00
390S	TH2MKS Thunderbird, 2 elements	378.00
396S	30/40 Meter Kit for Exp. 14	162.00

MODEL	MONOBAND BEAMS	AMATEUR NET
239S-1	103BAS 3 element 10 meter	$144.00
236S	153BAS 3 element 15 meter	200.00
226S	203BAS 3 element 20 meter	325.00
375S	105BAS Long John 5 element 10 meter	278.00
376S	155BAS Long John 5 element 15 meter	419.00
377S	205BAS Long John 5 element 20 meter	713.00
394S	204BAS 4 element 20 meter	539.00
371S	Discoverer 7-1 Rotary dipole 30/40 meter	294.00
372S	Discoverer 7-2 2 element 40 meter	662.00
373S	Discoverer 7-3 Director Kit for 7-2	416.00

ALL MERCHANDISE SHIPPED FREIGHT PREPAID FROM THE FACTORY DIRECTLY TO YOU. OFFER GOOD ONLY IN THE 48 CONTIGUOUS UNITED STATES OF AMERICA. ORDERS MUST BE RECEIVED AT THE FACTORY ON OR BEFORE OFFER EXPIRES ON NOVEMBER 30, 1990.

TELEX®

DX!



New 2nd Edition

Now that we have your undivided attention, here's the book you've been waiting for! W9KNI has done it again by updating the pre-eminent book on DXing. Covers basic listening and equipment, pile-up techniques, hunting, antenna and tower notes, more hunting techniques, advanced listening, QSLing, special language techniques, DX-pedition operating and more! Join with Bob in the joy of the chase and capture of that new one. This book is what DXing is all about — fun! Price is $12*.

N6RJ Electronic Second Op

All the DX info you need in one spot! DXCC listing with bearings, ranges, sunrise/sunset by day for each country (gray line), postal info, extensive logging system and log printing power (1 day, between two dates, countries), print DXCC/WAZ Oblast need list by band/mode, high-speed on-screen color displays with appropriate monitor, ITU callsign allocations, 3rd party and reciprocal lists, UTC clock, 52-page manual, help screens for all functions. Requires IBM-PC/XT/AT or true compatible, 640K memory, DOS 3.0 or greater, hard disk recommended, supports 132 column printer, Epson 80 column compatible or HP LaserJet II. Available on 5¼ or 3½ format, not copy protected. $60*.

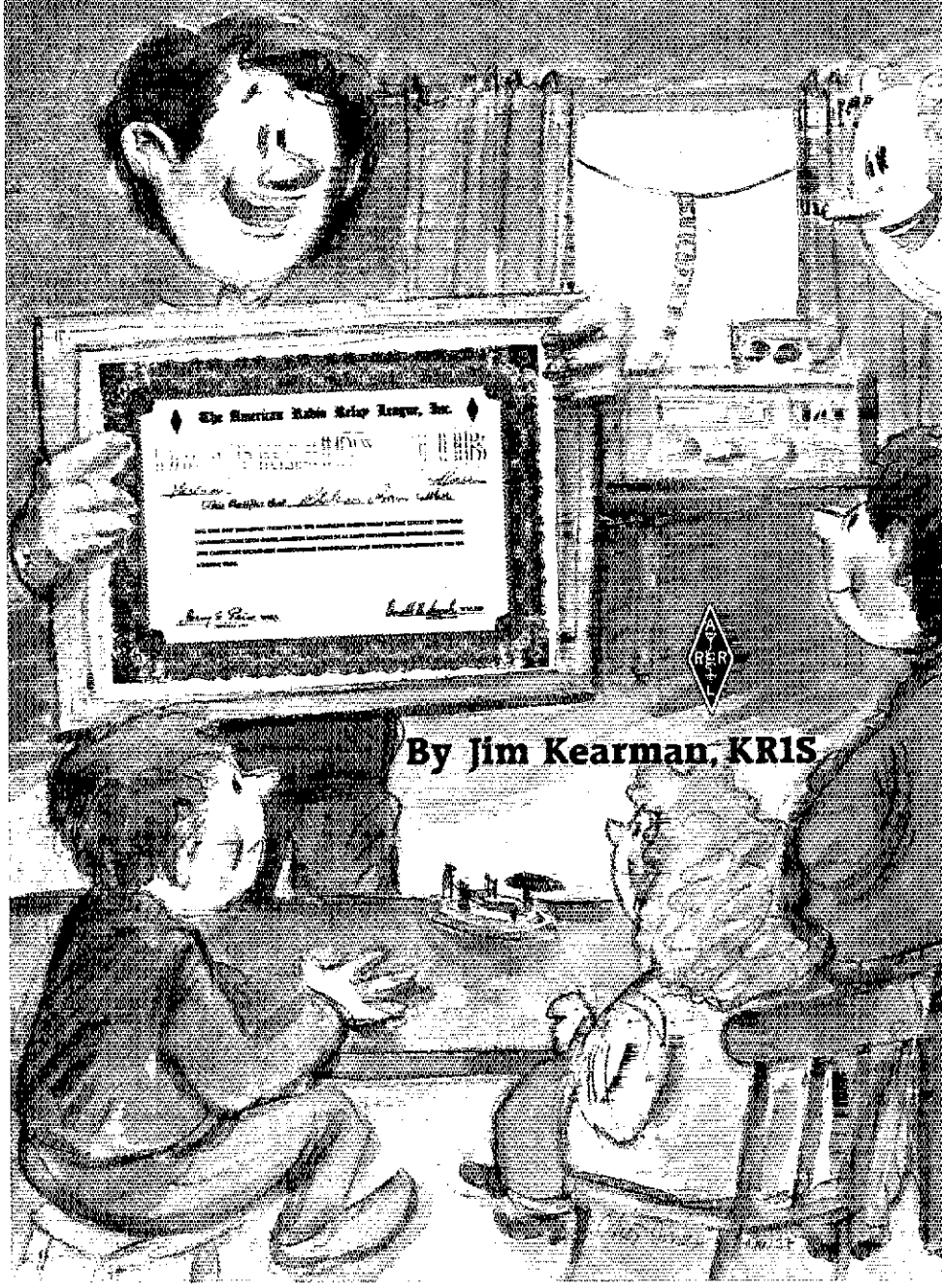
*See the ARRL Bookshelf page elsewhere in this issue for ordering information.

THE AMERICAN RADIO RELAY LEAGUE
225 MAIN ST.
NEWINGTON, CT 06111

THE DXCC COMPANION

$6.00

How to Work Your First Hundred Countries



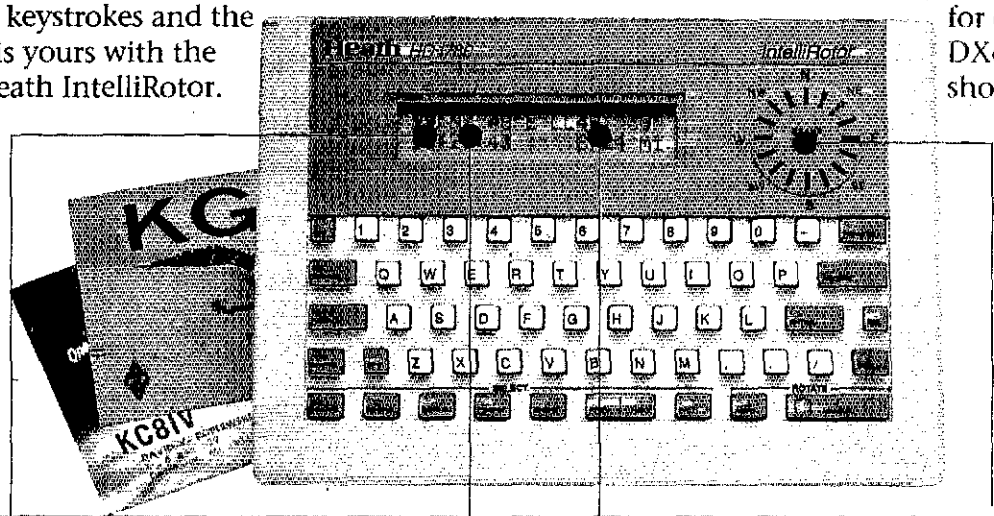
By Jim Kearman, KR1S

Just bitten by the DX bug? Then the **DXCC Companion** is just the book for you! It's filled with practical, easy to understand information for the beginning DXer. Follow the advice given by KR1S and you'll have your first hundred countries confirmed in no time. You'll learn about equipment, antennas, propagation and the rights and wrongs of QSLing. Available at your dealer or from ARRL Order #3398-for $6 (add $2.50 for postage and handling, $3.50 for UPS)

Now, beam your antenna with just a few keystrokes!

No mapping. No charting. No calculating bearings. No brake control. No manual rotation needed. Just a few keystrokes and the world is yours with the new Heath IntelliRotor.

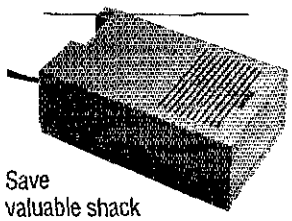
The most exciting ham innovation since digital displays replaced analog dials, the IntelliRotor is fast. It's easy. It's right on target for contesters, DXers and serious shortwave listeners.



Glance at the screen in standby mode and instantly note the local day, time and bearing to 1°. Bearing is also displayed on a compass rose of 16 LEDs with a resolution of 32 points.

The IntelliRotor replaces your manual control box and works with your exisiting Ham-M (series 3, 4, 5 and 6), Ham-II, Ham-III, Ham IV, T²X, HDR-300, CDE TR-44, CD-45 (series 2) or M2 rotator.*

Push a few buttons and the selected country's latitude, longitude, grid square, bearing, time of day and distance automatically appear on screen.



Save valuable shack space with separate power unit. Six-foot umbilical lets you place power unit out of the way, even under the table.

Scan through the permanent database and quickly view more than 400 countries and prefixes. Or customize the list by editing the database — or adding up to ten of your own named and detailed bearings.

Control the IntelliRotor with your PC-compatible computer, either as a transient program or pop-up. Software comes on both 5.25" and 3.5" disks.

Concentrate on making that important DX contact instead of controlling the beam when you use the fully automatic brake control. Enter the first letters of the call. The IntelliRotor completes the call prefix and country's name. Press AUTO to turn the beam to that country.

Enter the name of the country (or first few letters), a prefix (or partial prefix), latitude and longitude, grid square or bearing in degrees on the built-in QWERTY-style keyboard. Press AUTO and the IntelliRotor beams the antenna to the country you want.

To end the last tedious part of a great hobby, see your nearby Heath dealer.

For a FREE HeathKit catalog call us toll-free at 1-800-44HEATH (1-800-444-3284).

Heath®
Benton Harbor, MI

WEST: **Henry Radio** — Los Angeles, CA
Ross Distributing — Preston, ID
Ken-Comm — Grants, NM
Portland Radio Supply — Portland, OR
Amateur Electronic Supply — Las Vegas, NV
Burghardt Amateur Center — Watertown, SD
Texas Towers — Plano, TX

CENTRAL: **The Ham Station** — Evansville, IN
Dandy — Wellington, KS
RF Enterprises — Merrifield, MN
Amateur Electronic Supply — Milwaukee, WI
Amateur Electronic Supply — Wickliffe, OH
R & L Electronics — Hamilton, OH
N. Olmsted Amateur Radio — N. Olmsted, OH
Erickson Communications — Chicago, IL

EAST: **Lentini Communications** — Newington, CT
Delaware Amateur Supply — New Castle, DE
N & G Electronics — Miami, FL
Amateur Electronic Supply — Clearwater, FL
Amateur Electronic Supply — Orlando, FL
VHF Communications — Jamestown, NY

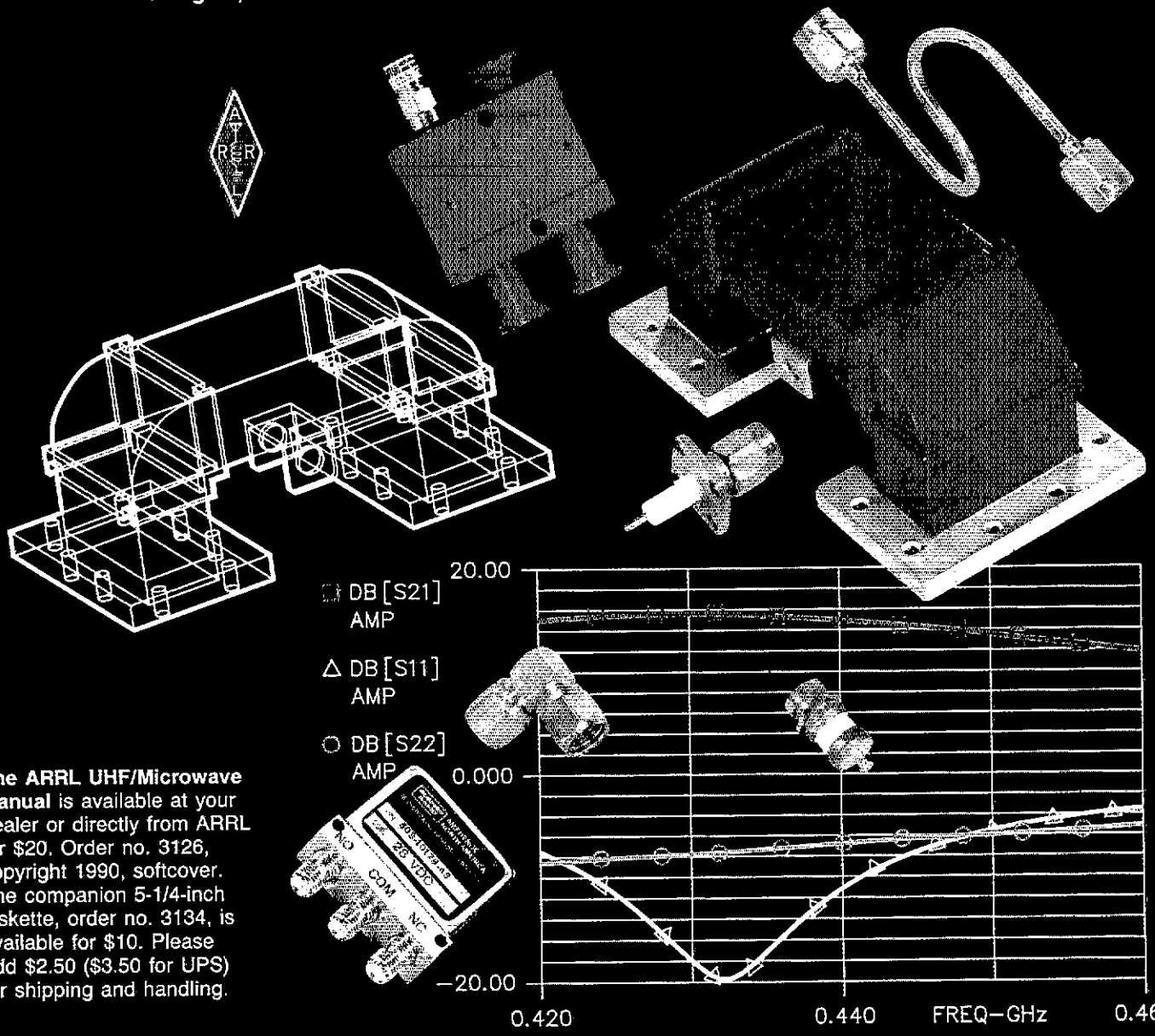
*Telex/Hy-Gain® honors rotator warranties when used with this controller. Telex/Hy-Gain is a registered trademark of Telex/HyGain.

AM-459

Discover the excitement and fun of UHF/Microwave experimentation and communication today!

The ARRL UHF/Microwave Experimenter's Manual is written for the growing number of radio amateurs who are discovering that there is life on our frequencies above 420 MHz. Technicians and engineers will find this book particularly useful as the basis for understanding microwave technology. Those with some experience in UHF and microwave work will certainly recognize familiar names among the many experts who contributed to each of the twelve chapters in this 448-page book: A Brief History, Safety, Propagation, Microwave Devices, Transmission Media, Design Techniques, System Design, Microwave Fabrication Techniques, Antennas and Feed Lines, Earth-Moon-Earth (EME) Communications, Getting Started in Microwave Measurements and Tackling Microwaves with Microcomputers. A companion 5-1/4-inch diskette is available separately which contains 25 programs for the IBM® PC and compatible computers.

The American Radio Relay League, Inc
225 Main Street
Newington, CT 06111



The ARRL UHF/Microwave Manual is available at your dealer or directly from ARRL for $20. Order no. 3126, copyright 1990, softcover. The companion 5-1/4-inch diskette, order no. 3134, is available for $10. Please add $2.50 ($3.50 for UPS) for shipping and handling.

CALL 1-800-423-2604

FRIENDLY SERVICE TEXAS STYLE!

AUSTIN AMATEUR RADIO SUPPLY

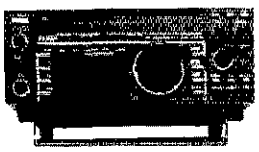
Multi Store Prices!

HOURS
M-F 9:00 - 5:30 (PHONE)
10:00 - 5:00 (WALK-IN)
SAT 9:00 - 5:00 (PHONE)
9:00 - 1:00 (WALK-IN)
CENTRAL TIME

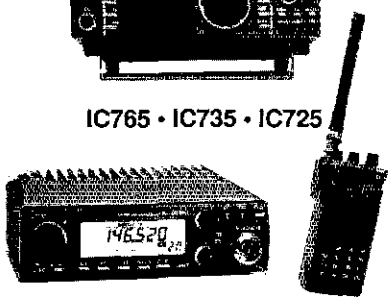
5325 NORTH I-35
AUSTIN, TEXAS 78723

SERVICE, INFO,
TEXAS RESIDENTS
(512)-454-2994

VISA MasterCard DISCOVER



IC765 • IC735 • IC725



IC229H • IC24AT • IC2SAT • IC2400A

Special Sale Prices!

IC2SAT

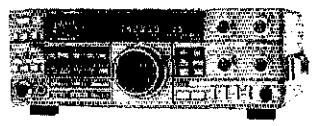
Battery Promo! Call Now!

IC24AT

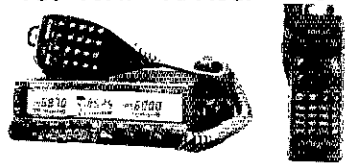
IC229H

IC735

IC2400A



• TS950SD •
TS940SAT • TS440SAT • TS140S



TM941A • TM731A • TM241A
TH75A • TH225A • TH27A

Special Sale Prices!

TH27A

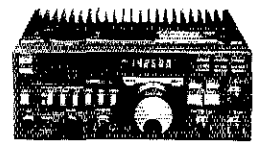
TM731A

New! TM941A

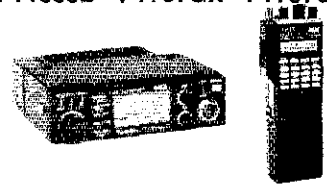
TS440S w/AT

Battery Promo! Call Now!

TH225A



FT1000D • FT767GX • FT757GX/II



FT212RH • FT470 • FT411E

Special Sale Prices!

FT470

FT212RH

FT757 GX/II

FT411E

ANTENNA ROTATORS *ON SALE!*

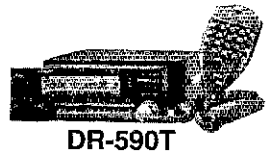
ALLIANCE
HD-73 In Stock!

TELEX
CD45-II • HAM-IV
TAILTWISTER

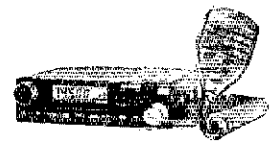
YAESU
G400RC

LARSEN DUAL BAND ANTENNA *ON SALE!*

Your Choice.
Mag Mount
Trunk Lid
Mount
Hole Mount



DR-590T
Now In Stock!
DR-570T
A Great Buy!



DR-110T • DR-112T
2M - 45 Watt
Super Value!

DJ-160T
Full Featured
2 Meter
Handheld
Always Competitive Pricing!
$ $

MFJ ANTENNA TUNERS & ACCESSORIES

New Low Pricing

986 • 949D • 941D • AND MORE...

AEA PK-232MBX • PK-88

MFJ 1270B • 1278 • 1278T

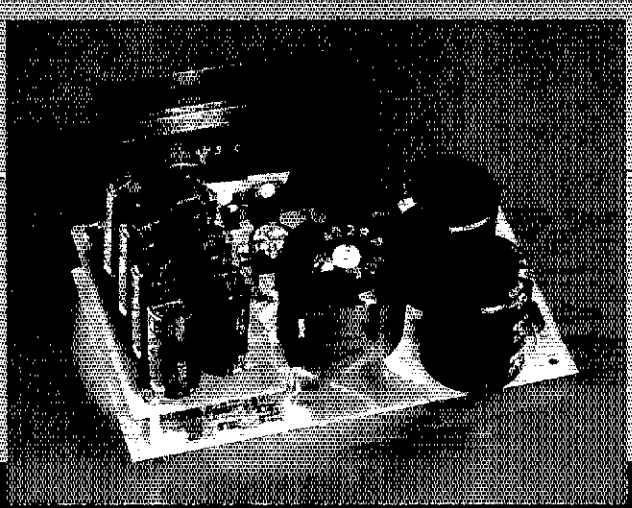
New Low Pricing

KANTRONICS KAM

$25.00

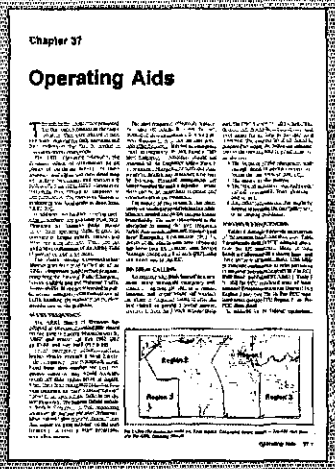
THE ARRL HANDBOOK

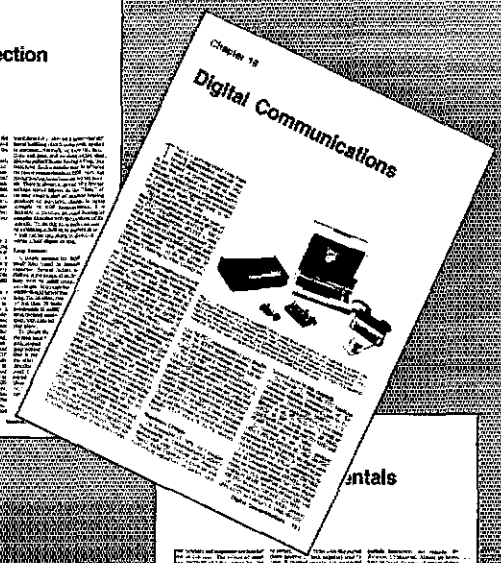
FOR RADIO AMATEURS

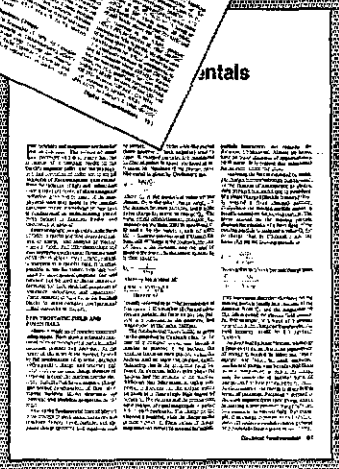


PUBLISHED BY
THE AMERICAN RADIO RELAY LEAGUE

1991







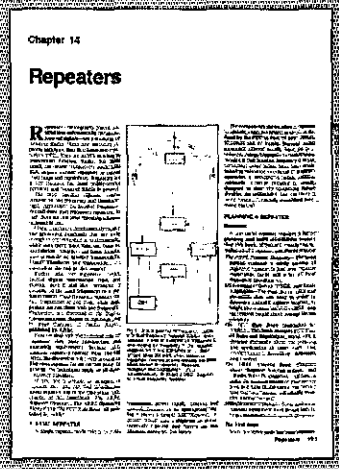
Super Book!

Microsats, digital communication on microwaves at the rate of 2-Megabits per second, spread-spectrum signal-acquisition, a lightweight 20 ampere, 12-V dc switched mode power supply about *half* the size of a shoe box. Could the contributors to "Handy's Handy Handbook" 65 years ago even have imagined that such subjects would be included in "The Standard Manual of Amateur Radio Communication?"

Besides the HQ staff, fourteen "outside authors" add flavor to the **1991 Handbook**. Their range of expertise includes digital communication techniques, power supply construction, satellite communications techniques and radio direction finding. On the operating side, there is an updated "Operating Aids" chapter with an Emergency Action section with guidance for the first critical stages of emergency communications. And there's more!

You'll also find many popular construction projects that can be built in a weekend, such as power supplies, keyers, measuring devices, QRP transmitters and VHF/UHF preamps. For the more ambitious builder, there are projects like high-power HF and VHF amplifiers. Don't forget the **Handbook** as a source of component data: There is an entire chapter devoted to everything from tube and transistor specifications to aluminum tubing sizes. The 69 chapters feature over 2100 tables, figures and charts, and an expanded index rounds out the book.

Even though the **ARRL Handbook** is written for the radio amateur, over the years it has developed a prestigious reputation among engineers and other communications professionals. The 1232-page 68th edition carries on that proud tradition!



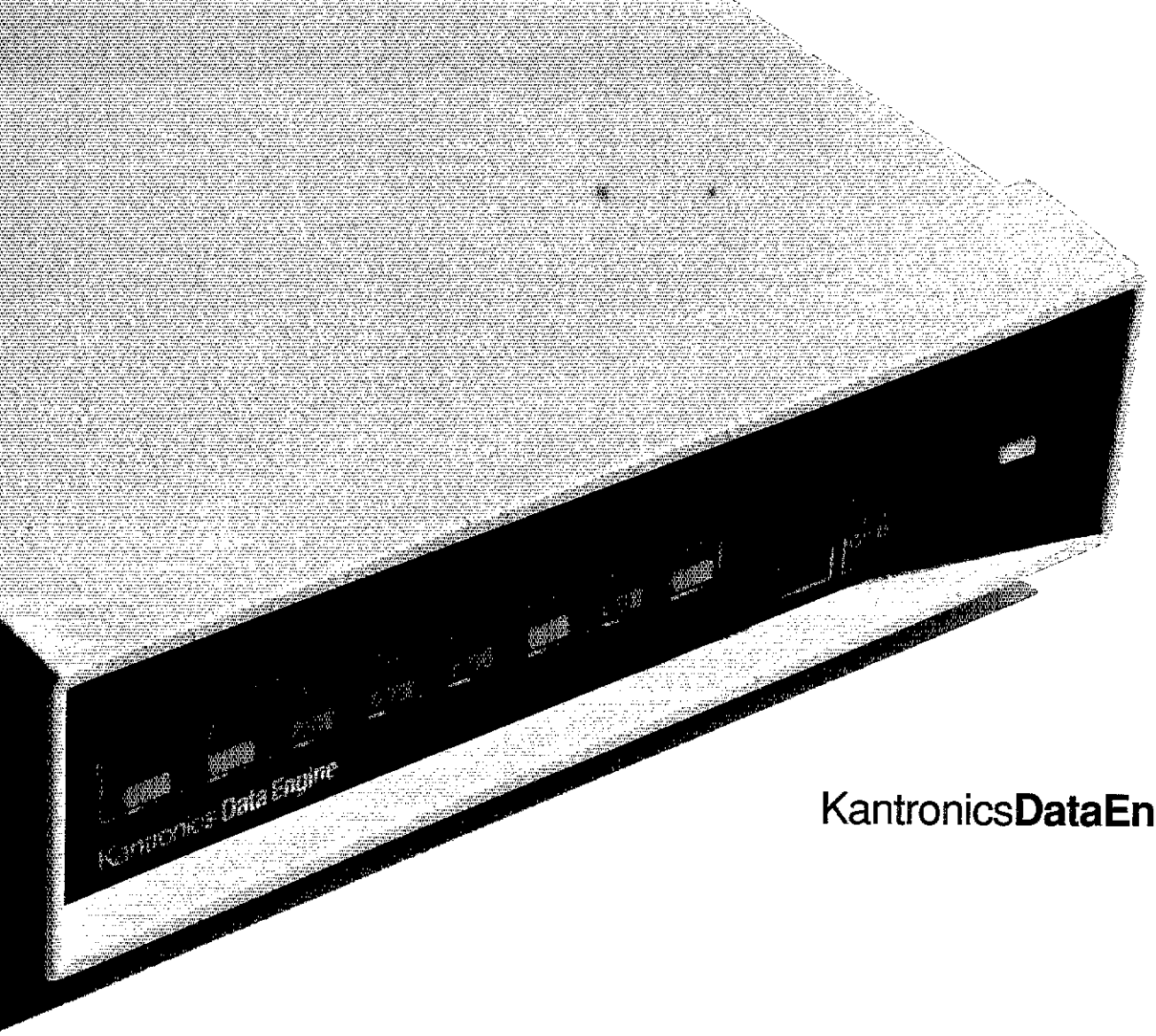
Shipping in mid- to late-October

The ARRL Handbook for Radio Amateurs, 1991 Edition, is available in hard cover at your favorite dealer or directly from ARRL for $25. Order number 1689. Please add shipping and handling charges of $3.50 for surface mail, $4.50 in the US for UPS.

The American Radio Relay League, Inc.
225 Main Street, Newington, CT 06111

Just a few of the projects in the *1991 Handbook*

(1) Flyback transformer for the Switched Mode Power Supply shown in (2). (3) 70-cm and 2-m J-Pole Satellite Antenna. (4) EIA Pin Connector Assignments. (5) Mobile RDF Setup. (6) Updated Frequency Counter. (7) 2-Mbit/s Microwave Data Link.



KantronicsDataEngine

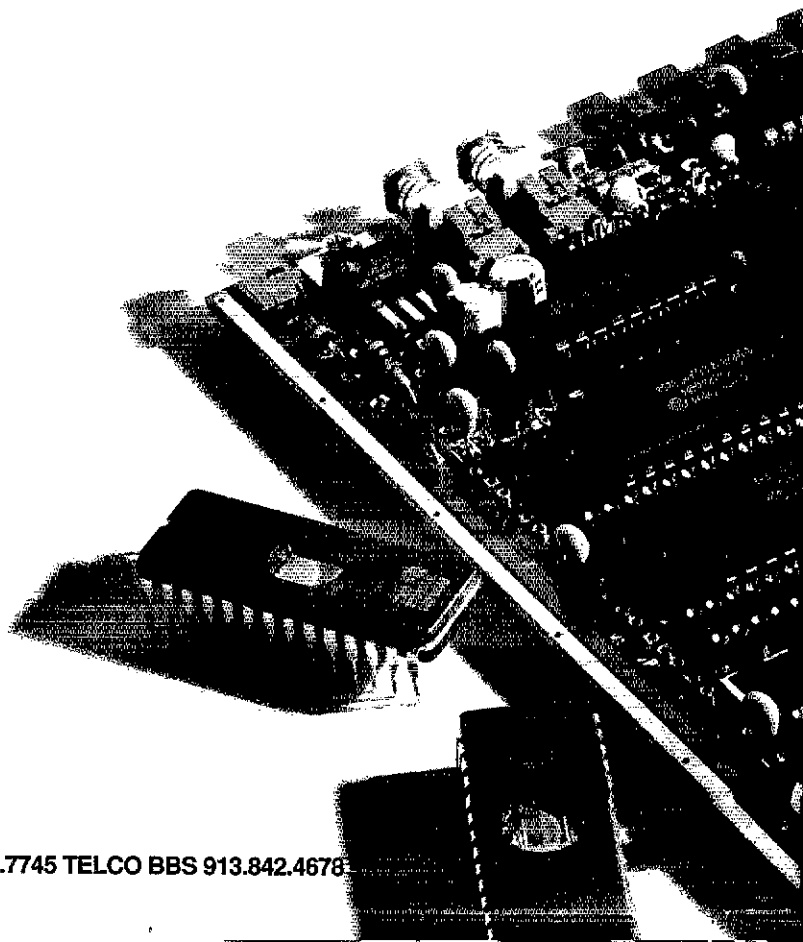
TNC development platform

Designed with the requirements of today's rapidly changing communications environment in mind, the Kantronics DataEngine represents the state of the art in speed, adaptability, and programmability.

The DataEngine was designed with an open architecture. This dual port, full duplex TNC, offers high speed capability and accommodates up to two modems (1200/9600). Features including a16-bit V40 PC compatible microprocessor , 85C30 communications controller, and sockets for .5 Mb EPROM and .5 MB RAM, make the DataEngine "developer ready".

The DataEngine was designed to be fully compatible with existing communication networks as well as advanced enough for those yet to be designed. Each unit is shipped with end-user firmware including terminal, BBS and KISS modes. G8BPQ networking code is available from the factory TELCO BBS. ROSE X.25 and TCP/IP are currently under development.

The Kantronics DataEngine, the platform to develop the next generation of advanced TNC applications.



Kantronics 1202 E. 23rd St., Lawrence, KS 66046, 913.842.7745 TELCO BBS 913.842.4678

PASS THAT EXAM . . .

with ARRL training material

There's no time like the present to begin studying for your next Amateur Radio exam. ARRL publications are written to make passing the exams as easy as possible, while learning the basic material for each exam.

Every ham needs a copy of the **FCC Rule Book.** It has all of the new regulations with easy-to-understand interpretations. It also presents what you need to know as far as the regulatory material that appears on the exams.

If you are not licensed, our popular beginner's package, **Tune in the World with Ham Radio** is just the ticket for the prospective Novice. The 257-page text covers the basic regulations and theory you need for the written exam. At the beginning of each chapter is a list of key words, and these words are highlighted the first time they appear in the text. The book contains the question pool currently being used on the exams as well as several chapters on how to get on the air once your license arrives. The kit also has two 90-minute cassettes. One teaches the code with voice explanations, and a second provides practice in the format used on the exam. If you have an IMB PC or compatible, **Morse Tutor** software will automatically generate individual letter practice and text at the speed you set—for those just learning the code or for those wanting high speed practice. The advanced version will send practice from text files entered on your computer. The **Morse University** package includes both a code learning cartridge for the Commodore C-64 and the **Tune in the World with Ham Radio Book.**

The *ARRL License Manual Series* consists of the **Technician, General, Advanced** *and* **Extra Class License Manuals** which are based on the current question pools used in the exams. They also have the key words presented at the beginning of each chapter, with the word highlighted the first time it is used. You will also find the complete question pool used on each exam with answers.

Besides the computer programs mentioned above, we have four sets of tapes that give practice from 5 to 22 Words Per Minute. On sets 1, 2, and 3 (at speeds up to 18 WPM) the individual characters are recorded at a rate of 18 WPM, but the spacing between the letters is increased to slow the overall average code speed. This makes it easier to learn the code at higher speeds. At speeds greater than 18 WPM and in set 4, standard code timing is used.

Teaching a Novice, Technician, or General class licensing course? **The ARRL Instructor's Manual** tells how to go about teaching such a course. The **Novice, Technician,** and **General Class Instructor's Guides** are tailored to the specific needs for each class of license.

FCC Rule Book New Rules 8th Ed.	**#2456**	**$9**
Tune in the World with Ham Radio Kit with book and cassettes	**#2472**	**$19**
Book only	**#2464**	**$14**
Morse Tutor software for the IBM PC 5¼ inch diskette	**#2081**	**$20**
3½ inch diskette	**#2936**	**$22**
Advanced Morse Tutor 5¼ inch diskette	**#3231**	**$30**
3½ inch diskette	**#3258**	**$30**
with Ham Radio book only	**#2499**	**$30**
Morse University	**#2480**	**$40**
Morse Code, the Essential Language History and tips on learning the code	**#0356**	**$ 5**
Code Practice Cassettes Each set of two C-90 tapes gives 3 hours of instruction		
Set 1: 5 to 10 WPM	**#2227**	**$10**
Set 2: 10 to 15 WPM	**#2235**	**$10**
Set 3: 15 to 22 WPM	**#2243**	**$10**
Set 4: 13 to 14 WPM	**#2251**	**$10**
License Manual (LM) Series		
Technician Class LM	**#2375**	**$ 6**
General Class LM	**#2383**	**$ 6**
Advanced Class LM	**#2928**	**$ 6**
Extra Class LM	**#2391**	**$ 8**
Instructor's Manual	**#2448**	**$ 6**
Instructor's Guide of Novice	**#0305**	**$ 5**
Instructor's Guide for Technician	**#0801**	**$ 5**
Instructor's Guide for General	**#2669**	**$ 5**

Dates and prices subject to change without notice. Amount of order/shipping and handling less than $20/$2.50, 20.01 to 30/3.50, 30.01 to 40/4.50, 40.01-50/5.50, 50.01-75/6.50 Over 75/7.50 Add $1 additional for UPS.

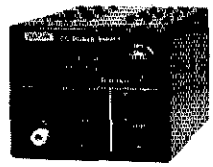
ARRL, 225 MAIN STREET, NEWINGTON, CT 06111

DAIWA

DEALER LIST

Ack Radio Supply	Atlanta	GA	404-351-6340
Ack Radio Supply	Birmingham	AL	205-322-0588
Allied Appliance & Radio	Englewood	CO	303-761-7305
Amateur & Advanced Comm.	Wilmington	DE	302-478-2757
American Electronics	Greenwood	IN	317-888-7265
A-Tech Electronics	Burbank	CA	818-845-9203
Barry Electronics	New York	NY	212-925-7000
B.C. Communications Inc.	Huntington Sta.	NY	516-549-8833
Burghardt Amateur Center	Watertown	SD	605-886-7314
C-Comm Inc.	Seattle	WA	800-426-6528
CW Electronics	Denver	CO	303-832-1111
Delaware Amateur Supply	New Castle	DE	800-441-7008
Denny's Technical Service	Lemars	IA	712-546-6625
D J Systems	Riveira Beach	FL	407-845-7021
Electronic Equip. Bank	Vienna	VA	800-368-3270
Eli's Amateur Radio	Ft. Lauderdale	FL	305-525-0103
Ham Radio Outlet	Woodbridge	VA	800-444-4799
Ham Radio Outlet	Salem	NH	800-444-0047
Ham Radio Outlet	Atlanta	GA	800-444-7927
Ham Radio Outlet	Phoenix	AZ	800-854-6046
Ham Radio Outlet	San Diego	CA	619-560-4900
Ham Radio Outlet	Anaheim	CA	800-854-6046
Ham Radio Outlet	Van Nuys	CA	818-988-2212
Ham Radio Outlet	Burlingame	CA	415-342-5757
Ham Radio Outlet	Oakland	CA	415-534-5757
Hamtronics Electronics	Trevose	PA	800-426-2820
H.C. Van Valzah Co.	Downers Grove	IL	312-852-0472
Henry Radio	Los Angeles	CA	800-877-7979
HR Electronics	Muskegon	MI	616-722-2246
Jun's Electronics	Culver City	CA	213-390-8003
Kalmus Engineering	Woodinville	WA	206-485-9000
K-40 Electronics	Warren	MI	313-939-3700
K Comm	San Antonio	TX	800-344-3144
Lentini Communication	Newington	CT	203-667-3561
Lett Electronics	Topeka	KS	800-835-0250
Madison Electronics	Houston	TX	713-520-7300
Michigan Radio	E. Detroit	MI	313-771-4711
Mike's Electronics	Ft. Lauderdale	FL	305-491-7110
Milbert Co.	So. St. Paul	MN	612-451-2241
N & G Distributing	Miami	FL	305-592-9685
North Olmstead Amat. Radio	N. Olmstead	OH	216-777-9460
Omar Electronics	Loganville	GA	404-446-3241
Omni Intl. Trading	Seattle	WA	206-628-2923
Portland Radio Supply	Portland	OR	503-233-4904
Quad Electronics	Pensacola	FL	904-438-3319
Radio Place	Sacramento	CA	916-441-7388
RF Enterprises	Merrifield	MN	800-233-2482
Rivendell Electronics	Derry	NH	603-434-5371
Ross Distributing	Preston	ID	208-852-0830
R & L Electronics	Hamilton	OH	513-868-6399
Soundnorth	So. Int. Falls	MN	218-283-9290
Super Sound	San Fernando	CA	818-361-1339
Tel-Comm, Inc.	Littleton	MA	617-486-3400
Texas Towers	Plano	TX	214-422-7306
The Ham Station	Evansville	IN	800-729-4373
Universal Amateur Radio	Reynoldsburg	OH	614-866-4267
Western Radio	San Diego	CA	619-268-4400
Westside Comm. Supply	St. Petersburg	FL	813-345-0739

POWER SUPPLIES



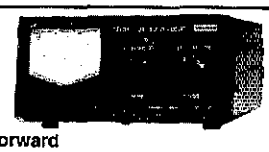
MODEL PS140II

MODEL:		
PS304	24A	18 lbs.
PS120M	9A	11 lbs.

Daiwa power supplies consist of quality IC's, transistors and diodes. Each model contains a over-current limiting protection circuit. This protects the power supply circuitry when shorting positive and negative line or when over current flows through the power supply circuitry.

Input Voltage	117 VAC ± 10%
Output Voltage	13.5 V
Output Current	12A
Volt Fluctuation	Less Than 1%
Ripple Voltage	Less Than 3 mv
Protection Circuit	When 14-2A
Pwr Consumption	350W Max.
Dimensions	128 × 104 × 225 mm
Weight	11 lbs.

Cross Needle SWR/Power Meters for All Bands

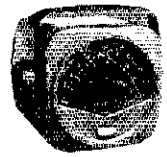


NS-660PA

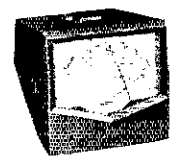
Model	Freq. Range Int. Sensor	Forward Power	Connectors
NS-660A/PA	1.8-150 MHz	30/300 W/3 kW	SO-239
NS-663BM/BN*	140-525 MHz	30/300 W	SO-239/N type
DP-810	1.8-150 MHz	0-1.5 kW	SO-239
DP-820/N	140-525 MHz	0-150 W	SO-239/N type
DP-830	1.8-525 MHz	0-1.5 kW/0-15 W	SO239/N type
CN-101	1.8-150 MHz	15/150 W/1.5 kW	SO-239
CN-103	140-525 MHz	20/200 W	SO-239/N

All models back lit *Average Power Reading Only

MOBILE/BASE CROSS NEEDLE SWR/POWER METERS



CN-460M



CN-520

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-410M*	3.5-150 MHz	15/150 W	SO-239
CN-460M*	140-450 MHz	15/150 W	SO-239
CN-465M*	140-450 MHz	15/75 W	SO-239
CN-520**	1.8-60 MHz	200 W/2 Kw	SO-239

*Back lit with mobile bracket **Optional mobile bracket available

LINEAR AMPLIFIERS

80W

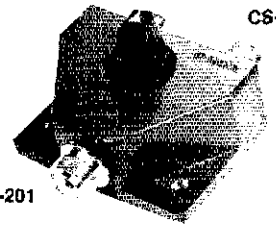
This Model is Available with Commercial Frequency Band— Special Order

LA2080H

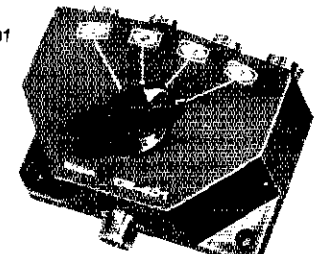
Model	LA2080H	LA2065R	LA2155H	LA2035R
Freq	144-148 MHz	144-148 MHz	144-148 MHz	144-148 MHz
Preamp Gain	15 dB	15 dB	15 dB	15 dB
Input Pwr	1-5W	1-14W	Low - 1.5W High - 25W	1-5W
Output Pwr	1.5Win-30 out 5Win-80out	10W-60out	1.5Win-150out 25Win-150out	1.5 in-30out
Power Consump	13.8VDC/ 12A Max	13.8VDC/ 8A Max	13.8VDC/ 27A Max	13.8VDC/ 5A Max
Dimension	122-45-175mm	122-45-175mm	170-79-250mm	100-36-140mm
Accessory	W/RX	W/RX	W/RX	W/RX

Coaxial Switches

PAT. No. 59-0003803



CS-201



CS-401

	CS-201 2 Position	CS-201G II 2 Position	CS-401 4 Position	CS-401G 4 Position
Frequency:	500 MHz	1.3 GHz	800 MHz	800 MHz
Connectors:	SO-239	N type	SO-239	N type
Isolation:	+60 dB	+60 dB	+50 dB	+50 dB
Power Rating:	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW

Insertion Loss: All models less than 0.2 dB

EDCO

Happy Holidays

ELECTRONIC DISTRIBUTORS CORPORATION

325 Mill Street • Vienna • VA 22180 • (703) 938-8105 • FAX 703-938-6911

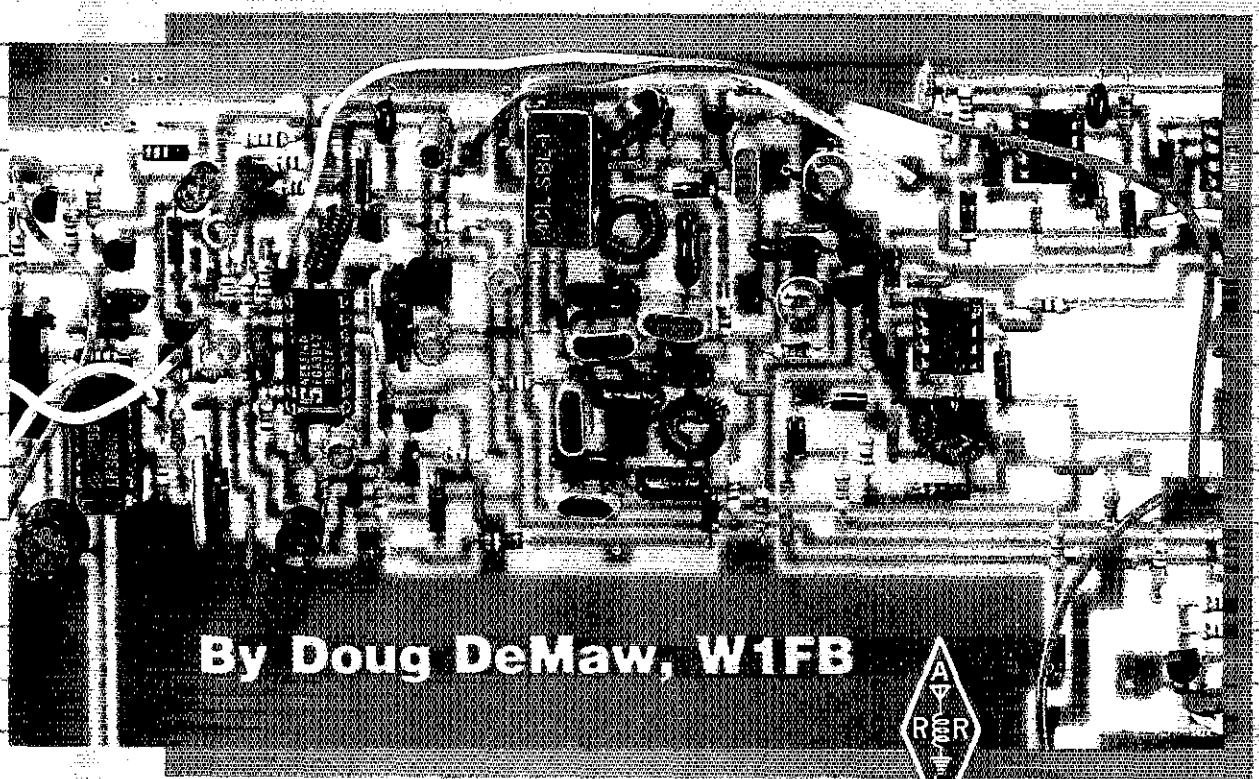
W1FB's Design Notebook

Practical Circuits for Experimenters

This is just the book for the avid builder of Amateur Radio equipment! This plain-language book is filled with simple practical projects that can be built using readily-available components and common hand tools. There are explanations of how the various circuits work, but without heavy mathematical analysis. Covered in six chapters are: Diodes, ICs and Transistors; Transistor Applications; Diode and IC Applications; Construction Practices; Practical Receivers and Techniques and Transmitter Design and Practice. Here's just one of the fun projects: You begin by building a simple 150-mW CW transmitter for 40 meters, then add a driver/amplifier, and tack on a 5-watt power amplifier.

The fourth volume in the Doug DeMaw notebook series, **The Design Notebook** is related to the **QRP Notebook,** but has even more equipment designs. Sound interesting? We think this book will be as big a hit among builders and experimenters as W1FB's previous works. There are 194 pages of text. The cover price is $10, order number 3207. Available from your dealer or order directly from ARRL. Add $2.50 ($3.50 for UPS) postage and handling.

The American Radio Relay League, Inc,
225 Main Street, Newington, CT 06111



By Doug DeMaw, W1FB

Fortunately for you, we've spared no expense to bring you the ultimate gift consultant.

Unfortunately, he's preoccupied at the moment.

Since you're on your own, turn the page for great gift ideas.

MORE SUPPLIES . . .

Cloth Patches
4" *ARRL Diamond* ..... **#2170 $ 2.00**
Life Membership goes with 4" ARRL Diamond ..... **#1170 $ 1.25**
Membership Pin ..... **#1180 $ 3.00**
Replacement Pin for Life Membership ..... **#1190 $ 3.00**
Life Membership Plaque ..... **#1240 $25.00**
ARRL License Plate ..... **#1095 $ 5.00**
Spark To Space
*HAT ..... **#1092 $ 7.00**
PATCH ..... **#1091 $ 3.00**
Bumper Sticker ..... **#1093 $ 2.00**
Member Stationery
50 pieces of stationery and envs. ..... **#1460 $ 8.00**
50 pieces of stationery ..... **#1465 $ 4.00**
50 envelopes ..... **#1470 $ 5.00**
Log Books
8½ x 11 Spiral ..... **#1250 $3.50**
3-hole Loose Leaf, 96 8½" x 11 sheets ..... **#1265 $ 4.00**
Maps and Atlases
U.S. Call Area ..... **#1270 $ 3.00**
*World Map — full color great circle map centered on the United States ..... **#1280 $10.00**
Grid Locator (US and Canadian Grid Squares) ..... **#1290 $ 1.00**
ARRL World Grid Locator Atlas ..... **#2944 $ 5.00**
Polar Map (for OSCAR) ..... **#1300 $ 1.00**
OSCARLOCATOR ..... **#3037 $ 8.50**

For Traffic Handlers:
Message Delivery Cards per package of 20 ..... **#1310 $ 1.00**
Message Pad with 70 sheets ..... **#1320 $ 2.00**
Message Pad with 70 sheets per package of 3 ..... **#1330 $ 5.00**

Antenna and Transmission Line Design Aids
Standard Smith Charts per package of 5 sheets ..... **#1340 $ 2.00**
Expanded Smith Charts per package of 5 sheets ..... **#1350 $ 2.00**
Smith Charts — 50 OHM Center per package of 5 sheets ..... **#1341 $ 2.00**
Antenna Pattern Worksheets 100 8½ x 11 sheets ..... **#1360 $ 3.00**

***QST Binders**
6½ x 9½ for *QST* 1975 and prior ..... **#1370 $11.00**
8½ x 11 for *QST* 1976 and after ..... **#1380 $12.00**

Video Tapes
SAREX W0ORE/Challenge VHS ..... **#1420 $25.00**
SAREX W0ORE/Challenge U-Matic ..... **#1430 $35.00**
Amateur Radio's Newest Frontier VHS ..... **#1440 $25.00**
Amateur Radio's Newest Frontier U-Matic ..... **#1450 $35.00**
New World of Amateur Radio VHS ..... **#WAR1 $20.00**
New World of Amateur Radio U-Matic ..... **#WAR2 $36.00**

USE THIS FORM OR PHOTOCOPY

ORDER FORM: Please allow 1 week for us to receive your order, 1 week for processing and 1 to 3 weeks shipping time in the US after your order leaves ARRL. In the US, add the following amounts to your order to cover shipping and handling. Add an additional $1.50 to the mail rate for shipment via surface mail outside the US, call or write for airmail rates. Include street address for UPS.

Amount of Order	Mail	UPS	Amount of Order	Mail	UPS
Less than $20.00	$2.50	$3.50	$40.01 — $50.00	$5.50	$6.50
$20.01 — $30.00	3.50	4.50	50.01 — $75.00	6.50	7.50
30.01 — 40.00	4.50	5.50	Over $75.00	7.50	8.50

Product #	Quantity	Title	
		Subtotal for books and non-exempt supplies	
		Enter shipping and handling based on above subtotal	
		Enter items exempt from shipping charges below	
		Donation to the Legal Defense Fund ($1 min.)	
☐ YES! Sign me up for membership at the rates shown at right			
Payment must be made in U.S. Funds drawn on a U.S. bank		TOTAL	

$7.50 minimum on all credit card orders

Charge to ☐ VISA ☐ MasterCard ☐ AMEX ☐ Discover

Name _____

Call _____

Street _____

City _____

_____

Card Number _____

Card good from _____

Card good to _____
Expiration Date

Signature _____

ARRL 225 MAIN STREET NEWINGTON, CT 06111 U.S.A.
(203) 666-1541

INVITATION TO MEMBERSHIP

JOIN TODAY! Take advantage of thes membership benefits: **QST** The interesting lively way to keep on top of everything tha is happening in Amateur Radio: Coverag of regulatory developments; Washingto news: operating — DX, VHF-UHF, an repeaters, OSCAR, SSTV, RTTY; Novic Notes; lists of hamfests where you ca meet local hams, hear interesting talks, an possibly find a bargain at a fleamarket; an you will find technical articles aimed spec fically at the beginner's level. **W1AW** is th voice of ARRL. This station transmits dail code practice sessions and regular bulle tins. **LOW COST INSURANCE** for you ham gear. **OTHER SERVICES:** Outgoin QSL, Operating Awards, Amateur Radi Emergency Service, Field Organizatio and much, much more! The League is **democratic organization,** of, by and for it members. The members determine pol *cies of the League through the Board o* Directors which is elected directly by th membership. The League is YOU! Fift percent of dues is allocated to QST, an *the balance for membership.*

DUES

	U.S.	Elsewhere
1 Year	$30	$42
2 Years	57	81
3 Years	80	116

Amateurs who are age 65 or over with proof of age:

1 Year	$24	$36
2 Years	45	69
3 Years	65	101

Life Membership: Please write for formal application.

ARE YOU AGE 17 OR YOUNGER?
ARE YOU THE OLDEST US LICENSE AMATEUR IN YOUR HOUSEHOLD?

If you answered "YES" to both question then these special rates apply: Age 13-1 $15.00. Age 12 and younger $7.50. Ev dence of your date of birth is required. At ach a copy of your birth certificate or hav your parent or guardian certify your date o birth. A list of all other amateurs in you household is required. Family membe ships, club commissions and rebates an multiple year rates do not apply.

FAMILY MEMBERSHIP An immediate relative of a full du paying member living at the same address, may become family member without **QST** for $4 per year.

ARRL BOOKSHELF

All prices are subject to change without notice. All publications (unless otherwise specified) are subject to shipping and handling charges.

1991 HANDBOOK

This is the most comprehensive edition since the *Handbook* was first published in 1926. It is updated yearly to present the cutting edge of rf communication techniques while presenting hundreds of projects the average Amateur Radio operator can build. The 68th edition is packed with information on digital communication modes as well as power supplies and amplifiers. Ready-to-use etching patterns are provided for many projects. This *Handbook* belongs in every ham shack. 1232 pages.
Hardcover only ..... **#1689 $25**

ANTENNA BOOKS

THE ARRL ANTENNA BOOK represents the best and most highly regarded information on antenna fundamentals, transmission lines, design and construction of wire antennas as well as yagie and quads for HF. You'll find chapters on VHF/UHF antennas, test equipment and propagation. The new 15th edition has over 700 pages of practical antenna information.
©**1988,** Softcover ..... **#2065 $18**

Novice Antenna Notebook is written for the beginner or experienced amateur who wants practical information on basic antenna designs and construction.
©**1988,** Softcover ..... **#3088 $10**

Antenna Impedance Matching a comprehensive book on the use of Smith Charts in solving impedance matching problems .. **#2200 $15**

W1FB's Antenna Notebook Practical wire and vertical antenna designs ..... **#2618 $10**

Transmission Line Transformers a source of practical design data covering the use of these devices for both commercial and amateur applicatons ..... **#2960 $20**

ANTENNA COMPENDIUM
..... © **1985 #0194 $10 US**

ANTENNA COMPENDIUM Vol. 2 packed with new material on quads, yagis and other interesting topics ..... **#2545 $12**

ANTENNA COMPENDIUM
Vol. 2 Diskette ..... **#2626 $10**
(Book and diskette together) ..... **#2863 $18**

HF ANTENNAS FOR ALL LOCATIONS
©**1982 264 pages** ..... **#R576 $15**

YAGI ANTENNA DESIGN
©**1986** ..... **#0410 $15**

RSGB Wire Antennas ..... **#R878 $14**

Reflections—Transmission Lines & Antennas ..... **#2995 $20**

Reflections—Software for IBM® PC 5¼" ..... **#3118 $10**

LICENSE MANUALS

Beginning with **Tune in the World with Ham Radio** for the Novice and progressing through the critically acclaimed **ARRL License Manual Series** for the Technician through Extra Class; you will find passing each exam element a snap! There are accurate text explanations of the material covered along with FCC question pools and answer keys. The latest edition of **The FCC Rule Book** is invaluable as a study guide for the regulatory material found on the exams and as a handy reference. *Every* amateur needs an up-to-date copy. **Morse Code the Essential Language** has tips on learning the code, high speed operation and history. If you have a Commodore 64™ or C 128 computer, **Morse University** provides hours of fun and competition in improving your code proficiency. **First Steps in Radio** from **QST** presents electronic principles for the beginner.

Morse Code: The Essential Language
©**1986** ..... **#0356 $ 5**
Morse University ..... **#0259 $40**

First Steps in Radio ..... **#2286 $ 5**
W1FB's Help for New Hams ..... **#2871 $10**
Tune in the World with Ham Radio
Kit with Book and Cassettes ..... **#2472 $19**
Book only ..... **#2464 $14**
Technician Class License Manual ..... **#2375 $ 6**
General Class License Manual ..... **#2383 $ 6**
Advanced Class License Manual ..... **#3274 $ 6**
Extra Class License Manual ..... **#3282 $ 8**
FCC Rule Book New Rules! ..... **#2456 $ 9**

GGTE Morse Tutor Software Learn the code, and keep code skills sharp with this software for the IBM® PC ..... #2081 $20
Morse Tutor For IBM® PC 3½" ... **#2936 $22**
Morse Tutor Software 5¼" with Tune in the World with Ham Radio (book only) ..... **#2499 $30**
Advanced Morse Tutor For IBM® PC 5¼" ..... **#3231 $30**
Advanced Morse Tutor For IBM® PC 3½" ..... **#3258 $30**
Code Practice Cassettes Each set of two C-90 tapes gives 3 hours of instruction
Set 1: 5 to 10 WPM ..... **#2227 $10**
Set 2: 10 to 15 WPM ..... **#2235 $10**
Set 3: 15 to 22 WPM ..... **#2243 $10**
Set 4: 13 to 14 WPM ..... **#2251 $10**

OPERATING/SWL

The ARRL Operating Manual 688 pages packed with information on how to make the best use of your station, including: interfacing home computers, OSCAR, VHF-UHF, contesting, DX traffic/emergency matters and shortwave listening.
©**1987 3rd ed. #1086 $15**

The ARRL Repeater Directory, 1990-91
#2987 ..... **$ 6**
The ARRL Net Directory-free shipping ... **#0275 $ 1**
Ferrell's Confidential Frequency List ... **#2206 $20**

HOLA CQ Learn to communicate with Spanish-speaking radio amateurs. 90 min. cassette and 15 page text. **#901N** **$7**
World Radio TV Handbook ..... **#2979 $20**
RSGB Awards Booklet ..... **#R819 $15**
The RSGB Operating Manual ..... **#R69X $14**
Operating an Amateur Radio Station
48 pages, free shipping ..... **#226X $ 1**
Passport To World Band Radio Information and listings of shortwave broadcast stations with frequency, times, and languages. 1991 ed. **#3337 $17**

PACKET RADIO/COMPUTERS

7th Computer Networking Papers
© **1988** ..... **#2138 $12**
8th Computer Networking Papers
©**1989** ..... **#2510 $12**
"From Beverages Thru OSCAR"
5¼" IBM® PC Plus Manual ..... **#3355 $79**
3½" IBM® PC Plus Manual ..... **#3363 $79**
Product Reviews ..... **#3347 $12**

9th Computer Networking Papers
© **1990** ..... **#3371 $12**

AX.25 Link Layer Protocol ..... **#0119 $8**
Gateway to Packet Radio How to get started, equipment you need and more ..... **#2030 $12**

DX/CALLBOOKS

The Complete DX'er by W9KNI ..... **#2083 $12**
DX Power by K5RSG ..... **#T740 $10**
DXCC Countries List — free shipping ... **#0291 $ 1**
Low Band Dxing ©1987 ..... **#047X $10**
North American Callbook ..... **#C090 $28**
International Callbook ..... **#C190 $30**
N6RJ 2nd Op. ..... **#243X $ 9**
N6RJ Electronic 2nd Op. ..... **#2421 $60**

QRP

QRP Notebook by Doug DeMaw, W1FB. An exciting book for the low power enthusiast ..... **#3061 $ 6**
QRP Classics ..... **#3169 $12**

VHF-UHF, MICROWAVE, SPACE

RSGB VHF/UHF Manual ..... **#R630 $30**
RSGB Microwave Handbook Vol. 1 .... **#2901 $35**
Microwave Update 1988 Conf. ..... **#2111 $12**
Microwave Update 1989 Conf. ..... **#2529 $12**
Mid-Atlantic VHF Conference ..... **#MID1 $12**
The Satellite Experimenter's Handbook by Martin Davidoff, K2UBC, 208 pages ..... **#0046 $10**
Weather Satellite Handbook ..... **#3193 $20**
Weather Satellite Handbook Software For IBM® PC ..... **#3290 #10**
AMSAT NA 5th Space Symposium .... **#0739 $12**
AMSAT NA 6th Space Symposium .... **#2219 $12**
UHF/Microwave Experimenter's Manual ..... **#3125 $20**
UHF/Microwave Experimenter's Software For IBM® PC ..... **#3134 $10**
Satellite Anthology ..... **#2103 $ 8**
Space Almanac ..... **#2898 $20**
23rd Central States VHF Conf. ..... **#2413 $12**
24th Central States VHF Conf. ..... **#3265 $12**

INTERFERENCE/DFing

Radio Frequency Interference ..... **#0429 $ 5**
Interference Handbook (Radio Pubs) .. **#6015 $12**
Transmitter Hunting (Tab) ..... **#2701 $19**

OTHER PUBLICATIONS

ARRL Data Book, 2nd Ed ..... **#2197 $12**
Hints and Kinks, 12th Ed. ..... **#3002 $ 8**
Novice Notes: The Book ..... **#2561 $ 6**
Fifty Years of ARRL ..... **#0135 $ 4**
GIL: Collection of cartoons from QST .. **#0364 $ 5**
ARRL 75Th Anniversary "From Spark to Space" ..... **#2596 $20**
200 Meters and Down ..... **#0011 $ 8**
Solid State Design for the Radio Amateur **#0402** **$12**
RSGB Radio Communications Hndbk. .. **#R564 $35**
RSGB Data Book ..... **#R673 $18**

FOR INSTRUCTORS

Written for those teaching classes using *ARRL License Manuals or Tune In The World*
General Class Instructor's Guide ..... **#2689 $ 5**
Technician Instructor's Guide ..... **#0313 $ 5**
Novice Instructor's Guide ..... **#0305 $ 5**
ARRL Instructor's Manual ..... **#2448 $ 6**
Proceedings of the ARRL National Educational Workshop 1989 ..... **#2405 $12**
Proceedings of the ARRL National Educational Workshop 1990 ..... **#3223 $12**

ADVENTURE

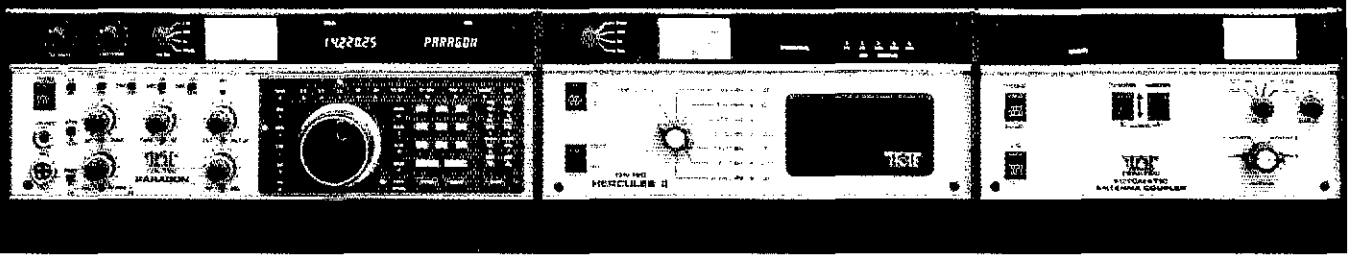
Murder by QRM..(Tompkins) ..... **#5064 $ 5**
Grand Canyon QSO (Tompkins) .... **#5048 $ 5**
SOS at Midnight..(Tompkins) ..... **#5005 $ 5**
CQ Ghost Ship...(Tompkins) ..... **#5013 $ 5**
DX Brings Danger(Tompkins) ..... **#5021 $ 5**
Death Valley QTH (Tompkins) ..... **#503X $ 5**
Set of 6 Tompkins books ..... **#1490 $25**
Night Signals (Wall) ..... **#2588 $ 5**

MEMBERSHIP SUPPLIES

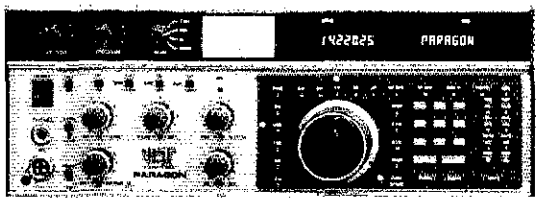
Shipping and handling charges apply to any supply item marked with an asterisk.
The ARRL Flag
Cloth Patch ..... **#1090 $ 5.00**
Pin ..... **#1070 $ 5.00**
Amateur Radio Emergency Service
Black and Gold Sticker 2/pkg. .... **#1100 $ 0.50**
Red White and Blue Sticker per package of 2 ..... **#1105 $ 0.50**
Black and Gold Decal ..... **#1110 $ 1.00**
Red White and Blue Decal ..... **#1115 $ 1.00**
Black and Gold Patch ..... **#1120 $ 3.00**
Red White and Blue Patch ..... **#1125 $ 3.00**
Member 5" Diamond Decal ..... **#1130 $ 1.00**
Life Member Decal 5/pkg. ..... **#1135 $ 1.00**

CONTINUED . . .

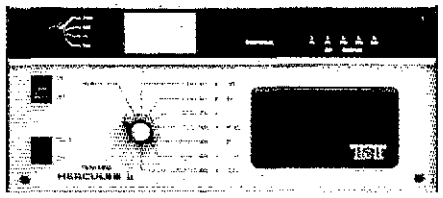
"ONE FOR THE MONEY...



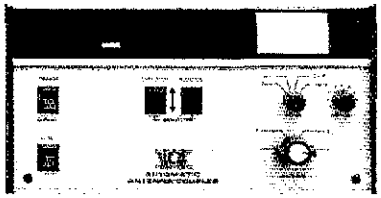
High tech simplicity. Isn't that refreshing!



The Paragon, Model 585



The Hercules II, Model 420



Model 253, Automatic Antenna Coupler

A 500 WATT OUTPUT STATION. Here is a full capability station that uses modern technology to simplify operation. The Hercules II amplifier and the new Model 253 automatic, 2 KW, "match anything" antenna coupler are both controlled by the Paragon (or Omni V) transceiver. All bands, 160 through 10 meters, all modes. A 500 watt output "transceiver" that works great with, or without, a world class antenna system. The really good news is that you can own this complete station for a price less than some competitive transceivers alone! Now, who offers the best value!

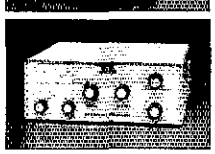
THE PARAGON is the choice of many of the most experienced operators on Earth. The fussiest phone folks, cw operators that are out-and-out snobs and many of the digital stations that lead the rtty DXCC list. General coverage receive from 100 kHz to 30 MHz. 100 watts of transmitter power from 1.7 to 29.999 MHz. All of the nifty features expected in a computer based design. Dual VFOs. TX and RX offset with display. 62 programmable memories that include frequency, mode and filter plus a 7 character alpha-numeric displayed tag feature. QSK cw with a changeover time of 30 ms. All digital modes with real FSK. Outstanding ssb with a standard speech processor that is a pleasure to hear. I-F filter selection, independent of mode. In short, a truly outstanding do-everything rig.

THE HERCULES II is a really classy solid state, all mode broadband amplifier that does not require any tuning. Remote band switching can be controlled by our Paragon or Omni V. Temperature controlled cooling system is whisper quiet on ssb, yet has adequate capacity to cool the internal heat sinks under key down conditions. Runs on 12-14 vdc for battery operation, mobile or base. (A heavy duty auto battery with a 10 amp charger makes a good, and inexpensive, base power supply.) Not shown is the Model 9420, 100 amp dc power supply that powers the Hercules II and the transceiver. A remote control system is available for mobile Hercules II installations. The Hercules II is fully metered and includes a 10 element LED peak power bar-graph display. Compact, good looking and a signal within one S-unit of the mighty TITAN!

THE MODEL 253, 2 KW AUTOMATIC ANTENNA COUPLER is the latest in our highly regarded line-up of tuners. Functions as an antenna management system with the front panel, four position, antenna switch. Positions 1 thru 3 are dedicated to coax fed antennas. Position 4 may be used for coax, single wire or balanced feeders through the built-in high power balun. Tuning is accomplished with a motor driven, roller inductor and fixed value capacitors selected with enclosed relays. The system is microprocessor controlled with one memory per antenna select position. Nine memories per antenna position are available when used with the Paragon or Omni V where band information is provided. The finishing touch for any station.

UNIVERSAL STATION ACCESSORIES

MODEL 240KW, DRY DUMMY LOAD. Forced air cooled. Designed to operate at 1500 watts "key down" for up to 2 minutes. 1.5 to 150 MHz. Alarm sounds if over-temperature reached. Rear panel connection for scope signal.



MODEL 254 200 WATT TUNER. "T" match design matches a broad range of impedances. Simple and fast to operate. Metered for power out and SWR. Small size and light weight makes this a favorite for mobile and portable operation.

MODEL 238, 2 KW ANTENNA TUNER. Time proven "L" network design will load virtually any antenna from 1.6 through 30 MHz. Metered for power and SWR. High power roller inductor with slide rule position indicator. High voltage variable capacitors are the same style as used in the Titan amplifier.

MODEL 5060 TV/FM HIGH PASS FILTER. Forty dB attenuation below 30 MHz. Insertion loss 2 dB or less. Extruded aluminum housing with a type F female input connector. Output is 4" of RG-59 cable with a type F male connector.

MODEL 5061, 2 KW TRANSMITTER LOW PASS FILTER. Ninth order Chebyshev circuit with less than .2 dB loss. 50 dB attenuation at 50 MHz with 70 dB ultimate attenuation. Unlimited operation at 1500 watts at 2:1 SWR. Rugged extruded aluminum housing with SO239 connectors.

MODEL 605 SINGLE PADDLE ELECTRONIC KEYER. Operation is just like a "bug" except the dashes are also keyed automatically. Adjustable paddle tension, speed and weighting. Also great for mobile use.

MODEL 604 ELECTRONIC IAMBIC KEYER. Unique torque driven paddles and adjustable magnetic tensioning system for the ultimate "touch" control. Front panel adjustment of speed and weighting. A cw operator's delight.

...TWO FOR THE SHOW"

THE OMNI V is unique in all the world. All of the great attributes of digital technology are combined with the demonstrable superiority of a crystal mixed oscillator. Phase noise is simply eliminated as a variable. All ham bands, 160 through 10 meters, in 500 kHz segments with 30 kHz overshoot at the band edges.

Large frequency display that you will appreciate. Selectable narrow filters are available for the 9 MHz I-F as well as the 6.3 MHz I-F. All are front panel selectable, independent of mode. Up to 24 poles of cascaded crystal filtering! Dual VFOs with an offset/split system that allows independent RX tuning throughout the 500 kHz segment. Momentary REVerse button lets you hear/set TX frequency. Fewer controls, fast operation and minimum operator-error opportunities.

QSK cw, real FSK and superb ssb performance. Standard features include speech processor, noise blanker, RS-232 interface, nonvolatile RAM for the 25 channel memory system, memory scratchpad and much more. Status register, clock and calendar are backed with a long life, easily replaced, "drug store" lithium battery. Options for FM and a remote frequency tuning encoder that can be positioned anywhere. The reasoned choice for the operator who places the first priority on optimized performance in the ham bands.

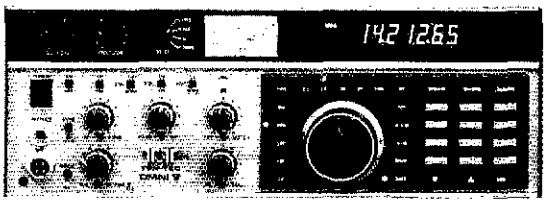
THE TITAN "LEGAL LIMIT" LINEAR AMPLIFIER is a workhorse of proven stamina. The heart of the Titan is a pair of Eimac® 3CX800A7 ceramic triodes. This tube is the popular choice among designers of high realiability commercial and military equipment in this power range. We consider the 3CX800 to be the 3-500Z of the 90s. 1500 watts continuous key-down output with ease. Super clean ssb. Unbelievably fast QSK cw using a Jennings® vacuum relay, rather than diodes. Assured reliability, even if you "pull the trigger" into high SWR. You older, really experienced operators never do that, right . . . .

Another Titan difference is the power supply. The power supply capacity required to maximize the performance of a pair of 3CX800 tubes, in our judgement, dictates a transformer size that will not fit into a RF deck of reasonable proportions. We also like the idea of not compromising the cooling of the tubes by adding the heat from the power supply. The Titan power supply is housed in a separate utility enclosure and remote controlled.

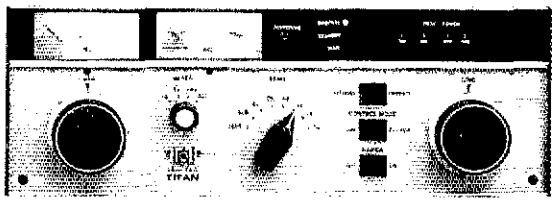
The TITAN has everything but the biggest price, including a limited three year warranty.

THE MODEL 961 POWER SUPPLY is a linear design that will operate at 22 amps and still deliver good clean dc and maintain regulation. A fast action circuit breaker is built-in to protect the transceiver power amplifier. Front panel speaker and styled to match the Paragon and Omni V.

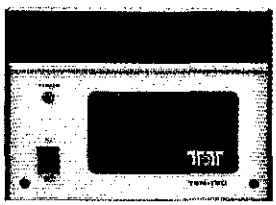
The "FORCE 5" station. Compare in any pileup!



The Omni V, Model 562

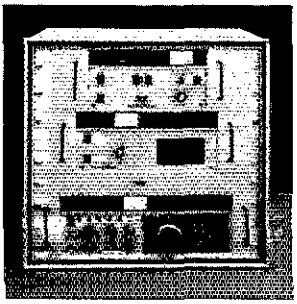


The Titan, Model 425



Model 961, Power Supply

HOW ABOUT OUR "CLOSET KILOWATT" CONCEPT!



The ultimate XYL pleaser. The entire station in a Ten-Tec cabinet measuring less than 19" high x 21" wide x 18" deep. 19" rack mount adaptors, with slide rails, are available for all major Ten-Tec equipment models.

OUR BEST FEATURE

is one you may never use. Our service and product support are legendary. Proven, not just claimed! All of our products are designed for field service to the board level. When you call us with a service need, you typically talk to one of the techs who services the model you own. Many times service can be accomplished with a "painless" mail order board exchange. If factory service is required, the work is thorough, fast and at a fair charge.

Send for our free catalog. Full description and specifications on all Ten-Tec equipment and accessories. Our enclosure catalog also available upon request.

...America's Best!

TEN-TEC

Highway 411 East
Sevierville, TN 37862
Phone 615-453-7172
FAX 615-428-4483

MADE IN USA

Ham-Ads

1) Advertising must pertain to products and services which are related to Amateur Radio.

2) The Ham-Ad rate is $1.00 per word. This includes firms or individuals offering products or services for sale. A special rate of 30 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

4) Closing date for Ham-Ads is the 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received September 14th through October 13th will appear in December *QST*. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you will stand by and support all claims and specifications mentioned in your advertising before your ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason

CLUBS/HAMFESTS/NETS

IMRA—International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1:00-3:00 PM Eastern Time. Rev. Thomas Sable, S.J., University of Scranton, Scranton, PA 18510.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

FCC EXAMS. Novice-Extra Class, Walk-in's only. Sunnyvale VEC ARC, POB 60142, Sunnyvale, CA 94088-0142, 408-255-9000, 24/hr. Gordon, W6NLG, President. Flea Market, March-Sept, Foothill College, Los Altos Hills, CA.

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write MARCO, Box 73's, Acme, PA 15610.

PROFESSIONAL CW operators, retired or active, commerical, military, gov.'t, police, etc. invited to join Society Of Wireless Pioneers - W6WOW, 146 Colleen Street, Livermore, CA 94550.

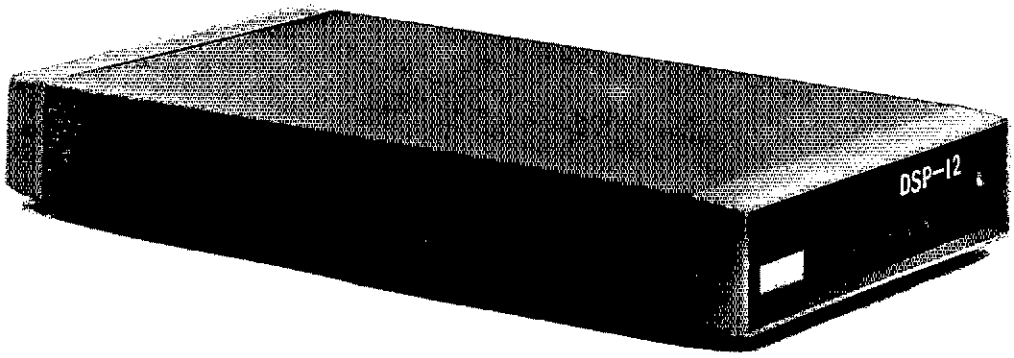
JOIN The Old Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C., 1409 Cooper Drive, Irving, TX 75061.

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed for entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA Inc., 1409 Cooper Drive, Irving, TX 75061.

LITTLE BIG HORN NETS. Sundays: 21.352-2130Z and 14.057-2200Z. WA2DAC/Nm.

SCARA Indoor Flea Market, Sunday Nov. 11, place North Haven Park and Recreation Center, 7 Linsley Street, North Haven, Conn. Sellers 7AM, Buyers 9AM. Tables $15 advance, $20 door. Admission $3. Talk-in 146.01/.61. Reservations no later than Nov. 1. None by phone. Info or reservations SASE: SCARA, Box 81, North Haven, CT 06473. Info call Brad, 7-10PM, 203-265-6478.

VERSATILITY PLUS +



L.L. Grace introduces our latest product, the **DSP-12 Multi-Mode Communications Controller** (shown above). The **DSP-12** is a user programmable, digital signal processing (DSP) based communications controller.

FEATURES

- Multi-tasking operating system built in
- PC-compatible (V40) architecture allows development of custom applications using normal PC development tools and languages
- Motorola DSP56001 DSP processor
- Serial interface speeds from 110 to 19200 bps
- Optional 8-channel A-to-D & DAC for voice and telemetry applications
- 12-bit conversion architecture
- V40 source code available for custom applications to qualified users
- RAM expandable to one megabyte. Useable for mailbox feature, etc.
- EPROM expandable to 384k bytes
- Low power requirements: 10-15vdc, 750ma
- 3 analog radio connectors. RX & TX can be split in any combination. Programmable tuning outputs are available on each connector.
- Over 40 modems available in the basic unit, including Packet, RTTY, ASCII, and PSK modems for high speed packet and satellite work.
- Both V40 and DSP programs can be down-line-loaded from your PC or a bulletin board. You can participate in new development!
- Built in packet mailbox
- V40 and DSP debuggers built in
- Open programming architecture
- Upgradeable to dual-port unit
- Free software upgrades
- Low cost unit
- Room for future growth

APPLICATIONS

- HF Packet
- HF RTTY & ASCII, including inverted mark/space and custom-split applications
- VHF Packet
- 400bps PSK (satellite telemetry)
- 1200bps PSK (satellite & terrestrial packet)
- V26.B 2400bps packet
- K9NG 9600bps direct FSK
- Morse Code
- Host interface supports PAKTERM

CUSTOM APPLICATIONS

- Voice compression
- Telemetry acquisition
- Message Store-and-Forward
- Voice Messages

COMING ATTRACTIONS

(Remember, software upgrades are free!)

- WEFAX and SSTV demodulators
- NAVTEX
- AMTOR and SITOR
- Multi-tone Modems

Commercial inquiries are welcomed. We offer rapid prototyping of custom commercial, civil, and government applications.

DSP-12 Multi-mode Communications Controller	$ 595.00
One Megabyte RAM Expansion Option	149.00
Date/Time Clock Backup Option	29.00
8-Channel A-To-D Telemetry/Experimentation Option	49.00
Wall-Mount Power Supply for DSP-12 (110 vac)	19.00

We accept MasterCard & VISA and can ship C.O.D. within the USA. All orders must be paid in US Dollars. Shipping & Handling: $5 ($20 International).

L. L. Grace Communications Products, Inc.
41 Acadia Drive, Voorhees, NJ 08043, USA
Telephone: (609) 751-1018

L. L. Grace also manufactures the Kansas City Tracker family of satellite antenna aiming systems. Call or write for more information.

BUY, Sell, Collect and Restore early tube equipment? Early receivers, tubes and telegraph gear? Join the Antique Wireless Association which sponsors old-time "meets", flea markets, museum and journal with technical articles and free want ads. Membership and annual dues only $10. Write for information and Museum hours: Bruce Kelley, W2ICE, Route 3, Holcomb, NY 14469.

MICROPHONES and related memorabilia used in radio/TV broadcasting prior to 1960 wanted. Cash paid: trade terms available. Write: James Steele, WKBK, Box 2525, Kingsland, GA 31548-2525, 912-729-6106.

WANTED: WWII Military Radios and Accessories. Need ATD Tuning Units, DY43 Dynamotor, BC 222/223 Manuals, ART-13 Connectors, ARR/41/MT-1518 Mount, ATB, GRC 106 Receiver, Hallicrafters HT20. Charlie, 501 Mystic Valley Pkwy., Medford, MA 02155.

CODE/CIPHER Machines Wanted! Historian buys code/cipher devices, manuals, books, etc! All periods! Melton, Box 5755, Bossier City, LA 71171, 318-798-7319.

WANTED: Pre-1930 QSTs. Richard Titus, NV2C, 231-9 Lucas Lane, Voorhees, NJ 08043, 609-772-0316.

COLLECTOR Looking For Pre-1942 Communications Receivers, Commercial, Amateur, Government. Kit, Homemade, etc. Anything considered. Wayne, NØTE, Rt. 1, Box 114, Burlington, KS 66839, 316-364-5353.

MANUALS for most ham-gear made 1935/1970, plus Kenwood. No quotes. Our current catalog "K", at $1, required to order. Over 2,000 models. HI-Manuals, Box K-802, Council Bluffs, IA 51502.

WANTED By Military Radio Collector: AN/PRC-66(*), AN/PRC-75(*), and AN/PRC-104(*). Complete set, rt, parts, or accessories. Jon Lowell, 3704-47th Avenue NE, Salem, OR 97305, 503-585-1853.

WANTED For Museum, Pre-1980 Microcomputers, and DT100, WYSE Y75 or WY60 Terminal; and Rohn 25 or 45 Tower. David Larsen, KK4WW, Blacksburg Group, 703-763-3311/231-6478.

MUSEUM SEEKING radio/television broadcasting equipment, literature, microphones, transcriptions. Radio, TV's. Van Dyke, Squires Avenue, E. Quogue, NY 11942, 516-728-9835.

WWII SUITCASE RADIOS WANTED! American (SSR-1, etc.), British (A Mark II, III, Mark II, A Mark III, etc.), and German. Bill Mills, 15 Hawthorn Avenue, Needham, MA 02192, 617-449-3536.

ANTIQUE RADIO CLASSIFIED. Free sample copy! Antique radio's largest-circulation monthly magazine. Old radios, TVs, ham equip., 40s & 50s radios, telegraph, books & more. Ads & articles. Free 20-word ad monthly. Subscribe today. Six-month trial: $13. Yearly rates: $24 ($36 by 1st class). Foreign: write. ARC, P.O. Box 802-B6, Carlisle, MA 01741.

E.F. JOHNSON Transmitters, Literature and Accessories wanted for my station. Wanted: Johnson kilowatt and/or Viking 500 for my station. Will pay cash and pickup. All inquiries are cheerfully answered. Phone 518-638-8199 or write Len Crispino, P.O. Box 702, Hudson Falls, NY 12839.

WANTED: Connectors/Plugs For ARC-5/SCR274 Command Set Equipment. Thanks, Ed Hammond, KB1DG, P.O. Box 4784, Manchester, NH 03108.

SELL: *QST* 1954-1970, 1977-1983, $8 per year plus shipping. Aaron Powers, W6NUM, Box 1714, Auburn, WA 98071, 206-735-0968.

TELEGRAPH & WIRELESS Bugs, Keys, Paddles Wanted For Private Collection. Donations appreciated. SX-115A/HT-32B/Linear, Vintage Station Wanted. John Hensley, WJ5J, 5054 Holloway, Baton Rouge, LA 70808, 504-928-2559.

EARLY RECEIVER WANTED. Examples: Pilot, Breting, Silver Marshall, National, RCA, Meissner, Patterson, Skyrider, Howard, McMurdo. Bob Mattson, KC2LK, 10 Janewood, Highland, NY 12528, 914-691-6247.

WANTED: Hallicrafter Skyriders with entire front panel silver color, Skyrider Commercial, S-30, S-33, S-35, Hallicrafter TV's and consumer electronics, other very old or unusual Hallicrafters items including advertising signs, memorabilia, parts, etc. Also want RCA ACR-111, AVR-11. Chuck Dachis, "The Hallicrafter Collector", 4500 Russell Drive, Austin, TX 78745.

COLLECT KEYS? You'll enjoy W1IMQ's illustrated references. "Introduction To Key Collecting", 64 pages, $9.95. "Vibroplex Collector's Guide", 67 pages, $14.95. Add $2 s/h to total. Artifax Books, Box 88-Q, Maynard, MA 01754.

PRE-1968 QSL of W6YTG, Charles May, sought by son. David May, KB1TC, 301-836-7961.

WANTED: *QST*s for Dec. 1915, Dec. 1916, Dec. 1919, June 1920, Oct. 1921, all of 1922. Have some 1916, 1917, 1919 for trade. Bob, W4JNN, 703-560-7161 or P.O. Box 165, Annandale, VA 22003.

4 SETS FB7 Coils in original boxes. $20 per set. W7MID, 602-253-9757.

WANTED: Hallicrafters SR-75 (an S-38B with Crystal-Controlled Transmitter). Any reasonable shape. Jim, WA8JUA, 721 Sierra Street, El Segundo, CA 90245, 213-322-0434.

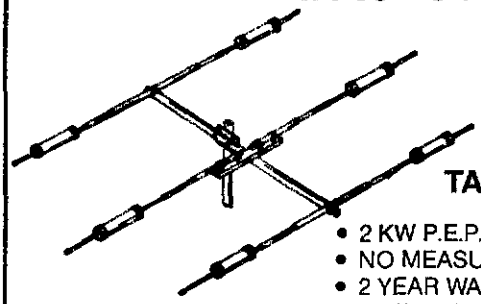
WANTED: old military communications gear, especially WW2 German, Japanese, Italian, anything related. Always interested in the less common: US Coast Guard, Forest Service, portable suitcase/clandestine, unusual avionics, manuals, etc. Thank you! Hugh Miller, KA7LXY, 8400 Maltby, Woodinville, WA *98072-8375, 206-487-3047 weekends.*

WANTED By Collector: Old Radios, Parts, Microphones, Advertising Signs, and TVs. Jerry Finamore, 87 Stonewood Place, Catasauqua, PA 18032, 215-264-8412.

EARLY TRANSMITTER WANTED. Examples: Gross, Stancor, Collins, Thordarson, Harvey, Temco, National, Utah, Hallicrafters, Hammarlund, Guthman, Rel. Bob Mattson, KC2LK, 10 Janewood, Highland, NY 12528, 914-691-6247.

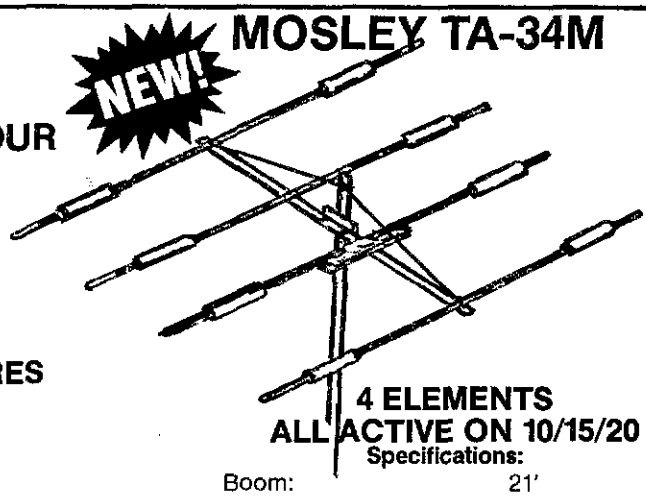
The World Famous MOSLEY MODEL TA-33M

YOU CAN CHANGE YOUR TA-33 TO A TA-34!!



NEW!

MOSLEY TA-34M



TA33/34 FEATURES

- 2 KW P.E.P.
- NO MEASURING
- 2 YEAR WARRANTY
- EASY, ASSEMBLY
- ALL STAINLESS STEEL HARDWARE
- CAN ADD 40 or 30 METERS
- LOW SWR

4 ELEMENTS ALL ACTIVE ON 10/15/20

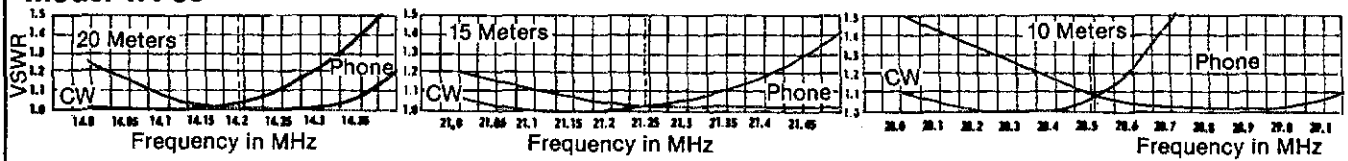
Specifications:

Boom:	21'
Turning Radius:	17'9"
Wt:	58 lbs.
Sq. Ft.:	6.9
Windload:	164 lbs.
Power:	2.5 KW P.E.P.

TA-34-XL uses a 2" heavy duty boom. Heavy duty hardware. No strut. Performance and specification the same. XL total weight 65 lbs.

SWR/Frequency Curves

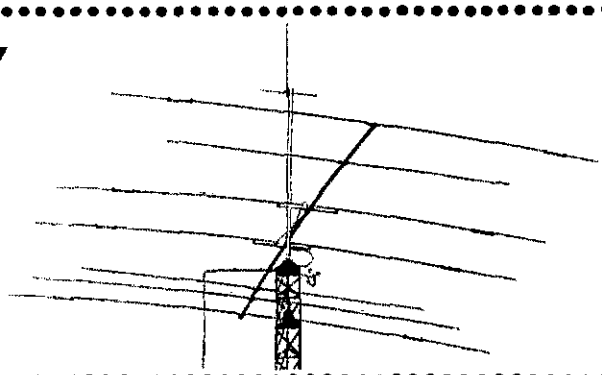
Model TA-33



MOSLEY

PRO-57-A & PRO-67-A

NEW!



PRO-57-A & PRO-67-A FEATURES

- Covers 10/12/15/17/20 Meters
- PRO-67 has 2 Elements on 40 Meters
- Monobander Performance on 20/17/15/12/10
- 7 Elements on a 24 Foot Boom
- 2.5 KW DC-CW, 5 KW PEP-SSB
- PRO-57-A — VSWR 1.5:1 or Better!
- Easy Assembly, NO MEASURING!!!!
- Very Rugged Construction
- All Stainless Hardware Standard
- 2 Year Warranty

PURCHASE MOSLEY ANTENNAS DIRECT FROM THE FACTORY. FOR A *FREE* CATALOG ON OUR COMPLETE LINE OF ANTENNAS OR TO ORDER, PLEASE CALL OR WRITE.

Check out these *SUPER SAVERS.*

	ANTENNA	REG.	SALE
	TA-31-JR-M	$119.95	$ 93.45
	TA-31-M	119.95	98.95
	TA-33-JR-M	249.95	208.95
	TA-33-M	342.95	278.25
	TA-34-M	464.95	364.95
	TA-34-XL	579.95	461.95
	TA-40-KR	149.95	98.95
	CL-33-M	449.95	350.95
	CL-36-M	615.95	516.95
	PRO-57-A	669.95	545.95
	PRO-67-A	829.95	688.95
NEW	PRO-77-A 10, 12, 15, 17, 20, 30 AND 40 ALL IN ONE!	899.95	758.95
	FULL SIZE BEAMS		
	YB-12-A	239.95	172.95
	YB-17-A	362.95	290.95
	YB-23-A 12 & 17 METERS	439.95	392.95
	ALL BAND VERTICALS		
NEW	RV-6-WARC 10, 12, 15, 17, 20, 40		249.95
NEW	RV-7-WARC 10, 12, 15, 17, 20, 30, 40		269.95
NEW	RV-8-WARC ADD 75/80 TO ABOVE		79.95

PLUS SHIPPING/HANDLING & INSURANCE

To Order Call...

1-800-325-4016

For Technical Info...

1-314-994-7872

Current SALE ends 12-15-90

The 5th DECADE of OUTSTANDING PERFORMANCE with MOSLEY ANTENNAS

DID YOU KNOW THAT ALL OF OUR ANTENNAS . . . .

- Are Hand-Crafted
- Have All Stainless Hardware Standard
- Use Seamless Aircraft Grade Aluminum
- Are Color-Coded and Pre-Drilled — No Measuring Required for Assembly
- Come with a 2 Year Warranty

Mosley Electronics Inc. 1344 BAUR BOULEVARD, ST. LOUIS, MO 63132

NOW ALL THESE ANTENNAS ARE UPS SHIPPABLE

WANTED: US Amateur Callbooks, 1920 thru 1936, plus 1939, 1940, 1941, 1945, 1955. Bob, W4JNN, 703-560-7161 or P.O. Box 166, Annandale, VA 22003.

GONSET G-76 Transceiver Wanted For My Station. Len Crispino, WB2MJH, P.O. Box 702, Hudson Falls, NY 12839, phone 518-638-8199.

GENERAL

DO-IT-YOURSELF DXpedition. Stay at ZF8AA. 1 or 2 br. units, beach, quad, rig. Fish or dive if bands fold. Write airmail: ZF8AA, Little Cayman, CAYMAN ISLANDS. Summer phone 206-246-8155.

WANTED: Drake 7-Line, RV-75, distance no problem. Tony Ficarra. 144 Gladstone Avenue, Wollongong, NSW, AUSTRALIA 2500. (042) 292573

WE BUY Electron tubes, diodes, transistors, integrated circuits, semiconductors. Astral Electronics, P.O. Box 707, Linden, NJ 07036. Call toll-free 800-666-8467.

THE ARRL LETTER—Professionally compiled and edited for active amateurs. Send SASE for a sample of the League's biweekly newsletter. Subscriptions are $19.50 (US funds) for a one-year subscription. (US and Canada, ARRL members only.) The ARRL Letter, 225 Main St., Newington, CT 06111.

CHASSIS & CABINET Kits. 5120 Harmony Grove Rd., Dover, PA 17315, SASE K3IWK.

COMPREHENSIVE Apple II/II+/IIe Software CW/RTTY with/without TU or TNCless Packet. Callsign and $49.95 brings either and manual on 5.25 inch disk. SASE for free brochure. W1EO, 39 Longridge Road, Carlisle, MA 01741.

RTTY JOURNAL published 10 times per year for those interested in digital communications. Read about RTTY, AMTOR, MSO's, PACKET, RTTY DX and Contesting. Plus technical articles concerning the digital modes. $12.50 per year (foreign higher). RTTY JOURNAL, 9085 La Casita Avenue, Fountain Valley, CA 92708.

HAM RADIO REPAIR, all makes, all models. Robert Hall Electronics, PO Box 8363, San Francisco, CA 94128, 408-729-8200.

TEFLON, SASE. W9TFY, Alpha, IL 61413.

SCHOOL CURRICULUM For Ham Radio by Carole Perry, WB2MGP. 26 lesson plans, code practice oscillator, audio cassette and VHS video tape. Suitable for all school grade levels with pull-out lessons. Can be used as separate course or as part of Social Studies or Science program. Also suitable for summer camp program, $99.95. Media Mentors Inc., P.O. Box 131646, S.I., NY 10313-0006, 718-983-1416.

RIGID Plexiglas Cover for following keys: Bencher $9.95; MFJ-422 $9.95; Vibroplex Iambic $11.95. George Chambers, KØBEJ, 302 S. Glendale Avenue, Coffeyville, KS 67337.

'N-TENNA Quad Kits, Boomless Tribanders, $64.50. Box 5332, Hickory, NC 28603.

TUBES WANTED: I pay cash or trade for all types of transmitting or special purpose tubes. Mike Forman, 1472 McArthur Blvd., Oakland, CA 94602, 415-530-8840.

SUPER VR85 replaces the popular VR85 satellite tracking program for the Commodore 64. Features include high resolution color map and satellite sprite, tracking data display, footprint sprite, ground trace, mutual acquisition table, transponder mode display, room for twenty satellite Keplerian element sets, Autotrak compatibility, extensive instructions, and strong user support. Send SASE for details. Super VR85: $35 ppd. (CA residents add 6% sales tax.) RLD Research, McCloud, CA 96057. W6AMW owner.

FREE Ham Radio Gospel Tracts. SASE. N3FTT, 5133 Gramercy, Clifton Heights, PA 19018.

TOWERS: Aluma crank-up with hinged base, house bracket, mast. Mobile van, rooftop, trailer towers. Stack sections. Take amateur gear or computers on trade. McClaran Sales, P.O. Box 2513, Vero Beach, FL 32961, 1-800-331-6188 tollfree.

FREQUENCY Directories. Press, Maritime, Aero, Military, Spy, SW/MW/FM Broadcast, Utes, Police, Federal Agencies, all modes, 10 KHz to 900 MHz. Free catalog. CRB Research, Box 56-QS, Commack, NY 11725.

AZDEN Service by former factory technician. Rush service available. PCS-300 NiCads $36.95. Southern Technologies Amateur Radio Inc., 10715 SW 190th Street #9, Miami, FL 33157, 305-238-3327.

$$$ SUPER SAVINGS $$$ on Electronic Parts, Components, Supplies and Computer Accessories. Send $1 for one year subscription for our 40 page catalogs and their supplements. Get on our mailing list. BCD Electro, P.O. Box 45207, Garland, TX 75045 or call 214-343-1770.

HAM TRADER Yellow Sheets. In our 29th year. Buy, Swap, Sell Ham Radio Gear. Published twice a month. Ads quickly circulate, no long wait for results. Send business size SASE for sample copy. $15 for one year (24 issues). P.O.B. 2057Q, Glen Ellyn, IL 60138-2057 or P.O.B. 15142Q, Seattle, WA 98115.

HAM RADIO REPAIR CENTER, quality workmanship. Solid state or tube, all makes and models. Also repair HF amplifiers. A-Z Electronic Repair, 3638 E. Indian School Road, Phoenix, AZ 85018, 602-956-3024.

GET Your "FCC Commercial General Radiotelephone License". Electronics Home Study. Fast, Inexpensive! Free details. Command Productions, D-170, Box 2824, San Francisco, CA 94126.

PRINTED Circuit Boards for projects in *QST*, Ham Radio, 73's and ARRL Handbook. SASE for list. Far Circuits, 18N640 Field Court, Dundee, IL 60118.

AYN RAND NET sked to discuss ideas presented in her novels "The Fountainhead" and "Atlas Shrugged". Send address to K1UKQ, 222 Wm. Henry Road, Scituate, RI 02857.

EXCELLENT Logging Software. See our display ad for LOGic. Personal Database Applications.

CRYPTOGRAPHY Equipment Wanted. Cipher machines, M-209, M-94, German Enigma, anything related to sending secret messages. Lou, WB2EZK, 17 Alfred Road West, Merrick, NY 11566, 516-378-0263.

VACATION IN COLORADO, fully furnished Chalet, Collins equipped station. By week or month. W0LSD, Box 156, Buena Vista, CO 81211, 719-395-6547.

W2IHY Digital Voice Recorder. Described in the 1989 and 1990 ARRL Handbooks. The audio equivalent of a CW memory keyer. Kits $45- $215. Assembled $300. Write Julius Jones, W2IHY, 15 Vanassa Lane, Staatsburg, NY 12580, 914-889-4933.

BEAM HEADINGS your QTH. $9.95. W8JBU, Box 397, Hinckley, OH 44233.

DX QSLs. The "Go List". We make getting the QSL cards as much fun as the QSO itself. Over 5000 QSL managers. Updated and published monthly. The W6GO/K6HHD QSL Manager List, P.O.B. 700A, Rio Linda, CA 95673. $20/yr/USA.

THE "NEW" QUAD CLIP. Beat the broken quad antenna wire syndrome. For information send a 25 cent stamp to Ampruss Co., KH6CTQ, P.O. Box 551, Aiea, HI 96701-0551.

LINEMAN'S Safety Straps, Leather or Kline Cord. 72' adjustable, spring loaded hooks, $15 ea. Leather climber straps, $5/set of four. Ship postage COD. John Orr, 715 River Road, Fair Haven, NJ 07704, 201-747-7334.

THE DX BULLETIN provides all the DX, propagation, QSL, equipment, DXpedition information you need, every week. SASE or call for samples. Box 50, Fulton, CA 95439, 707-523-1001.

$2.50 BEAM HEADINGS 330 DX Locations. Long SASE Info. DX Blue Book, 4920 Mayflower Street, Cocoa, FL 32927.

TRI-EX TOWERS, authorized dealer, best prices. KC2NB Tower Service, 201-873-2198.

THE DX MAGAZINE is your monthly ticket to the DX game: DXpedition reports, QSL managers, propagation, equipment reviews, more. Only $15/year. Box 50, Fulton, CA 95439, 707-523-1001.

BEAM Headings, DX and WAS, from your QTH $8. Wagner, WD8SBB, 5065 South Kessler-Frederick, Troy, OH 45373.

GORILLA HOOKS, Lineman Belts, and Tower Climbing Accessories. Free info. W9JVF, 1408 W. Edgewood, Indianapolis, IN 46217.

OPERATE Maritime Mobile aboard luxury 46 foot sailboat. A ham vacation the whole family will enjoy. New England summers. Caribbean winters. Captain Paul Tibbetts, K1PT, P.O. Box 542, Pocasset, MA 02559, 508-563-5256.

WANTED: Buy & Sell all types of electron tubes. Call tollfree 1-800-421-9397 or 1-612-429-9397 or FAX 1-612-429-0292. C & N Electronics, Harold Bramstedt, 6104 Egg Lake Road, Hugo, MN 55038.

YAGI BUILDERS. Tube Traps, Tubing, Clamps and Universal Plate for Boom to Mast or Elements. SASE for details. Brown Engineering Inc., 5501 SW 25th Court, Hollywood, FL 33023. Mon thru Fri 1- 800-833-3794 1-2 PM EST.

FREE PACKET software for the Commodore C64/128! Purchase a Digicom HF/VHF interface and receive free TNC software. Complete Packet system with features not found in other TNCs. See my article in 73 Magazine, August 1988. Kit $49.95, assembled $79.95 (plus $2.50 s/h). An autobooting cartridge (Digicart) is also available. SASE for more info. Barry Kutner, W2UP, 207 Winding Lane, Newtown, PA 18940.

TS-440 COMPUTER INTERFACE. Functionally equivalent to IF-232C + IC-10C. Includes software. Kit $49.95, $5 S&H. SASE for information. Phil Whitehouse, W1GEE, P.O. Box 527, Hampden, ME 04444.

LIMITED-SPACE Dipoles by G5RV and W1JC. SASE. Tom Evans, 113 Stratton Brook, Simsbury, CT 06070.

GAP-GAP-DX-V1 Vertical Antenna Free Radials $219. Plus UPS. McClaran Sales Inc., 1-800-331-6186.

CALL LETTER ID Tags, (authentic dog tags), stainless steel, customized; name, call letters, QTH, etc. Up to five seventeen space lines. $4.29 postpaid, neck chain included. JPW Enterprises, P.O. Box 353, Logan, UT 84321.

DIGICOM/64 Master Command Guide. Keyboard Overlay. $5 ppd. Fuller, RD #2, Box 122, Saegertown, PA 16433.

WANTED: Hallicrafters SX-115 Receiver, excellent to mint, no hum problems please. Jim Hagerty, WA1FFL, 64 Nonquit Lane, Tiverton, RI 02878, 401-624-4739.

WANTED: donation of IBM-PC, TNC, Transceivers and Technical Books for Soviet HARN Emergency Radio Service. KK4WW, Amateur Radio Peace Corps., Floyd, VA 24091-0341, 703-763-3311.

APPLE IIgs HyperStudioR software for Novice written exam. Color, animation, sound. Requires 3.5'drive; 1.25MB $30. David Koch, W8LNJ, 4516 Fremont Lane, Plano, TX 75093-3909.

VP5 HAM HOLIDAY!! Enjoy great VP5 DXing, snorkelling, diving on providenciales, Turks and Caicos Islands. For information write: Coral Conexions, P.O. Box 350164, Ft. Lauderdale, FL 33315.

WANTED: Swan WM-3000. K4NBN, "No Bad News".

25-420 MHz Military Aviation Frequency Directories for North America-over 20,000 newly researched listings. Send SASE info to: HAP2, Box 754, Flemington, NJ 08822-0754, 201-806-7134.

WANTED: Removeable Tuning Knob from R26/ARC5. N2BDU, 38 Chapin Street, Canandaigua, NY 14424.

"INTENSIVE CARE FOR AILING RADIOS". Dr. K-GOR has the cure with a seven day program guaranteed to stop your radio from smoking, overeating components, and speech disorders. K-GOR Electronic Repair Inc., 6154 Circle View Drive, Kansas City, MO 64118, 816- 454-6700, 816-4-KGOR-00.

COMMUNICATIONS RECEIVERS: The Vacuum Tube Era. Book covers history, specs on 700 receivers, 51 companies, 123 photos. $14.95 plus $2 P/S. Details SASE. RSM Communications, Box 218-Q, Norwood, MA 02062.

PRODUCT REVIEWS—Planning on buying a used rig? Here's a booklet that shows where to find reviews of all the popular gear appearing in *QST*, *CQ*, *Ham Radio* and *73* magazines between 1945 and 1988. Reviews from RSGB's *RadCom* between 1979 and 1988 also appear. This bibliographic listing is in alphabetical order by manufacturer (from A&A Engineering to Zycomm) then by model. Shows publication, issue and page number. "Product Reviews" is copyrighted by Didah Publishing and is available for $12 plus $2.50 ($3.50 UPS). Order no. 3347 from ARRL, 225 Main Street, Newington, CT 06111.

HOMEBREW Components Catalog SASE. KA7QJY, Box 7970, Jackson, WY 83001.

K1EA CT logging program CW interface, links computer (via serial port) to any transmitter, electrically isolates, adjustable weighting, just plug into rig/computer, $59.95; CYRIL IBM-compatible program that sends Russian and/or Roman characters in Morse via the serial port and displays text on screen, $29.95; CYRIL and keying interface, $79.95. (Add $3 shipping.) Jim Talens, N3JT, Box 19346, Washington, DC 20036.

"HAMLOG" COMPUTER PROGRAM. 18 modules. Full features. Auto-logs. 7-band WAS/DXCC. Apple, IBM, CPM, Kaypro, Tandy, C-128. $24.95. *QST*-KA1AWH, P.O. Box 2015, Peabody, MA 01960.

LONG WAVE and 1750 Meter Products and Kits. Free brochure. Mail SASE to Curry Communications, 852 N. Lima Street, Burbank, CA 91505.

WANTED: Collins KWS-1 Transmitter, Hammarlund HQ-180 Receiver. Carter Elliott, WD4AYS, 1460 Pinedale Road, Charlottesville, VA 22901, 804-979-7383.

WANTED: Yaesu FT-101B in good condition. Tom, 7914 Ray Bon Drive, #115, San Antonio, TX 78218, 512-590-6920.

WANTED: NJ's Ballooning in Bloomsbury blank QSL cards. Will pay original cost and shipping. Write WB2REM, 23 Pennroad Avenue, Trenton, NJ 08638.

STAMP COLLECTORS! SASE brings ham stamp price list. WB4FDT, 411 Sparta, Ruston, LA 71270.

ANTENNA TUNER, Dentron MT-3000A, 3KW 1.8-30 MHz, $180. W2GJJ, 717-253-6320.

ICOM, KENWOOD, YAESU, DRAKE, COLLINS & HEATH OWNERS: 8 Pole & 10 Pole Crystal Filters. Ask yourself these questions! Are you continually being interfered with during QSO? You can't seem to pull out a weak signal in the QRM? Yes, to either, purchase our SSB or CW Filters! Monthly ICOM, Kenwood & Yaesu separate newsletters. 10 to 13 yrs. of back issues. High tech Service Dept. Authorized Kenwood Service Center. Send 45 cent SASE for free 20 page catalog to: International Radio & Computers Inc./Fox Tango, 751 S. Macedo Blvd., Port St. Lucie, FL 34983, 1-407-879-6668. (This issue see our display ad.) Order now for Christmas.

1380 DX CERTIFICATES from 113 countries described in K1BV's comprehensive directory. $16.10. Ted Melinosky, 525 Foster Street, South Windsor, CT 06074-2936.

DON C. WALLACE, W6AM. This book describes the history of amateur radio, as experienced by Don Wallace. By Jan D. Perkins, N6AW. Hardbound, 350 pages. Prepublication price $19.95, plus $2 shipping & handling. California residents add $1.35 sales tax. Available from Wallace & Wallace, 11823 Slauson Avenue, Suite 38, Santa Fe Springs, CA 90670.

WANTED: Yaesu FL-101 Transmitter, with Processor Control on front panel. Serial #308001 and up. Ten-Tec KR-50 Keyer. Joe Locastro, 183-1/2 Lake Avenue, Auburn, NY 13021, 315-252-6107.

WANTED: KT-34A, TH7DXS or TH5DXS Beams; HDX572 or larger, HG70HD or larger crank-up towers. Price in first letter. Will pick up anywhere near I-40 Lexington to Albuquerque. K4RN, 9500 Tasco NE, Albuquerque, NM 87111, 505-821-5615.

WANTED: Arizona Ham Operating QTH. January 1st through April 30th, 1991. Need 3 bedroom home (minimum) with all amenities. Prefer North Scottsdale or vicinity with minimum antenna restrictions. Local references, highest professional care and financial integrity. Jim Moran, KA1KZ, 53 Austin Street, Leominster, MA 01453.

1991 CALLBOOKS. "Flying Horse". Published in Illinois. North American $23.95, International $23.95. S&H $4 per order. 11-30-90 delivery. Discount on ARRL, other books. Extra charge COD. Visa. Burk Electronics, 35 North Kensington, La Grange, IL 60525, 708-482-9310.

WANTED: Collins R/E S-Line Station or just the Transmitter. Also want Hallicrafters SX-28A, SX-42, SX-88, SX-100. All above wanted for my own station. Lee Bahr, WØVT, 914 Golden Bear Lane, Kingwood, TX 77339.

SUPER QTH For DX-Contesting-Fishing. Former WM5G contest station near Athens, Texas. 28 acres, mostly wooded with large 12 acre lake stocked with Florida Bass and Catfish. Beautiful 4BR, 4 bath house rebuilt in 1986. Separate radio building with air conditioning-venting system. Large workshop area, boathouse, many improvements. Includes 128' rotating "Big Bertha" Pole + 110' 25G tower + bases, achors for seven more towers up to 180' tall. Large amount of buried coaxial, rotor, and control cable. 8 beverage antennas of receiving. Price $275,000. Call for brochure. Jim Tucker, WM5G, 800-527-4642 or 214-348-8800.

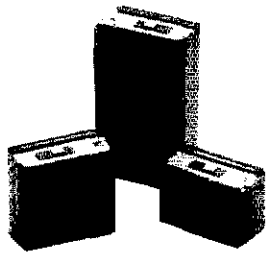
AFRAID OF FCC TESTS? Let your C64/128 drill you. All questions on 5¼" disk. With instructions. Full screen diagrams if used. Your call on screen and on optional printed summary. Tech or General $19.95 ppd. Advanced or Extra $24.95 ppd. Ralph Parlette, WB6JOY, 27 Morning Sun, Mill Valley, CA 94941, 415-383-0507.

KENWOOD TS-830S, mint, original carton, manuals, new finals, $500. Joe, W1FLX, 413-442-8287 after 6.

BATTERIES "R" US...

You've bought our replacement batteries before...

NOW YOU CAN BUY DIRECT FROM US, THE MANUFACTURER!



ICOM
CM2, BP2 7.2v @ 500MAH
CM5, BP5 10.8v @ 500MAH
SUPER
7S 13.2v @ 1200MAH **$63.95**
8S 9.6v @ 1200MAH **$59.95**
(base charge only - 1" longer)
ICOM CHARGERS AVAILABLE

For ICOM: Convertible Battery
8 Cells
Alkaline or
Nicad Holder

$26.00 COMPLETE WITH (8) ALKALINE BATTERIES

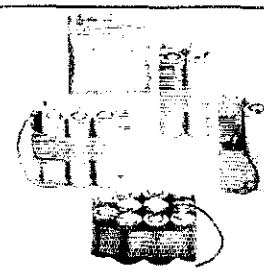
BP-7 13.2v @ 500MAH **$61.95**
13.2v @ 600MAH **$64.95**
BP-8 8.4v @ 800MAH **$61.95**
8.4v @ 1000MAH **$64.95**

NOVEMBER
Special of the Month

ALL KENWOOD REPLACEMENT BATTERY PACKS

10% OFF

Look for December's *Special of the Month*



CUSTOM MADE BATTERY PACKS & INSERTS
Made to your specifications.
Introductory Offer!
KENWOOD INSERTS
PB-21 - $13.75, PB-25 - $20.00,
PB-26 - $20.00
ICOM INSERTS
BP-5 - $23.00, BP-3 - **$17.45**
BP-7, BP-8

Prices subject to change without notice.

MasterCard and Visa cards accepted. NYS residents add 8¼% sales tax. Add $3.50 for postage and handling.

1 SOURCE FOR ALL YOUR COMMUNICATION BATTERY REPLACEMENT NEEDS.

W & W ASSOCIATES

29-11 Parsons Boulevard, Flushing, N.Y. 11354

WORLD WIDE DISTRIBUTORSHIPS AVAILABLE. PLEASE INQUIRE.

In U.S. & Canada Call Toll Free (800) 221-0732 • IN NYS (718) 961-2103 • Telex: 51060 16795 • FAX: (718) 461-1978

MADE IN THE U.S.A.
SEND FOR FREE CATALOG AND PRICE LIST

COMTELCO INDUSTRIES

Take Your H.T. Mobile!

19.95

MAGNET MOUNT DUAL BAND MOBILE ANTENNA
140-150 mhz / 435-450 mhz
150 WATT POWER RATING
Supplied with 12 ft. of RG 58 Coax
Choice of BNC or PL259 Connector.
**Also Available As a Body or Trunk Mount*
Antenna Only .....$12.95 ea
Trunk Mount .....12.00 ea
Thru Body Mount .....5.00 ea

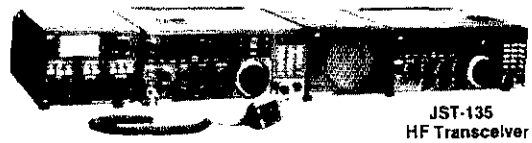
1-800-634-4622
1-708-790-9894
(In Illinois)

Quality products Made in the U.S.A.

COMTELCO INDUSTRIES INC
P.O. Box 681429, Schaumburg, IL 60168

BUY—SELL—TRADE

All brands new and reconditioned



JST-135
HF Transceiver

WE TRADE

- All Modular Construction
- 150 W Output
- General Coverage Receiver
- 1 Chip Direct Digital Synthesis
- U/LSB AM FM AFSK

JRC ASK FOR SPECIAL SALES PRICES

Find out why thousands of customers have switched to us.

NEW! AUTHORIZED AZDEN DEALER

KENWOOD, ICOM, TEN-TEC, Astron, Cushcraft, Larsen, MFJ, Butternut, B&W, Hustler, Antenna Specialists, AEA, Ameritron, Van Gorden, ARRL, RF Concepts, Diamond, Kantronics, CallBook, Alpha Delta, Heil, Grundig, Uniden, Bearcat, Mirage, Ameco, Alliance, Daiwa, Hy-Gain & others

N4EDQ Amateur Radio Sales & Service

4400 Hwy. 19-A
Mount Dora, FL 32757

FOR THE BEST DEAL!
1-800-828-6433
10:00 to 5:00 P.M. EST. (Mon.-Fri.)

THE WIREMAN

1-800-727-WIRE

FOR ALL AMATEUR WIRE & CABLE
"CERTIFIED QUALITY"
1-803-895-4195 (Tech Help & Ragchew)

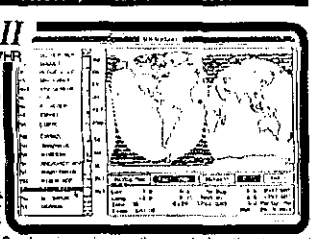
CERTIFIED COMMUNICATIONS
261 PITTMAN ROAD, LANDRUM SC 29356

DX Helper II

Macintosh Software W7HR
MUF Map • MUF Plot
Gray Line • Great Circle
Prefix, Zone, Oblast
WWV Alert • CW Drill

$49.95 ppd Info $1

AntennasWest
Box 50062-D, Provo, UT 84605
1-800-926-7373



See band openings on the map before they happen!

WORLD FAMOUS
CURTIS KEYERS
Write for Brochures
8044/8044B still $16.70 ppd

New
8044ABM-$19.95
(plus $1.75 shipping)

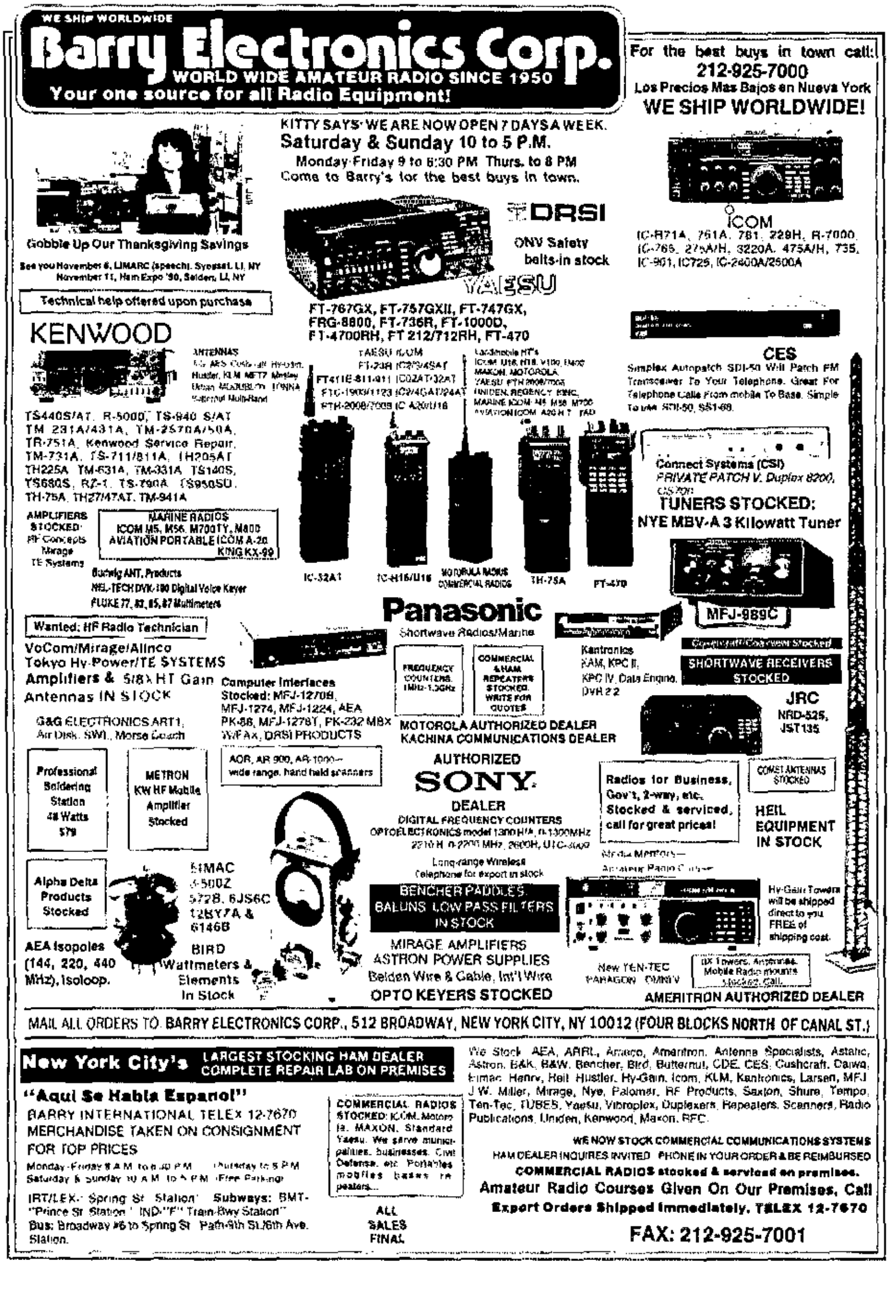
CURTIS ELECTRO DEVICES, INC.
(415) 964-3846
Box 4090, Mountain View CA 94040

Genuine Seth Thomas 24 Hour Quartz Clock

SPECIAL
$29.95
+ 2.50 S/H
SAME DAY SHIPPING
Check/MO/VISA

B.A. FOX, INC.
LARRY - WA4LPV
113 N. Church St.
Spartanburg, S.C. 29301
(803) 582-6464

Matching 12 Hour CLOCK Also Available At Same Low Price and LARGE 12/24 Hour Digital - The Perfect Addition To Any Shack



ROSS'$$$$ New November (Only) Specials: JSC RG-213 500 Ft. $150, Kenwood TM-631A $629.90, TS-711A $889.90, TM-241A $394.90, TS-790A $1659.90, TS-811A $1039.90, TS-440S $1049.90, TS-440S/WAT $1209.90, TM-731A $625.90, TM-411A $339.99, TM-701A $464.90, ICOM IC-765 $2439.90 (open box), IC-781 $5119.90, IC-24AT $534.90, IC-735 $934.90, IC-2SA $289.90, IC-490A $509.90, IC-701 $589.90, Yaesu FT-747GX $709.90, FT-757GXII $1019.90, FT-703RTT $264.90, FT-709R $289.99, FT-33R $259.90, FT-470 $394.90, FT-411E $329.90, Ten-Tec 562 $1819.90, 961 $224.90, 222 $29.90, 425 $2699.90. Send SASE for used and open box list. All LTO (limited time offer). Looking for something not listed? Call or write. Over 9004 ham-related items in stock for immediate shipment. Mention ad. Prices cash, FOB Preston. Hours Tuesday-Friday 9:00 to 6:00 PM, Monday 9:00 to 2:00 PM. Closed Saturday & Sunday. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830.

MACINTOSH HAM SOFTWARE—DX Helper™ shows bearing, distance, gray line, Great Circle, MUF, call sign identifier, CW code practice, more! Satellite Pro™ shows graphics, view from space, az, el, alt, more! Write or call for info. MacTrak Software, P.O. Box 1590, Port Orchard, WA 98366, 206-871-1700.

QUADS 4 Element 10-15-20 $675. Lightning Bolt Antennas, RD 2, Rt 19, Volant, PA 16156, 412-530-7396.

ARGONAUT 505, Ten Tec's classic QRP rig. Includes power supply, antenna tuner, electronic keyer, CW filter, manuals. Excellent condition. $275. Mike, WA6WJR, 916-926-3117.

COMPLETE Oscar Satellite Station. AOP1 Cushcraft Antenna, Rotators for Azimuth & Elevation. ICOM 490A, Kenwood TR9000, Hamtronics LPA-4-30 30W Amp, Lunar Gasfet Preamp. Complete with all books, cables and extras. All in very good condition. Asking $700. Call Joe, WE5V, 318-855-9202.

KENWOOD TS830S w/CW Filter, instruction and shop manuals $675. VFO-230 $175. Bill, K6AG, 619-858-4459.

WANTED To Rent July and August 1991 mountain modern summer home maximum altitude 7000 feet NM, CO, MT, Idaho antenna space. Alden Davis, W0PCW, Halstead, Kansas, 316-835-2094.

YAESU FR101 digital receiver, FM and 2 meter converters and external speaker, FL101 transmitter with microphone and two extra sets of tubes. Complete with manuals. Excellent condition $625. Mosley TA33 beam, good condition $75. Pickup only. K0USC, days 316-662-9301, after 4PM 316-663-2998.

TWO-METER Handheld. Heath HW2XL with AC and mobile chargers, speaker/mic, magnet-mount 5/8 wave antenna. Perfect condition. Cost $405. Sell for $200. Mike Ryder, KA9N, 503 S. 5th Street, Oregon, IL 61061.

SELL: Towtec Electric Tower Winch, Model 102A. In original carton. With HD upper & lower limit switches, remote switch, test switch. $300 pp. K0ODY, 605-347-6292.

FOR SALE: Miscellaneous Laser Diodes. SASE any Callbook, K6LMN, 213-474-2447.

LOOKING For Schematic and Service Booklet for Realistic DX-300. Also Hammarlund HQ150 with a good power transformer. Need manuals for above. Service booklet preferred. John McMillan, 7726 SW 53rd Place, Gainesville, FL 32608.

ICOM 28A 2M 25W, like new, $300. ICOM FL32 CW Filter, $35. N1DPG, 203-584-1600.

STAINLESS STEEL U-Bolts, Turnbuckles, Eyebolts, Screw Eyes, Bolts, Screws. Small quantities. Free catalog. Elwick, Dept. 796, 230 Woods Lane, Somerdale, NJ 08083.

KENWOOD TS-530S, Y88SN + YK88CN filters, SP-230, manuals, original cartons, excellent condition, low hours, $695 + shipping. Mark, KA2ORK, 216-382-4762.

WANTED: Ham Equipment And Other Property. The Radio Club Of Junior High School 22 NYC Inc. is a non-profit organization, granted 501(C)(3) status by the IRS, incorporated with the goal of using the theme of Ham Radio to further and enhance the education of young people nationwide. Your property donation or financial support would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. Meet WB2JKJ and the "22 Crew" on the Classroom Net, daily, 1100-1230 UTC, 7.238 MHz. Then from 1230 to 1900 on 21.395. We look forward to meeting Radio Club Of America members and friends at the NY Athletic Club during the RCA banquet on November 16. Write us at: RC Of JHS 22, P.O. Box 1052, New York, NY 10002. Round the clock hotlines: Voice 516-674-4072. FAX 516-674-9600.

NAPLES, FL Winter Home For Rent. Includes Henry 2K, TS-530, TH60X4AT 66 feet. No TVI. 2 bedroom, 2 bath on canal, completely furnished. $1200/mo in season other months $900. Call K4FA, 813-775-0964.

HIGH PERFORMANCE 2M BEAM. Dramatically improve your Cushcraft 11-element beam's directivity & gain. Easy conversion plans needing no extra parts. Or homebrew 8-element beam from included dimensions. $10, check or money order: WB9OZB, Dept. *QST*, P.O. Box 357, Mount Prospect, IL 60056.

HAVE that old Heath radio gear reconditioned, aligned, calibrated. SASE for quote. RTO Electronics, 4166 Maple Street, Berrien Springs, MI 49103.

EP2ST or NCX-1000 National Transceiver Wanted by Allen Watson, 316 East Hurd, Edmond, OK 73034.

MINT Drake C-Line, Extras, $500. Wanted: TR-7. W9BV, 219-663-2324.

DENTRON MLA2500 Amp, mint, $795; HW101/AC Supply, $195; Tempo VHF-1 2M Synthesized $130; Drake 2B/2BQ, $150. K1BY, 203-447-9436.

1991 CALLBOOKS: Prepublication orders until 11/24: North American $24.95; International $26.95. Both $48.95. Postpaid USA. California residents add sales tax. Duane Heise, AA6EE, 16832 Whirlwind, Ramona, CA 92065.

WANTED: Drake 4 line or seperate pieces to build same. Also TR7A service manual, extender boards, dead TR7. Frank, KG9H, 27 West 235 Lennox Road, Wheaton, IL 60187, 708-682-8484.

LSASE for list of surplus military radios, ham gear, transmitting tubes, etc. Gary Cain, 1775 Grand Avenue #302, St. Paul, MN 55105.

WANTED: Hallicrafters SX-88 Receiver, NC300, 32V3, 75A-1 Pay top dollar. Ken, W2OSO, P.O. Box 4652, Diamond Bar, CA 91765, 714-861-7040.

SELL: Japan Radio NRD-93 Commercial Shortwave Receiver With NDH-93 Scanner, Cables, Manuals, Accessories, Mint. Paul Hammond, 303-651-1548.

EMERGENCY Power Generators—new, used all types. Francis M. Strenk & Associates, N3FGH, 521 N. 4th Street, Telford, PA 18969, 215-723-8223.

1991 CALLBOOKS. North American $30, International $30. Both $55. 6 or more, any mix $25 each. Personal check or MO. Insured UPS paid. Shipping starts Nov 20. Avatar/ W9JVF, 1408 W. Edgewood, Indianapolis, IN 46217.

"MODIFIED Cubic Incher" Transmitter Kit for 80, 40, 30 or 20 Meters. Custom PC Board and Parts $16 postpaid. 624 Systems, N4LTA, 803-583-1304.

COLLINS EQUIPMENT: 32S-3, 75S-3B, 516F-2, 312B-4. Wing emblem. All with original factory cartons. All in mint condition $950. 32S-1, 75S-1, 516F-2 very good condition $550. N6UON, 707-961-9611.

1500' MT. TOP OTH seven acres two 60' twrs TA33/Ringo mod home 1680' firm $74K. If interested send SASE for detailed descriptions. See Callbook, N5BK.

QRP HOMEBREW Components And Kits. New expanded catalog. Send $1 to KE8KL, Oak Hills Research, 20879 Madison Street, Big Rapids, MI 49307.

LINEAR: Drake L4 & PS new cond $695. Ron, NG6X, 129 Club Drive, San Carlos, CA 94070, 415-591-1357.

YOU CAN be an author for The Blacksburg Group -chapter or whole book on amateur radio topics. David Larsen, KK4WW, Blacksburg, VA 24063-0001, 703-763-3311.

MORSE TERMINAL kits allow sending and receiving Morse Code with your computer. For Tandy Color ($39.95), Tandy 1000 ($49.95), and IBM compatible computers ($49.95) plus $3 shipping. Free catalog. Dynamic Electronics, Box 896, Hartselle, AL 35640, 205-773-2758.

COLLINS 75S3, 32S1 & PS 312B4, good cond, manuals, $875 or BO. Collins 30L1, good cond, $595. Ron, NG6X, 129 Club Drive, San Carlos, CA 74070, 415-591-1357.

LIKE TO Trade an excellent Kenwood TS-830S for an excellent Yaesu FT-757GXII or ICOM 735 or Kenwood 440S or $650. AA5RH, 505-835-3346.

HELP ME Complete My Collection, Xmtrs Wanted: Viking Navigator, Knight Kit T-400, Lafayette Voyager, Starlete, Wrl CW-7, Philmore N1200, Globe Chief 90, Int. Xtal Co. AOT-50, ET-1 CW, ERL Excello, Matric QRP 50 (has anyone ever seen one?). Kantronics Rockhound, Walter Ashe WAT25 and Heath HA-14 Amp, Ameco PS3 A/C Supply, Philmore CR5A RX. Gary, K3OMI, 11124 Oak Hollow Road, Knoxville, TN 37932, 615-690-4217 days.

SWAN Equipment and Accessories Wanted For My Personal Station. Any condition considered. Looking for Swan Mike, Linear Amp Mark I or II, or anything for my 350 Transceiver. Also interested in 270B Cygnet Transceiver or any other Swan gear. Paul Zimick, WB9HZT, 2395 Cascade Drive, Lebanon, OR 97355, 503-259-3609.

EIMAC 8877/3CX1500A7 new, warranty $595. Eimac 3CX800A7 $295. SK-2210/SK-2216 $125/set. Jennings UCS-300-7.5KV Vacuum Capacitor, Variable $135. Jennings RJ1A-26 Vacuum Relay $75. All new. Alan, K6GA, 714-964-3912.

COMMODORE 64 Ham Programs—8 disk sides-over 200 Ham programs-$16.95. 25 cent stamp gets unusual software catalog of utilities, games, and British disks. Home-Spun Software, Box 1064-Q, Estero, FL 33928.

KENWOOD TS711A $650, TS440S W/Internal Tuner, PS50HD Power Supply, Matching Speaker, CW & Audio Filters $1200, AEA PK232 $250. Gary Dantord, 3032 S. Hampton, Bettendorf, IA 52722, 319-355-2276.

FOR SALE—Kenwood TL922A mint condition, less than 30 hrs on unit, $1150. Call Art, NF3E, 215-855-7821.

2-METER Linear 75-watt output, Aztec, never used, $55. Burke, RD-1, Box-164A, Farmingdale, NJ 07727.

ANT. TUNER Heathkit SA2040 like new $60. Call 919-756-2162 eves. Sandy, KM4ZA, 507 Cedarhurst Road, Greenville, NC 27834.

FOR SALE: self supporting tubular steel radio tower Triangular base, twenty foot sections, heights 154 ft. Phil, 219-565-3499.

FOR SALE: AEA PK88 TNC, works, manuals, original box, $100. Johnson Viking One, good for parts, $60. Hallicrafters SX111 Receiver, works great, $65. You ship. KB4EFE, 919-523-3654 eve.

BUTTERNUT HF6V with 18 & 24 MHz, $125. GAM TG-3S 2-meter base vertical, $30. All WW2 ARC-5 antenna tuner parts, incl. 2 roller inductors, $30. All include UPS. Don, N4VZD, 704-687-9303 eves only.

FOR SALE: Hy-Gain/Tristao CZ454 55ft. crankup tilt over tower with T4X rotor, cables guys base hardware also one year old Hy-Gain TH7DXX antenna pick up only $1500. W4HY, 803-481-4465.

FOR SALE: Kenwood station. You ship. Call Herb, WB4PHI, 813-581-7378.

IC2GAT, mint, hardly used, extras, $295. Bud, N7BFN, 206-939-6899.

WANTED—CW Keyboard Heathkit or similar, also number one issue of Hints and Kinks. W7JU, 2200 Kingston, Riviera, AZ 86442, 602-758-2274.

WANTED: 8' single sided, double density, soft sector program disk for Packet, RTTY, etc. for Tandy Model II computer or printed program to make my own. C.A. Cearley, 537 S. San Jacinto Street #5, Hemet, CA 92343.

WANTED: Wilson WR-1000 Rotator, any condition. Bob Eshleman, W4DR, 1818 Manakintown Ferry Road, Midlothian, VA 23113, 1-804-794-7143.

MODERN, 3200 sq. ft., 3 br, 3 baths, massive fireplace; heat pump; air cond., split level. Detached two car garage + shop Independant 800 sq. ft. guest apartment above garage; ideal for radio shack. Coastal Mtns. 35 air miles NW Portland, OR. 1400 ft. elev. 7 acres. 3 acres landscaped. Underground utilities Asking $230,000. Harley D. Anders, Star Route Box 1375-F, Forest Grove, OR 97116.

WANTED: FM Module, SBA-1400-1, with manual for Heathkit SB-1400 Transceiver. Thomas Donabedian, KA1UGK, 66 Chatham Street, Worcester, MA 01609, 508-792-6517.

YAESU FT-902-DM. All options installed. $595. W6HXT, Las Vegas, NV, 702-736-4775.

HUSTLER 4BTV Antenna, excellent condition, $45 plus UPS. KG6HW, 4538 Golfview Drive, Brighton, MI 48116, 313-229-8339.

SEASIDE DX QTH For Sale St. Augustine, FL 32084. W4GI, phone 904-829-2187.

HENRY AMPLIFIERS WANTED: 3006A, 3002A, 3004A; 4K-Ultra; also Bird 2KW Dummy Load or Attenuator. Bruce, K1ISJ, P.O.B. 2047, Vineyard Haven, MA 02568, 508-693-5981.

FOR SALE: Tektronix & Hewlett Packard Scopes, Fluke Power Supplies and Assorted Electronics. Will sell or trade for ham gear. Please send SASE for list. Harlin Bachmann, WB0SUW, Webster, SD 57274, 605-345-4616.

FOR SALE: Kenwood Sta. TS-430S, CW Filter, AT-250, PS-430, SP 430. Nye-Viking Paddle & Keyer, Cushcraft AV-5 Multi-Band Vertical, all manuals, used only one year, CW only purchased new 10/84, mint cond. sold as complete sta. only. $1200 OBO. You ship. Bob, KA9RYC, 715-372-4404.

TWO DELUX RELAY RACKS—both are new in unopened cartons. Grey, front and rear doors, adjustable panel mounting rails. Soundoller WA200-61. Dealer cost $419 each. Asking $450 for both. W8TOM, X-3 Crowfields, Asheville, NC 28803, phone 704-274-5152.

WANTED: mint ICOM IC-730 with CW Filter, MFJ-401B. NC0N, 219 South 35th, Parsons, KS 67357.

SELL OR TRADE: TI-PC color computer. Want TR-851A Xcvr or R-2000 Rcvr or equiv. W5FRC, 214-583-8872.

WANTED R-1000 or equivalent General Coverage Receiver. W7ABY, 1920 SW 157th Street, Seattle, WA 98166, 206-243-4074.

KENWOOD TR-2200A FM Transceiver. Complete setup for mobile. Will include Touchtone control and 10 watt amplifier, mint condition, shipping included. W1ULR, 1-617-598-3380.

WANTED: TS790A. WB8ERN, 4939 Beaune Road, Ludington, MI 49431, 616-845-5840.

HEATH COURSES DC, AC, semiconductors, electronic circuits & trainer. $380 new, $200. Bird Termaline 500 watt dummy load $100. Hallicrafters SR160 $125. NC0Z, 701-258-7324 evenings.

WANTED: HW-101 in good condition with PS and mic. Steve, KB5KDX, 713-821-5431.

WANTED duplexer for 2 meter repeater. Send info to Eddie, N4UFE, 29 Oakhill Sub, Northport, AL 35476.

ANTENNA PARTS Catalog, Lowest Prices: Dipole/Quad/ Ground Radial Wire, insulators, center feeds, open wire feed line, RG-213 mil spec $.37/ft. Revolutionary hybrid product: 168 strand copper "Flex-Weave™, #14, strong, flexible, non-stretch, won't rust/kink like copper weld, $34 first 275' (minimum), $.12/ft. thereafter, includes shipping! Catalog: $2. Davis RF, P.O. Box 230-Q, Carlisle, MA 01741, 508-369-1738.

REPAIR major brand amateur electronics-analog or digital $30/hour plus parts and shipping-custom engineering or applications services available -also service and repair 2-way equipment. Malcom Technical Support, 206-668-2497.

KENWOOD TH-215A, $250. Sony ICF-SW20 Nine Band Receiver, $60. W2UJJ, 718-492-7222.

NC101X WANTED. Myers, 1425 E. Jackson Blvd., Elkhart, IN 46516.

URM-25F Signal Generator 10 KHz-50 MHz includes modulation and crystal calibrator, $125. W2AWS, 79 Magic Drive, Kingston, NY 12401, 914-331-9019.

SIGNAL/ONE CX-11A Transceiver, $2,395. ETO Alpha-78 Amplifier, $2,195. Collins KWM-1 Transceiver, $995. Collins 30S-1 Amplifier, low hours, $1,995. Telrex 10M636 Heavy-Duty 6L-Yagi, $475. All excellent. Alan, K6GA, 714-964-3912.

SQUIRES-Sanders SS-1R Noise Blanker, never used, $50. Ed, WA9GQK, 708-749-3261.

VACATION SWAP—Hawaii QTH any time for summer in northern US or any time worldwide. WH6CIt, 808-696-4186 or 813-867-2100.

CRYSTALS: Build something. Hands on construction satisfies and teaches. Simple QRP rig, conversions, ancient rigs etc. Inexpensive FT-243 crystals. Quantity discounts same band only. 40M fundamentals and multipliers from 40M to 20M, 15M, 10M $3.95, five or more $2.95, ten $2.25 each. 80M $3.95, five $2.95. 9 MHz for 17M $3.95, five $2.95. 30M fundamentals great for QRP $3.95, five $2.95. 160M $5.95, five $3.95. Airmail 35 cents per crystal. Four stamps or $1 for listings-circuits package, 1700 to 60,000 kilocycles. "Crystals Since 1933." C-W Crystals, Marshfield, MO 65706.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION

HAMEXPO 90

An ARRL Registered Hamfest - Sponsored by Radio Central Amateur Radio Club
Sunday, November 11, 1990 - Suffolk Community College, Selden, NY

LONG ISLAND'S LARGEST HAMFEST! - 9:00AM TO 3:00PM - $ 5.00 *(Under 13 free)*

*Seminars	*Forums	*Guest Speakers
*Manufacturers	*Dealers	*License Exams

****

Advanced Table Registration Required by November 1st.

Table are $ 20.00 each - Doors open at 6:30AM for Sellers; 9:00AM for Buyers

VE License Exams - Walk-ins accepted (Pre-registration not required.)

Exam fee (except Novice) is $ 4.95. Bring: License (original and 1 copy), Photo ID and CSCE (if any).

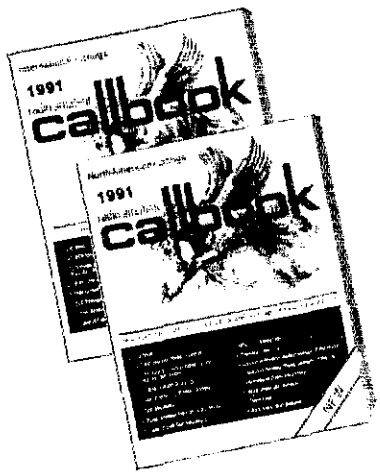
****

Directions: LIE (Rte 495) to Exit 62, Country Road 97 (Nicolls Rd), North 1-1/2 miles to HAMEXPO Site.

Repeater Talk-In: WA2UEC/R 145.15 MHz 449.525 MHz (2A PL)

Contact: John Mark KB2QQ (516)689-6336
Ron Katz WB2DVK (516)689-3279
Jo Ann Colletti N2IME (516)399-1877

1991 CALLBOOKS



THE QSL BOOK!

Extending a 70 year tradition, we bring you three new Callbooks for 1991 with more features than ever before.

The 1991 North American Callbook lists the calls, names, and address information for over 500,000 licensed radio amateurs in all countries of North America, from Panama to Canada including Greenland, Bermuda, and the Caribbean Islands plus Hawaii and the U.S. possessions.

The new 1991 International Callbook lists 500,000 licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions).

The 1991 Callbook Supplement will be published June 1, 1991, with thousands of new licenses, address changes, and call sign changes received over the preceding six months. This single Supplement will update both the North American and International Callbooks.

Every active amateur needs the Callbook! Fully updated and loaded with extra features, the new 1991 Callbooks will be published December 1, 1990. Order now from your dealer or directly from the publisher.

☐ RC0191 North American Callbook	
incl. shipping within USA	$33.00
incl. shipping to foreign countries	39.00
☐ RC0291 International Callbook	
incl. shipping within USA	$33.00
incl. shipping to foreign countries	39.00
☐ RC0391 Supplement, published June 1st	
incl. shipping within USA	$13.00
incl. shipping to foreign countries	14.00

SPECIAL OFFER

☐ RC01912 Both N.A. & International Callbooks incl. shipping in USA	$63.00
incl. shipping to foreign countries	73.00

* * * * * * * * * * * *

Illinois residents please add 6¼% tax.
All payments must be in U.S. funds.

RADIO AMATEUR **callbook** INC.
Dept. RACM0004
925 Sherwood Dr., Box 247
Lake Bluff, IL 60044, USA
Tel: (708) 234-6600

BATTERY PACK Rebuilding: Send Your Pack / 48 Hr. Service. ICOM BP2/BP3/BP22 $19.95, BP5 $25.95, BP7/BP8 $32.95, BP70 $29.95, Kenwood PB21 $15.95, PB21H $21.95, PB25/26 $24.95, Yaesu FNB9 $19.95, FNB10 $23.95, FNB11 $27.95, FNB4/4A $36.95. U-Do-It Inserts: ICOM BP2 $17.50, BP3 $16.95, BP5 $22.95, BP7/8 $27.50, BP22 $17.95, BP70 $25.95, Kenwood PB21 $12.95, PB21H $18.95, PB24/25/26 $19.95, Tempo S1/2/4/15 $22.95, Yaesu FNB9 $16.95, FNB10 $18.95, FNB4/4A $32.95, Azden $19.95. New Packs w/Case: ICOM BP5 or BP8B (base chg only) $39.95, Yaesu FNB2 $19.95, FNB12 $44.50, Santec 142/1200 $22.95. Free catalog. $3 shipping/order. PA + 6%. Visa-M/C + $2. Cunard, RD 6, Box 104, Bedford, PA 15522, 814-623-7000.

YAESU, FT-101ZD, FV-101DM, Digital, Shure 444 Mic, all cables and manuals. NJ1T, P.O. Box 749, Hinsdale, MA 01235.

FOR SALE: College Wins, Kenwood TS-830S and MC-50 in mint condition, will ship UPS, $650. N8JVV, 507-669-2053.

GROUND RADIAL Wire For Verticals Or Slopers: Improves performance, new #16 bare solid copper. Lowest cost: $38 for 1000 foot spool, includes shipping! Davis RF, P.O. Box 230-Q, Carlisle, MA 01741, 508-369-1738.

MADISON: TUBES 6146B $12; 572B $69; 3-500Z $99; 4CX1000A $300; 4CX1500B $300; receiving tubes $1-up; 807 $5; 6BF5 $6; 6CL6 $9; warranty. Prices FOB Houston. Madison Electronics, 12310 Zavalla, Houston, TX 77085, 1-800-231-3057, 1-713-729-7300.

LIQUIDATING, no minimum order. RF connectors, UHF, BNC, N and others. Axial/radial electrolytic capacitors. Resistors, composition/wirewound 1/4 watt-100 watt, fixed & adjustable. Super prices. K1DFC, 413-323-4088.

WANTED: Hammarlund HQ-170 Receiver. Mark Kohlbacher, 123 Martin Road, Jamestown, NY 14701.

IBM HAM Software By W3YY - The Log Program for everyday logging operations, $19.95; The DX Record for 11 band/4 mode record keeping, $17.95. Write for information. Viking Business Systems, 10310 Main Street, Suite 106, Fairfax, VA 22030.

KENWOOD 830, mint, low hours, original boxes and manuals, $625. I ship. Astatic D-104, new, amplified, $45. KA2IWR, evenings till 10:00, 201-431-1579.

YAESU FT-207R, Mike, NC-3 Charger, Car Adapter, $175. N1BHC, 508-664-2937.

SWISSLOG: The most popular logging program in Europe is now available in the United States. It features on line DXCC, WAZ, ITU and WPX checking. Beam heading, all zones, local time and distance to QSO partner. Print Logs, QSL cards and labels. Contest duping, fast input and report mask. Grid square support. Graphic full color MUF map presentation shows grayline and path. DXCC statistics, conversion from K1EA, DXLOG and DBase. Much more. IBM PC, 640K, hard disk. $75. Frank, KD2LL, 10 Robbins Avenue, Amityville, NY 11701, 516-598-0011.

SSB ELECTRONIC USA VHF/UHF/SHF Equipment 50 MHz-10 GHz. GaAsFet Pre-Amplifiers, Transverters, Converters, Amplifiers, Ungar Soldering Equipment, etc. Call/write 40 page catalog. M-F after 6:30 PM-weekends anytime. K3MKZ, 717-868-5643, 124 Cherrywood Drive, Mountaintop, PA 18707.

WANTED: BC-348 WWII Aircraft Receiver in good condition with manual. Also Johnson Viking Adventurer Xtal CW Transmitter and manual. Mike Whatley, WA4D, 5844 Doris Drive, Alexandria, VA 22311, 703-845-5427.

KENWOOD TS-120S $395, TS-830S $735, VFO-230 $350, AT-250 $195, DFC-230 $235, AT-200 $155, Drake MN-2000 $225, MN-4 $135, TR-6 $375, RV4C $165, RV4 $135, TR22 $75, Yaesu FT-102 $625, FV-102DM $375, YR-901 $275, YC-601 Display $250, 601B $275. John Korona, WA2V, 1117 Dewitt Terrace, Linden, NJ 07036, 201-486-0039.

WANTED: Tektronix 7A18, 7A26, 7B53A, 7D10, 7L5, etc. 465 Bird 2500H. Hank, WD5JFR, 4161 Oak Road, Tulsa, OK 74105, 918-742-1845.

IBM-PC SOFTWARE FOR PK-232! New CompRtty II/PK is the complete communications program for the PK-232/HK-232. Uses host mode of PK-232 for complete control. Text entry via built-in screen editor! Adjustable split screen display, including optional Triple Split (TM) in Packet mode. Instant mode/speed change. Hardcopy, diskcopy, break-in buffer, select calling, text file transfer, customizable full screen logging, 24 programmable 1000 character messages, supports mailbox facility. Ideal for MARS, traffic handling. Requires 256k PC compatible. $65. Non-PK-232 version still available. Send call letters (including MARS) with order. David A. Rice, KC2HO, 144 N. Putt Corners Road, New Paltz, NY 12561.

1991 CALLBOOKS. Prepublication orders till 11/20: North American and International, $26 each, both $50 postpaid USA. Any 10 or more: deduct $1/book. Bonus! Free computer beam headings. Include your lat/long. Mike Klein, KC3NE, Box 306, Cheltenham, PA 19012.

STRONGER SIGNAL! Clearer, Noise-Free Reception! Interference Problems Solved! Proven Methods! Illustrated Manual-$5 ppd. KB4UGW, P.O.B. 581-T, Leeds, AL 35094-0581.

ESTATE SALE W2KUW Air Ground Electronics-Panasonic RF-4800 Transceiver, 3 plus Power Supplies, HP volt meter, test-o-matic tube tester, Foregger Forescope, many misc parts & chassis. Would prefer to sell as a package. Contact Ted Dames, days 201-725-3307, nights 201-389-3784, leave message.

WANT BOOK, Basic Television By Grob. KF6WM, 45300 Royal, King City, CA 93930.

SALE: Drake TR-4 Transceiver with power supply and speaker, excellent, pair 4X250B Tubes new. W8LLQ, 304-229-8824.

JRC JST-135 Transceiver, NRD-525 Receiver, with all options available. Also other brands available. N4EDQ, Amateur Radio Sale 1-800-828-6433.

SELL: Hallicrafters Super Defiant, clean, needs S-Meter, $65; mint SX99, $95; S-38, $40; HT32A, $95; 6 foot open Bud-Rack, KW PS, $85; 100 KC Calibrator, PS, $25; 3 El. 10, 15, 20 Telrex Beams, $300; Heath QF-1, $25; Vibroplex, $60; JW Miller AT-2500 Auto Antenna Tuner, $575; Amphenol Pclp, $35; Trade 1959 International Fire Truck for $2500 HF Station; Want To Buy: Rohn 20, 25, 45, 55 Tower, Telrex Rotor Cable, RG-17, RG-214, Ameritron RCSBV, 1915-17 QST Books, A3WS Beam. K8CCV, 216-427-2303, 6-9 PM EST weeknights.

WEEKLY HAM TRADER. Mailed First Class every Friday. Subscriptions $10 for six months (26 issues). Ad rates 20 cents per word non-commercial, 40 cents commercial. Prepaid ads and subscriptions to: Weekly Ham Trader, P.O. Box 1159, Arnold, MO 63010.

COLLINS R390A/URR front panel perfect, A1 condition, $350; Wrl Globe Champion 300A, $200; Wrl DSB 100, $75. List SASE. K4UJZ, 608 W. Thompson Lane, Murfreesboro, TN 37129, 615-893-5344.

OUACHITA MOUNTAINS, Arkansas—Custom brick ranch with many unique features. 3 bedrooms, 1-3/4 baths, high efficiency heat pump. Ham station elgantly designed on one wall of den. Two 60 foot Rohn towers with rotors; TA 33 Tribander, 215WB 2M beam; DX-A Sloper, AV-801 scanner antenna. Complete workshop for electronic and mechanical work. Garden house, drive-through RV & implement shed, redwood deck. On 5 well groomed acres with large stocked pond. Half mile from beautiful Irons Fork Lake in pristine watershed area of Ouachita National Forest. A rare home in a rare location. $120,000. N5BRE, RR 3, Box 302, Mena, AR 71953, 501-394-5724.

JOBS FOR HAMS

RADIO OFFICERS NEEDED: Radio-Electronics Officers Union has immediate openings in US Merchant Marine Communications-Electronics Officer Trainees. $2,500/mo. during 6 month training period. Excellent wages and benefits afterward. Must be a drug-free US citizen in good health. No criminal record. First or Second Class FCC Radio-Telegraph License, 1415 Moylan Road, Panama City Beach, FL 32407, 904-233-6100.

TRAVEL! HIGH INCOME! Radio Officers needed for shipboard employment. Must have FCC Second Class Radio-Telegraph license and background in electronics. Approximately $7000 per month to start after 6 month training. Call or write: Rae Echols, W7FFF, American Radio Association, 5700 Hammonds Ferry Road, Linthicum Heights, MD 21090, 301-850-5379.

ADVERTISING DEPARTMENT STAFF

Brad A. Thomas, KC1EX, Advertising Manager
Angela M. Beebe, KA1SER, Advertising Assistant

203-667-2494 is a direct line, and will be answered only by Advertising Department personnel.

Index of Advertisers

GREAT RADIO AND ANTENNA BUYS

KENWOOD

TS-950SD

Digital - 150W - Dual RX - And Much More! Also Available Without The Digital Signal Unit. A Top Performer. **Call For Your Price!**

TS-940SAT

General Coverage HF Xcvr - 100W - More. A Great Performer. **Call For Your Price!**

TS-440SAT

General Coverage Xcvr - Optional Auto Tuner. A Good Performer. **Call For Price.**

TS-140S / TS-680S

General Coverage Xcvr - TS-680S Has 6M! Economical HF Radios. **Call For Price!**

VHF / UHF MOBILES AND HANDIES

TM-731A - 2M / 70CM
TM-631A - 2M / 220
TM-701A - 2M / 70CM
TM-231A - 2M, 45W
TM-331A - 220, 25W
TM431 - 70CM, 25W
TM-2530A - 2M, 25W
TM-2550A - 2M, 45W
TM-2570A - 2M, 70W
TM-3530A - 220, 25W
TR-751A - 2M, SSB
TH-75 - 2M / 70CM HT
TH-26 - 2M Tiny HT
TH-25 - 2M Tiny HT
TH-225 - 2M, 5W HT
TH315 - 220 HT

Call For Your Special Kenwood Pricing!

YAESU

FT-1000D

Digital - 200W - Dual Rx - Deluxe And Standard models Are Available. **Call For Your Price!**

MORE YAESU RADIOS - IN STOCK

FT-767GX - General Coverage - With Tuner.
FT-757GXII - General Coverage Xcvr - 100W.
FT-747GX - Economical HF Xcvr - 100W.
FT-736R - VHF / UHF All Mode Base Xcvr.
FT-470R - 2M / 70CM Deluxe Dual Band HT.
FT-411R - 2M Full-Featured Handie Talkie.
Please Call For Your Special Low Prices!

ALINCO

VHF / UHF MOBILES AND HANDIES

DR-570T - 2M/70CM - Dual Band Mobile.
DR-510T - 2M/70CM - Dual Band Mobile.
DR-110T - 2M - 45W - VHF Mobile.
DJ-500T - 2M/70CM - Dual Band Talkie.
DJ-160T - 2M - Tiny - Full Featured Talkie.
DJ-100T - 2M - Tiny VHF Handie Talkie.
ELH-230G / ELH-230D - 30W HT Amplifier.

AMERITRON

HF LINEAR AMPLIFIERS

AL-1500 - 1500W
AL1200 - 1500W
AL82 - 1500W
AL80A - 1000W
AL84 - 600W
CALL FOR PRICE!

FREE SHIPPING ON RADIOS!

ICOM

IC-781A

General Coverage - HF Xcvr - Full Dual RX - With Built in Band Scope. Top Performer. **Call For Price!**

IC-765A

Digital - General Coverage - 100W - HF Xcvr. Great Performer. **Call!**

IC-735A

General Coverage HF Xcvr - 100W. Good Performer. **Call For Price!**

MORE ICOM RADIOS - IN STOCK

IC-725 - Economical HF Xcvr.
IC-726 - Economical HF W/ Xcvr.
IC-970 - VHF / UHF All Mode Base.
IC-2400 - VHF / UHF Mobile Xcvr.
IC-228A - 2M - 25W Mobile Xcvr.
IC-228H - 2M - 45W Mobile Xcvr.
IC-32AT - VHF / UHF - 2M Talkie.
IC-24AT - VHF / UHF - 2M Tiny HT.
IC-2GAT - 2M - 7W Super Talkie.
IC-2SAT - 2M - Tiny Handie Talkie.

MFJ IN STOCK

New Product - 948 Tuner $ 119

901B / 941 D Tuners ..... 59 / 99
945C / 949D Tuners ..... 89 / 139
986 / 989C Tuners..... 259 / 299
1278 / 1270B TNC's .... 249 / 129
202 / 204 Nx Bridges ..... 59 / 79
250 / 260 / 262 Loads 49 / 29 / 69
407 / 401 Keyers ..... 69 / 49
422 MFJ / Bencher Combo 129

ASTRON

12 VDC POWER SUPPLIES

MODEL	AMPS	ICS	PRICE
RS4A	3	4	$ 49
RS7A	5	7	59
RS12A	9	12	79
RS20A	16	20	99
RS20M	16	20	119
RS35A	27	35	159
RS35M	27	35	179

Models With "M" Suffix Have Meters.

OTHER ACCESSORIES

AEA PK232MBX - All Mode TNC.
KANTRONICS KAM - All Mode
NYE MBV-A - 3KW Antenna Tuner.
RF CONCEPTS - Amplifiers.
MIRAGE - VHF / UHF Amplifiers.
OTHERS TOO. - PLEASE CALL!

HEATH

HW2P - 2M Tiny Handie Talkie.
HW-24T - 2M/70CM Handie Talkie.
Call For Price All Heath Models!

TEN - TEC

Paragon - General Coverage Xcvr.
Omni V - Ham Bands Only Xcvr.
Titan - 1500W HF Linear Amplifier.
Call For Prices On All TEN - TEC Equipment! Most Items In Stock.

BUTTERNUT ANTENNAS

HF5B Butterfly - Compact Triband Beam. 6FT Boom Length - 12.5 FT Element Length. $ 259.95
HF6V - 6 Band Vertical Antenna. Handles Full Legal Power $ 159.95
HF2V - 80/40M Vertical Antenna. Handles Full Legal Power $ 149.95
RMKII - Roof Mount Kit $ 59.95
STRII - Radial Kit 59.95
T8R160 - 160M Coil 59.95
30MRK - 30M Kit 39.95
Free Shipping On Butternuts!

COAX AND CONNECTORS

RG213/U - 95% Shield - Non Contaminating Jacket. $ .39 / FT.

RG8X - 95% Shield - Mini-SizeCoax. Uses UG176 Adapt. $ .25 / FT.

9086 International - Equivelent to Belden 9913 - 100% Shield - Solid Center Conductor $ .45 / FT.

Connectors:
Amphenol PL259 - Silver - $ 1.50.
Amphenol UG21B - N Male 3.50.
Amphenol N Male For 9913 4.95.

ANDREW HELIAX®

LDF4-50 - 1/2 Copper (/Ft.) $ 2.19
LDF5-50 - 7/8 Copper (/Ft.) .. 5.49
Connectors: 1/2" - 29.00, 7/8" - 69.00

ROTOR CABLE

Standard 8 Conductor Rotor Cable. (2 # 16Ga. & 6 # 22Ga.) $ .25 / FT.

Heavy Duty 6 Cond. Rotor Cable. (2 # 16Ga. & 6 # 18Ga.) $ .45 / FT.

ROTATORS

Telex CD45II - 8.5 SQ. FT.
Telex HAM4 - 15 SQ. FT.
Telex TAILTWISTER - 20 SQ. FT.
Telex HDR300 - 25 SQ. FT.
Yaesu G500A Elevation Rotor.
Please Call For Prices On Rotors!

cushcraft

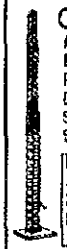
A3S - 3 Element Triband Beam.
A4S - 4 Element Triband Beam.
A743 / A744 - 30/40 Kit For Above.
R5 - 20-10M, No Ground Vertical.
AP8 - 80-10M Vertical Antenna.
D40 - 40M Rotatable Dipole.
40-2CD - 2 Element, 40M Beam.
A50-5 - 5 Element, 6M Beam.
215WB - 15 Element, 2M Beam.
230WB - 30 Element, 2M Beam.
4218XL - 18 Element, 2M Beam.
3219 - 19 Element, 2M Beam.
ARX2B - 2M Vertical antenna.
Call For Prices On All Cushcraft!

PHILLYSTRAN GUY CABLE

HPTG1200I - 1200 Lb. Rating. $ .32
HPTG2100I - 2100 Lb. Rating. $ .36
HPTG4000I - 4000 Lb. Rating. $ .59
HPTG6700I - 6700Lb. Rating. $ .79
Phillystran Guy Cable Is Non-Conducting - No More Insulators. Also, The New Phillystran No Longer Uses Potting Heads, But Uses Regular Cable Clamps. Please Call Us For Details!

TELEX Hygain

CRANKUP SALE



All Models Shipped Factory Direct - Prepaid. Features: All Steel - Hot Dipped Galvanized - Self-Supporting - With Rotor Shelf and Wench.

Model	Height	Load
HG37SS	37 FT.	9 S.F.
HG52SS	52 FT.	9 S.F.
HG54HD	54 FT.	16 S.F.
HG70HD	70 FT.	16 S.F.

Accessories For Hygain Towers Are Also Available For Immediate Delivery. CALL FOR PRICE!

TELEX HYGAIN ANTENNAS

New DX88 HF Vertical Antenna.
7-2 Discoverer - 2 El., 40M Beam.
7-3 Discoverer - 3rd El. add-on Kit
Explorer 14 - 3 Element Tribander.
QK710 - 30/40M Add-on Kit.
V2S - V3S - V4S - VHF/UHF Vert.
TH5MK2S - 5 El., Triband Beam.
TH7DXS - 7 El., Triband Beam.
205BAS - 5 El., 20M Beam.
155BAS - 5 El., 15M Beam.
105BAS - 5 El., 10M Beam.
204BAS - 4 El., 20M Beam.
64BS - 4 El., 6M Beam Antenna.
18AVT/WBS - 80-10M Vertical.
18HTS - 80-10M Hytower Vertical.
Call For Prices On All Hygain.

ROHN

GUYED TOWER PACKAGES

HEIGHT	25G	45G	55G
50	849	1229	1549
60	939	1389	1939
70	999	1719	2159
80	1199	1869	2369
90	1289	2039	2579
100	1369	2199	2989
110	1449	2459	3209
120	1669	2619	3429

These Towers Are Shipped Complete With The Following: All Guy Hardware, Base Section, Rotor Plate; According To ROHN Specifications. 70 MPH Design. Towers Are Shipped Freight Collect From Plano, TX. **IN STOCK NOW!**

FOLDOVER TOWERS

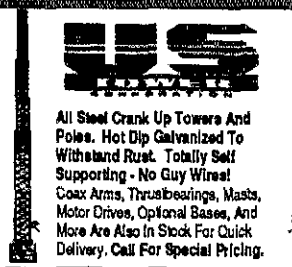
Model	Height	Load Cap.
FK2548	48 Ft.	15.4 S.F.
FK2558	58 Ft.	13.3 S.F.
FK2568	68 Ft.	11.7 S.F.
FK4544	44 Ft.	34.8 S.F.
FK4554	54 Ft.	29.1 S.F.
FK4564	64 Ft.	26.4 S.F.

GGK25GII - Double Guy Kit $ 299.
GGK45GII - Doudle Guy Kit $ 319.

The Above Specifications Are At 70 MPH, With The Above Double Guy Kit Properly Installed. ROHN Foldover Towers Are Drop Shipped Freight Paid; Cost 10% Higher West Of The Rockies.

STACKED SECTIONS

20G - Light Duty 12 Inch $ 54.50
25G - Medium Duty 12 In 65.50
45G - Heavy Duty 18 Inch 153.50
55G - Extra Heavy 18 Inch 197.50
Please Call For Pricing On All Rohn Accessories. Most Are In Stock For Immediate Delivery!



All Steel Crank Up Towers And Poles. Hot Dip Galvanized To Withstand Rust. Totally Self Supporting - No Guy Wires! Coax Arms, Thrustbearings, Masts, Motor Drives, Optional Bases, And More Are Also In Stock For Quick Delivery. **Call For Special Pricing.**

Model	Min Ht.	Max Ht.	Load	Price
MA40	21 Ft.	40 Ft.	10 Sq.'	629
MA50	22 Ft.	50 Ft.	10 Sq.'	999
TX438	22 Ft.	38 Ft.	18 Sq.'	919
TX455	22 Ft.	55 Ft.	18 Sq.'	1385
TX472	22 Ft.	72 Ft.	18 Sq.'	2279
HDX555	22 Ft.	55 Ft.	30 Sq.'	2079
HDX572	22 Ft.	72 Ft.	30 Sq.'	3559

Shipping On US Tower Models is Collect From Visalia-California. Calif. Residents Please Add 6% State Tax.

ROHN SELF SUPPORTING 8X TOWERS

Model	Height	Load	Weight	Price
HBX40	40 Ft.	10 Sq.'	228	$ 449
HBX48	48Ft.	10 Sq.'	303	569
HBX56	56 Ft.	10 Sq.'	385	699
HDBX40	40 Ft.	18 Sq.'	261	569
HDBX48	48 Ft.	18 Sq.'	363	689

All ROHN BX Series Towers Are Shipped Freight Prepaid In The Continental United States. These Towers Come With The Base Stubbs At No Additional Charge As Well As The Rotor And Top Plates. The Above Antenna Load Ratings Are At 70 MPH. Please Note That ROHN Does Not Recomend Using This Tower With Antennas That Have A Boom Length Exceeding 10 Foot.

GUY WIRE AND HARDWARE

3/16 EHS Guywire (3990 Lb. Rating)	.15 / Ft
1/4 EHS Guywire (6650 Lb. Rating)	.18 / Ft
5/16 EHS Guywire (11,200 Lb. Rating)	.29 / Ft
5/32 (7X7) Aircraft Cable (2700 Lb. Rating)	.15 / Ft
3/16 CCM - Cable Clamp For 3/16 or 5/32	.45
1/4 CCM - Cable Clamp For 1/4	.55
1/4 TH - Thimble For All Guywire Listed	.45
3/8 EE - 3/8 X 6 Eye And Eye Turnbuckle	6.95
3/8 EJ - 3/8 X 6 Eye And Jaw Turnbuckle	7.95
1/2 X 9 EE - 1/2 X 9 Eye And Eye Trnbkl.	9.95
1/2 X 9 EJ - 1/2 X 9 Eye And Jaw Trnbkl.	10.95
1/2 X 12 EE - 1/2 X 12 Eye And Eye Trnbkl.	12.95
1/2 X 12 EJ - 1/2 X 12 Eye And Jaw Trnbkl.	13.95
5/8 X 12 EJ - 5/8 X 12 Eye And Jaw Trnbkl.	16.95
3/16 Preformed Guy Grips (Replaces CCM)	2.49
1/4 Preformed Guy Grips (Replaces CCM)	2.99
GAS604 - 6 In. X 4 Ft. Earth Screw Anchor	19.95
500D - Guy Insulator (Up To 3/16)	1.99
502 - Guy Insulator (Up To 1/4)	3.49
Ground Rod - 5/8 X 8 Ft. Copper Clad	12.95
Coax Seal - Waterproofs Coax Connectors	2.50

GALVANIZED STEEL MASTS

Wall	5'	8'	10'	12'	15'	20'
.12	29	39	49	59	69	89
.18	49	75	89	109	129	149
.25	69	109	129	159	189	249

These Galvanized Steel Mast Measure 2 Inch, Outside Diameter And Are Available In 3 Different Wall Thicknesses. They Are All Galvanized, High Carbon Steel. Mast Measuring 8 Feet Or Less Can Be Shipped By Ups. Mast That Are Longer Than 8 Feet Must Be Shipped By Collect Freight.

HUSTLER ANTENNAS

6BTV - 6 Band Vrt...149
5BTV - 5 Band Vert...129
G7-144B - 2M Vert...129
G6-144B - 2M Vert...89
Hustler HF Mobile Resonators Are Also In Stock. **Please Call For Pricing On Other Hustler Items.**

PLEASE ADD ESTIMATED SHIPPING ON TOWER AND ANTENNA RELATED PRODUCTS.

ORDER TOLL FREE 1 - (800) 272 -3467

LOCAL AND TECHNICAL INFORMATION PHONE : 1 - (214) 422 - 7306

FAX ORDER AND INFORMATION PHONE: 1 - (214) 881 - 0776

HOURS: 9AM - 5PM
SAT. 9AM - 1PM

TEXAS TOWERS

C.O.D.
MC / VISA

Div. of Texas RF Distributors, Inc., 1108 Summit Ave. Suite # 4, Plano, TX 75074

ORDER TOLL-FREE 1-800-821-7323

MasterCard—VISA—Discover—COD

RADIO CENTER USA

AEA • ALINCO • ASTRON • ALPHA-DELTA • AMERITRON • ANTENNA SPEC • B&W • BENCHER • BUTTERNUT •

KENWOOD

NEW!

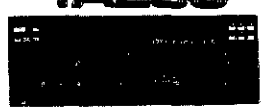
TS-950SD

TRANSMIT THE ULTIMATE SIGNAL

- Digital Signal Processing
- Dual Frequency Receive
- Digital AF Filter • 100 Memories

CALL FOR DETAILS AND ORDER TODAY!

YAESU



FT-1000

THE BEST OF THE BEST

- 200 Watts Output
- All Amateur Bands
- Dual Receive
- DDS-Direct Digital Synthesis

CALL FOR ALL THE DETAILS!

ICOM IC-765

ADVANCED PERFORMANCE HF TRANSCEIVER

- DDS (Direct Digital Synthesizer)
- Auto. Antenna Tuner
- 100 Watts Output
- 99 Memories

CALL TODAY!

ALINCO

DR-590

2 METER/440 MOBILE

NEW!

- 45 W/2 Meter 35 W/UHF
- *Cross Band Repeater Function*
- Receiving and Scanning on Both Bands
- Detachable Front Control Panel

CALL FOR DETAILS!

KENWOOD

SALE

TM-231A

COMPACT 2 METER FM

- 50 Watts, 20 Memories
- Multiple Scanning Modes
- Selectable, Built-in CTCSS Tone

DON'T DELAY—CALL TODAY!

YAESU

SALE

FT-470

COMPACT DUAL BAND FM HANDHELD (2M/70CM)

21 Memories for Each Band
Dual VFO's for Each Band
Up to 5 Watts Power
Built-in CTCSS
Built-in 10-Memory DTMF Autodialer

CALL FOR ALL THE DETAILS!

ICOM IC-229H

ULTRA COMPACT 2 METER

- Transmit 140-150 MHz Receive 136-174 MHz
- 50 Watts Output
- 20 Memories
- Simple Operation

CALL TODAY!

ALINCO

DR-570T

VHF/UHF TWIN BANDER

- 45W on 2M/35W on 70cm
- Receive on both Bands at Same Time
- Extended Receiver Range
- More Features for the Money Than Anyone Else

ALL ALINCO SALE PRICED!

KENWOOD

TH-27A

2 METER SUPER COMPACT HT

- Receive 118-165 MHz
- Up to 5 Watts Output
- CTCSS Encode/ Decode Built-in
- Multi-Function Scanning
- TH-47A, 70 cm Model

CALL TODAY!

Kantronics

DataEngine

- High Speed Packet
- Internal 1200 Baud Modem
- Off The Shelf 9600 Baud Packet With The DVR 2-2
- Internal 9600 Baud, G3RUH Type Modem Available

CALL TODAY!

ICOM

IC-24AT

DUAL BAND FM TRANSCEIVER

- 140-150 MHz 440-450 MHz
- Compact and Lightweight
- Up to 5 Watts Output
- Versatile Scan Functions

CALL TODAY!

ALINCO

DJ-160T

DELUX 2 METER HANDHELD

- Receive 137-173.995 MHz
- *20 Memories*
- 3 Watts Standard
- 3 Scan Modes
- Store Duplex/ Simplex Pairs, Call Channel, 38 Encoding Subtones

CALL TODAY!

MFJ SALE MFJ

LARGEST STOCK OF ALL YOUR MFJ FAVORITE ACCESSORIES CALL TODAY FOR BEST PRICE

MFJ-1278

Multi-Mode Data Controller

CALL FOR EXTRA SAVINGS

HUSTLER

G-10 10 METER COLINEAR VERTICAL

Fiberglass Construction
½ Wave Gain Antenna

SPECIAL SALE

$39.95

(BELOW DEALER COST)

LIMITED SUPPLY—CALL TODAY

CAROL CABLE

(Columbia Cable)

4080 Rotor Cable	22¢/foot
4090 H.D. Rotor Cable	34¢
1108 RG8, Mini	21¢
1198 RG8, Super Flex	30¢
1180 9913 Type	41¢
1176 RG213, Mil Spec	36¢

10% DISCOUNT ON FULL ROLLS

ASTRON

• RS7A	$49	• RS35M	$159
• RS12A	$70	• VS35M	$174
• RS20A	$89	• RS50A	$199
• RS20M	$109	• RS 50M	$219
• VS20M	$124	• RM50M	$259
• RS35A	$139	• VS50M	$232

102 N.W. Business Park Lane Kansas City, MO 64150

Send SASE For Used List

Call Toll Free - 8 AM - 5 PM Mon.-Fri. 9 AM - 2 PM Sat.
In Missouri Call—816-741-8118

WANTED: QUALITY USED GEAR, CASH OR TRADE

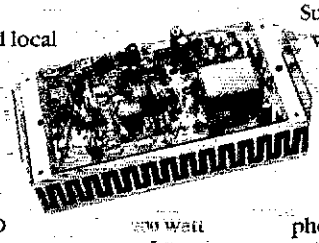
CUSHCRAFT • DIAMOND • DRSI HEIL • HUSTLER • HYGAIN

TECH KNOWLEDGY

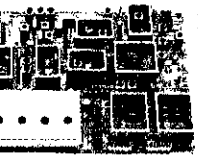
One Year Limited Warranty

What is "tech knowledgy"? Read the facts.

200 Watt Transmitter
The FT-1000 delivers continuously adjustable output from 20 to 200 watts. Using a massive power transformer and powerful 10" squirrel cage blower, the FT-1000 far outdistances linears requiring 100–150W output. The full 200 watts output and exceptional audio provide outstanding "barefoot" pile-up performance.

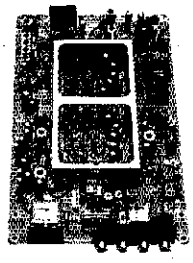

200 Watt Amp

Clean DDS derived local signals and conservative design mean the FT-1000's MRF-422 final transistors, operating at a 30 volt Vcc level, offer third order IMD of −36 dB at 150W PEP. The FT-1000 may be used at 100 watts output continuous duty.


DDS Circuitry

Direct Digital Synthesis
Yaesu assembled a special independent R&D team to create the FT-1000's Direct Digital Synthesizers. Two 10-bit and three 8-bit DDS permit very low carrier/noise on transmitted signals and wide receiver blocking dynamic range by providing exceptionally clean VFO sources to the PLL local oscillators.

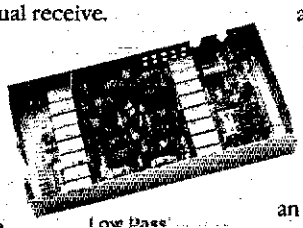
Dynamic Range
Enjoy unparalleled strong signal handling with the FT-1000. You get 14 five-pole main receiver front end bandpass filters (11 on the optional BPF-1), a switchable cascode dual JFET RF preamp, and a double-balanced mixer ring using high-Idss JFETs.


Receiver Circuitry

In addition, the front end gain distribution may be adjusted by switching to IPO, or by adding attenuation in 6 dB (1 S-Unit) steps. Typical measured two-tone dynamic range is 108 dB (at 50 kHz, 500 Hz BW, preamp off), yielding a +32 dBm 3rd order IP1.


Dual Tuning

Simultaneous Dual (Unlimited) Frequency Reception
On the FT-1000, each receiver (Main and Sub) has its own weighted flywheel tuning knob and the two receive channels may be different modes and/or different filter bandwidths. Add the optional BPF-1 module for crossband dual receive.


Low Pass Filter

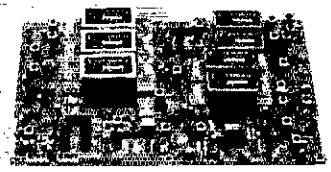
Use headphones or speakers for monitoring, mixing or splitting audio in either mono or stereo. A single RX MIX control adjusts the relative volume of each channel. Install the optional BPF-1 and enjoy true diversity reception by using a separate antenna for each receive channel.

Competition-Grade Receiver
Frequency, mode and bandwidth information are stored independently for each of the two vfos on each band (or the 100 memories). Filter bandwidths of 2.4 kHz, 2.0 kHz, 500 Hz and 250 Hz along with an IF notch filter, IF Shift, variable bandwidth and a CW Audio Peaking Filter provide unmatched ORM rejection. Plus, the FT-1000 offers a dual-mode noise blanker and all-mode squelch. The front-panel RX ANT switch allows convenient enabling of your Beverage or loop receiving antenna.

The optional DVS-2 Digital Voice Storage unit gives you a 16-second receive memory to correct potential "busted calls" or dump an important QSO to tape for archival purposes. The DVS-2 also functions a two- or four-memory voice "CQ Machine" for contests.

CW Operation
The FT-1000 provides the most complete package ever offered to demanding CW operators. For instance, CW Spot, samples your (offset) CW carrier, assures precise "zeroing" during pileups. Other exceptional features include BFO offsets of 400, 500, 600 or 700 Hz, a PLL-controlled CW tuning visual indicator, built-in electronic keyer and full QSK. Key jacks for paddle input are located on *both* front and rear panels.

Optimal Digital Communication
The FT-1000 offers special provisions for RTTY/AMTOR and packet modes including an independent, built-in microprocessor to control AFSK generation. Use the RTTY mode button to select Mark frequencies and Hz shifts. The display can show the Mark or any offset you load in.


IF Filter

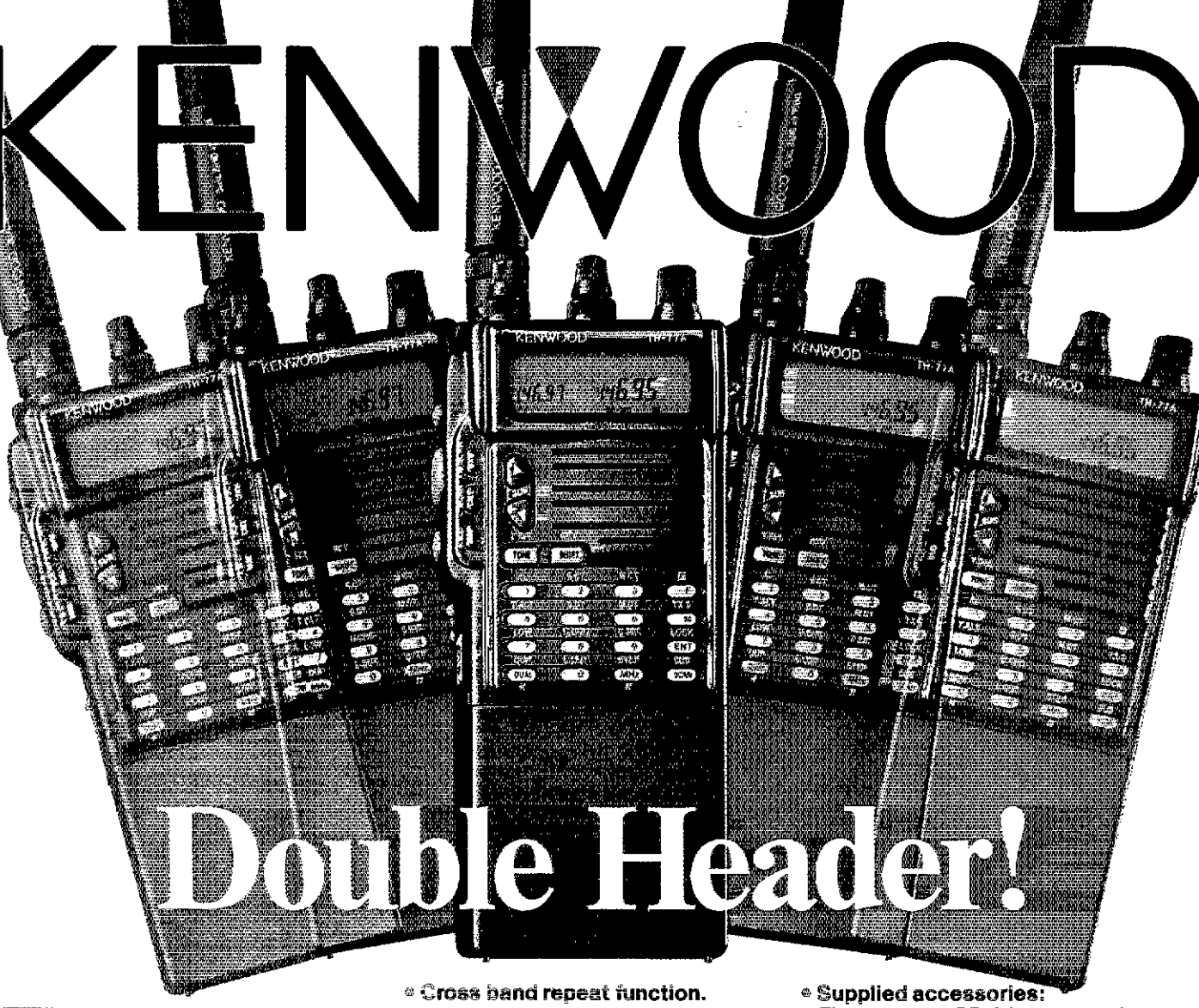
Non-standard tone pair/shifts can also be accommodated with the manual IF shift and independent display offset adjustment on the front panel.

Flexible Mode and Filter Selection
Each receiver (main and sub) has its own vfo on each of 10 bands and each of these vfos has two sub-band channels. As a result, the FT-1000 give you 40 tunable vfo channels and 99 tunable memories—each with its own independently selected and memorized filter and mode combination.

Tap into the FT-1000 Tech Knowledgy
Call your local Yaesu dealer today!

YAESU
Performance without compromise.

KENWOOD



Double Header!

TH-77A

Compact 2m/70cm Dual Band HT

Here's a radio that deserves a double-take! The TH-77A is a feature-packed dual band radio compressed into an HT package. The accessories are compatible with our TH-75, TH-25, and TH-26 Series radios. Repeater and remote base users will appreciate the DTMF memory that can store *all* of the DTMF characters (*, #, A, B, C, and D) that are usually required for repeater functions!

- **Wide band receiver coverage.** 136–165 (118–165 [AM mode 118–136] MHz after modification) and 438–449.995 MHz. TX on Amateur bands only. (Two meter section is modifiable for MARS/CAP. Permits required.)
- **Dual receive/dual LCD display.** Separate volume and squelch controls for each band. Audio output can be mixed or separated by using an external speaker.
- **Cross band repeat function.**
- **Dual Tone Squelch System (DTSS).** Uses standard DTMF to open squelch.
- **CTCSS encode/decode built-in.**
- **Forty-two memory channels.** All channels odd split capable.
- **DTMF memory/autodialer.** Ten 15-digit codes can be stored.
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **Multi-function, dual scanning.** Time or carrier operated channel or band scanning.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Two watts (1.5 W on UHF) with supplied battery pack.** Five watts output with PB-8 battery pack or 13.8 volts. Low power is 500 mW.
- **DC direct-in operation** from 6.3–16 VDC with the PG-2W.
- **T-Alert with elapsed time indicator.**
- **Automatic repeater offset on 2 m.**
- **Battery-saving features.** Auto battery saver, auto power off function, and economy power mode.
- **Supplied accessories:** Flex antenna, PB-6 battery pack (7.2 V, 600 mAH), wall charger, belt hook, wrist strap, keyboard cover.

Optional accessories:
• **BC-10:** Compact charger • **BC-11:** Rapid charger • **BH-6:** Swivel mount • **BT-6:** AAA battery case • **DC-1/PG-2V:** DC adapter • **DC-4:** Mobile charger for PB-10 • **DC-5:** Mobile charger for PB-6, 7, 9 • **PB-5:** 7.2 V, 200 mAh NiCd pack for 2.5 W output • **PB-6:** 7.2 V, 600 mAh NiCd pack • **PB-7:** 7.2 V, 1100 mAh NiCd pack • **PB-8:** 12 V, 600 mAh NiCd for 5 W output • **PB-9:** 7.2 V, 600 mAh NiCd with built-in charger • **PB-11:** 12 V, 600 mAh OR 6 V, 1200 mAh, for 5 W OR 2 W • **HMC-2:** Headset with VOX and PTT • **PG-2W:** DC cable w/fuse • **PG-3F:** DC cable with filter and cigarette lighter plug • **SC-28, 29:** Soft case • **SMC-30/31:** Speaker mics. • **SMC-33:** Speaker mic. w/remote control • **WR-1:** Water resistant bag.

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

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications and features are subject to change without notice or obligation.