

QST

FCC Adopts Novice Enhancement!

March 1987 \$3.00

devoted entirely to Amateur Radio



ARRL Visitors Center
One Step Closer!



1927-1987 HENRY RADIO... 60 years of dedication to the best of amateur equipment... still a leader in amateur radio

There are a lot of good reasons. We know that we have provided the kind of equipment and service that thousands of amateurs have come to expect. They keep coming back. We'll do our best to see to it that they, and you, have every reason for coming back.

- * A large inventory of fine equipment from the world's leading manufacturers.
- * A knowledgeable staff dedicated to amateur radio.
- * A complete line of accessories.
- * A well stocked repair shop staffed by experienced technicians.
- * We take trade-ins and sell used equipment.
- * Generous discounts on cash purchases.
- * We carry our own financing.

Some of the names we stock include:
 HENRY • TEMPO • KENWOOD • ICOM • YAESU • ACE • ADVANCED
 RECEIVER RESEARCH • AEA • ALINCO • AMECO • AMPHENOL • ASTATIC •
 ANTRONIC • ARCO • ARRL • ASTRON • B&K • B&W • BEARCAT •
 BECKMAN • BENCHER • BIRD • BUTTERNUT • CES • CETRON •
 CENTURIAN • COLLINS • COMMUNICATIONS SPECIALISTS • CONNECT
 SYSTEMS • CURTIS • CUSHCRAFT • DAIWA • DIGIMAX • DOWKEY •
 DRAKE • EIMAC • FANON • GE • HAL • HUSTLER • HY GAIN • JIL •
 KENPRO • LANDWEHR • LARSEN • LUNAR •
 CONTROL SPECIALTIES • J. W. MILLER • MINI PRODUCTS • MIRAGE/KLM
 • WM. M. NYE • PALOMAR • PIPO • SANYO • SIMPSON • SWITCHCRAFT
 • TRAC • TRANSCOM • TRIEX • TRIPPLITE • TX/RX • UNADILLA •
 VIBROPLEX



2050 S. Bundy Dr., Los Angeles, CA 90025 (213) 820-1234
 Butler, Missouri 64730 (816) 679-3127
 TOLL FREE ORDER NUMBER: (800) 421-6631 For most areas except California. Calif. residents please call collect on our regular numbers.

Telex: 67-3625 (Henradio)
 FAX (213) 826-7790

Henry Radio



KENWOOD

...pacesetter in Amateur radio

NEW!
Computer Interface

“DX-celence!”

TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

• **100% duty cycle transmitter.**

Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.

• **High stability, dual digital VFOs.**

An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning “feel!”

• **Graphic display of operating features.**

Exclusive multi-function LCD sub-

display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.

• **Low distortion transmitter.**

Kenwood's unique transmitter design delivers top “quality Kenwood” sound.

• **Keyboard entry frequency selection.**

Operating frequencies may be directly entered into the TS-940S without using the VFO knob.

• **QRM-fighting features.**

Remove “rotten QRM” with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.

• **Built-in FM, plus SSB, CW, AM, FSK.**

• **Semi or full break-in (QSK) CW.**

• **40 memory channels.**

Mode and frequency may be stored in 4 groups of 10 channels each.

• **Programmable scanning.**

• **General coverage receiver.**

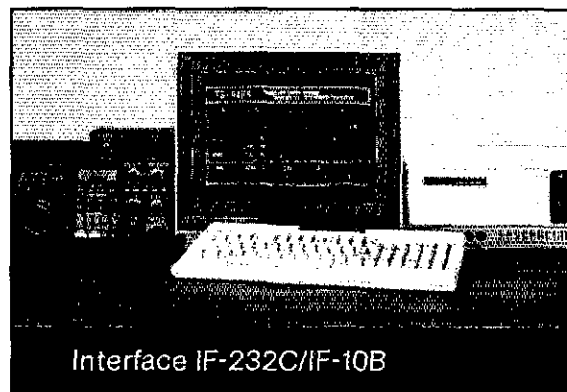
Tunes from 150 kHz to 30 MHz.

• **1 yr. limited warranty.**

Another Kenwood First!

Optional accessories:

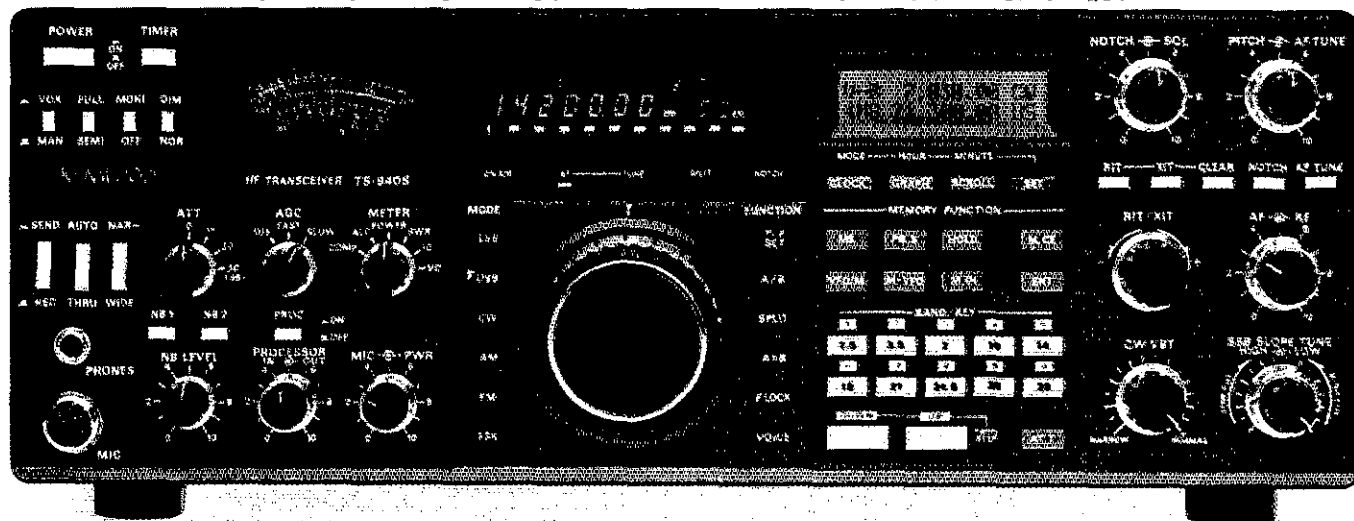
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external



Interface IF-232C/IF-10B

speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.

SEE THE TS-940S PRODUCT REVIEW IN THE FEBRUARY 1986 ISSUE OF QST



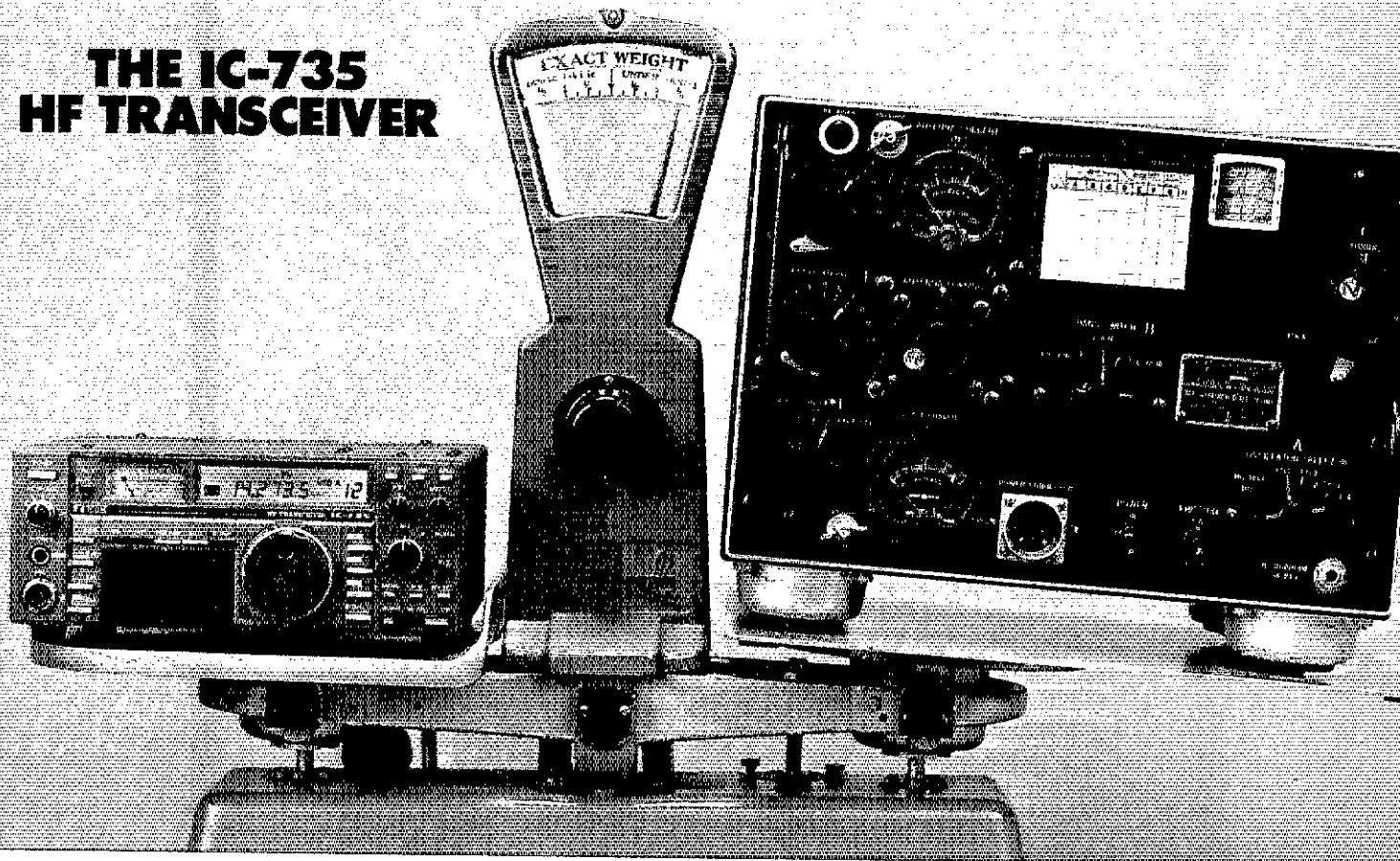
More TS-940S information is available from authorized Kenwood dealers.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

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

THE IC-735 HF TRANSCEIVER



BUY YOUR HF FOR PERFORMANCE, NOT BY THE POUND

- All HF Band Transceiver/
• General Coverage Receiver
- HM-12 Scanning Mic Included
- 12 Memories/Frequency and
Mode
- 105dB Dynamic Range
- All Modes Built-In USB, LSB,
AM, FM, CW

The IC-735 is a heavyweight when you compare features and performance. Other transceivers may weigh more than the advanced IC-735 compact HF transceiver, but inch-for-inch and pound-for-pound, the IC-735 outweighs them all.

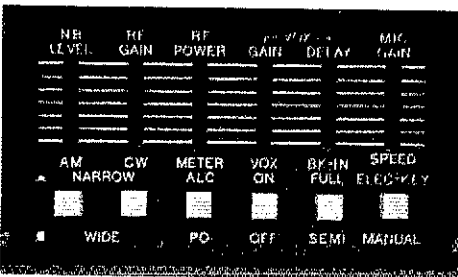
Ultra Compact. Measures only 3.7 inches high by 9.5 inches wide by 9 inches deep and weighs only 11.1 pounds. Without question, the IC-735 is the best HF transceiver for mobile, marine or base station amateur operation.

All Amateur Band Coverage. It's a high performer on all the ham bands, plus it includes general coverage reception from 100kHz to 30MHz. May be easily modified for MARS operation.

12 Memories. Frequency and MODE may be easily stored and retrieved in the 12 tunable memories.

Exceptional Receiver. To enhance receiver performance, the IC-735 has a built-in receiver attenuator, preamp, and noise blanker. PLUS it has a 105dB dynamic range and a technologically advanced low-noise phase locked loop for extremely quiet rock-solid reception.

Simplified Front Panel. Controls which require infrequent adjustment are placed behind a unique hatch cover on the front panel of the radio. The hatch cover is designed to protect seldom used controls from being accidentally knocked off line, but also provides easy access. The large LCD readout and con-



veniently located controls enable easy operation, especially important for the mobile environment.

More Features. FM built-in, HM-12 scanning mic, program scan, mode scan and memory scan. Switchable AGC, automatic SSB selection by band and RF speech processor. Continuously adjustable output power up to 100 watts, 12V operation, 100% duty cycle and deep tunable notch filter.

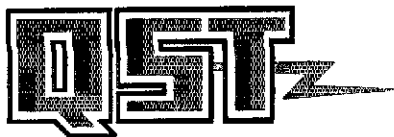
Options. A new line of accessories are available, including the AH-2 mobile antenna system, AT-150 whisper quiet automatic bandswitching antenna tuner for base station operation and the PS-55 power supply. The IC-735 is also compatible with most of ICOM's existing line of HF accessories.

See the IC-735 performance heavyweight at your local authorized ICOM dealer.



ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3150 Premier Drive, Suite 126, Irving, TX 75063
ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 735-108



March 1987 Volume LXXI Number 3

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

David Sumner, K1ZZ
Publisher
 Paul L. Rinaldo, W4RI
Editor
 E. Laird Campbell, W1CUT
Managing Editor
 Joel P. Kleinman, N1BKE
Assistant Managing Editor
 Andrew Tripp, KA1JGG
Editorial Supervisor, Up Front in QST
 Paula McKnight, N1DNB
Editorial Assistant, Strays
 Charles L. Hutchinson, K8CH
Technical Editor
 Gerald L. Hall, K1TD
Associate Technical Editor
 Paul Pagel, N1FB, Mark J. Wilson, AA2Z
Senior Assistant Technical Editors
 Larry D. Wolfgang, WA3VIL, Robert Scheigen, KU7G,
 Bruce O. Williams, WA6IVC, David Newkirk, AK7M,
 Bruce S. Hale, KB1MW
Assistant Technical Editors
 Maureen Thompson, KA1DYZ
Technical Editorial Assistant
 Phillip M. Sager, WB4FDT
Happenings, League Lines
 John C. Hennessee, KJ4KB
Correspondence, Washington Mailbox
 Michael F. Riley, KX1B
Public Service
 Billy Lunt, KR1R
Contests
 Donald B. Search, W3AZD
DXCC
 Lee Hayford, AH2W
Club Spectrum
 John Foss, W7KQW
Exploring Ham Radio
 Robert J. Halprin, K1XA, Richard K. Palm, K1CE
Editorial Associates
 Ed Tilton, W1HDQ, John Troster, W6ISQ,
 William A. Tynan, W3XO, Stan Horzepa, WA1LOU,
 Harry MacLean, VE3GRO, Bob Atkins, KA1GT,
 Ellen White, W1YL4, Richard L. Baldwin, W1RU,
 John Huntoon, W1RW, Doug DeMaw, W1FB/B,
 Scott Springate, N7DDM, Vern Riportella, WA2LQQ,
 Joan Gibson, KG1F
Contributing Editors
 Michelle Chrisjohn, WB1ENT, *Production Supervisor*
 D. J. Strzeszkowski, *Assistant Production Supervisor*
 Sue Fagan, *Graphic Design Supervisor*
 David Pingree, *Technical Illustrator*
 Jodi Morin, KA1JPA, Leslie K. Bartoloth, KA1MJP,
Layout Artists
 Rose Cyr, Sandra L. Damato, *Typesetters*
Production Staff
 Staffie Nelson, KA1IFB
Proofreader
 Lee Aurick, W1SE
Advertising Manager
 Sandy Gerli, AC1Y
Deputy Advertising Manager
 Debra Chapor
Circulation Manager
 Beth A. Douglass
Deputy Circulation Manager

Offices
 225 Main St, Newington, CT 06111 USA
 Telephone: 203-666-1541
 Telex: 650215-5052 MCI

Subscription rate: \$25 per year postpaid in the US and Posses-
 sions and \$33 elsewhere. All payments must be in US funds.
 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. Individuals may apply for
 membership at the rates shown. Canadians apply to CRRL
 Headquarters, address on page 8. Licensed Amateur Radio
 operators over 65—\$20 US, \$28 elsewhere, plus proof of age.
 Persons age 17 or under may qualify for special rates. Fifty
 percent of dues is allocated to QST, the balance for member-
 ship. Single copies \$3.00.

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

Copyright © 1987 by the American Radio Relay League, Inc.
 Title registered at US Patent Office. International copyright
 secured. All rights reserved. *Quedan reservados todos los
 derechos.* Printed in USA

QST is available to blind and physically handicapped individuals
 on flexible discs 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

With the support of the amateur
 community, the ARRL Visitors' Center
 promises to be a showcase for our
 technical achievements, a recruitment tool
 and a place for League members to visit
 time and again. Details on the proposal
 are in the article beginning on page 53.
(model by Tai Soo Kim, Architect)



CONTENTS

TECHNICAL

- 17 The Shopper's Guide to Packet-Radio TNCs *Stan Horzepa, WA1LOU*
- 22 Monolithic Microwave Integrated Circuits—Part 2 *Al Ward, WB5LUA*
- 29 The Omni-Shift Tuner—A Comprehensive Tuning System
 for HF Packet/AMTOR/RTTY *Richard A. Nelson, WB0IKN*
- 34 *Under Construction: How to Build and Use Balun Transformers*
Doug DeMaw, W1FB
- 38 The Hidden Dangers of Electrostatic Discharge—ESD *David S. Hollander, N7RK*
- 41 *Product Review: Trio-Kenwood TR-751A 144-MHz All-Mode Transceiver*

NEWS AND FEATURES

- 9 *It Seems to Us: Novices Join the Mainstream*
- 11 *Up Front in QST*
- 15 *Novice Enhancement: It's Here!* *Curt Holsopple, K9CH*
- 47 *Novice Notes: How About Used Gear for 80- and 40-Meter CW?*
Larry Lisle, K9KZT
- 51 *What's a Special Service Club All About?* *Rich Moseson, N2BFG*
- 53 *Next Steps into the ARRL Visitors' Center* *Phillip M. Sager, WB4FDT*
- 55 *ARRL Board Meets in Hartford...* *Steve Place, WB1EYI*
- 62 *Happenings: Written Examination Credit: Effective February 13!*
- 69 *Washington Mailbox: Information, Cooperation and Action:
 The Keys to Solving RFI*
- 71 *IARU News: This and That from Here and There*
- 82 *Public Service: Vive la Révolution!*

OPERATING

- 85 *Results, Tenth Annual ARRL International EME Competition*
Michael B. Kaczynski, W1OD and Billy Lunt, KR1R
- 80 *Results, First ARRL 10-GHz Cumulative Contest* *Mark Wilson, AA2Z*

DEPARTMENTS

Amateur Satellite Communications	70	League Lines	14
Canadian NewsFronts	74	Making Waves	73
Club Spectrum	72	Mini Directory	75
Coming Conventions	89	Moved and Seconded	57
Contest Corral	91	The New Frontier	77
Correspondence	64	New Products	37, 44
DX Century Club	68	QSL Corner	67
Exam Information	63	Section News	93
FM/RPT	75	Silent Keys	81
Ham Ads	149	Special Events	92
Hamfest Calendar	89	The World Above 50 MHz	78
Hints and Kinks	45	W1AW Schedule	78
How's DX?	65	YL News and Views	80
Index of Advertisers	170	50 and 25 Years Ago	81

Or This Inexpensive It Really Shouldn't Be This Easy

Remember just a few years ago, how it took a roomful of equipment just to work RTTY. And if you wanted more than one mode it took a dedicated computer system costing thousands of dollars. The new AEA Pakratts are proving it doesn't take lots of equipment or money to enjoy working all bands in five different modes.

First, A Good Idea

The idea behind the Pakratt is very simple. One controller that does Morse, Baudot, ASCII, AMTOR, and Packet, and works both HF and VHF bands. Of course the decoding, protocol, and signal processing software must be included in the unit, and connection to the computer and transceiver have to be easy. The unit also has to be small and require only 12 volts, so it will work both in the shack and on the road.

Second, Computer Compatible

It doesn't matter what kind of computer you have, we have a Pakratt for you. The PK-64 works with the popular Commodore 64 or 128, and the PK-232 works with any other computer or terminal that has an RS-232 serial port. The PK-64 doesn't require any additional programs. Simply connect to the computer and transceiver and you're on the air. The PK-232 needs a terminal or modem program for your computer. The one you're using with your telephone modem will work just fine.

Fourth, AEA Quality and Price

Not many manufacturers like to discuss quality and price at the same time. AEA thinks you want high quality and low price in any product you buy, so that's what you get with the Pakratts. Ask any friend who owns AEA gear about our quality. The people who buy our products are our best salespeople. As for price, the PK-64 costs \$219.95, or \$319.95 with the HF option. The PK-64A, an enhanced software unit with a longer flexible computer cable, costs \$269.95 or \$369.95 with the HF option. The PK-232 costs \$319.95 with the HF modem included. All prices are Amateur Net and available from your favorite amateur radio dealer. For more information contact your local dealer or AEA.

Prices and specifications subject to change without notice or obligation.

PAKRATT™ Model PK-64



PAKRATT™ Model PK-232

Third, Performance and Features

The real measure of any data controller is what kind of on-air performance it gives. While the PK-64 and PK-232 use different types of modems, both give excellent performance on VHF. The optional HF modem of the PK-64 uses independent four-pole Chebyshev filters for both Mark and Space tones, and A.M. detection. The HF option can be factory or field installed.

The PK-232 uses an eight-pole bandpass filter followed by a limiter discriminator with automatic threshold correction. The internal modem automatically selects the filter parameters, CW $F_c = 800$ Hz, BW = 200 Hz; HF $F_c = 2210$ Hz, BW = 450 Hz; VHF $F_c = 1700$ Hz, BW = 2600 Hz.

The PK-64 uses on screen indicators to show status, mode, and DCD (Data Carrier Detect) while the PK-232 uses front panel indicators. Both units use discriminator style tuning for HF operation. And that's just the tip of the iceberg. Features like multiple connects on packet, hardware HDLC, CW speed tracking, and other standard AEA software features are included in both the PK-64 and PK-232.

AEA

Advanced Electronic Applications, Inc.
P.O. Box C-2160, Lynnwood, WA 98036-0918
206-775-7373 Telex 6972496 AEA INTL UW

THE BIGGEST IMPROVEMENT IN YOUR SPACE

A PART FOR PART BOOMER 215WB AND 124WB

Best gain for two element antennas in a simplex sideband or Packet mode. **124WB** is the choice of more active hams. For gain and directivity in a limited space, **124WB** with wideband technology, is the newest Boomer.

Both models include time proven computer designed features with T match driven elements for lowest SWR over the entire two meter band. The strong construction is heavy wall tubing, solid aluminum rod elements plus all stainless steel hardware, and precision machine formed components. You will also like the quick easy assembly of these antennas.

Make Boomer your choice today for more 2 meter enjoyment.

SPECIFICATIONS

124WB 215WB

Frequency MHz	144-148	144-148
Gain	Excellent	
F/B Ratio dB	Excellent	
Boom length ft	4	15
Beam width Deg.		
E Plane	2 x 30	2 x 17
H Plane	2 x 42	2 x 18
Weight lbs	3	8

SHOULD BE ON THE TOWER

ANT FACTS

NEARBY OBJECTS

Sometimes nearby objects have an adverse effect on antennas. Usually, these effects do not alter performance significantly. Minute effects may be detected by measuring the SWR while rotating the antenna. Guy wires, powerlines, the ground, houses and other antennas are most common objects in your antennas near field. On the air tests are an excellent way to check overall performance. Placing your antenna as high and in the clear as possible will normally produce excellent results.



Cushcraft ANTENNAS



P.O. BOX 4680, 48 Perimeter Road, Manchester, NH 03108 USA • Telephone: 603-627-7877
Telex: 4949472 Cushsig Man

KENWOOD

...pacesetter in Amateur radio

NOW!
70 cm

All Mode Mobility!

TR-751A/851A

Compact all mode transceivers

It's the "New Sound" on the 2 meter band—Kenwood's TR-751A! Automatic mode selection, versatile scanning functions, illuminated multi-function LCD and status lights all contribute to the rig's ease-of-operation. All this and more in a compact package for VHF stations on-the-go!

• Automatic mode selection, plus LSB
144.0 144.1 144.5 145.8 146.0 148.0 MHz

CW	USB	FM	USB	FM
----	-----	----	-----	----

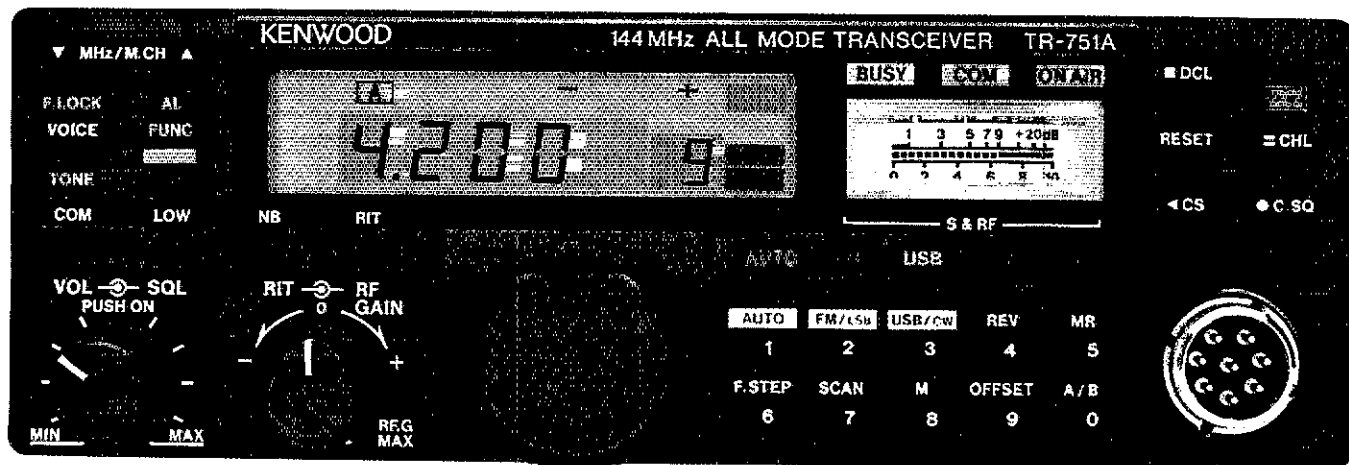
- Optional front panel-selectable 38-tone CTCSS encoder
- Frequency range 142-149 MHz (modifiable to cover 141-151 MHz)
- High performance receiver with GaAs FET front end
- VS-1 voice synthesizer option

- 25 watts high/5 watts adjustable low
- Programmable scanning—memory, band, or mode scan with "COM" channel and priority alert
- 10 memory channels for frequency, mode, CTCSS tone, offset. Two channels for odd splits.
- All mode squelch, noise blanker, and RIT
- Easy-to-read analog S & RF meter

- Dual digital VFOs
- Semi break-in CW with side tone
- MC-48 16-key DTMF hand microphone and microphone hook included
- Frequency lock, offset, reverse switches
- Digital Channel Link (DCL) option

Optional accessories:

- CD-10 call sign display
- PS-430, PS-30 DC power supplies
- SW-100A/B SWR/power meter
- SW-200A/B SWR/power meter
- SWT-1 2 m antenna tuner
- SWT-2 70 cm antenna tuner
- TU-7 38-tone CTCSS encoder
- MU-1 modem unit for DCL system
- VS-1 voice synthesizer
- MB-10 extra mobile mount
- SP-40, SP-50B mobile speakers
- PG-2N extra DC cable
- PG-3B DC line noise filter
- MC-60A, MC-80, MC-85 deluxe base station mics.
- MC-43S UP/DOWN mic.
- MC-55 (8-pin) mobile mic.
- MA-4000 dual band antenna with duplexer



Actual size front panel

TR-851A

70 cm SSB/CW/FM transceiver

The same winning features are yours on 70 cm with the TR-851A!

- Covers 430-439.999 MHz
- 25 W high power/5 W adjustable low
- MC-43S UP/DOWN mic. and mic hook included



KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation. Specifications guaranteed for the 144-148 MHz Amateur band only.

KENWOOD

...pacesetter in Amateur radio

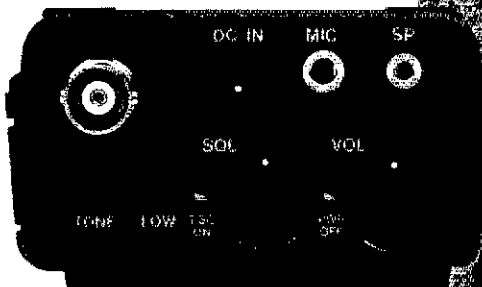
NEW!

This HT Has it All!

TH-215A/415A

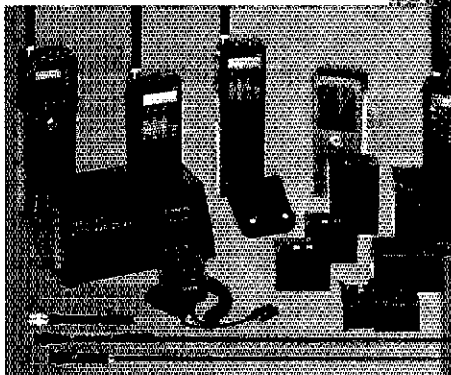
Full-featured Hand-held Transceivers

Kenwood brings you the greatest hand-held transceiver ever! More than just "big rig performance," the new TH-215A for 2 m and TH-415A for 70 cm pack the most features and the best performance in a handy size. And our full line of accessories will let you go from hamshack to portable to mobile with the greatest of ease!



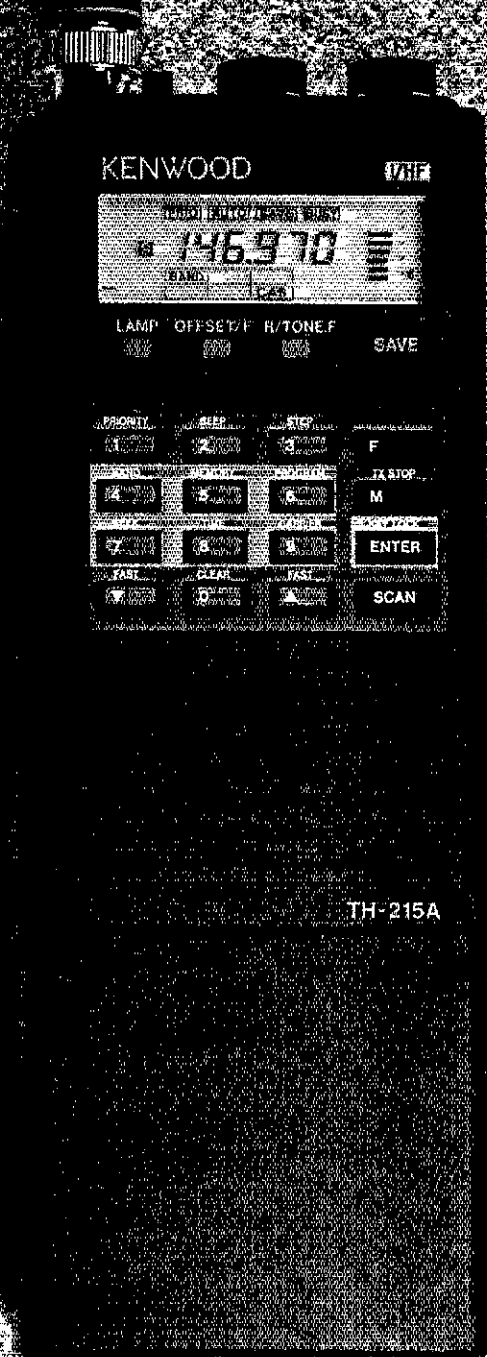
- **Wide receiver frequency range.** Receives from 141-163 MHz. Includes the weather channels! Transmit from 144-148 MHz. Modifiable to cover 141-151 MHz (MARS or CAP permit required).
- **TH-415A covers 440-449.995 MHz.**
- **5, 2.5, or 1.5 W output, depending on the power source.** Supplied battery pack (PB-2) provides 2.5 W output. Optional NiCd packs for extended operation or higher RF output available.
- **CTCSS encoder built-in.** TSU-4 CTCSS decoder optional.
- **10 memory channels store any offset, in 100-kHz steps.** Each memory channel can store frequency, frequency step, offset, reverse switch position, and CTCSS frequency.
- **Nine types of scanning!** Including new "seek scan" and priority alert.
- **Intelligent 2-way battery saver circuit extends battery life.** Two battery-saver modes to choose, with power save ratio selection.
- **Easy memory recall.** Simply press the channel number!
- **12 VDC input terminal for direct mobile or base station supply operation.** When 12 volts is applied, RF output is 5 W!
- **New Twist-Lok Positive-Connect™ locking battery case.**
- **Frequency entry by keyboard or UP/DWN keys.**
- **Priority alert function.**
- **Monitor switch to defeat squelch.** Used to check the frequency when CTCSS encode/decode is used or when squelch is on.

- **Large, easy-to-read multi-function LCD display with night light.**
- **Audible beeper to confirm keypad operation.** The beeper has a unique tone for each key. DTMF monitor also included.
- **Supplied accessories:** Belt hook, rubber flex antenna, PB-2 standard NiCd battery pack (for 2.5 W operation), wall charger, dust caps.



Optional Accessories:

- PB-1: 12 V, 800 mAh NiCd pack for 5 W output
- PB-2: 8.4 V, 500 mAh NiCd pack (2.5 W output)
- PB-3: 7.2 V, 800 mAh NiCd pack (1.5 W output)
- PB-4: 7.2 V, 1600 mAh NiCd pack (1.5 W output)
- BI-5 AA cell manganese alkaline battery case
- BC-7 rapid charger for PB-1, 2, 3, or 4
- BC-8 Compact battery charger
- SMC-30 speaker microphone
- SC-12, 13 soft cases
- RA-3, 5 telescoping antennas
- RA-8B StubbyDuk antenna
- TSU-4 CTCSS decode unit
- VB-2530: 2m, 25 W amplifier
- LH-4, 5 leather cases
- MB-4 mobile bracket
- BH-5 swivel mount
- PG-2V DC cable
- PG-3C cigarette lighter cord with filter



TH-215A

TH-215A shown

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
111 West Walnut Street
Compton, California 90220

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

Directors

Canada

THOMAS B. J. ATKINS, VE3CDM,
55 Havenbrook Blvd, Willowdale, ON M2J 1A7
(416-494-8721)

Vice Director: Harry MacLean, VE3GRO,
500 Riverside Dr, London, ON N6H 2R7
(519-473-1668)

Atlantic Division

HUGH A. TURNBULL, W3ABC, 6903 Rhode Island
Ave, College Park, MD 20740 (301-927-1797)

Vice Director: James M. Mozley, W2BCH, 126
Windcrest Dr, Camillus, NY 13031 (315-488-9051)

Central Division

EDMOND A. METZGER, W9PRN, 1520 South
Fourth St, Springfield, IL 62703 (217-523-5861)

Vice Director: Howard S. Huntington, K9KIM,
65 South Burr Oak Dr, Lake Zurich, IL 60047

Dakota Division

HOWARD MARK, W0QZC, 11702 River Hills Dr,
Burnsville, MN 55337 (612-890-9114)

Vice Director: Richard Whiting, W0TN, 4749 Diane
Dr, Minnetonka, MN 55343 (612-938-6652)

Delta Division

CLYDE O. HURLBERT, * W5CH, PO Box 502,
Biloxi, MS 39533-0502 (601-435-5544)

Vice Director: Lionel A. "Al" Oubre, K5DPG, Star
Route A, Box 185-E, New Iberia, LA 70560
(318-367-3901)

Great Lakes Division

GEORGE S. WILSON, III, * W4OYI, 1649 Griffith Ave,
Owensboro, KY 42301

Vice Director: Allan L. Severson, AB8P, 1275 Ethel
Ave, Lakewood, OH 44107 (216-521-1555)

Hudson Division

STEPHEN A. MENDELSON, WA2DHF, 318 New
Milford, Ave, Dumont, NJ 07628 (201-384-0570/0680)

Vice Director: Paul Vydareny, WB2VJK,
259 N Washington St, N Tarrytown, NY 10591-2314
(914-631-7424)

Midwest Division

PAUL GRAUER, * W0FIR, Box 190, Wilson, KS
67490 (913-658-2155)

Vice Director: Richard Ridenour, KB0ZL,
9 Lake Pembroke Dr, Ferguson, MO 63135
(314-521-2520)

New England Division

TOM FRENAYE, K1KI, 23 Pinehurst Rd,
Box 62, Unionville, CT 06085 (203-673-5429)

Vice Director: Robert Weinstock, KN1K, 26 Sewell St,
Framingham, MA 01701-6001 (617-492-9225)

Northwestern Division

RUSH S. DRAKE, W7RM, Rte 2, Box 372 AC
La Center, WA 98629 (206-263-3048)

Vice Director: William R. Shrader, W7QMU
2042 Jasmine Ave, Medford, OR 97501
(503-773-8624)

Pacific Division

RODNEY J. STAFFORD, KB6ZV, 5155 Shadow
Estates, San Jose, CA 95135 (408-274-0492)

Vice Director: James Knochenhauer, K8ITL,
133 Sylvan Ave, San Mateo, CA 94403
(415-345-9511)

Roanoke Division

NAV E. MILIUS, JR, W4UG,
1416 Rutland Dr, Virginia Beach, VA 23454
(804-481-5095)

Vice Director: John C. Kanode, N4MM,
RFD 1, Box 73-A, Boyce, VA 22620 (703-837-1340)

Rocky Mountain Division

MARSHALL QUIAT, AG0X, 1860 Wynkoop, Suite 850
Denver, CO 80202 (303-333-0819)

Vice Director: Hugh Winter, W5HD, Box 14904
Albuquerque, NM 87191 (505-293-5735)

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,
11552 Gail La, Garden Grove, CA 92640
(714-539-6849)

West Gulf Division

JIM HAYNIE, WB5JBP, 3226 Newcastle Dr
Dallas, TX 75220 (214-352-6180) home;
11837 Judd Ct, #114, Dallas, TX 75243
(214-437-1363) business

Vice Director: Thomas W. 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 16 divisions of the League are further arranged into 73 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.

Canada

Alberta
British Columbia
Manitoba
Maritime/Nfld
Ontario
Quebec
Saskatchewan

Atlantic Division

Delaware
Eastern Pennsylvania
Maryland-DC
Southern New Jersey
Western New York
Western Pennsylvania

Central Division

Illinois
Indiana
Wisconsin

Dakota Division

Minnesota
North Dakota
South Dakota

Delta Division

Arkansas
Louisiana
Mississippi
Tennessee

Great Lakes Division

Kentucky
Michigan
Ohio

Hudson Division

Eastern New York
NYC-Long Island
Northern New Jersey

Midwest Division

Iowa
Kansas
Missouri

Nebraska

New England Division

Connecticut
Eastern Massachusetts
Maine
New Hampshire
Rhode Island
Vermont
Western Massachusetts

Northwestern Division

Alaska
Idaho
Montana
Oregon
Washington

Pacific Division

East Bay
Nevada
Pacific
Sacramento Valley
San Francisco

San Joaquin Valley
Santa Clara Valley

Roanoke Division

North Carolina
South Carolina
Virginia
West Virginia

Rocky Mountain Division

Colorado
New Mexico
Utah
Wyoming

Southeastern Division

Alabama
Georgia
Northern Florida
Southern Florida
West Indies

Southwestern Division

Arizona
Los Angeles
Orange
San Diego
Santa Barbara

West Gulf Division

Northern Texas
Oklahoma
Southern Texas

Bill Gillaspie, VE6ABC, 10932 68 Ave, Edmonton, T6H 2C1 (403-438-2510)
H. E. Savage, VE7FB, 4553 West 12th Ave, Vancouver V6R 2R4 (604-224-5226)
Jack Adams, VE4AJE, 227 Davidson Ave E, Dauphin R7N 2Z4 (204-638-9270)
Leigh Hawkes, VE1GA, Box 864, Armdale, NS B3L 4K5 (902-443-6360)
L. P. Thivierge, VE3GT, 34 Bruce St W, Renfrew K7V 3W1 (613-432-5967)
Harold Moreau, VE2BP, 80 Principale St, Simon Co, Bagot J0H 1Y8 (514-798-2173)
Gordon Kosmenko, VE5GF, 59 Kowalchuk Cres, Regina, S4R 6W7 (306-543-7923)

Harold K. Low, WA3WIY, Rte 6, Box 66, Millsboro 19966 (302-945-2871)
Kay C. Craigie, KC3LM, 128 Berkeley Rd, Devon 19333 (215-688-5045)
John A. Barolet, KJ3E, 108 Elliott Ct, California, MD 20619 (301-862-3201)
Richard Baier, WA2HEB, 1226 Audubon Dr, Toms River 08753 (201-270-9292)
William Thompson, W2MTA, RD 1—Rock Rd, Newark Valley 13811 (607-642-8930)
Otto Schuler, K3SMB, 3732 Colby St, Pittsburgh 15214 (412-231-6890)

David E. Lattan, WD9EBQ, RR 1, Box 234, Makanda 62958 (618-529-1578)
Ronald J. Koczor, K9TUS, 2512 Glenwood Ave, Fort Wayne 46805 (219-483-1365)
Richard R. Regent, K9GDF, 5003 South 26th St, Milwaukee 53221 (414-282-0312)

George E. Frederickson, KC0T, RR #2—Box 352, South Haven 55392 (612-558-6312)
Roger "Bill" Kurtti, N0AFP, Rural Route—Box 34, Rock Lane 58365
Roland Cory, W0YMB, 1010 7th St, W. Moberg 57601 (605-845-2400)

Joel M. Harrison, Sr., WB5IGF, Star Rte 3—Box 306, Judsonia 72081 (501-729-3301)
John M. Wondergem, K5KR, 600 Smith Dr, Metairie 70005 (504-837-1485)
Paul Kemp, KW5T, 3581 Beaumont Dr, Pearl 39208 (601-939-7812)
John C. Brown, N0AQ, PO Box 37, Eva 38333 (901-584-7531)

Dale Bennett, WA4JE, 320 Loy St, Columbia 42728 (502-384-2639)
James R. Seelye, WB8MTD, 21615-29½ Mile Rd, Springport 49284 (517-857-2013)
Jeffrey A. Maass, K8ND, 9256 Concord Rd, Powell 43065 (614-873-3234)

Paul S. Vydareny, WB2VUK, 259 N Washington, North Tarrytown 10591 (914-631-7424)
John H. Smale, K2IZ, 315 Kensington Ct, Copiague 11726 (616-226-4835)
Robert R. Anderson, K2BJG, 69 Page Dr, Oakland 07436 (201-337-9644)

Rollin J. Sievers, WB6AVW, Rte 3-Box 62, Storm Lake 50588 (712-732-2085)
Robert M. Summers, K0BXF, 3045 North 72nd, Kansas City 66109 (913-299-1128)
Benton C. Smith, K0PCK, 3301 Sinclair, Rte 3, Box 196-A, Columbia 65203
(314-443-5168)
Vern J. Wirka, WB0GQM, 3106 Vinton, Omaha 68105 (402-341-4572)

John T. Ronan, K3ZJJ, 114 Old Redding Rd, Weston 06883 (203-226-3388)
Luck Hurdur, KY1T, PO Box LL, North Eastham 02651 (617-255-2029)
Clevio O. Laverty, W1RWG, 17 Fair St, Norway 04268 (207-743-2353)
William Burden, WB1BRE, 11 Briand, Nashua 03063 (603-882-0021)
John Vota, WB1FDY, 41 Brookside Ave, Centerdale 02911 (401-231-1934)
Frank I. Sultor, W1CTM, 727 North Ave, Burlington 05401 (802-863-5907)
William C. Voedisch, W1UD, 240 Main St, Leominster 01453

James L. Moody, Jr., N17C, PO Box 102841, Anchorage 99510 (907-694-4077)
Don Clower, KA7T, 5103 W. Cherry Ln, Meridian 83642 (208-888-7020)
L. C. "Les" Belyea, N7AIK, PO Box 327, Belgrade 59714 (406-388-4253)
Randy Stimson, KZ7T, 9890 SW Inglewood St, Portland 97225 (503-297-1175)
Brad Welis, KR7L, 1290 Puget Dr, E, Port Orchard 98366 (206-871-6546)

Bob Valio, W6RGG, 18655 Sheffield Rd, Castro Valley, CA 94546 (415-537-6704)
Joseph D. Lambert, W8IXD, PO Box 1201, Boulder City 89005 (702-294-0505)
Army Curtis, AH6P, PO Box 4271, Hilo, HI 96720 (808-935-8893)
Robert H. Watson, W6IEW, 10994 Clinton Bar Rd, Pine Grove, CA 95665 (209-223-0101)
Robert Odell Smith, NA6T, 320 Park St—PO Box 1425, Fort Bragg, CA 95437
(707-964-4931)

Charles P. McConnell, W6DPD, 1658 W Mesa Ave, Fresno, CA 93711 (209-431-2038)
Glenn Thomas, WB6W, 554 Simas Dr, Milpitas, CA 95035 (408-263-9450)

Rae Everhart, K4SWN, PO Box 41, Lexington 27293-0041 (704-249-8734)
James G. Walker, WD4HLZ, Rte 1, Box 5395, Marion 29571 (803-423-3645)
Claude E. Feigley, W3ATQ, 135 The Main—RR #1, Williamsburg 23185 (804-253-0658)
Karl S. Thompson, K8KT, 5303 Pioneer Dr, Charleston 25312 (304-776-4352)

William "Bill" Sheffield, KQ0J, 1444 Roslyn St, Denver 80220 (303-355-2488)
Joe Knight, W5PDY, 10408 Snow Heights Blvd, NE, Albuquerque 87112 (505-299-4581)
James R. Brown, NA7G, 865 Manchester Rd, Kaysville 84037 (801-544-0056)
Richard G. Wunder, WA7WFC, Box 2807, Cheyenne 82003 (307-634-7385)

Joseph E. Smith, Jr., WA4RNP, 1211 13th St, N, Bessemer 35020 (205-424-4866)
Edmund J. Kosubicki, K4JNL, 5525 Perry Ave, Columbus 31909 (404-322-2856)
Royal V. Mackey, N4ADI, 161 Shell Point W, Maitland 32751 (305-644-5905)
Richard D. Hill, WA4PFK, 3800 SW 11th St, Ft. Lauderdale 33312 (305-583-6932)
Alberto L. Valdejuili, WP4CSG, V-11 19 St, Berwind Estates, Rio Piedras, PR 00924

James E. Swafford, W7FF, 5906 W Miramar Dr, Tucson 85715 (602-298-7793)
Eugene R. "Bob" Poole, AJ6F, 2059 Reynosa Dr, Torrance, CA 90501 (213-326-2801)
Jon H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (714-687-8394)
Arthur R. Smith, W6INI, 4515 Melissa Way, San Diego, CA 92117 (619-273-1120)
Byron W. Looney, K6FI, 6540 Buckley Dr, Cambria, CA 93428 (805-927-8733)

Phil Clements, K5PC, 1313 Applegate La, Lewisville 75067 (214-221-8873)
William E. Goswick, K5WG, 12717 S. 124th E. Ave, Broken Arrow 74011 (918-369-2115)
Arthur R. Ross, W5KPL, 132 Sally La, Brownsville 78521 (512-831-4458)



The American Radio Relay League, Inc. is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communications in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1954. Its affairs are governed by a Board of Directors, whose voting members are elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

"Of, by, and for the radio amateur," ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A bona fide interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US and Canada.

Membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA

Telephone: 203-666-1541 Telex: 650215-5052 MCI.

MCI MAIL (electronic mail system) ID: 215-5052

Canadian membership inquiries and correspondence should be directed to CRRL Headquarters, Box 7009, Station E, London, ON N5Y 4J9, tel 519-225-2188.

Founding President

Hiram Percy Maxim, W1AW

Officers

President: LARRY E. PRICE,* W4RA

PO Box 2067, Statesboro, GA 30458

First Vice President: JAY A. HOLLADAY,* W6EJJ,

5128 Jessen Dr, La Canada, CA 91011

(818-790-1725)

Vice President: LEONARD M. NATHANSON,

W8RC, 20833 Southfield Rd, Suite 240,

Southfield, MI 48075 (313-569-3191)

Vice President: WILLIAM J. STEVENS,

W6ZM, 2074 Foxworthy Ave. San Jose, CA 95124

(408-371-3819)

International Affairs Vice President: TOD OLSON,

K8TO, 292 Heather Ln, Long Lake, MN 55356

(612-931-8629)

Executive Vice President: DAVID SUMNER,* K1ZZ

Secretary: PERRY F. WILLIAMS, W1UED

Treasurer: JAMES E. MCCOBB JR, K1LLU

Staff

Washington Area Coordinator

Perry F. Williams, W1UED

Publications

Manager: Paul L. Rinaldo, W4RI

Deputy Manager: John Nelson, W1GNC

Advertising Department

Lee Aurick, W1SE, Manager

Sandy Geril, AC1Y, Deputy Manager

Circulation Department

Debra Chapor, Manager

Beth A. Douglass, Deputy Manager

Production/Editorial Department

Laird Campbell, W1CUT, Manager

Joel Kleinman, N1BKE, Deputy Manager

Technical Department

Charles L. Hutchinson, K8CH, Manager

Gerald L. Hall, K1TD, Deputy Manager

Membership Communications Services

Manager: John F. Lindholm, W1XX

Deputy Manager: Robert J. Halprin, K1XA

Volunteer Resources

Manager: Stephen C. Place, WB1EYI

Volunteer Examiner Department

Jim Clary, WB9IHH, Manager

Club Services Department

Curtis R. Holsopple, K9CH, Manager

Field Services Department

Richard K. Palm, K1CE, Manager

Administrative Services

Controller:

Purchasing/Office Services Department

Kathy McGrath, Manager

Counsel

Christopher D. Imlay, N3AKD

*Executive Committee Member

"It Seems to Us ..."

Novices Join the Mainstream

Richard Nixon was sworn in as President. Neil Armstrong became the first man to set foot on the moon. "Midnight Cowboy" won the Academy Award for Best Motion Picture. The Mets won the World Series in five games. ARRL asked that Technicians be given 10-meter phone privileges. The year was 1969.

Gerald Ford was President. U.S. civilians were evacuated from Saigon as the South Vietnamese government fell. The FBI captured Patty Hearst. The Red Sox lost the World Series to Cincinnati in the seventh game. ARRL asked that Novices be given 220-MHz privileges. The year was 1975.

President Reagan faced his last two years in office with both houses of Congress in Democratic hands. The Dow Jones average smashed the 2000 mark. "Tax Reform" took effect. The Giants won the Super Bowl. Novices were granted 220-MHz privileges, and Technicians (along with Novices) gained 10-meter phone privileges. The year was 1987.

Can it be true, that after so many years Novices and Technicians are getting their long-sought new privileges? In a word, yes. And it portends great things for Amateur Radio.

In a couple of months, Novices will be able to put their present HF rigs on 10-meter SSB. They'll be able to hook up their computers to work RTTY, AMTOR, and packet. They'll be allowed to get on 220 and 1270 MHz and talk to other local hams. The rush to get ready for the "band-warming weekend" already has begun.

Why is this so important? Ask one of the tens of thousands of Novices who have never used their operating privileges or who grew tired of manually sent Morse code before getting around to upgrading. Ask an "Elmer" who has worked patiently with a budding ham, only to have them lose interest. Ask a school radio club advisor who has seen his potential club members drift into

computers and CB.

No longer will the beginning Novice be limited, paradoxically, to the operating mode that requires the greatest amount of operating skill. No longer will the socialization of a new ham have to be conducted at five words per minute. No longer will new and exciting aspects of Amateur Radio be off-limits to enthusiastic newcomers. When the new FCC rules take effect, Novices will join the mainstream of Amateur Radio—we hope to continue on to greater personal achievements and privileges.

In adopting Novice Enhancement essentially as proposed by the League, the FCC added one interesting wrinkle of its own. The present Element 3 written examination for Technician and General is to be split into two parts, Elements 3(A) and 3(B), covering VHF and HF matters, respectively. The Novice wishing to upgrade to Technician will face just a 25-question written exam—which should encourage upgrading. Going on from Technician to General will involve a 25-question written exam in addition to the 13-WPM code test.

In 1983, in response to the FCC proposal to eliminate the Morse code examination requirement, hams acknowledged the need for growth but expressed overwhelming opposition to that particular stimulant. In abandoning its own proposal in the face of this opposition, the FCC entrusted us with responsibility for seeing that Amateur Radio would grow on our own terms rather than theirs. The following year, the ARRL Board set a goal for Amateur Radio growth: 600,000 licensees by the end of the decade. In 1985 the blueprint for achieving that goal was unveiled: Novice Enhancement. Now, in the words of FCC Private Radio Bureau Chief Mike Fitch, "We've provided these new growth tools to Amateur Radio. It's up to the amateur community to put the tools to work."

And with your help, so we shall.

—David Sumner, K1ZZ

Finally, an HT that's built to take the realities of life.

Let's face it. It's easy to bump, drop, or get rain on an HT. ■ But if your HT is Yaesu's mini 2-meter FT-23R or 440-MHz FT-73R, such mishaps are a lot less worrisome. ■ They're built to last, with rugged aluminum-alloy cases that prove themselves reliable in a one-meter drop test onto solid concrete. Plus, their moisture-resistant seals really help keep the rain out.

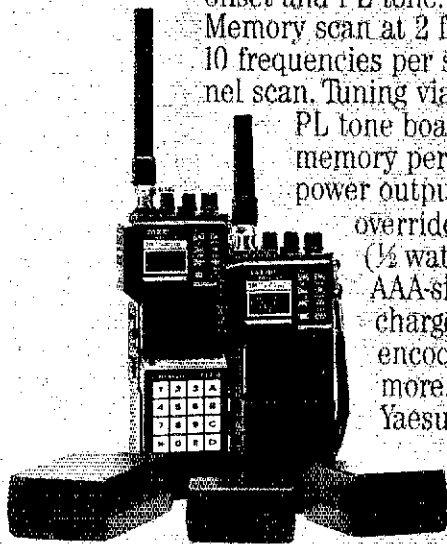
Built for the realities of operating. Despite their miniature size, both radios have all the operating capabilities of larger microprocessor-controlled HTs. Yet operating them couldn't be easier. Consider: ■ You get a 7.2-volt, 2-watt battery pack. (Optionally, a 12-volt, 5-watt pack, or 7.2-volt miniature 2-watt pack.) 10 memories that store frequency, offset and PL tone. (7 memories can store odd splits.)

Memory scan at 2 frequencies per second. Band scan at 10 frequencies per second. Tx offset storage. Priority channel scan. Tuning via tuning knob, or up/down buttons.

PL tone board (optional). PL display. External PL selection. Independent PL memory per channel. PL encode *and* decode. Expanded Rx coverage.* LCD power output and "S"-meter display. Battery saver circuit. Push-button squelch override. Eight-key control pad. Keypad lock. High/low power switch (½ watt on low power.) ■ Options available: Dry cell battery case for 6 AAA-size cells. Dry cell battery case for 6 AA-size cells. DC car adapter/charger. Programmable CTCSS (PL tone) encoder/decoder. DTMF keypad encoder. Mobile hanger bracket. External speaker/microphone. And much more. ■ So get the intelligent mini HT that's built for life's realities. Yaesu's 2-meter FT-23R, or 440-MHz FT-73R.



Radios above shown actual size



YAESU

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. Repair Service: (213) 404-4884. Parts: (213) 404-4847.
Yaesu Cincinnati Service Center 9070 Gold Park Drive, Hamilton, OH 45011. (513) 874-3100

*Modification required. Prices and specifications subject to change without notice. PL is a registered trademark of Motorola, Inc.



NOVICE ENHANCEMENT UPDATE

FCC Gives Stamp of Approval
Details on page 15



Contesting, Microwave Style: The key ingredient was "portable," as amateurs took to the great outdoors as part of a great indoor sport—contesting. That was one of the many exciting aspects of the First ARRL 10-GHz Cumulative Contest, held over two weekends last September and October. Many got the chance to take in some scenic countryside while trying to work the same station from as many locations as possible, such as this group from the Concordia University ARC, VE2CUA, who dragged their dishes to the top of 4393-foot Mt Mansfield in Vermont (FN26) to work the X-band. If you participated, you won't want to miss the contest results on page 87. If you didn't take part, why not check out the article anyway. You might just get inspired to take part in the Second 10-GHz Contest. (VE2DUB photo)

WA9GVK Receives Prestigious Award From Navy

Bruce J. Brown, WA9GVK, of Falls Church, Virginia, has received the Navy Distinguished Civilian Service Award, the highest honorary award that can be given to a civilian employee of the Navy. In presenting the award, Secretary of the Navy John H. Lehman cited Bruce for making "an extraordinary number of notable technical and managerial achievements furthering tactical operations at sea through the design, development and introduction of technological innovations in voice, data, and image communications." Currently Deputy Director for Submarine Electronic Warfare at the Naval Sea Systems Command, Bruce holds seven US patents and has written more than 30 technical papers on signal processing, radar display, communications and circuit design. He has also contributed heavily to the 1985, 1986 and 1987 ARRL *Handbooks* and to the upcoming 1987 edition of the *ARRL Operating Manual*, primarily in the area of image communications. Congratulations, Bruce!



Last Call for National Convention Papers

If you're interested in presenting a paper or forum at the 1987 ARRL National Convention in Atlanta on July 10-12, you'll have to hurry to get your request in. The deadline for prospective presentations is March 1. Technical and operating presentations are

preferred. Inquiries from groups desiring meeting space at the Convention are also welcome. Contact Sandy Donahue, WA4ABY, ARRL National Convention, 960 Ralph McGill Blvd, Atlanta, GA 30306, tel 404-875-9450 (after 5 PM Eastern Time).

Nominations Open for Hiram Percy Maxim Memorial Award

Do you know of any hams under 21 years of age who exemplify the bases and purposes of Amateur Radio? Nominations are open for the Hiram Percy Maxim Memorial Award, given annually in recognition of a young person's accomplishments and contributions in public service, technical development, operating, recruitment, public relations and other amateur-related activities.

In keeping with the tradition of the award since its inception in 1936, formal nominations are made by ARRL Section Managers. So, your nominations and any supporting information, including the endorsement of ARRL-affiliated clubs and elected or appointed League officials, must first be submitted to the appropriate Section Manager for consideration. Nominations should

document only the candidate's achievements during the previous calendar year, and must be received by the Section Manager **no later than June 1, 1987**. Section Managers, in turn, must submit the formal nomination to ARRL HQ by the close of business on June 15 for it to be eligible for consideration by the Volunteer Resources Committee.

There is no limit to the number of nominations that may be submitted by each Section Manager.

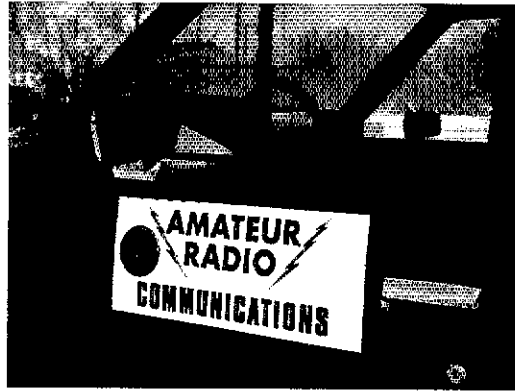
The Maxim Award recipient will receive a cash award of \$1000, an engraved plaque, and travel and accommodations expenses to enable him or her to attend an ARRL Convention, at which a formal presentation of the Award will be made.

Get the Message Across . . .

. . . with magnetic signs, banners, ID cards and any other appropriate items to identify yourself quickly as an authorized Amateur Radio emergency communicator. A magnetic sign on the side of your car can help you get through a roadblock. An ID badge will help relief officials pick you out of a crowd. During parades or other public-service events, a large banner can get your message across clearly to the public that Amateur Radio is providing free, professional-quality communications.

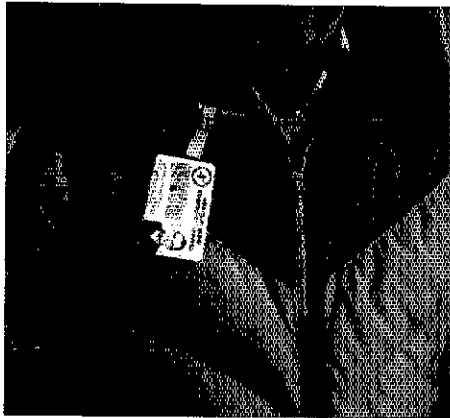
There are several known suppliers of these materials. For instance, San

Diego Section hams have been getting magnetic signs like the one shown above from a local company for some time. Made of sturdy vinyl with a magnetic backing, this 8- by 19-inch sign can be attached and removed easily from metal surfaces, such



as a car door. For years, HQ has supplied Amateur Radio Emergency Service ID cards (shown at left) to the League's grassroots emergency communicators. To protect the ID from wear and the elements, you might put it in a plastic holder or even laminate it, and clip the ID securely to your outerwear.

Another company produces an attractive 8- by 3-foot heavy-vinyl banner with the standard wording "Communications For This Event Provided By Amateur Radio Operators." Customized wording is also available. Contact the ARRL Field Services Department for more information and the names and addresses of some suppliers of these materials. Also, if you know of any reliable vendors, let HQ know; we'll add the names to our list.



Double Vision? Some people driving by the QTH of Jim "Skip" Youngberg, K1NKR, do a double-take when they notice his license plates. A USAF Lieutenant Colonel, Skip maintains two "residences" and has a car registered for each: one in his home state of Rhode Island; the other at the USAF Space Division in California, a state that allows nonresident military personnel to register cars locally. Skip says he's seen a number of second cars for which hams have apparently obtained vanity plates with a modified version of their call (K1NKR-2, for example). He wonders if there are any other hams who have multiple "straight call" plates.

Call for Packet-Radio Papers

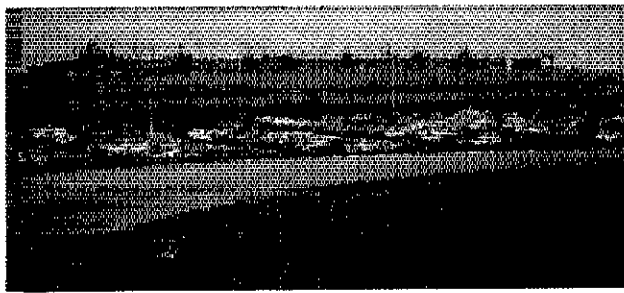
Are you well-versed in some facet of packet radio and wish to share that knowledge with others? You could get a chance to do so at the Sixth ARRL Amateur Radio Computer Networking Conference, to be held August 29, 1987 at Redondo Beach, California. Host for the conference is the TRW Amateur Radio Club. Papers are invited on amateur digital communications, particularly packet radio, including transmission technologies, networking, network expansion and development, applications, operations, message handling, international matters, spectrum management, and integration of data, voice and images. Prospective authors should contact Mrs. Maty Weinberg, ARRL, 225 Main St., Newington, CT 06111, tel 203-666-1541, for an author's kit. Camera-ready originals are due at ARRL HQ no later than July 27, 1987.

Good Ice Breaker: Ever wish you had something to help you explain the benefits of Amateur Radio to your neighbors or to a local zoning board? Enter the new ARRL brochure: *Ham Radio, A Community Resource*. Produced by the Club Services Department, this handy publication answers many of the questions nonhams have concerning Amateur Radio, including who hams are, why formidable-looking antennas are often necessary, how hams provide a public service to their communities and how to find out more about becoming a ham. Contact the ARRL Club Services Department for information on obtaining copies.



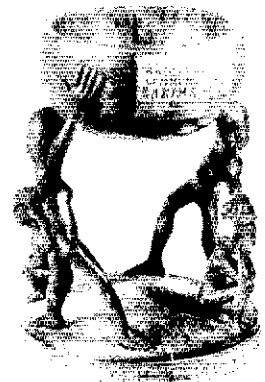
HAM RADIO





QST, Ink: Members know that *QST* is produced each month by the ARRL staff, but few know what happens to it between the time it leaves HQ and reaches their mailboxes. After each issue is prepared at HQ—from writing to editing, to typesetting to layout—it is sent by overnight express mail to R. R. Donnelley & Sons Company, in Glasgow, Kentucky. RRD has printed *QST* since 1976, when the magazine went to a larger format. One of several Donnelley plants, this one specializes in magazines; another plant, in Indiana, printed the 1987 *ARRL Handbook*. After printing and binding are completed, address labels supplied by HQ are put on and the magazine arrives at a post office substation—housed in the plant—for mailing to members. This photo was taken by ARRL Production Supervisor Shelly Chrisjohn, WB1ENT, who visited the printing facility in early November with Layout Artist Jodi Morin, KA1JPA. They timed their visit to coincide with the beginning of the extensive printing process December *QST* would go through.

Elusive Award: Here's one award that has eluded radio amateurs so far—and is likely to go unclaimed for quite some time! This unique trophy is the Elser-Mathes Cup, to be awarded to the first amateur who establishes a two-way between Earth and Mars. Hardly a modern idea, the Cup was conceived by Colonel Fred Elser, then-K3AA, and Lieutenant Commander Stanley Mathes, then-K1CY, while both were in the Philippines in 1928. As the story goes, Elser was inspired by the deep interest ARRL's cofounder, Hiram Percy Maxim, had in the "Red Planet." The two found the trophy, a native Igorot carving, in a store in Baguio. The base represents the Earth, and the seated figures its inhabitants. The bowl represents Mars, and the standing figures represent the radio amateurs who bridge the distance between the two worlds. The Elser-Mathes Cup is on permanent display in the ARRL Museum—that is, of course, until someone wins it. Any takers?



Monitoring Stations Sought

Do you have operating experience, maturity, spare time, equipment resources and technical knowledge? The ARRL Amateur Auxiliary is looking for qualified amateurs to fill Regional Monitoring Station appointments for the following regions: Alaska, Great Lakes, Hawaii, Mid-Central, North-Central and Puerto Rico. A volunteer position, the RMS works closely with FCC Field Operations Bureau enforcement staff on hard-core cases that are beyond the normal scope of ARRL Official Observers. Because of the sensitive and important nature of this position, the RMS appointment is made only by the ARRL President. If you think you qualify, contact the ARRL Field Services Department for more information.

Want to Spice up Your Club Meetings?

Looking for a captivating program for your next club meeting? ARRL has a library of more than 100 films, slide presentations, tape recordings and videotapes that are available on loan for free to League members, Affiliated Clubs and instructors teaching a license class. Ham-in-Space operations, Field Day and FCC tutorials are among the many topics available. For a copy of HQ's *Audio/Visual Program Catalog*, send an SASE with 2 units of postage to ARRL Librarian Karl Townsend.

Ham Horizon: This beautiful scene was captured by a member of the Radio Club Mar del Plata during an operation last October 20-25. At the time, the club was operating AZ1D from Trinidad Island, on the east coast of Argentina, in honor of the 9th IARU Region 2 Meeting in Buenos Aires. Here, one of the club's members finishes the 2-element directional antenna for 40 meters. During the operation, club members racked up about 1200 contacts with US stations. (photo courtesy LU4EJ)

League Lines

Novice Enhancement has been approved by the FCC! However, at press time, the only official word from FCC was a short press release. The release states that Novices have been granted new privileges which include all emission modes in portions of the 1.25-meter (220 MHz) and 23-centimeter (1270 MHz) bands, and CW, SSB and digital privileges in a 10-meter subband. Present Novices will be grandfathered into the new privileges. At the same time, the Commission also separated examination Element 3 into Elements 3(A) and 3(B). This will mean that persons who want to upgrade to Technician class will now be taking a shorter examination, dealing with VHF/UHF matters, and will take a further written examination along with the 13-WPM code test, to upgrade to General.

The FCC release omits many pertinent details, including the effective date of the new rules. However, from what information we do have, the Report and Order is expected to closely mirror the original ARRL proposal. Monitor W1AW for further details as they become available.

See pages 9 and 15 for more information about Novice Enhancement.

Written examination credit for Amateur Radio exams, PR Docket 86-63, *became effective February 13, 1987*. For more details, see the Happenings column on page 62.

The ARRL Board of Directors met January 16 and 17 in Hartford. One of its major actions was to take another step toward refurbishing W1AW and adding a visitors' center here at Headquarters. For a complete update concerning the Center, see page 53. The Board also created an Education Task Force to review and update curricula for the teaching of Amateur Radio classes, asked that the Ad Hoc Committee on Amateur Radio Digital Communications develop a proposal for facilitating message handling via packet, and expanded the call-sign badge program. The complete minutes of the Board meeting begin on page 57.

Help ARRL celebrate its 75th, or Diamond, anniversary! **The ARRL Board is seeking applications from groups wishing to sponsor the 1989 National Convention.** Applications to sponsor the Convention will be accepted until June 1, 1987 and the site selected at the July 1987 Board meeting. The selection will be based on the guidelines which appear in March 1986 *QST*, page 13.

Each year, the ARRL Foundation sponsors a number of scholarships and the Victor Clark Youth Incentive Program. **The deadline for ARRL Foundation Scholarship applications** for the 1987-88 academic year is **May 1, 1987**. The Clark Program provides minigrants year-round to groups that demonstrate a serious intent to provide support for the development of Amateur Radio among high-school age youth. For further information about these scholarships, which range from \$500 to \$5000, and other Foundation programs, contact the ARRL Foundation, c/o ARRL, 225 Main St, Newington, CT 06111.

Worked 100 countries for the DXCC Golden Jubilee award? If not, March 7-8, the phone weekend of the ARRL International DX Contest, will provide a good opportunity. For details, see December 1986 *QST*, page 80.

Been licensed for 20 years or longer? In recognition of current amateurs who held an amateur license 20 or more years ago (lapses permitted), the ARRL sponsors an Old-Timers Club award (OTC). If you qualify, just drop a note to Headquarters with the date of your first amateur license and your call sign then and now for your certificate. There is no charge, but please include an SASE.

W1AW made over 275 QSOs in the Novice Roundup. Operators from the Headquarters staff included KA1CV, KB1MW, NJ2L, WB4FDT, KJ4KB and KH6CP.

Job openings at HQ. Resumes are requested from applicants for the ARRL HQ position of Advertising Manager which will be open as of the end of August 1987, upon the retirement of Advertising Manager Lee Aurick, W1SE. The successful candidate should report to HQ in June or early July for overlap during more than one *QST* advertising cycle. Proven sales ability, knowledge of the Amateur Radio industry and products, managerial experience, and ability to travel are required. Starting salary \$25,428-30,914 depending on qualifications. Qualified applicants please contact Publications Manager Paul Rinaldo, W4RI.

HQ has an immediate opening for the Training Program Manager in the Club Services Department. The Training Program Manager is responsible for writing the *QST* column Exploring Ham Radio, and works with the Club Services Department to develop new and revitalized hams through clubs, instructors and Elmers. The successful candidate must have five or more years experience as a licensed amateur, as well as teaching experience, creative writing ability, and typing and word-processing skills. In addition, the candidate should have some experience in preparing audiovisual materials and/or in radio/TV production. The salary range is \$16,120-22,568. For further information, contact Curt Holsopple, K9CH, at Headquarters.

Novice Enhancement: It's Here!

More frequencies plus more modes equals more fun and usefulness for Novice licensees. Now, there are even better reasons for anyone to join—and stay in—the Amateur Radio fold.

By Curt Holsopple, K9CH
Manager, ARRL Club Services Department

As the snows of January swirl around the Northern Hemisphere, a lot of folks across the land wish they had a crystal ball. Just a couple of days before this issue of *QST* is going to press, the Federal Communications Commission has announced that Novice Amateur Radio operator privileges will be expanded. The final and official details were not due out until well past press time, but we have good reason to believe that the FCC has adopted virtually everything proposed by the ARRL.¹

What We Got

According to the FCC's January 30, 1987, news release, Novices will be permitted all emission modes on the 23-centimeter band (1270 MHz), apparently including operation through repeaters. The FCC's news release similarly states that Novice privileges will "...include all emission modes for the...1.25 meter band..." so Novices apparently will receive an allocation on 220 MHz, again with repeater use permitted! In both cases, as we understand it, just a portion of the band will be available to Novices. They also will be authorized to use CW, data and single-sideband modes on a portion of the 10-meter band.

The FCC will "grandfather" existing licensees, permitting current Novices to use the added privileges once the new Rules become effective. Likewise, as in the past, Technicians will benefit from the expansion of the 10-meter Novice band and operating modes.

New Tests...

Once the new Rules take effect (we don't yet know when that will be, but probably by early April), candidates for the Novice license will be taking a somewhat longer written exam—expanded from 20 questions

to 30 questions. The expanded Novice exam will permit additional questions to be asked regarding the newly added privileges (that is, packet radio, single sideband, FM and repeaters, etc), but the content will be kept at a level appropriate for an entry-level license. The Novice and Technician license exam will still include the 5-word-per-minute code test.

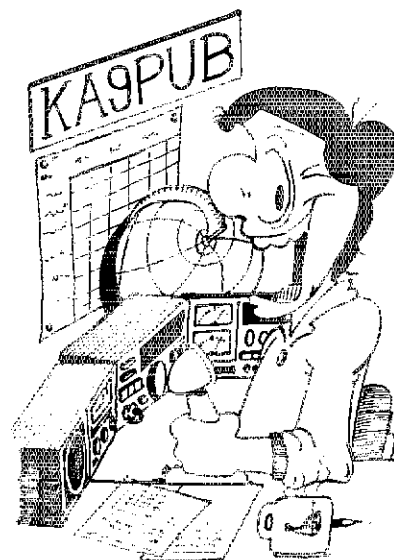
Technicians and Generals will be affected by the FCC's Novice Enhancement Rulemaking as well. Previously, the Technician and General class written exams shared the same 50-item written element, with only the difference in code test speeds

The ARRL's instructional materials will be updated quickly in light of Novice Enhancement.

setting the two licenses apart. Under the new Rules, Technicians and Generals will have separate *and shorter* written exams of 25 questions each, with the tests more closely relating to actual privileges being granted for each class of license. Upgrading from Technician to General for future Technicians will involve a 25-question written examination in addition to the 13-WPM code test. Presumably, presently licensed Techs will not have to be re-examined on material they have already passed, but at press time the mechanics for differentiating were unknown.

...And New Procedures

Apparently, the FCC will require *two* examiners to administer the new Novice exams, as requested by ARRL, but the



qualifications for serving as an examiner for a Novice test have not changed, and Novice testing has *not* been absorbed into the VEC system. As before, Novice examiners must be at least 18 years old, hold a valid General, Advanced or Amateur Extra Class license, and not be related to the candidate. The FCC's financial conflict-of-interest rule (97.319[b]) prevents someone from serving as an examiner if he/she derives income from Amateur Radio-related commerce.

What It Means to Novices

Obviously, expanded operating privileges for Novice class licensees affects the Novices themselves the most. As this is being written in late January, the Novice bands are busy with CW contacts for the 1987 Novice Roundup operating event. Using Morse code is hardly a dead issue for Novices, yet it's easy to picture Novices licking their chops at the notion of soon being able to use a microphone and keyboard for communications.

Novices are already involved in public service activities, notably CW traffic-handling, but the expanded frequencies and operating modes will greatly enhance their ability to serve in times of a communications emergency. The expanded capabilities will also help Novices get a broader taste for ham radio, giving them the added drive to upgrade their licenses and expand their operating privileges.

What It Means to Instructors

Many instructors teaching Novice courses right now wonder how Novice Enhancement will affect their approach to teaching Novice courses. Like most exciting possibilities in life, there's no simple

¹See "FCC Issues Novice Enhancement NPRM," June 1986 *QST*, pp 48-51.

formula for this one. But we have some suggestions.

We don't know exactly when the new FCC Rules will take effect, but it's likely that the winter-spring 1987 crop of Novice classes will be completed and tests administered under the old (existing) rules. Novice candidates being tested in the first several months of 1987 can probably expect to be responsible for the material represented in the existing FCC-authorized question pool, PR Bulletin Number 1035A, released in July 1985. (No new Novice pool was issued in 1986.)

All information needed to prepare for

Be sure your Novices are trained operators so they can have fun, not frustration, with their expanded privileges.

the current 20-question Novice written exam is contained in the sixth edition of the ARRL's Novice study guide, *Tune In The World With Ham Radio*. If you're teaching a Novice course, the 1986 edition of the ARRL's Novice Instructor's Guide is also very helpful. Obviously, the ARRL's instructional materials will be updated quickly in light of Novice enhancement, once the FCC releases the specifics.

What It Means to Elmers

What an opportunity! You've probably bumped into some folks who have said they didn't think ham radio had anything for them. With HF SSB and packet and VHF/UHF FM and packet to offer, as well as other modes, the Novice ticket now has some very interesting "carrots" to attract newcomers. As an instructor or "Elmer" (mentor), you can now point out to potential hams that the land rush for FM and packet modes is now available to Novices, too. In the meantime, Novice instructors and Elmers should start teaching more than "how to pass the test." Novice candidates should have exposure and training in SSB and FM/repeater operating techniques, as well as packet radio procedures. Make an effort to get candidates on the air as third-party operators with a licensed ham present as control operator. Give the would-be Novices a chance to have fun as hams long before they ever sit for the Novice license exam.

Newcomers to ham radio typically have a lot of questions about how to find suitable gear and set it up. Even old CW-only rigs need some peripherals to be

usable—an external antenna changeover relay and CW sidetone monitor, for example. Although 10-meter SSB and packet gear and VHF/UHF FM phone and packet gear will probably be newer and simpler to set up, the Novice may now need help with such things as learning computer techniques and soldering interface cables.

The new operating privileges will bring with them a special jargon and etiquette. Novices will need help making the transition from student to user of the airwaves. Be sure your Novices are *trained operators* in these new modes so that they can have fun, not frustration, with their expanded privileges.

What It Means to the Field Organization

Novice enhancement means a big bonus for the ARRL's cadre of volunteers all over the country. Traffic handlers will now find Novice operators much more available for local/regional FM traffic nets on 220 MHz. As packet and 10-meter single-sideband activity catches on, the National Traffic System will incorporate these capabilities and the large pool of Novice operators that comes with them.

The new Novice license privileges permit far more latitude for Novices active in public service communications as well. Whether it's walk-athons or weather spotting, nobody can doubt the need for disciplined communications using hand-held radios. One out of five licensed hams hold Novice tickets, but until now the Novices were mostly on the outside looking in. From a public service communications standpoint, the potential pool of Amateur Radio operators just grew about 20% with

What Novice Enhancement Means

At press time, we still didn't have final details from the FCC. *The FCC has not yet said precisely when Novice operating privileges will be expanded.* We are told, however, to expect something along the following lines to be the expanded Novice privileges.

- *23 centimeters* (1270-1295 MHz subband), 5 watts PEP output; all authorized modes, including repeater use
- *1.25 meters* (Novice subband not yet known): 25 watts PEP output; all authorized modes, including repeater use;
- *10 meters*: 28.1-28.3 MHz subband—CW and data modes; 28.3-28.5 MHz subband—CW and SSB modes, 200 watts PEP output.

Monitor W1AW bulletins, the *ARRL Letter* and next month's *QST* for updates as they become available.

Inevitable start-up factors may influence the FCC's timetable for putting Novice Enhancement Rules into effect.

Novice enhancement. That should keep our Emergency Coordinators awake nights dreaming of their newfound wealth and capability!

What It Means to Clubs

When the expanded 28-MHz allocation becomes a reality for Novices, it will also be added to the Technician's bag of tricks. Both Novices and Technicians will, therefore, become even more capable of participating in major operating events as well as serving as on-air operators during communications emergencies. And don't overlook 10 meters as a good place for a local net in the evening! The possibilities are limited only by your imagination!

With additional modes of operation coupled with improving conditions on 10 meters, radio clubs should find it easier to incorporate Novices and Technicians into DXing, contesting and traffic handling. The FM and repeater capabilities will also help Novices get integrated into local public service events using hand-held radios.

What It Means to the Amateur Radio Service

When the Novice and Technician licenses were created over 35 years ago, they both had AM phone privileges on VHF but activity was sparse. How things have changed! Now the VHF and UHF spectrum is readily accessed and the bands are busy. Getting Novices going in this area of the spectrum will be a big drawing card for potential hams, and help reverse the Novice dropout rate.

Now, more than ever, the entry-level Amateur Radio license gives a tantalizing sample of what Amateur Radio can be. In this way, we are making it even more enticing for all licensed radio amateurs to be *active* members of the amateur community. Let's get busy looking for ways to turn possibilities into realities.

When Do We Start?

By the time you read this, the FCC may have released the full details of its new Report and Order on PR Docket 86-161, the Rules regarding Novice Enhancement. If so, W1AW bulletins will have contained

(continued on page 54)

The Shopper's Guide to Packet-Radio TNCs

Packet-radio TNCs come in all shapes and sizes. Before you go shopping, learn what the differences are!

By Stan Horzepa, WA1LOU
QST Contributing Editor
75 Kregger Dr, Wolcott, CT 06716

The use of initials or abbreviations in Amateur Radio is traditional—AF, IF, RF and MUF. Then there's AM, FM, SSB, UTC, RTTY, ASCII and SSTV, and we can't forget BFO and VFO. The initials that conjure up magic in Amateur Radio today are "TNC." Packet radio is a fast-growing mode in our hobby because it mates our radios with the home computer to produce an efficient person-to-person and computer-to-computer communication system. The TNC ties the knot between the radio and the computer.

Background

When the initials TNC were first used, they stood for "terminal node controller," the computer-controlled device that performs the packet assembler/disassembler (PAD) function in a packet-radio system. The PAD assembles digital information from a terminal into "packets," and transfers the packets to a modem. The modem converts the digital output of the PAD into analog signals that are transmitted over the air. The PAD also performs the reverse function—that is, it disassembles received packets into a stream of information that is accepted by the terminal for output.

Doug Lockhart, VE7APU, designed the first amateur TNC. It consisted of a bare PC board that the user populated with parts. It used a packet radio "protocol" (set of operating procedures) that was developed by Doug and the Vancouver Amateur Digital Communications Group (VADCG). As a result, Doug's TNC became known as the "Vancouver Board," and the protocol became known as the "Vancouver protocol," "VADCG protocol" or "V-1" (to differentiate it from later versions V-2 and V-3).

The Vancouver board was a true TNC—that is, it provided only the PAD function. An external modem was required between the TNC and the radio equipment. For VHF packet-radio operation, VADCG chose to use modems that were compatible with the Bell 202 standard because these modems were readily available. Bell 202 modems operate half-duplex at 1200 bits per second (bit/s) using AFSK tones of 1200 Hz for a mark and 2200 Hz for a space. These modems are still being used today on 2 meters, to the near exclusion of all other modems.

PAD Plus

Today, the term "TNC" connotes more than just the PAD function. Many systems now being sold as TNCs include the modem function as well as the PAD function. The external modem is no longer needed.

In 1981, the Tucson Amateur Packet Radio Corporation (TAPR) designed hardware that included a PAD together with a modem that was compatible with the Bell 202 standard. This development became known as the "TAPR board" or "TAPR TNC 1." It used VADCG V-1, as well as a new protocol that resulted from a series of meetings of packet-radio enthusiasts. This new protocol is based on the commercial packet-switching

protocol, CCITT X.25, and became known as the "amateur X.25" or "AX.25" protocol.

In 1985, TAPR introduced a new TNC, dubbed the "TAPR TNC 2." It implemented only AX.25, but provided a more advanced implementation of that protocol (Version 2). As a result, the TNC 2 offered the user more AX.25 features and capabilities than the TNC 1. Most of the TNCs on the market today are functional equivalents (compatibles) of either the VADCG board or the two TAPR boards, TNC 1 and TNC 2.

HF Versus VHF

Modem requirements for HF and VHF packet radio differ. The Bell-202-compatible modem (1200 bit/s) is the modem of choice on 2 meters, but for operation below 28 MHz, FCC requirements dictate a maximum of 300 bauds (this translates to 300 bit/s). The TAPR TNCs and the initial TAPR-compatible TNCs only provided a 1200-bit/s modem. To use those TNCs on HF, you had to modify the built-in modem or add an external modem.

Today, some TNCs include built-in switchable modems. On command, you can configure the TNC to operate at 300 bit/s for HF or 1200 bit/s for 2-meter operation. There is incompatibility between the 300-bit/s HF modems used in TNCs, however. Some Bell-103-compatible modems use AFSK tones with a frequency shift of 200 Hz between mark and space, while others, not Bell-compatible, use the preferred frequency shift of 600 Hz.¹

Universal or Computer Specific

The original TNCs functioned with any terminal or computer that had an EIA RS-232-C serial interface. The TNC's "user interface," (the set of TNC commands and status messages available to the user), did not differ from one terminal/computer system to another. Whether you used an IBM® PC or a Radio Shack® TRS-80 Model I, "****CONNECTED TO WA1LOU" was the message you received after successfully connecting with this station using a TAPR TNC, or compatible, connected to the RS-232-C interface on your PC or Model I.

Today, some TNCs are computer specific. They are designed for operation with only one computer and, as a result, computer-specific software or firmware can be included to make the user interface more friendly. Such features as split-screen displays of received and transmitted text are possible when the user interface is created for a specific computer.

¹Since most of the listed equipment include VHF modems, and many of them include HF modems, specifications for only those equipment with modems that do not meet the Bell-202 standard for VHF or the Bell-103 standard for HF are identified. For a complete description of modem specifications, see *The 1987 ARRL Handbook*, M. Wilson, ed. (Newington: ARRL, 1986), pp 19-34 to 19-38.

Table 1

List of TNC Manufacturers

- Advanced Electronics Applications, Inc (AEA), PO Box C-2160, Lynnwood, WA 98036-0918, tel 206-775-7373
- Amateur-Wholesale Electronics, 46 Greensboro Hwy, Watkinsville, GA 30677, tel 404-769-8706
- Australian Amateur Packet Radio (AAPRA), 59 Westbrook Ave, Wahroonga, NSW 2076, Australia
- Bill Ashby & Son, Box 332, Pluckemin, NJ 07978
- GLB Electronics Inc, 151 Commerce Pkwy, Buffalo, NY 14224
- Hamilton and Area Packet Network (HAPN), Box 4466, Station D, Hamilton, ON L8V 4S7, Canada
- Heath Co, Benton Harbor, MI 49022
- Kantronics, 1202 E 23rd St, Lawrence, KS 66048
- MFJ Enterprises Inc, PO Box 494, Mississippi State, MS 39762
- Microlog, 18713 Mooney Dr, Gaithersburg, MD 20879
- Pac-Comm Packet Radio Systems Inc, 3652 West Cypress St, Tampa, FL 33609
- Packeterm, Box 835, Amherst, NH 03031
- Richcraft Engineering Ltd, No. 1, Wahmeda Industrial Park, Chautauqua, NY 14722
- Tucson Amateur Packet Radio Corp (TAPR), PO Box 22888, Tucson, AZ 85734-2888
- Vancouver Amateur Digital Communications Group (VADCG), 9531 Odlin Rd, Richmond, BC V6X 1E1, Canada

Packet Plus

The latest innovations in TNCs are units that operate in other digital modes, or at higher speeds. The other modes include CW, RTTY (Baudot and ASCII) and AMTOR. The TNC that operates at a higher speed has broken the 1200 bit/s barrier—modus operandi on 2 meters for the past seven years.

What's Available?

With all the available choices, someone starting out in packet radio may find the TNC marketplace a real jungle. The goal of this article is to sort out what is available, and provide the packet-radio beginner with a clearer choice in selecting a TNC.

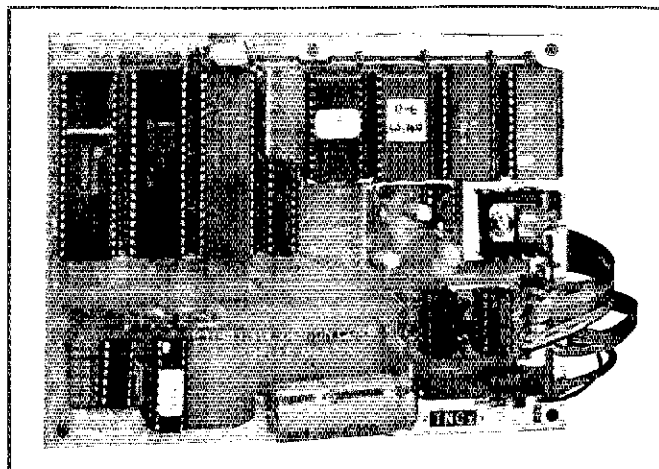
The following listing of available TNCs is not complete, although at the time this was written, every attempt was made to provide as complete a listing as possible. At the rate that new TNCs are appearing on the market, this list should be updated on almost a daily basis. Prices shown are list prices—they, too, could be updated to reflect closeout pricing, sales, and so on. Some TNCs have been covered in *QST's* Product Reviews. Where applicable, issue and page are shown. Manufacturers of the listed TNCs are shown in Table 1.

The Original VADCG TNC and a Compatible

The original VADCG board, being a "true TNC," required an external modem connected to its RS-232-C serial port. Originally, it only used VADCG V-1 because V-1 was the only protocol in existence. It was capable of using each new protocol that came into existence, however. The current VADCG board, the TNC+, uses AX.25 and VADCG V-1, V-2 and V-3. It still requires an external modem connected to its serial port, or, optionally, to its TTL modem port. Four LEDs provide status indication. The unit requires 12 V dc.

Bill Ashby & Son PAC/NET System

The PAC/NET system is a scaled-down version (4.5 × 6.0 inches) of the original VADCG board. An RS-232-C serial port provides the connection to an external modem. The board requires 8 to 10 V dc at 0.5 A. It is available as a bare PC board (\$80), or assembled and tested with AX.25 in EPROM (\$240). All required ICs (except for 2 EPROMS) are available separately (\$80).



Bill Ashby & Son PAC/NET System, a VADCG-board compatible.

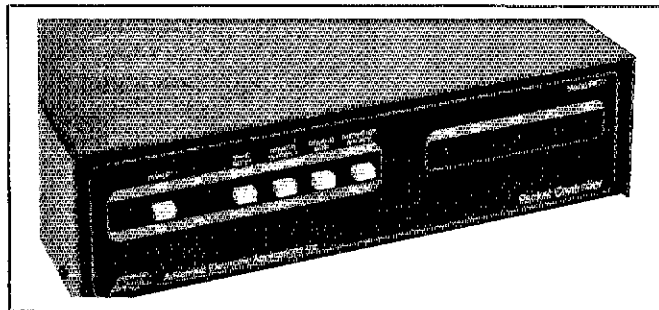
The First AX.25 Implementation: TAPR TNC 1 Compatibles

The TAPR TNC 1 was the first to include a built-in modem (Bell 202 compatible, 1200 bit/s), and to use AX.25 Version 1 (also VADCG V-1). An RS-232-C serial port provides the connection between the TNC and a terminal/computer and supports the standard data rates between 50 and 19,200 bauds. The TNC 1's radio port supports data rates between 50 and 4800 bauds, but an external modem is required above 1200 bauds. The data rates of both ports are software selectable. The unit uses a 6809 microprocessor and provides eight status indicators. It operates from 117 V ac, and includes a watchdog timer for protection during unattended operation.

TNC 1 was a kit that included all necessary parts and extensive documentation. Although TNC 1 is no longer available, except as used equipment, it was the precursor of the following TNCs and some of these are still available. The AX.25 Version 1 in the TNC 1 does not provide such features as multiple connections and full-function monitoring that AX.25 Version 2 in the TNC 2 provides. Ronald Raikes, WA8DED, has written new firmware for the TNC 1 and its compatibles (the AEA PKT-1 and Heath HD-4040) that provides these missing features. Ron's code uses a different user interface than the TNC 1 or TNC 2, but it is easy to learn and use. His code is available on various landline and packet-radio bulletin boards. It must be downloaded and burned into two 2764 EPROMs that replace the original TNC 1 EPROMS.

AEA PKT-1

The PKT-1 (\$589) was the first commercial TNC. It is functionally the same as the TNC 1, varying only in being preassembled and using a 12 V dc power supply.

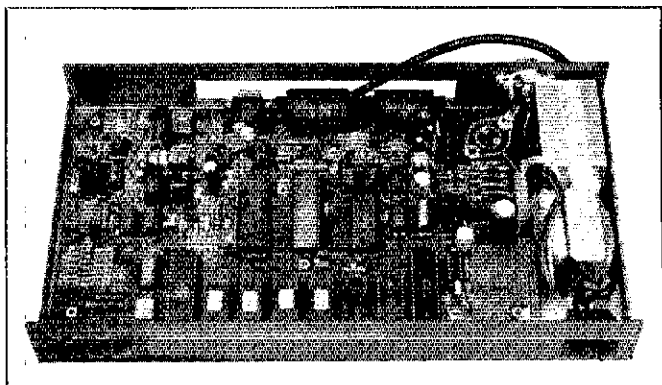


AEA PKT-1 TNC, the first TAPR TNC compatible.

Heath HD-4040

The Heath TNC is nearly an exact duplicate of the TNC 1. The difference is its enclosure. Naturally, Heath's duplication

of the TNC 1 is a kit (\$200), and includes the HD-4040-1 status indicator and connect alarm kit and the HCD-4040-2 HF modem filter (available separately at \$25 and \$10, respectively). The PKT-1 and the HD-4040 were covered in Product Review, *QST*, Nov 1985.



Heath HD-4040 TNC, the first commercial TNC kit.

Kantronics Packet Communicator

This discontinued, but still available, TNC (\$219) was the first to provide built-in modems for HF and VHF. It uses a 6803 microprocessor and a modified version of the TNC 1 firmware. It is powered by 12 V dc, but does not have a watchdog timer. The Kantronics firmware modification allows the TNC to perform certain hardware tasks in software, thus eliminating the components that perform these tasks (most significantly the HDLC controller IC). As a result, this unit's dimensions (2 × 6 × 8 inches) are smaller than the TNC 1. This modification makes no difference to the user interface as its commands and messages are the same as those used with the TNC 1. However, the maximum data rate of the radio port is 1200 bit/s. In all other respects, this first Kantronics entry in the TNC field is functionally the same as the TNC 1.

Packeterm IPT

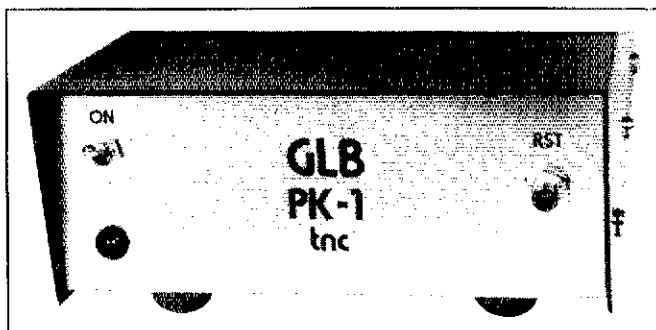
This portable packet terminal (\$995) includes a 9-in video display, 74-key full-travel keyboard and a TNC (compatible with the TNC 1) with modems for HF and VHF operation. An RS-232-C serial printer port is provided and the whole terminal can be powered by 13.8 V dc.

A Different Approach

GLB Electronics PK-1 and PK1-L

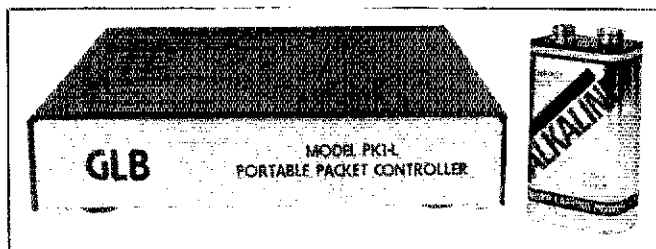
GLB tried something different. It was called "the software approach" and, in essence, was an attempt to perform certain TNC hardware tasks, primarily the HDLC function, in software. GLB's effort predated Kantronics' by two years. The philosophy of this approach is that it would eliminate expensive components, and, thereby, the final product would be smaller and less expensive. GLB was successful. Its TNC is smaller and less expensive than others, and, in general, it performs like a TNC should. However, there are some differences between these TNCs and the other TNCs.

Because of the software approach, once you begin typing a message, the TNC cannot send or receive packets until you finish entering the message. (This unique feature may be eliminated in later firmware versions.) Also, the radio operates at a data-rate top speed of 1200 bit/s. The GLB user interface is unique—a complete departure from the TAPR and VADCG user interfaces, although the TNCs do use both AX.25 and VADCG V-1 protocols. This Z80A[®] microprocessor-controlled TNC is also able to save received packets in RAM for later retrieval, and it may be remotely controlled over the air. An optional teleprinter interface allows it to use a TTY machine as a terminal.



GLB Electronics PK-1 TNC, the first "software approach" TNC.

GLB's "software approach" TNCs are available in two pre-assembled versions. The PK-1 (\$165 less cabinet) is the older and larger of the two (4.5 × 9.5 × 1.5 inches) and requires 12 V dc at 200 mA. It has 4 kbytes of RAM that is user-expandable to 14 kbytes or factory-expandable to 56 kbytes. A watchdog timer for unattended operation is included. The PK1-L (\$210 including cabinet) is smaller (4.6 × 5.9 × 1.0 inches) and requires 9 to 15 V dc at a miniscule 25 mA. Its low power requirement makes it attractive for remote digital repeater applications. It includes a watchdog timer, 8 kbytes of RAM and a lithium battery for RAM backup.



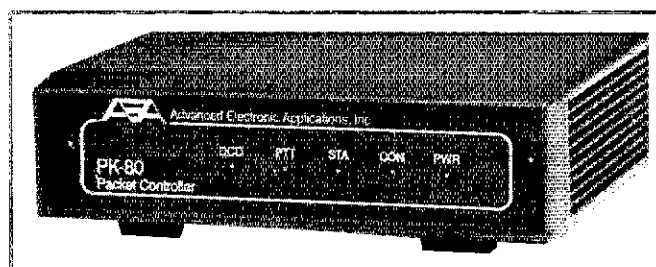
GLB Electronics PK1-L TNC, a 25-mA version of the PK-1.

The Ongoing AX.25 Implementation—TAPR TNC 2 and Compatibles

The TAPR TNC 2 was the next logical step after TNC 1. It differed from TNC 1 in that it is physically smaller, uses a more fully developed AX.25 (Version 2), but it doesn't use the VADCG protocol. The maximum data rate of the radio port is now 9600 bit/s, but the data rates of the radio port and the RS-232-C serial port are now hardware selectable by means of a DIP switch, rather than software selectable. It is supplied as a well-documented kit with a Z80A microprocessor, lithium battery backup for retention of operating parameters and a 12 V dc power supply. The life of the TNC 2 ended abruptly as a number of manufacturers offered their versions of the unit, thus putting TAPR out of the kit business and back into the research and development business (where it preferred to be). The following TNC 2 compatibles are currently available.

AEA PK-80

This preassembled (\$260) version of the TNC 2 has beefed-up

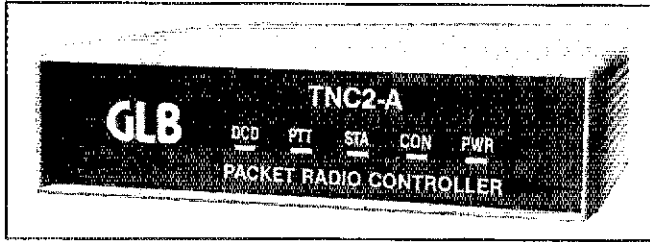


AEA PK-80 TNC, a preassembled TAPR TNC 2 compatible.

circuitry to suppress RFI. It does not use CMOS parts and, as a result, its power requirements are relatively high—12 to 15 V dc at 400 mA. Otherwise, it is identical to the TNC 2.

GLB Electronics TNC2A

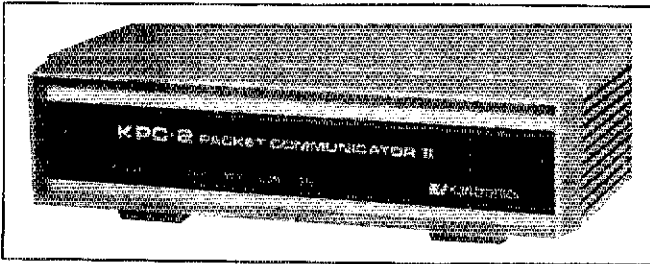
GLB's kit is available in two versions: a CMOS version (\$170) rated at 10 to 15 V dc at 110 mA, and an NMOS version (\$155) rated at 10 to 15 V dc at 260 mA. Other than cosmetic differences, the TNC2A and TNC 2 are identical.



GLB Electronics TNC2A TNC, a TAPR TNC 2 compatible kit available in CMOS and NMOS versions.

Kantronics KPC-2

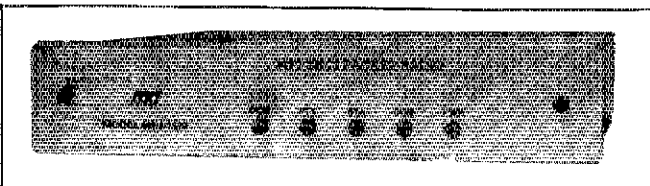
The KPC-2 (\$220) is similar to the original Kantronics Packet Communicator in that it has the same built-in HF and VHF modems, the same 6803 microprocessor, and the same modified firmware with a maximum radio data rate of 1200 bit/s. It is compatible with AX.25 Version 2, and in addition to the standard RS-232-C serial port, has a TTL interface (for computers such as the Commodore® 64). Serial port and radio port data rates are software selectable.



Kantronics KPC-2 TNC, a preassembled TAPR TNC 2 compatible with built-in VHF and HF modems.

MFJ MFJ-1270

This unit is preassembled (\$140), and it provides a TTL interface (for Commodore 64™ compatibility), as well as the standard RS-232-C serial port. Cosmetically, it is very different from the other TNC 2 work-alikes, but it is functionally the same. (See Product Review, *QST*, Sep 1986.)



MFJ MFJ-1270 TNC, an inexpensive, preassembled TAPR TNC 2 compatible.

Pac-Comm TNC-200

The TNC-200 is available in a variety of flavors: assembled and tested CMOS and NMOS versions (\$220 and \$200, respectively); kit versions (CMOS \$170, NMOS \$155); and kit versions less cabinet (CMOS \$145, NMOS \$135); PC board and hard-to-

find parts (CMOS \$85, NMOS \$80) and bare PC board (\$40). Again, other than cosmetic differences, Pac-Comm's versions of the TNC 2 are the same as the original.

Pac-Comm TNC-220

Another TNC 2 work-alike, the TNC-220 (kit, \$125 or assembled, \$160), includes two radio ports and each port may be configured for 300-baud (HF) or 1200-baud (VHF) operation. Switching between ports is software controlled and an active band-pass filter is included for the HF-configured port. The computer/terminal interface can be selected for TTL or RS-232-C compatibility. Front-panel status indicators are color coded and there are provisions for an optional tuning indicator.

Something for Everyone

GLB Electronics PK2

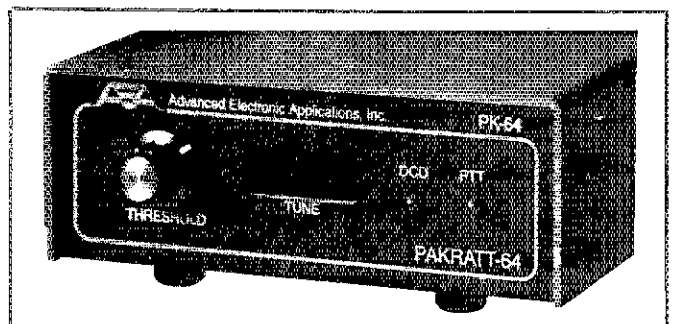
GLB's latest entry into the marketplace offers something for everyone. The unit uses AX.25 (Versions 1 and 2) and VADCG V-1. Its user interface is compatible with both the TNC 2 and the unique GLB PK-1/PK1-L user interfaces. Unlike the PL-1 and PK1-L, the PK2 uses hardware for all HDLC tasks. The PK2 uses a Z80A microprocessor and includes 16 kbytes of RAM (expandable to 48 kbytes) to save received packets for later retrieval. GLB's 7910 plug-in modem provides software selectable HF and VHF operation. Its RS-232-C serial port operates at standard data rates between 45 and 19,200 bauds, and its radio port operates up to a maximum of 19,200 bauds with provisions for high-speed external modems. Unit dimensions are 9.9 × 5.6 × 1.6 inches, and the power requirement is 12 V dc at 300 mA. A lithium battery provides RAM backup.

For Your I/Os Only: Computer-Specific TNCs

Certain computers are found in ham shacks more often than other computers, and it is economical for manufacturers to design packet-radio products specifically for the more popular computers. Packet-radio equipment has been specifically designed for use with the Commodore 64, the IBM PC, and the Radio Shack TRS-80 Models I, III and 4 computers.

AEA PK-64

The PAKRATT™ Model PK-64 (\$220) provides the Commodore 64 and 128 computers with packet-radio capability; in addition, Morse, RTTY (Baudot and ASCII) and AMTOR operation are possible. The unit is compatible with the TNC 2 and AX.25 Version 2. The PK-64's user interface is menu driven, so you do not have to remember all of the various TNC commands. They are all shown right there on the computer display. The unit provides split-screen operation with separate windows for received text, transmitted text and status indications. The unit is preassembled and plugs into the cartridge port of the Commodore computer. In addition to a built-in VHF modem, operation on HF is selectable (300 bit/s, 200 Hz frequency shift). An optional HFM-64 modem (\$100) provides improved HF operation. The unit is equipped with an audible alarm that sounds if a connection is made. Power requirement is 13 V dc. (See Product Review, *QST*, Jun 1986.)



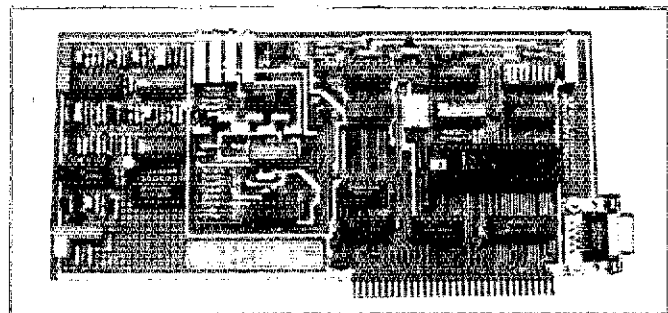
AEA PK-64 all-digital-mode controller designed for use with the Commodore C64 and 128 computers.

AAPRA

The Australian Amateur Packet Radio Association has a packet-radio hardware and software package (\$55 Australian) for the Commodore 64 and 128 computers. The hardware portion of the package consists of a bare 1200/300 bit/s modem PC board that plugs into the cartridge port of the Commodore. The modem board contains provisions for a watchdog timer and a PTT relay. The computer powers the PTT circuit to ensure that the transmitter is not activated if the computer is turned off. The software portion of the package is on a disk, and emulates the function of a TNC. The software was written by Chris Mills, VK4BCM, and is compatible with AX.25 Version 2. The user interface is similar to that written for the TNC 1 by Ron Raikes, WA8DED. For Commodore owners who do not own a disk drive, an EPROM plug-in cartridge version of the AAPRA package is also available (\$80 Australian).

HAPN HAPN-1

The Hamilton (Ontario) Area Packet Network (HAPN) provides the HAPN-1 packet-radio adapter hardware and software package (preassembled with software, \$199 US; bare PC board with software, \$75 US) for the IBM PC and compatibles. The hardware consists of an 8.5-inch card that plugs into an expansion slot in the PC. The card includes TNC hardware and a watchdog timer, prototyping area and a modem for VHF operation. The card is powered by the computer and supports data rates up to 9600 bauds using an external modem. HAPN has a 4800-baud modem in the works. HAPN's software provides AX.25 Version 2 compatibility. An optional VADCG V-1 and V-2 software package (\$25 US) and a packet bulletin board and file transfer package (\$25 US) are also available. The user interface is function-key driven with pop-up menus and dialog boxes.



Hamilton Area Packet Network HAPN-1, a TNC that plugs into an IBM PC, or compatible, expansion slot. The prototype area at the left side of the card contains HAPN's experimental 4800-baud modem.

Richcraft Engineering's Synchronous Packet Radio Using the Software Approach, Vols 1 and 2.

Bob Richardson, W4UCH, wrote two TNC emulation software packages for the Radio Shack TRS-80 Models I, III and 4 computers. With this software, the TRS-80 performs all TNC hardware functions (an appropriate external modem is required). The user interface is menu driven. Volume 1 is based on VADCG V-1, and Volume 2 is based on AX.25 Version 1. (Volume 1 or 2 documentation including program listings, \$22; Volume 1 or 2 program on disk without documentation, \$29.)

All-Digital Wonders: Multimode Products

If, in addition to packet radio, you are interested in other digital Amateur Radio modes, you might seriously consider one of the following all-digital-mode products. Because this article concerns TNCs, only the packet-radio capabilities of these units will be described.

AEA PK-64

This Commodore 64- and 128-specific product was covered under computer-specific TNCs.

Kantronics KAM™

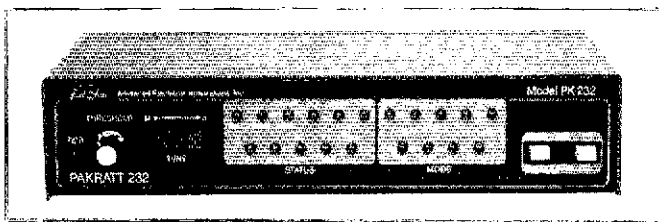
The "Kantronics All Mode" (\$319) does just that—Morse, Baudot, ASCII, AMTOR and packet-radio modes. It may be connected to any computer or terminal with a standard RS-232-C serial port or a TTL interface. Two radio ports are included for HF and VHF operation. On HF, the mark and space tone frequencies are programmable and a front-panel tuning indicator is provided. One-hundred software commands control the operation of this unit.

Microlog ART-1

As of this writing, the ART-1 (\$199) provides Morse, Baudot, ASCII and AMTOR capabilities for the Commodore 64 and 128 computers. Packet-radio capability is promised soon. Stand by for more information on this one.

AEA PK-232

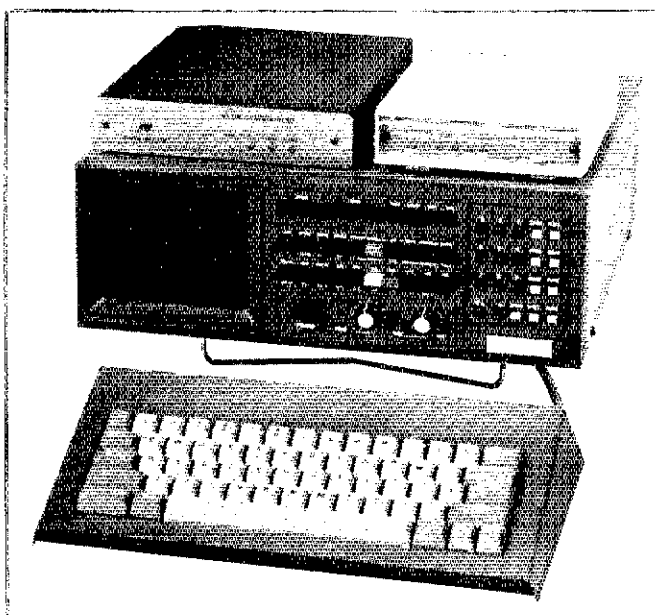
The PAKRATT™ Model PK-232 (\$320) provides Morse, Baudot, ASCII, AMTOR and packet-radio capability for any computer equipped with an RS-232-C serial port. The unit is preassembled and includes internal modems for HF (200-Hz frequency shift) and VHF operation. Provisions are included for using external modems operating between 2400 and 9600 bauds. A Z80A microprocessor runs the show. The unit operates from 13 V dc.



AEA PK-232 all-digital-mode data controller. This unit is capable of operating Morse, Baudot, ASCII, AMTOR and packet radio.

Tono EXL-5000E

The EXL-5000E (\$795) is a compact, all-mode (Morse, Baudot, ASCII and AMTOR) communications terminal that can be used for packet radio, with the addition of a TNC. The unit is distributed exclusively by Amateur-Wholesale Electronics. (See Product Review, *QST*, July 1985.)



Tono EXL-5000E, an all-digital-mode terminal. This unit requires an external modem for packet-radio use.

(continued on page 44)

Monolithic Microwave Integrated Circuits

Part 2: Last month, we learned about MMICs and simple applications. This month, we will see how to combine these devices for more power output and look at important performance characteristics.

By Al Ward, WB5LUA
Rte 9, Box 132
McKinney, TX 75069

Last month, I showed how easy it is to cascade MMICs for increased gain. The next logical question is "How can I increase the power-output capability of these devices?" Since the 01 through the 04 series MMICs are unconditionally stable, it is easy to parallel two or more devices for increased power output. The 1-dB compression point for two devices in parallel is almost 3 dB greater than that for a single device. For four devices in parallel, the 1-dB compression point is about 6 dB greater! Of course, the gain of a paralleled-MMIC amplifier will be no greater than that of a single device; in fact, the gain may be slightly lower because of losses in the divider/combiner networks.

A Simple Amplifier

In its simplest form, a four-MMIC amplifier can be built as shown in Fig 1. Amplifier input and output impedances will be approximately $50/4 = 12.5$ ohms. The input of each MMIC must have a dc blocking capacitor for isolation from the other MMICs, but the outputs can be connected together directly. Dc is applied through a common RF choke and a series bias resistor of appropriate resistance and power rating. A single blocking capacitor is used on the output.

Since it is normally desirable to retain a nominal 50-ohm input and output impedance, some sort of matching circuit is required. For maximum bandwidth at HF, simple toroidal transformers may be used. This concept is shown in Fig 2. The transformers supply equal-amplitude signals that are 180 degrees out of phase. These 1:1 transformers are typically called baluns and lend themselves to push-pull operation rather easily. Amplifier bandwidth will be determined mainly by the frequency response of the transformer, not the MMIC. The RF choke in the output network is included to allow all four MMICs

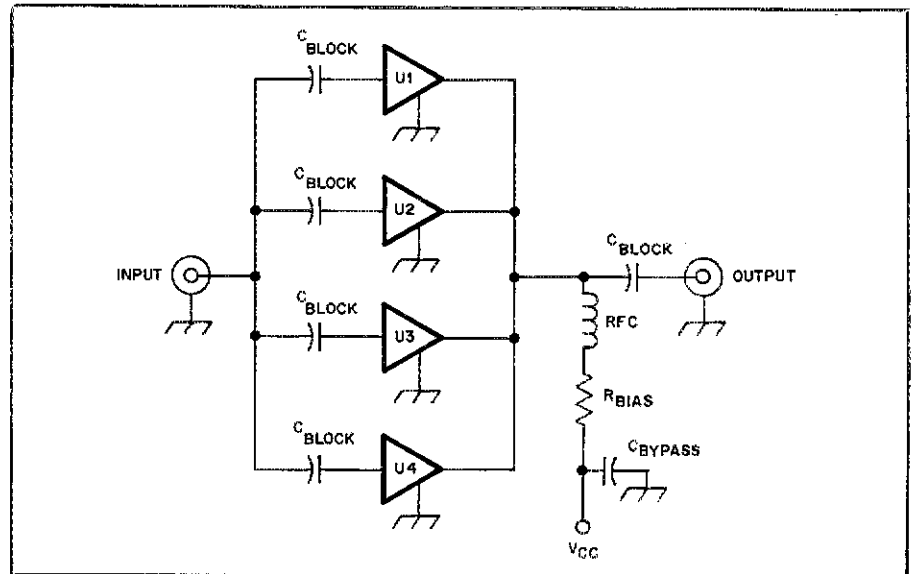


Fig 1—The simplest form of parallel-MMIC amplifier ties the inputs and outputs of the devices together. Input and output impedances are $50/4 = 12.5$ ohms, so some sort of impedance matching is desirable if this amplifier is to be used in a 50-ohm system.

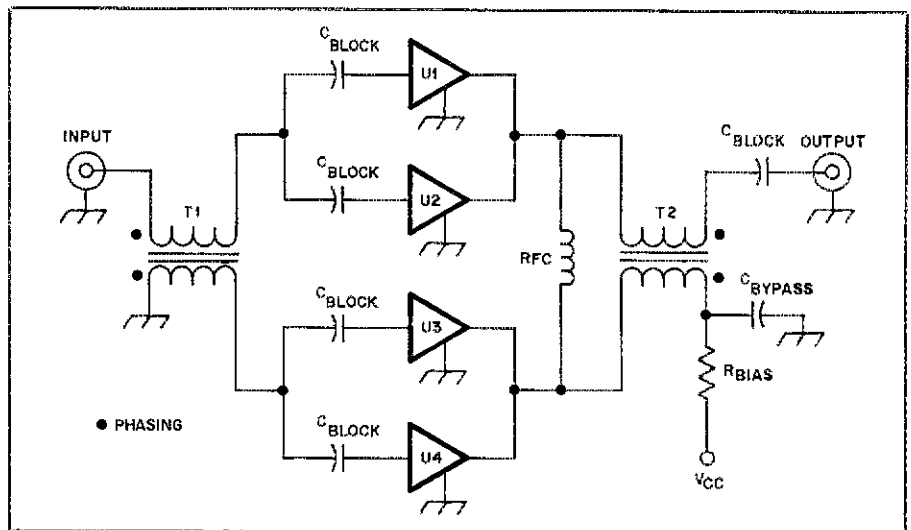


Fig 2—For use at HF, the basic four-MMIC amplifier can be paralleled in a push-pull configuration and matched to 50 ohms with 1:1 transformers. C_{BLOCK} and C_{BYPASS} should have a low reactance at the frequency of operation, while the RFC should have a high reactance. The bias-resistor value will depend on which MMICs are used.

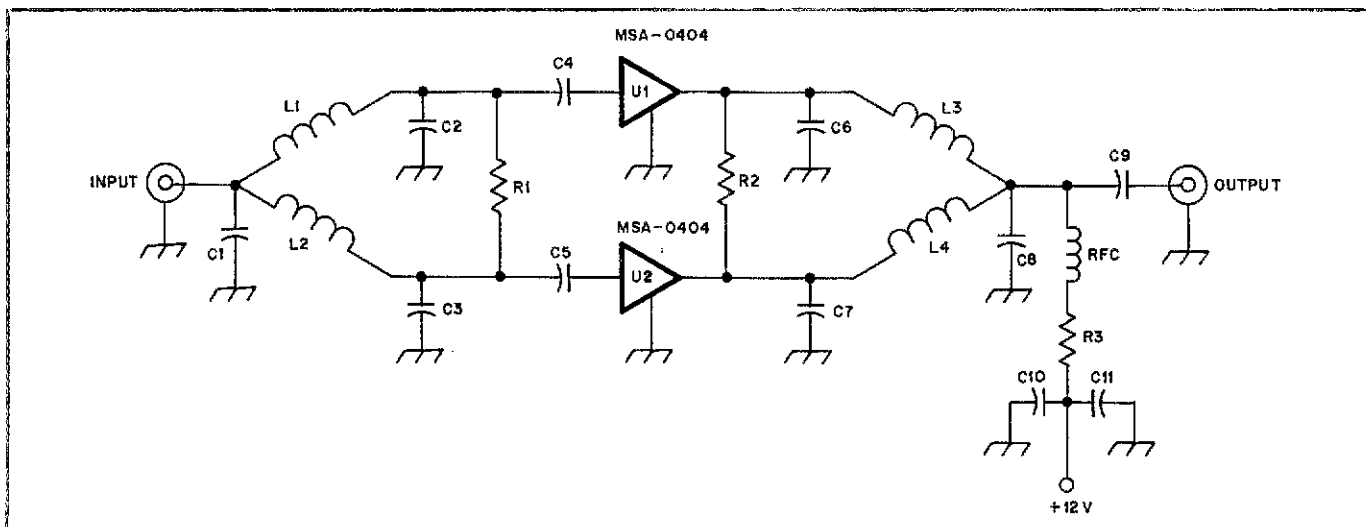


Fig 3—For VHF, MMICs in parallel may be matched to 50 ohms with Wilkinson divider/combiner networks. This amplifier may be built for 220 or 432 MHz. See text and Table 1.

to be fed from a single bias resistor.

Parallel MMICs at VHF

At VHF, impedance matching for a parallel-MMIC amplifier can be accomplished with Wilkinson-type power divider networks. A circuit that uses lumped elements to combine two MMICs is shown in Fig 3. Eqs 1-4 can be used to calculate element values for single-section Wilkinson power dividers in a 50-ohm system at any frequency of interest. The values for L1-L4 are:

$$L = \frac{70.7}{2\pi F_0} \quad (\text{Eq 1})$$

where

L = inductance in henrys

F_0 = frequency of operation in hertz

For C2, C3, C6 and C7:

$$C = \frac{1}{2\pi F_0 70.7} \quad (\text{Eq 2})$$

where

C = capacitance in farads

F_0 = frequency of operation in hertz

For C1 and C8:

$$C = 2 C_2 \quad (\text{Eq 3})$$

For R1 and R2:

$$R = 2 Z_0 \quad (\text{Eq 4})$$

where Z_0 = the nominal impedance in ohms. Z_0 will always be 50 ohms in MMIC circuits, so R1 and R2 will always be 100 ohms. An in-depth description of Wilkinson power dividers appeared in *Ham Radio* several years ago.¹

C4, C5, C9 and C10 should have a low reactance (less than several ohms) at the frequency of operation. The RF choke

should have a reactance such that when added to the series-bias-resistor value, the total value will be approximately 10 times the output impedance, or 500 ohms. C11 is a low-frequency bypass capacitor.

At amateur frequencies up to 225 MHz, the lumped-constant Wilkinson power divider approach works well with MMICs. Above 225 MHz, the performance may not be as expected for several reasons. First, the capacitor values as calculated are small (less than 10 pF); with standard components it may be hard to achieve the exact value. Second, dipped silver-mica capacitors that exhibit their marked value at low frequencies (1 MHz) may not necessarily exhibit the same value at 400 MHz because of parasitic components such as lead inductance or shunt reactance.

A third, and not so obvious, reason is that although MMICs typically have a nominal 50-ohm input and output impedance, it may not be exactly 50 ohms resistive. When an MMIC is designed to operate over a very wide bandwidth, the circuit values inside the MMIC package are chosen so that the gain, as measured in a 50-ohm system, is relatively constant over a wide frequency range. As a result, the input and output match may not be optimum at any frequency. If the input and output impedance at each frequency is plotted on a Smith Chart, the plot resembles a circle whose center would be near 50 ohms resistive. Since the devices are somewhat reactive, they have the effect of changing the resonant frequency of the Wilkinson networks. The Wilkinson network is generally lowpass by design, so it follows that if the network were designed for a slightly higher frequency, the MMIC amplifier may not require any further tuning.

Table 1

Component Values for the Circuit of Fig 3

	220 MHz	432 MHz
C1, C8	20-pF SM	1-10 pF (variable)
C2, C3, C6, C7	10-pF SM	5-pF SM
C4, C5, C9, C10	470-pF SM	100-pF SM
C11	0.1 μ F	0.1 μ F
L1-L4	50 nH (see text)	26 nH (see text)
R1, R2	100 Ω	100 Ω
R3	62 Ω , 1 W	62 Ω , 1 W
RFC	0.47 μ H	0.47 μ H
U1, U2	MSA-0404	MSA-0404

Wilkinson divider, I designed and tested a 220-MHz version of the amplifier shown in Fig 3 using the values shown in Table 1. Dipped silver-mica capacitors of the closest standard value to the calculated value were used for the matching elements. L1 through L4 are each four turns of no. 24 wire, 0.125-inch ID, spaced one wire diameter. Leads 0.25 inch are included in the design to facilitate mounting. See Fig 4.

A swept-frequency-response plot showing gain and reverse isolation for the

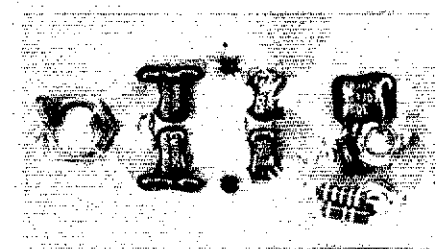


Fig 4—A 220-MHz version of the amplifier shown in Fig 3 can be built on unetched PC-board material.

¹E. Franke, "Wilkinson Hybrids," *Ham Radio*, Jan 1982, pp 12-18.

Test Amplifiers for 220 and 432 MHz

To analyze the basic concept of the

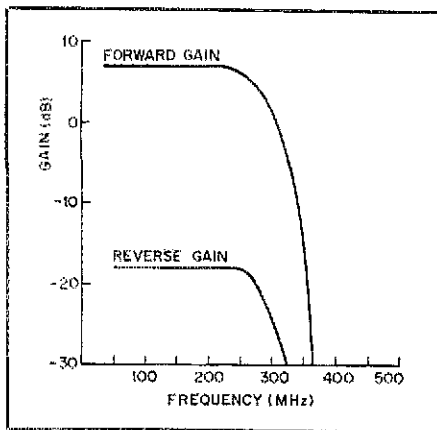


Fig 5—Gain of the 220-MHz MMIC amplifier shown in Fig 4 is almost flat below the design frequency but falls off rapidly above it. This graph shows both forward and reverse gain.

220-MHz amplifier is shown in Fig 5. Reverse isolation (S12) is indicative of amplifier stability. In the case of the 220-MHz amplifier, stability is quite good since $-S_{12}$ is 11 dB greater than S_{21} . If $-S_{12}$ were no greater than S_{21} , stability would be marginal. As mentioned earlier, the response is lowpass in nature. Gain is similar to that of a single device, while the 1-dB compression point is +16 dBm (40 mW) and the compressed output will be more than +18 dBm (63 mW).

If greater gain is desired at the expense of power output capability, the 01, 02 or 03 series devices can be paralleled instead of the 04 devices. This concept will work fine down to HF as long as appropriate element values are calculated and appropriate blocking and bypass capacitors and RF choke are chosen.

A similar amplifier was designed and

built for 432 MHz using the element values determined from the preceding equations. Component values are shown in Table 1. L1 through L4 are each 1.5 turns of no. 24 wire, 0.125-inch ID, spaced one wire diameter. Inductor leads are 0.25 inch long. During construction and testing, I found that if C1 and C8 were made variable, gain could be peaked at 432 MHz and input and output SWR could be minimized.

The response of the amplifier built and tuned as described here is shown in Fig 6. Gain is flat down to 200 MHz (gain was not measured below 200 MHz), and input and output SWR are also quite acceptable. Allowing C1 and C8 to be variable allows you to tune out the reactive component of the MMIC and in fact does produce additional gain over the untuned 220-MHz amplifier just described. The 432-MHz amplifier is capable of power output similar to the 220-MHz amplifier.

Techniques for 902 MHz and Above

Although the paralleled MMICs work very well at HF and VHF, the real advantages don't show up until they are applied at 902 MHz and higher. At microwave frequencies, the transmission line equivalent of the Wilkinson power divider is constructed very easily. Two possible options are shown in Fig 7.

The transmission line is a quarter wavelength long at the frequency of operation, and its characteristic impedance is determined from

$$Z_0 = \sqrt{Z_{in} \times Z_{out}} \quad (\text{Eq 5})$$

where Z_{in} and Z_{out} are the impedances to be matched.

For the two-MMIC amplifier shown in Fig 7A, the 50-ohm nominal impedance of the MMIC has to be transformed to

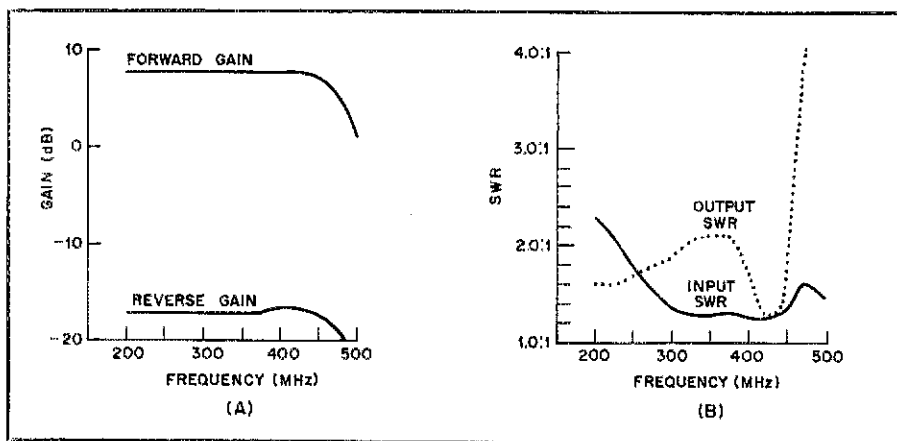


Fig 6—Gain response (A) of a 432-MHz version of the amplifier of Fig 3 is good down to at least 200 MHz. Part B shows that the input and output SWR is best at the design frequency.

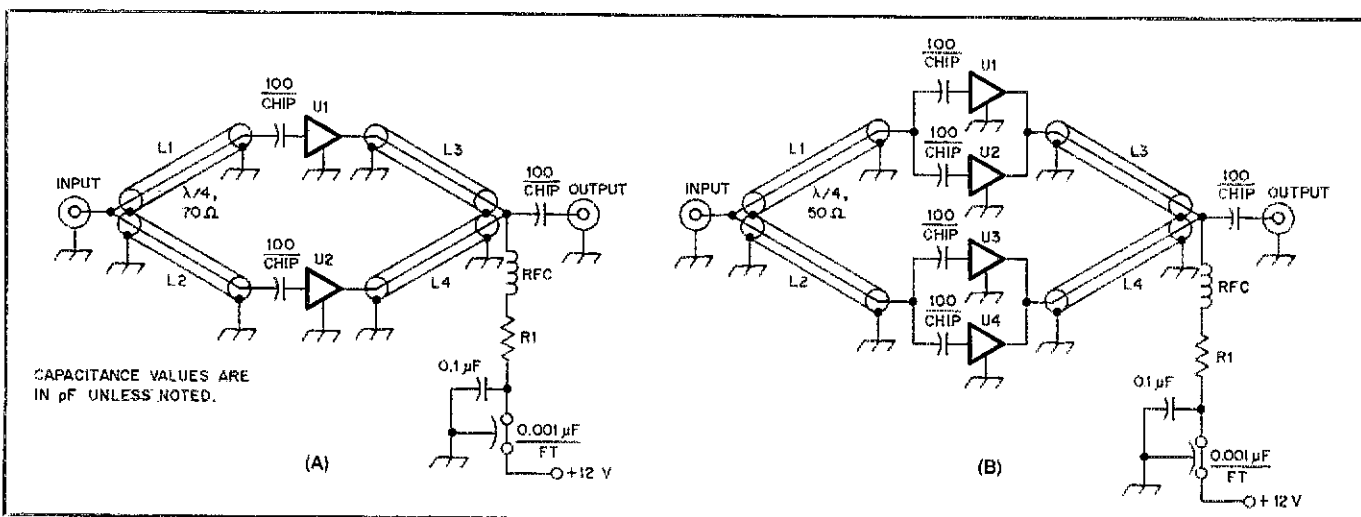


Fig 7—At 902 MHz and above, $\frac{1}{4}$ -wavelength transmission lines replace the lumped elements in the Wilkinson dividers. The circuit at A, for two MMICs, uses 70-ohm lines, while the four-MMIC amplifier at B uses 50-ohm lines. Line lengths for various frequencies are shown in Table 2. All 100-pF capacitors are 50-mil or 100-mil RF-type ceramic chips.

L1-L4—See text and Table 2.

R1—For the circuit in A: 62 Ω , 1 W. Set for 100-mA idling current. For the circuit

in B: 40 Ω , 2 W. Set for 200 mA idling current.

RFC—6t no. 24 wire, 0.125-in ID, spaced

1 wire diam.

U1-U4—Identical MMICs. MSA-0404 recommended for maximum power output.

100 ohms so that two of these networks can be paralleled to yield 50 ohms. Therefore, the characteristic impedance of the transmission lines should be

$$Z_0 = \sqrt{50 \times 100} = \sqrt{5000} \\ = 70.7 \text{ ohms}$$

For the four-MMIC circuit of Fig 7B, two MMICs are first paralleled to yield 25 ohms and then transformed to 100 ohms. This is done so that two of these networks can be paralleled to obtain a nominal 50-ohm impedance. Therefore, the characteristic impedance of the transmission lines for this circuit is

$$Z_0 = \sqrt{25 \times 100} = \sqrt{2500} = 50 \text{ ohms}$$

Identical transmission-line networks are used for both input and output matching. No tuning is required. The 50-ohm and 70.7-ohm transmission lines can be constructed from coaxial cable or simulated in a microstripline configuration! Table 2 shows the length of the $\frac{1}{4}$ -wavelength lines for several frequencies. Above 2 GHz, correction had to be made to the cable length to compensate for end effects and parasitics. The cable dimensions are measured shield end to shield end.

Table 2
Lengths of $\frac{1}{4}$ -Wavelength Lines For UT-141 Cable

Frequency (MHz)	Length (Inches)
902	2.3
1296	1.6
2050	0.9
2304	0.8

The circuit of Fig 7B is very attractive since low-loss, 50-ohm 0.141-inch semirigid cable is readily available and allows four MMICs to be paralleled easily. The 1-dB gain-compression point will be 5 to 6 dB greater than with a single MMIC. I recommend using the MSA-0404 MMIC in the parallel amplifiers because it offers the highest power output of any of the inexpensive plastic devices. Measured power output at the 1-dB gain-compression point for an assembly of four MSA-0404s is +19 dBm at 1296 MHz and +17 dBm at 2304 MHz. At 902 MHz, +19 dBm should be achieved easily. Saturated power output has been measured at more than +20 dBm (100 mW) at 1296 MHz and +18 dBm (60 mW) at 2304 MHz.

Gain at 1-dB gain compression measures 5 dB at 1296 MHz and 4 dB at 2304 MHz. These amplifiers have gain over a broad frequency range. The usable bandwidth of the 1296-MHz model is 300 MHz.

Construction of a 1296-MHz Amplifier

Fig 8 shows the layout of a 1296-MHz version of the four-MMIC amplifier of Fig 7B. It is built on a 2.05- x 4.05-inch

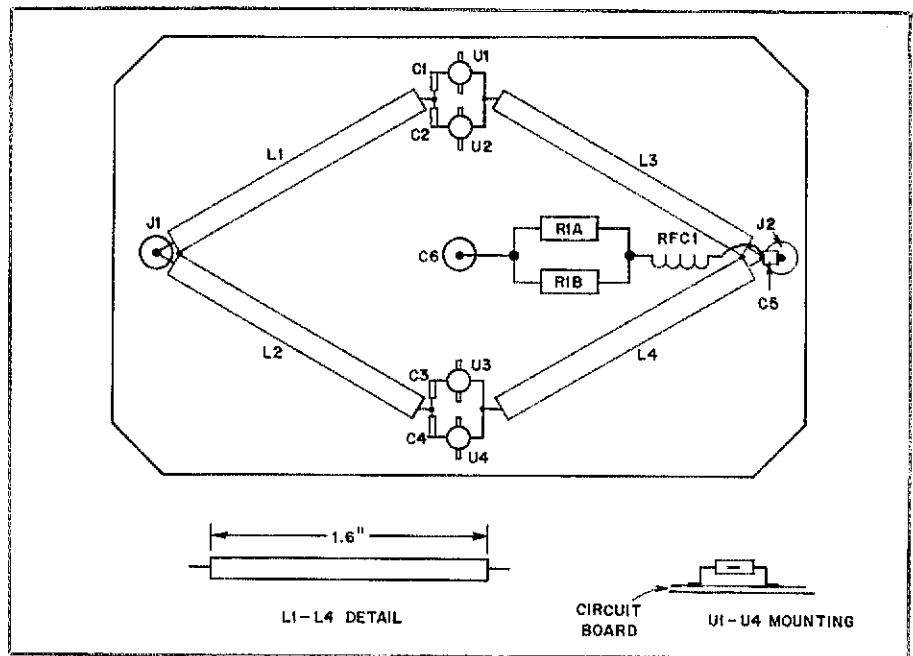


Fig 8—Board layout for a 1296-MHz version of the amplifier shown in Fig 7B.

piece of 0.062-inch-thick, glass-epoxy, double-sided circuit board. The board is not etched on either side and acts as a convenient circuit ground plane. This board will fit nicely into the lid of an aluminum diecast box (Bud CU-124 or Hammond 1590B). SMA connectors are desirable because of their small size and good UHF characteristics. Use screws or small wires to attach the flange (ground connection) of the SMA connector to the ground plane on the component side of the board. The ground must be carried through the board to ensure good RF performance.

The transmission lines are made from miniature 50-ohm, 0.141-inch, semirigid coaxial cable (UT-141). Cut each piece so that the outer jacket is 1.6 inches end to end. All four cables should be cut to the same length within ± 0.020 inch, which amounts to slightly over ± 1 electrical degree at 1296 MHz. Excessive differences in cable length contribute to a phase error which will prohibit the outputs of the four MMICs from adding in phase and producing maximum power output. Tack solder the ends of each piece of UT-141 cable to the ground plane. Soldering along the entire length of the cable jacket is not required.

Be very careful when handling MMICs; the leads may break off if they are bent directly at the case. Use the lead from a 1-W resistor as a tool to form the leads of each device as shown in Fig 8. Use a 15-W soldering iron to tack solder the ground leads to the ground plane and to solder the input and output leads. Mount the devices so that the center-to-center distance is $\frac{5}{16}$ -inch maximum. This way, the 0.1-inch-square chip capacitors can be mounted between the UT-141 center conductor and the device input. A very

short length of no. 24 wire can be used to tie the MMIC outputs and the UT-141 center conductor together. When laying out the board, be sure to leave enough room for C5 near the output connector.

A 2304-MHz Microstripline Amplifier

At 2304 MHz, inexpensive MMICs can be used to reach a power level of 50 mW or so, enough for local QSOs and even DX contacts under the right conditions. There are, however, some design considerations to be aware of. As we begin to cascade the MMIC amplifiers, we need to make sure that it is the final output stage that begins to compress first. If a driver stage were to compress first, it might be difficult, if not impossible, to drive the final to the desired power output. In addition, intermodulation distortion (IMD) products will increase. As a rule of thumb with identical devices, if one MMIC is used to drive two MMICs, the gain of each MMIC should be greater than 3 dB and preferably 6 dB. If the gain of each device were 3 dB in a one-driving-two circuit, the driver and output stages would reach the 1-dB gain-compression point at the same time. The result would be an amplifier with a 2-dB gain-compression point where 1-dB gain compression was desired. In a one-driving-four MMIC circuit, the gain of each MMIC should be greater than 6 dB, and preferably 9 dB.

Herein lies the design problem associated with the inexpensive MSA-0404. The gain at 2304 MHz is only 5-6 dB. One 0404 driving four 0404s would result in a 1-dB gain-compression point of only +15 to +16 dBm, a compromise because +17 dBm is possible. The problem is solved by using one MSA-0404 to drive a pair of MSA-0404s and then using each one

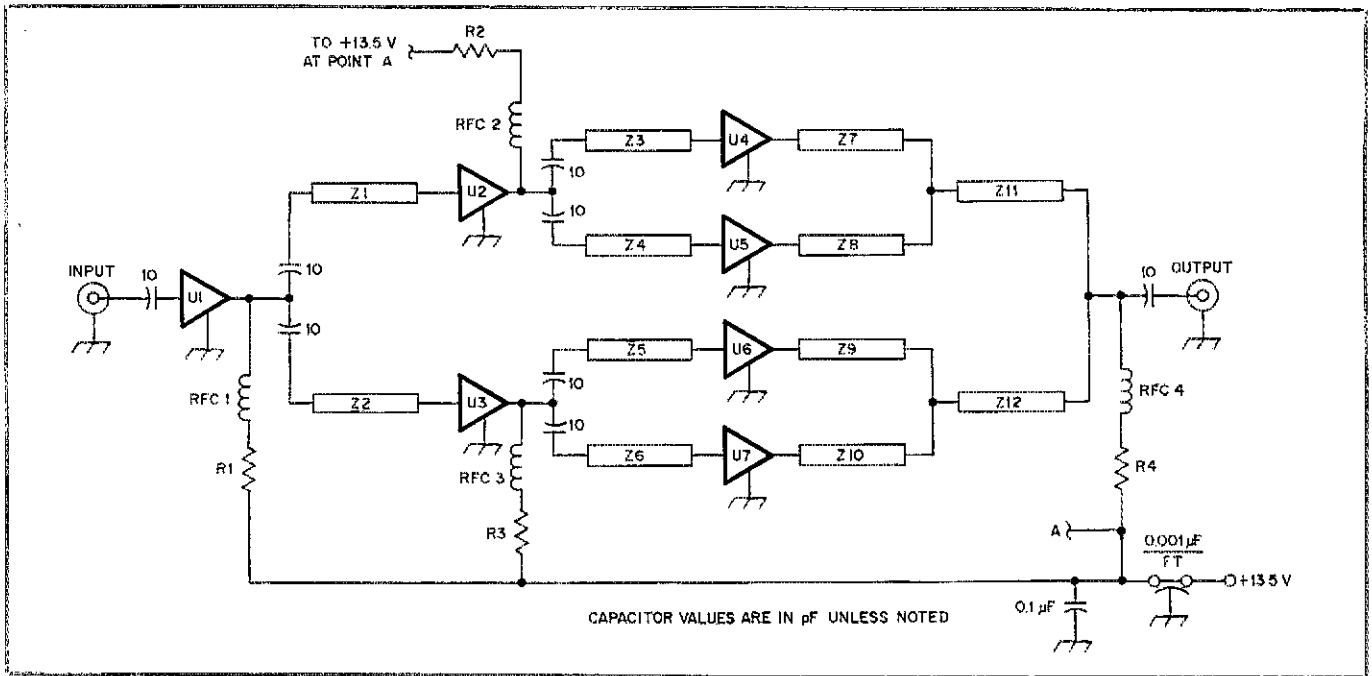


Fig 9—Schematic of a 2.3-GHz microstripline amplifier using seven MSA-0404 MMICs. All 10-pF capacitors are 50-mil or 100-mil RF-type ceramic chips.

R1-R3—150-Ω, ½-W carbon resistor.
R4—30-Ω, 2-W (minimum). Made from five 150-Ω, ½-W carbon resistors in parallel.

RFC1-RFC4—6t no. 28 wire, 0.125-in ID, spaced 1 wire diam.
U1-U7—MSA-0404 or MSA-0485 MMICs.

Z1-Z12—Etched ¼-wavelength, 70-ohm microstriplines. See text and Figs 10 and 11.

of the pair to drive another pair of MSA-0404s. The outputs are then recombined to give a single 50-ohm output. The divider and combiner networks can be constructed of 70-ohm microstriplines in a Wilkinson power divider configuration. This concept is shown schematically in Fig 9 and photographically in Fig 10.

The microstripline network is realized by using double-sided, 0.031-inch-thick Duroid® 5880 or 3M material with a dielectric constant of 2.17. The 50-ohm transmission lines are 0.120-inch wide, while the 70-ohm transmission lines are 0.060-inch wide. An etching pattern and parts-placement diagram are shown in Fig 11. Copper is retained on the bottom side for use as a ground plane. The etched board fits nicely in the lid of a Bud CU-124B diecast aluminum box. Space restrictions dictated the use of six-turn RF chokes rather than etched quarter-wavelength bias-decoupling lines. As it turns out, this may have contributed to the excellent bandwidth obtained with this design.

The performance of the unit was as expected at 2304 MHz. Gain was measured at 17 dB, and the power output at 1-dB gain compression was measured at +17 dBm (50 mW). Saturated power output was 60 mW. I wanted to get some idea of bandwidth of this unit, so I had the gain measured on a Hewlett-Packard HP 8409 automatic network analyzer. To my amazement, the gain went up to 19 dB at 2 GHz and 21 dB at 1296 MHz. I could achieve a saturated power output of

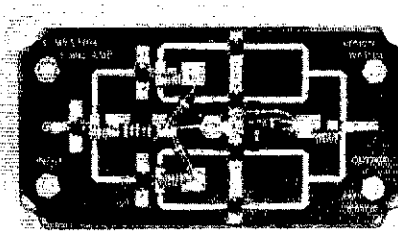
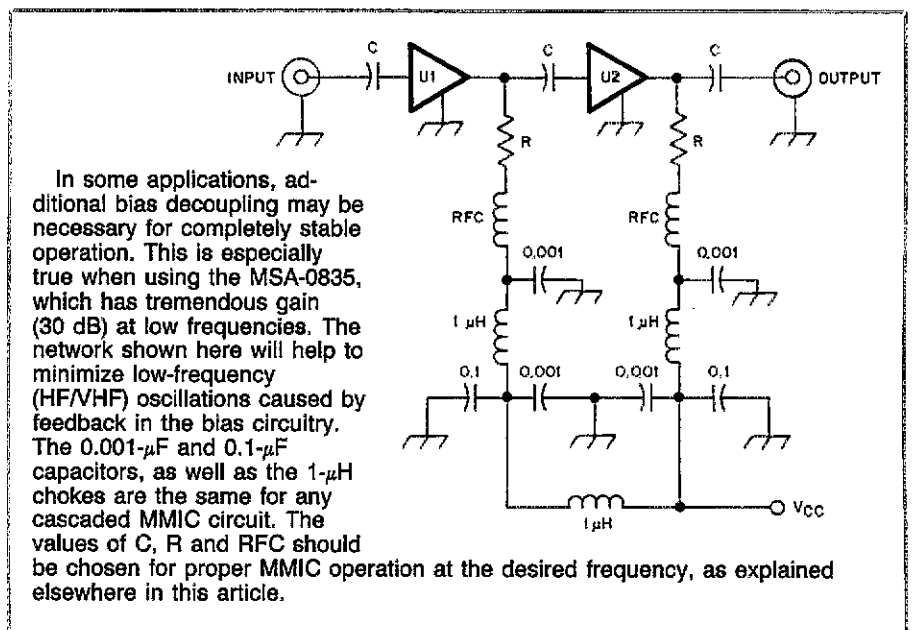


Fig 10—The finished 2.3-GHz, seven-MMIC amplifier fits neatly in the lid of a standard diecast box.

100 mW at 1296 MHz. Even though the matching networks were designed to be resonant at 2304 MHz, the rejection below 2304 MHz is offset by an increase in MMIC amplifier gain and a reduction in MMIC input and output SWR. The result is a 3-dB gain bandwidth of more than 2 GHz as shown in Fig 12. Input SWR is less than 1.6:1 between 500 MHz and 3 GHz, while the output SWR is 1.9:1 at 2304 MHz and increases with decreasing frequency.

The wide bandwidth of this amplifier



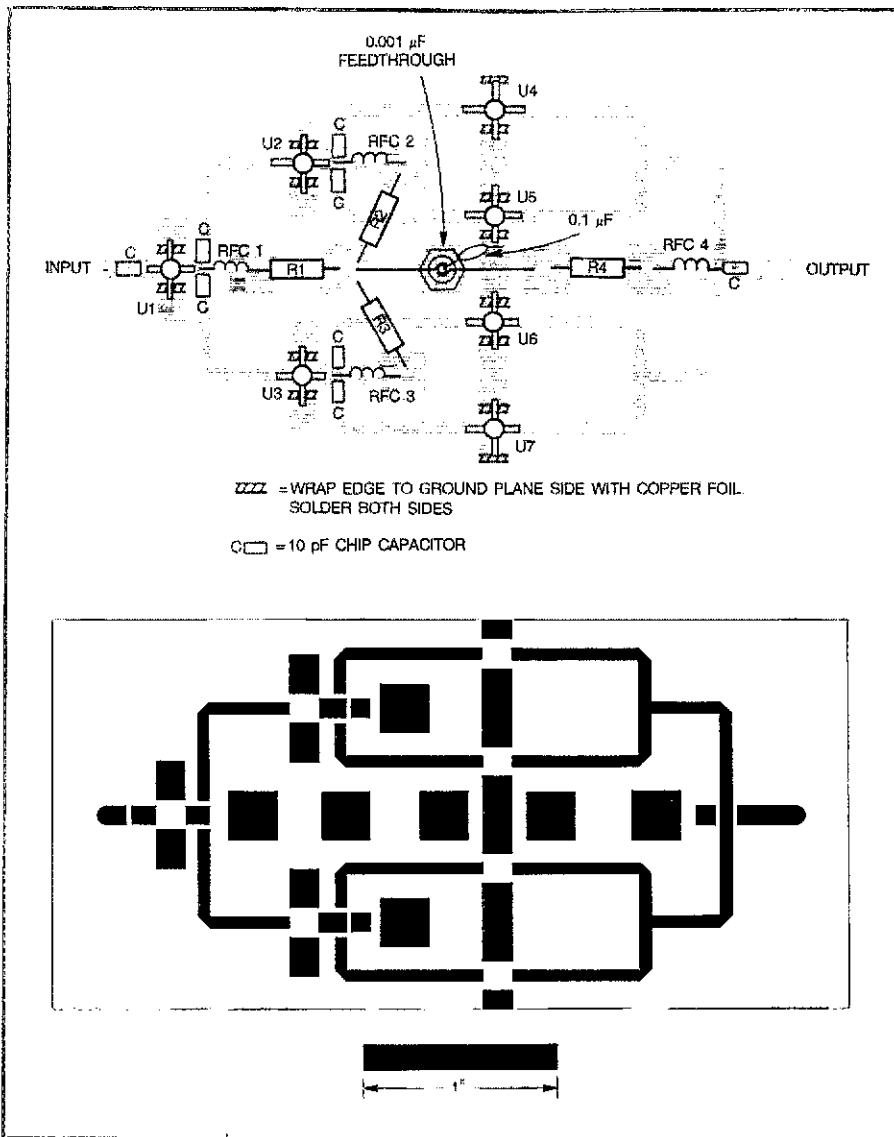


Fig 11—Etching pattern and parts-placement guide for the 2.3-GHz amplifier of Fig 9. The board layout is for 0.031-inch-thick, double-sided Duroid 5880 material ($E_r = 2.17$). The artwork must be revised if PC-board material with a different dielectric constant is used. One side of the board is left unetched to act as a ground plane. All components mount on the etched side of the board.

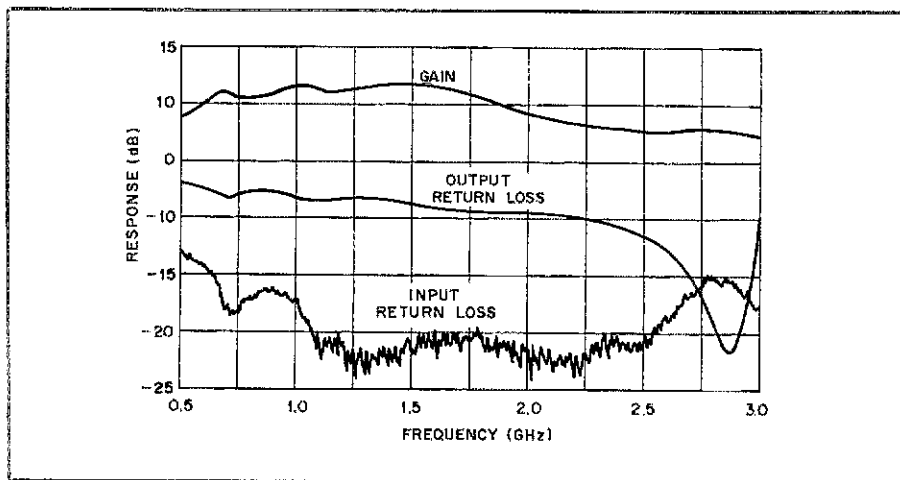


Fig 12—Gain, input return loss and output return loss of the 2.3-GHz MMIC amplifier show that this amplifier is usable from 500 MHz to 2.5 GHz.

makes it usable on several amateur bands. Remember that all this performance comes from an amplifier with no tuning! Total MMIC cost is only \$21 for the seven 0404s and less than \$14 if the new MSA-0485s are used. Gain for the 0485 version will even be slightly higher. Each MMIC draws 50 to 60 mA, so combined current drain is about 350 mA. Current requirements are the same with or without drive since the amplifier is running class A.

Construction

Construction is similar to that of the 1296-MHz amplifier described earlier and the microstripline amplifier described in Part 1 of this article. The etched PC board fits nicely into the lid of a diecast aluminum box. Clear away some ground-plane copper (approximately 0.130 inch) around the hole for each SMA-connector center pin and solder the connector flange to the PC-board ground plane. Drill holes in the box lid to clear the connectors. A feedthrough capacitor supplies V_{cc} to the amplifier.

Connect the MMIC common leads to ground using the techniques described in Part 1 of this article. Chip capacitors should be good 0.05- or 0.10-inch-square RF types, such as those manufactured by Dielectric Labs or ATC.

Predicting MMIC Amplifier Performance

It's very easy to cascade and/or parallel MMICs for a wide variety of applications. When deciding which (and how many) devices to use to fill a given need, it is helpful to do a little homework first. Predicting the performance of an amplifier made from a given combination of MMICs is merely a matter of understanding a few basic parameters: gain, SWR, noise figure, 1-dB gain compression, and intercept point.

When dealing with transmitter stages, generally all parameters except noise figure are considered important. Since the noise figure for most MMICs is in the 5-6 dB range, the noise level is so low that other levels in the exciter such as carrier suppression and phase noise are the most dominant factors. In a receiver, all parameters should be considered if good dynamic range is desired. The intent of this section is simply to review these concepts and give several examples. Actual system requirements will be left up to the builder.

Gain

Gain is a measurement of the difference in power available at the source and power available after the device under test (DUT) is inserted. This is shown in Fig 13. To get the most accurate gain measurements possible, the source impedance and the power measuring instrument should exhibit a low SWR (less than 1.15:1) referred to the system impedance (50 ohms in this case). Occasionally the impedance of the signal source or power meter is not 50 ohms resistive. A 50-ohm, 6- to 10-dB attenuator can be used between the DUT and test

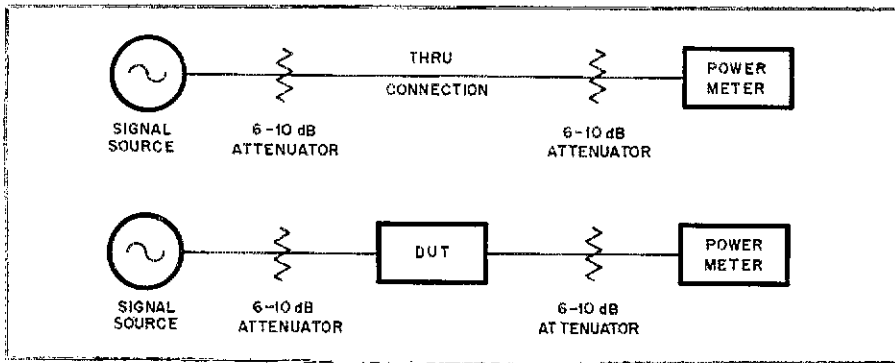


Fig 13— A test setup for measuring gain is first calibrated without the amplifier (DUT) in line. The 6-10 dB attenuators ensure adequate impedance matching of all components to 50 ohms.

equipment to obtain an adequate impedance match.

Since we are making a gain measurement with the "available power" method (which, by the way, is the standard accepted industry method), the effect of the DUT input and output SWR is automatically taken into account with the gain measurement. Included in the gain measurement of the DUT is the mismatch loss which is associated with the SWR of the DUT. Mismatch loss (ML) can be calculated from:

$$ML = -10 \log \left[1 - \left(\frac{SWR - 1}{SWR + 1} \right)^2 \right] \quad (\text{Eq 6})$$

If the input and output SWR is 1.0:1, then the corresponding mismatch loss is 0 dB. Any improvement in the input and output SWR of an amplifier results in an increase in measured gain equal to the reduction in mismatch loss at each port.

When cascading MMICs, we would like to see the resultant measured gain equal to the sum of the individual MMIC gains. This would be possible if the input and output SWR of each MMIC were 1.0:1. However, this is rarely the case. Eq 7 can be used to calculate mismatch loss as a function of two SWRs beating against one another.

Mismatch Loss =

$$20 \log \left[1 \pm \left(\frac{SWR_1 - 1}{SWR_1 + 1} \times \frac{SWR_2 - 1}{SWR_2 + 1} \right) \right] \quad (\text{Eq 7})$$

The resultant mismatch loss will either add to or subtract from the sum of the individual MMIC gains. The + term in Eq 7 will give the maximum possible additional loss, while the - term will give the minimum possible additional loss (which is in reality gain). Maximum mismatch loss will occur at some electrical spacing, L, between the two MMICs. Minimum loss will occur at a spacing $\frac{1}{4} \lambda$ shorter or longer than L. It is possible for two SWRs (>1.0:1) to be a conjugate match (that is, $R + jX$ and $R - jX$ on the Smith Chart). If this occurs, the cascaded MMICs will produce more gain than the

sum of the gains of the individual MMICs would indicate is possible.

For example, two 1.5:1 SWRs could produce 0.34 dB additional loss, or 0.35 dB less loss (more gain) than the sum of the individual amplifier gains. Suppose an amplifier has two cascaded MMICs. The output SWR of MMIC no. 1 is 2.0:1, and the input SWR of MMIC no. 2 is 1.5:1. Assume the input SWR of MMIC no. 1 and output SWR of MMIC no. 2 to be 1.0:1. The mismatch loss could be +0.56 dB maximum or -0.6 dB minimum. If the gain of MMIC no. 1 is 6 dB and the gain of MMIC no. 2 is 7 dB, the possible resultant gain of the cascaded pair could be

$$6 \text{ dB} + 7 \text{ dB} + 0.56 \text{ dB} = 13.56 \text{ dB} \text{ maximum gain}$$

or

$$6 \text{ dB} + 7 \text{ dB} - 0.6 \text{ dB} = 12.4 \text{ dB} \text{ minimum gain.}$$

The actual gain will be between 12.4 and 13.56 dB, depending on the electrical length between the two devices. Eq 7 gives an idea of the relative uncertainty of the cascaded gain. Keep this in mind as MMICs are cascaded.

Noise Figure

The noise figure of a cascaded series of devices is calculated readily from the following equation.

NF (total) =

$$NF_1 + \frac{NF_2 - 1}{G_1} + \frac{NF_3 - 1}{G_1 G_2} + \frac{NF_4 - 1}{G_1 G_2 G_3} \dots \quad (\text{Eq 8})$$

where noise figure (NF) and gain (G) are expressed in unitless ratios. To convert from noise figure or gain expressed in decibels to a ratio, first divide the number in dB by 10 and take the inverse base 10 log to obtain the ratio.

As an example, let's analyze the noise figure of the 2304-MHz receiving converter shown in Fig 14. Two MSA-0835 MMICs are used as RF amplifiers, followed by a band-pass filter, doubly balanced mixer and IF amplifier.

To simplify the calculation, the loss of the filter and mixer can be added to the noise figure of the IF amplifier. This allows the receiver to be analyzed as only three stages: the two MSA-0835s, each having a 4-dB NF with 13-dB gain and the filter/mixer/IF amp having a 10.5-dB NF and 10-dB gain.

NF (total)

$$\begin{aligned} &= 2.5 + \frac{2.5 - 1}{20} + \frac{11.2 - 1}{20 \times 20} \\ &= 2.5 + 0.075 + 0.255 \\ &= 2.60 \\ &= 4.15 \text{ dB} \end{aligned}$$

This calculation assumes no additional mismatch loss. Mismatch loss can be factored in as additional loss, or as an increase in noise figure of the stage just following the mismatch.

Compression Point

Calculating 1-dB gain compression of a series of amplifiers is not as straightforward as gain or noise figure. The 1-dB gain-compression point typically occurs several decibels after amplifier performance diverges from linearity, but it does depend on device characteristics. Unless this

(continued on page 33)

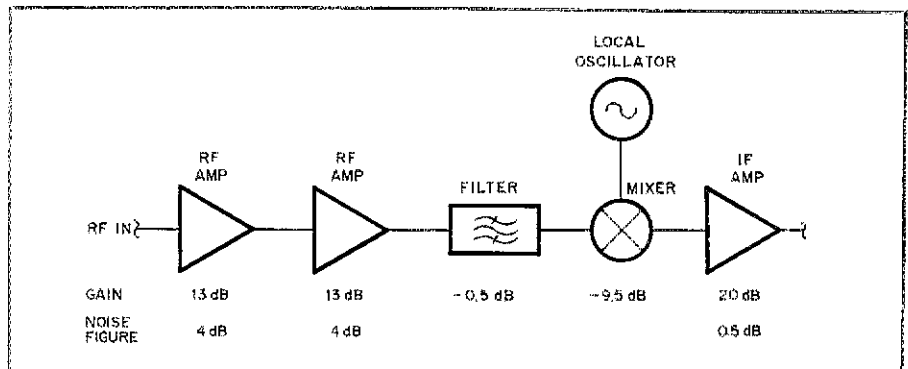


Fig 14—Block diagram of a 2.3-GHz receiving converter. To calculate the system noise figure of a cascaded series of components, the gain (or loss) and noise figure of each stage must be known.

The Omni-Shift Tuner—A Comprehensive Tuning System for HF Packet/AMTOR/RTTY

Can't tune in those packet and RTTY signals? Zero in on 'em with this easy-to-build precision tuning aid!

By Richard A. Nelson, WB0IKN
3640 Juanita Rd
Fort Collins, CO 80524

When my article, "A Tunable CW Filter," appeared in *QST*, I expected experimenters to find additional applications for the circuit.¹ One of the more novel and useful modifications was developed by Marcel De Vaux, W6ZDX, and Paul Cooper, N6EY, who were working on a tuning system for packet communications.² Several months of collaboration produced the Omni-Shift Tuner described here.

Radio amateurs have been using frequency-shift keying for RTTY for many years. Normally, amateurs use 170-Hz shift for 60- and 100-WPM RTTY. The use of 170-Hz shift has its heritage in the Bell System operating procedures. There, everything is phase locked to a master oscillator and employs frequencies that are multiples of 85 Hz. This explains how the commonly used frequencies of 2125 and 2295 Hz came into being.

There are several characteristics of HF operation that affect FSK. Marginal signal-to-noise ratios (S/N), combined with selective fading, can make solid copy difficult. Therefore, modern demodulators have become quite sophisticated, employing individual tone filters, complex comparators and decision circuits with variable thresholds. FSK demodulators based on PLLs (such as the Exar 2211) do not really perform well in this environment, although they do perform satisfactorily on VHF and the "twisted pair" (telephone lines).

Tuning Systems

The incoming signal tones must be



matched accurately to the decoder filters for optimum performance. So, tuning in FSK stations requires something better than simply listening to the audio tones and tuning until clean copy is obtained.

... the most accurate and informative tuning system employs an oscilloscope ...

There are three commonly used tuning systems. Many older "terminal units" (what modems were called "back when") used a twin-meter system. The meters were fed from the individual filters, and proper tuning was indicated when the meter readings were equal. A second system that has attained recent popularity is the solid-state equivalent using bar-graph LED displays.

By far, the most accurate and informative tuning system employs an oscilloscope

with one filter feeding the horizontal amplifier and the second filter feeding the vertical amplifier. The resulting crossed-ellipse pattern allows tuning within a few Hz: As the receiver is tuned off-center, the pattern rolls dramatically. Such a system is particularly useful when S/N ratios are low. Using a scope, it is possible to accurately tune in signals that are barely audible.

AMTOR and packet-radio FSK systems have made accurate signal tuning even more critical. This requirement has caused HF packet stations to huddle together on certain frequencies because they are afraid that if they QSY, they'll never find one another! In addition, it can get frustrating when packets sound okay, but don't print correctly. With an oscilloscope tuning system, it is usually possible to tell why at a glance.

The Omni-Shift Tuner

This tuner incorporates the essential circuits for a complete, accurate tuning-indicator system. With this tuner, two tone pairs can be preset, making it useful for multimode operation. The appropriate pair of frequencies is selected by means of a

¹Notes appear on page 33.

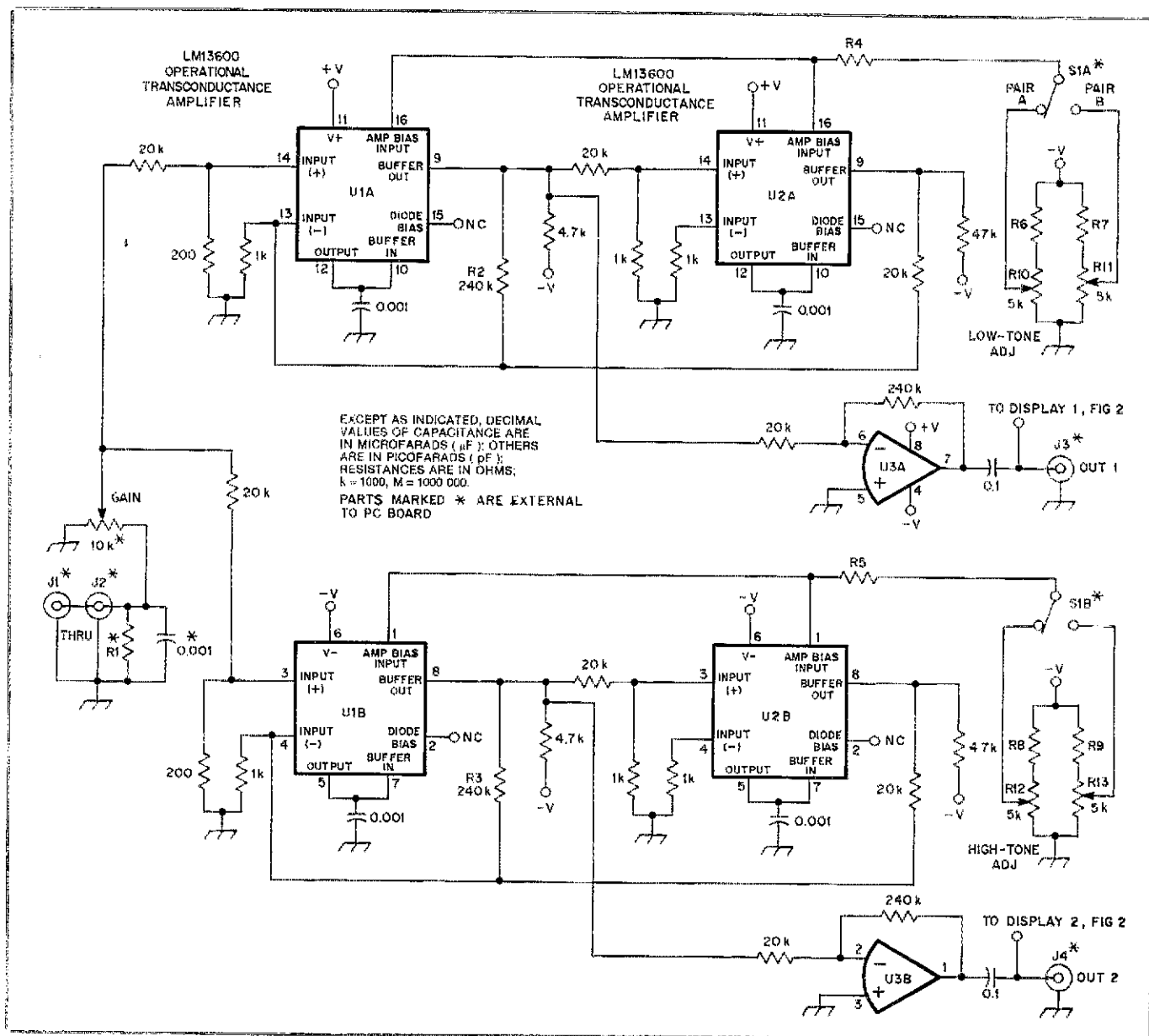


Fig 1—Schematic diagram of the filter/buffer assembly. This circuit alone may be used with an oscilloscope and an external ± 5 V to ± 12 V power supply. If a power supply and/or LED tuning indicator are needed, combine this circuit with either one or both of the circuits presented in Fig 2. The $-V$ and $+V$ points are connected to the chosen supply voltage; see text and Table 1.

J1, J2—1/8-inch miniature phone jack.

R1—20- Ω , 1/2-W.

R2, R3—240-k Ω (see text).

R4-R9, incl—See text and Table 1.

R6-R9—5-k Ω , 15-turn trimmer potentiometer (Bourns 3006P, Weston 830P, Beckman 89PR or equiv).

U1, U2—LM13600 OTA (National Semiconductor).

U3—MC1458 dual 741 op amp (or equiv).

front-panel-mounted switch. The version presented here includes a built-in LED display and provisions for an oscilloscope display. Those of you who own a scope may wish to omit the LED portion of the system to reduce project complexity and cost. A power supply is also shown, although a bench supply may be substituted.

Circuit Design and Construction

The theory behind the tunable filter design is detailed in my original article. Here is a brief summation. The two identical filter sections are based on operational transconductance amplifiers (OTAs), U1 and U2 of Fig 1. OTAs exhibit

a transconductance (the inverse of resistance) that is programmable, generally by means of an external bias current. In this filter, each OTA is tuned by means of a control current derived through a voltage-to-current converting resistor (R4 and R5) from a potentiometer-controlled voltage divider. This allows the transconductance of two or more OTAs to track a single control voltage.

A state-variable filter configuration was chosen for its ease of tuning and stability at high Q. Tuning a state-variable filter normally requires a ganged, dual-element potentiometer. With voltage-controlled tuning, however, only a single potentiometer is needed. This makes switching tone

pairs easier and reduces the possibility of hum production because only control voltages, not audio signals, are adjusted.

Tuning Range and Supply Voltage Selection

Because the tuning range of the filters depends on the voltage across the frequency determining potentiometers (R10-R13, inclusive), different supply voltages will yield widely different tuning ranges unless the appropriate resistor values are scaled. To allow the use of available power supplies with outputs between ± 5 and ± 12 V, values for R4 through R9, inclusive, are

Table 1
Frequency Dependent Resistor Values

Resistor Number	Supply Voltage		
	±5	±8 or 9	±12
R6-R9, inclusive	2 kΩ	1 kΩ	750 Ω
R4, R5	75 kΩ	120 kΩ	180 kΩ

presented in Table 1. These values provide a tuning range from below 300 Hz to above 3000 Hz. Select the proper values for your anticipated supply voltage before you begin assembly. R10 and R11 allow for adjustment of the low tones of each frequency pair, while R12 and R13 permit adjusting the high tones of each pair.

Filter Q

The Q of the individual filter sections has been experimentally optimized for oscilloscope use. Ringing increases with increased Q, and this hangover causes "noise" in the

scope display. This is not a problem with the LED display, however, and narrower filters will improve the resolution. The filter Q is scaled easily by changing the value of R2 and R3. Increasing their value increases the Q. You may wish to provide switch selection of various Qs, or even use a dual-section potentiometer to vary the Q of the two filters.

Amplifier Gain

The signals from the filters are amplified by a dual op amp, U3. Amplifier gain is set by the 240-kΩ feedback resistor across each op amp. The gain may be varied, if desired, by scaling the value of these resistors—higher values will increase the gain. The amplifier outputs are ac coupled to the oscilloscope. C1 and C2 connect the display board to the oscilloscope outputs and prevent rectified dc from bouncing the scope pattern. These capacitors may be omitted if an oscilloscope output is not provided.

An input-matching resistor, R1, may be

used if desired. A 20-Ω, ½-W resistor will handle the speaker output of most receivers. Many rigs also include tape-recorder or phone-patch outputs that may be used provided they are low-impedance outputs (less than about 1 kΩ).

LED Display

Each of the audio signals is processed by a peak detector circuit that smooths modulation of the individual tones. This eliminates distracting jitter in the LED display, thus improving resolution. The 10 LEDs in each channel are driven by an LM3914. This IC includes 10 comparators connected to a built-in resistor chain and voltage reference along with associated LED driver circuitry. The resulting linear voltmeter display has instantaneous response and excellent readability, making it ideal for use with highly dynamic signals.

Power Supply

If you do not have a suitable bench supply and your computer cannot provide

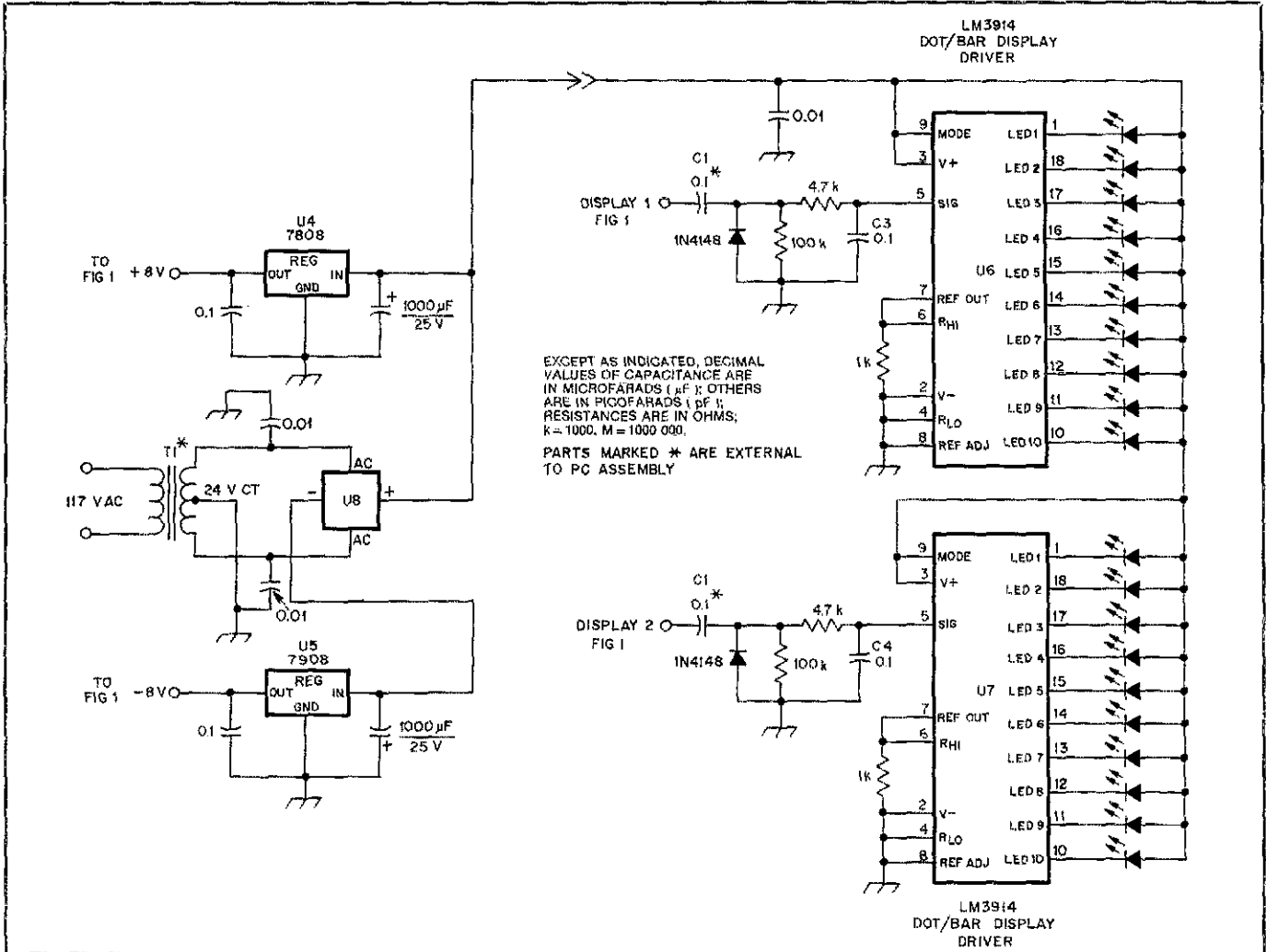


Fig 2—Schematic diagram of the optional display and power-supply circuits. Either one or both may be added to the filter/buffer assembly as required.

- DS1-DS20, incl—T1 LED.
- T1—Power transformer, 117-V ac primary, 24-V ac center-tapped secondary,
- 300 mA (Stancor P-8396 or equiv; see text).
- U4—7808 positive 8-V regulator.
- U5—7908 negative 8-V regulator.
- U6, U7—LM3914 dot/bar display driver.
- U8—DIP bridge rectifier (VM06 or equiv).

the required ± 5 to ± 12 V, you'll have to construct the power supply shown in Fig 2. The supply is designed to provide ± 8 V for the filter and display sections. It uses three-terminal regulators in their basic configuration. Although the supply outputs are not clean enough for critical designs, ripple suppression is more than adequate for this application. The regulated ± 8 V outputs feed the filter board, and the unregulated positive line feeds the LED display. This arrangement prevents any possibility of supply line noise modulating the audio signal.

Assembly

An inside view of the prototype unit is shown in Fig 3. I recommend the use of PC boards for construction.³ PC-board etching patterns and parts overlays for each of the three modules are available from the ARRL.⁴ Each of the boards may be built separately; this eases construction, simplifies testing and helps to eliminate disasters. Note that the filter/buffer board requires two jumpers to be soldered to the foil side. Run a jumper between the pair of hex-shaped pads marked A and a second jumper between the pads marked B.

... includes a built-in LED display and provisions for an oscilloscope display.

The power supply board is designed to mount above the filter board as shown in Fig 3. I found a transformer in my junk box that fit neatly into the Radio Shack enclosure (RS 270-253) after some filing of the mounting tabs. Make sure that there is adequate clearance for the transformer you select before you start to punch holes in the cabinet.

Carefully check the orientation of all ICs and polarized devices before mounting the PC boards in the enclosure. Note that most LEDs have their cathode lead marked by a flat side and/or their anode lead is the longer of the two. If in doubt, you can test for polarity using a 9-V battery in series with a 1-k Ω resistor. Install the LEDs with their anodes toward the outside edge of the PC board, being careful to orient them vertically. Touch up any that are crooked by quickly reheating the solder joint and adjusting the LED's position.

I chose to mount the LEDs behind a red lens/bezel assembly. You can save a few dollars by mounting the LEDs directly on the front panel using plastic retainers. Of course, this requires punching 20 evenly spaced holes. Don't try to do this with a hand-held drill; you'll probably be disappointed with the results. The opening

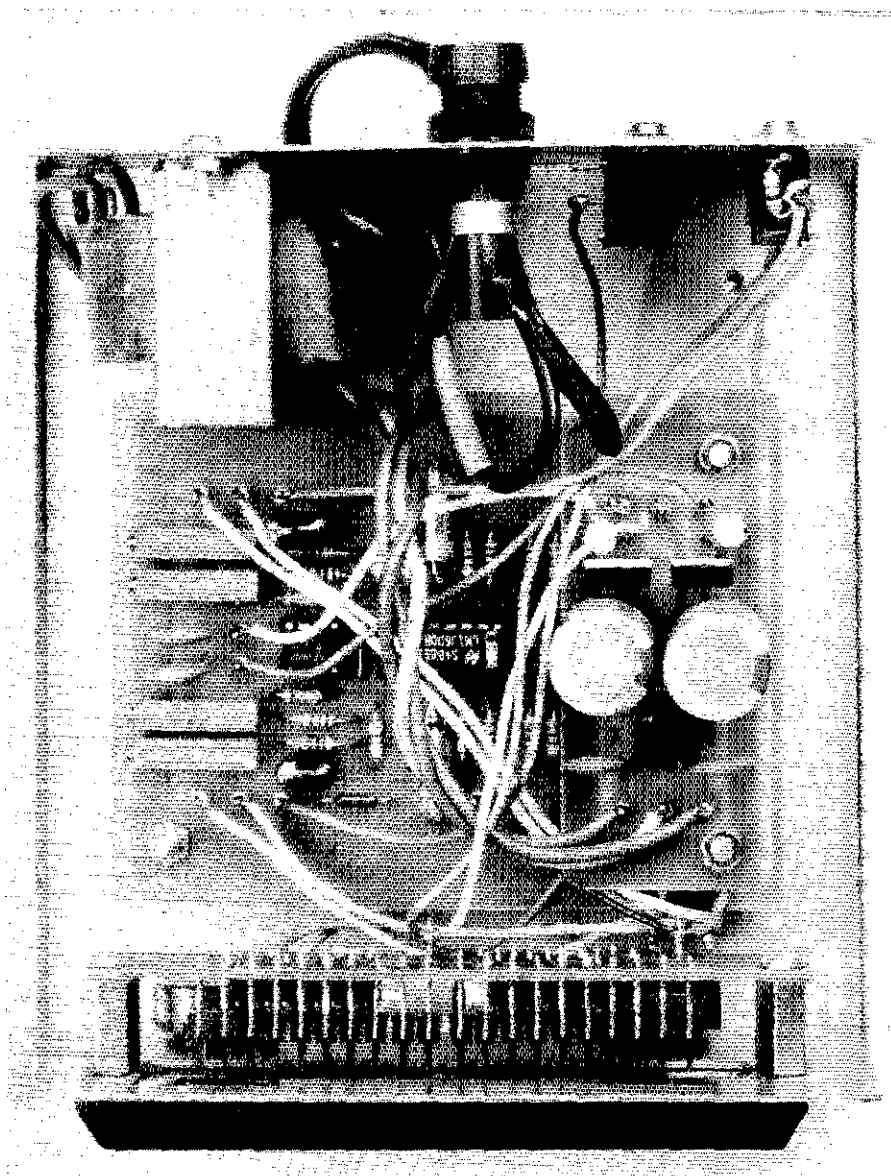


Fig 3—An inside view of the Omni-Shift Tuner. The power-supply board is at the right foreground, mounted above the filter board. A small PC board supports the 20 LEDs of the display behind the front panel. At the left of the filter board are the four trimmer potentiometers used to preset the filter center frequencies. The power transformer, fuse and four miniature phone jacks (mounted in two pairs, one above the other, so only one pair is visible) are mounted on the rear panel. The two jacks to the left are the THRU jacks. On the right are the MARK (upper) and SPACE (lower) scope jacks. Not visible in this photograph are the GAIN potentiometer and PAIR A/PAIR B switch mounted beneath the LED display; see title photo.

for the bezel may be rough-cut using a nibbling tool, then carefully filed to exact size. A front-panel drilling/mounting template for the design shown in the photographs is available.⁵ This template may also be covered with laminating plastic (available at drafting stores) and mounted to the front panel using spray adhesive; this provides a neat, mar-resistant labeling.

Setup and Use

Insert the Omni-Shift Tuner in the line between your receiver and demodulator using the two jacks labeled THRU (J1 and J2). If you will be using an oscilloscope with a high-impedance input, connect it to the SCOPE OUT jacks. Connect the high-

frequency tone to the scope's vertical input, and the low-frequency tone to the horizontal input.

A front-panel drilling/mounting template is available.

Next, you must adjust the tuner to respond properly to the two tone pairs you've selected. With the TAPR TNC 1, setup is particularly easy, especially if you

have provisions to monitor your off-the-air signal. The TNC 1 has a built-in calibrate mode that allows continuous tones to be generated for either the mark or space frequencies. If you use a transmitter as a signal source, you should use low power and a dummy load. Another calibration method is to use a signal generator and a frequency counter.

Although the LED display may be used

The resulting linear voltmeter display has instantaneous response and excellent readability.

as an indicator during these adjustments, better accuracy and precision are achieved by using a voltmeter connected to the buffer output of the section under alignment. To preset the first frequency pair, place the select switch to PAIR A. Feed the proper tone frequency to the filter and adjust the appropriate low- and high-tone trimmer potentiometers (R10 and R12). Carefully adjust the trimmers for maximum output at the appropriate frequency for each section. The second frequency pair is similarly preset after flipping the select switch to PAIR B. Now adjust R11 and R13 for the low and high tone. It is important that the filters be tuned to the exact frequencies required by your demodulator. Any error introduced at this point will cause similar errors in tuning.

Don't overload the tuner's input . . .

To tune in a signal using the LED display, adjust the GAIN control until several LEDs light while tuning across a signal. (Don't overload the tuner's input with too high a signal level or you're liable to have difficulty interpreting the display response.) Note that the two display sections illuminate from left to right. Quickly, but carefully, tune back and forth until both display sections are equally lit. That's all there is to it!

An oscilloscope permits exact tuning and gives a great deal of information on signal and band conditions. When using a scope, watch the pattern while you adjust the receiver frequency. As you approach the correct frequency, the pattern size will increase and a pair of crossed ellipses will begin to emerge. At the center frequency, the ellipses will form a cross. As you tune past center, the pattern rolls and rapidly shrinks in size. The visual display is very striking and allows extremely precise tuning. If you have never experienced crossed-ellipse tuning, you will be surprised how quickly you can tune to within a few hertz of being "on the nose."

Keep in mind that different TNCs use different tone pairs, although a shift of 200 Hz at 300 bauds is standard on HF. Some TNCs use tones of 1600 and 1800 Hz, while others may use 2110 and 2310 Hz; the actual frequencies are arbitrary so long as

the split is 200 Hz. If you're using LSB with AFSK (which most of us do), and the transmitter is calibrated in terms of the equivalent carrier frequency, then the receiver frequency display will read differently for different tone pairs. Remember this when comparing frequencies or setting up skeds.

Conclusion

Though this unit is constructed for two tone pairs, with proper modification, several tone pairs can be accommodated. An accurate tuning indicator is a valuable asset to anyone operating FSK on the HF bands. If you are using an older PLL-type demodulator, adding the Omni-Shift Tuner to your system will ensure reliable copy. Users of state-of-the-art demodulators will appreciate the ease and speed of tuning. My thanks to Marcel De Vaux and Paul Cooper for developing the modification, testing my prototype and contributing to the manuscript.

Notes

¹R. Nelson, "A Tunable CW Filter," *QST*, Oct 1983, pp 14-16. Feedback, *QST*, Feb 1984, p 49.

²M. DeVaux and P. Cooper, Technical Correspondence, *QST*, Sep 1986, pp 51-52.

³PC boards, kits and parts are available from Analog Technology, PO Box 8964, Fort Collins, CO 80525, tel 303-484-6749. The *ARRL* and *QST* in no way warrant this offer.

⁴PC-board patterns and parts overlays for the filter, power-supply and display boards are available at no cost from HQ. Write to the Technical Department Secretary and request the Nelson Omni-Shift Tuner templates.

⁵Correspondence and requests for front-panel templates may be addressed to the author. Please include an SASE. QST

Monolithic Microwave Integrated Circuits

(continued from page 28)

portion of the gain curve is accurately known, it may be hard to determine which stage is actually compressing. It's also possible that two or more stages are compressing simultaneously.

The simplest solution is to ensure that the only stage driven to the 1-dB gain-compression point is the output stage. Make sure that each driver stage is running at an output power at least 3 dB, and preferably 6 dB, lower than its 1-dB gain-compression point.

IMD Products

Of great concern to amateurs who must share a band is how clean an amplifier chain will be. Undesired close-in intermodulation distortion (IMD) products must be well below the level of the fundamental signal, or the result will be "splatter" for many kilohertz on either side of the desired signal. MMICs are linear class-A devices, so they are relatively clean.

Typically when an MMIC amplifier is run up to 1-dB gain compression, the two-tone, third-order IMD products are at

Table 3

Measured IMD Performance of MMIC Amplifiers

Device (MSA-)	1.3 GHz		2.3 GHz		3.4 GHz	
	PEP Output (dBm)	3rd Order IMD Level (dB)	PEP Output (dBm)	3rd Order IMD Level (dB)	PEP Output (dBm)	3rd Order IMD Level (dB)
0485	+12	-32	+12	-28	+12	-28
0835	+15	-28	+15	-27	+12	-29
0404/0404	+12	-31	+12	-28	Not Tested	
7 x 0404	+17	-32	+17	-27	Not Tested	
	+18	-29	Not Tested		Not Tested	

about 27 to 32 dB below the PEP output. For every 1-dB decrease in power output level, the third-order IMD power level will decrease by 3 dB. The IMD products relative to the desired signal decrease by $3 - 1 = 2$ dB. As power out approaches 1 dB gain compression, IMD becomes significantly worse than at lower power levels.

Measured IMD data is shown in Table 3 for several MMIC amplifiers at

different frequencies. This data was taken with the amplifier power output at, or slightly greater than, the 1-dB compression point. IMD performance tends to be worse at higher frequencies.

IMD products for a cascaded series of amplifiers tend to be worse than for a single device. For example, in one test, third-order IMD products for a two-stage MSA-0404 amplifier were 2 dB worse than for a single device. QST

• *Under Construction*

How to Build and Use Balun Transformers

Understanding baluns will help you to apply them properly. Building your own unit can be simple and inexpensive.

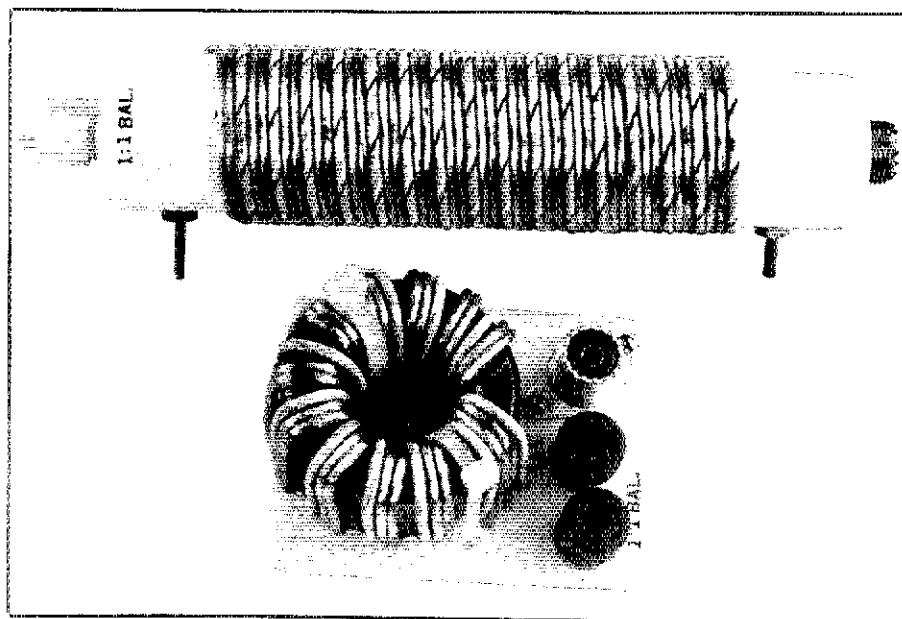
By Doug DeMaw, W1FB
ARRL Contributing Editor
PO Box 250, Luther, MI 49656

Do I need a balun transformer? How should I install the darned thing? Will it cure TVI? These common questions are asked by amateurs with regard to the sometimes mysterious balun.

Let's begin by considering what the term "balun" means. The word is a composite of "balanced to unbalanced." If we add the word "transformer" after it, the expression becomes definitive. A *balanced-to-unbalanced* transformer is the result, and it is self-explanatory. Balun is one of the most mispronounced words in Amateur Radio. Frequently it comes out as "baylon, bal-oon or ballum." I recently heard a ham say on 75 meters, "I think I need one of them baylons in my dipole so that I can get out better." This and similar statements indicate the general lack of understanding about the purpose and use of balun transformers. There is probably more misuse of baluns than correct applications of the device. Let's learn how to use them, and what the common pitfalls of incorrect use might be.

Typical Applications

Suppose you are using a balanced antenna, such as a half-wavelength dipole. The antenna's average height above ground is 40 to 60 feet for most amateur installations, which provides a feed impedance between 40 and 75 ohms, depending on the dipole form (inverted V or straight dipole) and electrical height above ground. For the purpose of this exercise, let's assume we have a 50-ohm feed impedance. The usual practice under this condition is to feed the dipole with 50-ohm coaxial cable. In effect, we now have an unbalanced feed line connected to a balanced antenna. Will this impair the antenna performance? Not really, because the antenna is close to ground in terms of wavelength (a height of 0.5 wavelength or greater ensures the bi-directional figure-8 pattern), the pattern is pretty much omnidirectional and is at high radiation angles (great for close-in com-



munications). If the antenna were 0.5 wavelength or greater above ground, we could measure the figure-8 pattern with a field-strength meter, and with the unbalanced

helpful when we use tri-band Yagi antennas, since they do exhibit a well-defined radiation pattern.

Now, let's suppose we are using a 300-ohm folded dipole (height above ground not considered) and want to feed it with coaxial cable (Fig 1A). Not only do we have a balanced-to-unbalanced feed condition, we also find a considerable difference between the feed impedance of the antenna and that of available coaxial cables. Here we can effectively apply the concept of baluns. If we install a 4:1 balun transformer at the antenna feed point, we can use 75-ohm coaxial feed line from the antenna to the ham shack. Not only have we converted a balanced feed point to balanced line, we have matched the 300-ohm impedance to 75 ohms. Is this desirable? Definitely, yes!

Do Baluns Cure TVI?

A fair amount of mumbo jumbo has been spread about curing TVI through the addition of a balun transformer at the antenna feed point. First, let's remember that TVI is caused by harmonic or spurious radiations, and by fundamental over-

A saturated core produces square waves, and these cause harmonic currents...

feeder we might notice a slight distortion or skew in the pattern. But with the wide lobes of a dipole, it would make no practical difference in our communication ability. Therefore, a 1:1 balun transformer is not needed. On the other hand, if we were rich and fortunate enough to have a two- or three-element 75-meter Yagi antenna at 120 feet or greater, the balun would be worth including in the system, at the antenna feed point in order to help preserve the classic radiation pattern of the antenna. Balun transformers are also

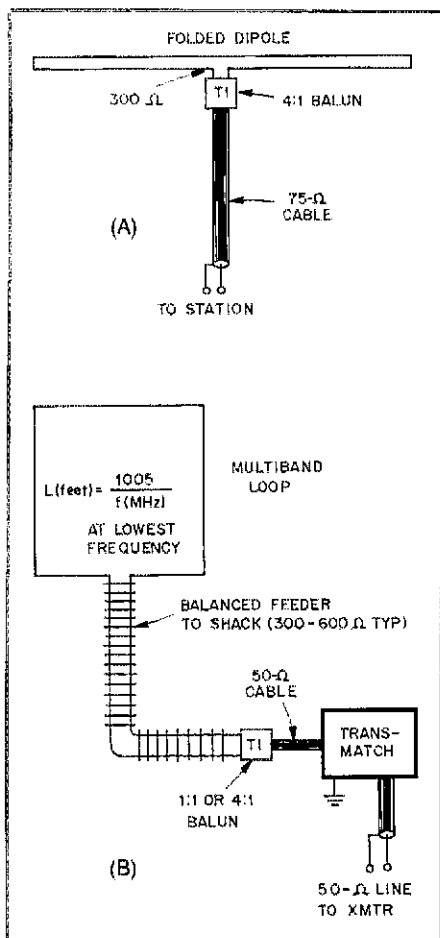


Fig 1—A 4:1 balun is used (A) to convert the 300-ohm feed to 75 ohms, while providing balanced feed to an unbalanced line. The system at B shows the typical arrangement for a multiband loop. T1 may be a 1:1 or 4:1 balun for converting the balanced feeder to coaxial line (see text). A 4:1 balun is preferred in this system.

loading of the front ends in TV receivers. Although a balun can cause harmonic currents (more on this later), it does not cure TVI. The exception is when the ham-antenna feed line is close to the TV antenna or its feeder. If there is unbalance in the ham-antenna feeder, it will radiate considerably (usually with vertical polarization), and this may induce RF energy into the nearby TV-antenna system to cause fundamental overloading. If the amateur signal has significant harmonic energy in it, the proximity of the two antenna systems may lead to harmonic TVI that would otherwise not be observed. A balun may help resolve these problems.

Baluns with Multiband Antennas

The greatest example of balun misuse is seen when we install one in, for example, a multiband dipole antenna feed system. In a typical case, the antenna is cut for 80 meters, but is used on all of the bands from 80 through 10 meters. Normally, we will feed this antenna with open-wire

balanced feed line, 300-ohm TV ribbon or 450-ohm molded ladder line. The balun transformer (1:1 or 4:1) is usually located in the radio room, near or inside a Transmatch (antenna tuner). A broadband transformer (a balun is one) is not intended for use at high impedances. The recommended upper terminal impedance is on the order of 500-600 ohms, especially at high

... make sure there is ample core size to handle the power from your transmitter.

RF-power levels. A dipole multiband-antenna feed line (depending on its length) may reflect a variety of impedances. Some may be as great as 2000 ohms. This explains why many amateurs who use QRO (high power) with unknown load impedances discover smoke and arcing in the balun transformer under certain load conditions. The greater the transmitter output power, the more probable this catastrophic event. Furthermore, because baluns are designed for specific transformation integers (1:1, 4:1, 9:1, and so on), they no longer perform as true broadband transformers under conditions of high mismatch. On the other hand, a loop antenna, even during harmonic operation, has a low feed-point impedance. This makes the arrangement of Fig 1B entirely practical.

Some Balun Problems

Any transformer, irrespective of its application, is designed to provide a specific voltage or transformation ratio. This means that the primary and secondary windings of conventional transformers should be terminated in resistive loads that are within the design transformation ratio. As we learned earlier, broadband transformers are intended for impedances from a few ohms to 500-600 ohms if they are to function properly. Also, the reactance (X_L) of the windings must be at least four times the termination impedance at the lowest intended operating frequency: eg, $X_L = \geq 200$ ohms for a 50-ohm load.

Baluns that contain magnetic cores

There is probably more misuse of baluns than correct applications of the device.

(ferrite or powdered-iron rods or toroids) must have cores of sufficient cross-sectional area to withstand the RF power without saturating. Core saturation causes a change

in permeability, heating and, in a worst case, destruction of the core. The higher the RF voltage and current in the transformer winding, the larger the core must be to avoid saturation. Our earlier example of a balun being used with a multiband antenna (where very high RF voltages may develop, and where a severe mismatch exists) suggests easy saturation at the higher RF power levels. Ferrite cores may, under these conditions, undergo an irreversible change in permeability from saturation, whereas powdered iron will usually recover after cooling. A saturated core produces square waves, and these cause harmonic currents to flow to the antenna (TVI potential!). Also, a radical change in permeability (decrease), even in a matched situation, can reduce the effective inductance of the windings below the $\times 4$ reactance value stated earlier. This will cause power loss and mismatch if severe enough.

All transformers cause some power loss, because no one has yet invented a transformer that is 100% efficient. So, we must recognize that even under ideal conditions for a balun or other RF transformer, there will be some loss through it. Thus, if you don't need a balun in your antenna system, avoid it! The foregoing discussion applies to baluns as well as conventional transformers.

Practical Baluns

I have purposely excluded the fine points of baluns from this discussion, such as stray reactance, effective bandwidth, and such. Since this is intended as a practical discussion, let's proceed with the nuts-and-bolts part of the article.

Our focus is on 1:1 and 4:1 transformer configurations. In the case of the 1:1 balun, we may wind it as an air-core unit or with a magnetic core. Air-core 4:1 baluns are also possible, and for many years such a device was available from Barker and Williamson.¹ But, homemade air-core 4:1 baluns are somewhat hard to build, and they tend to become quite large. I prefer to wind my 4:1 baluns on toroid cores.

You are probably wondering about the advantages of air-wound versus magnetic-core baluns, or vice versa. First, the air-wound unit is less expensive, but it is larger than a toroidal version. Second, a balun with a magnetic core may have reduced losses because of fewer turns in the winding. The core material provides an equivalent inductance with fewer turns of wire, and this reduces the ac resistance of the winding.

Fig 2 shows the electrical equivalent of 1:1 (A) and 4:1 (B) balun transformers. The black dots indicate polarity of the windings. These must be observed closely when arranging the input and output ports of the transformer. The 1:1 transformer uses a trifilar winding (three windings of identi-

¹Notes appear on page 37.

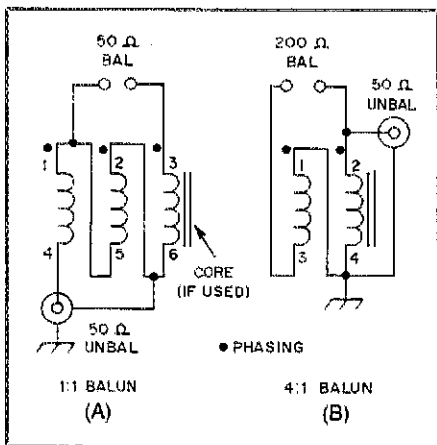


Fig 2—Circuit arrangement for a 1:1 balun (A) and a 4:1 balun (B). The large black dots indicate the polarity of the windings.

cal length, wound at the same time). The 4:1 transformer uses a bifilar winding (two identical-length windings).

Fig 3 is a photograph of an experimental 1:1 air-core balun. It is designed to operate from 3.5 through 30 MHz. To expedite the construction, I used heavy-duty no. 18 speaker wire (two conductor) as two wires of the trifilar winding. The third wire is an equivalent length of no. 18 insulated hookup wire that was on hand. I used this scheme mainly to make identification of the three windings less difficult. The speaker wire has one plated and one copper conductor for easy identification. The coil form is a 7-inch length of 1½-inch-OD high-impact polystyrene. I obtained this stock from the United States Plastics Corp.² The balun has a 5-inch-long trifilar winding (16 turns). I cut plastic end plugs for the coil form (Fig 4) to accommodate two binding posts on one end, and an SO-239 coaxial jack on the opposite end. The plugs are glued in place with epoxy cement after the wiring is completed. Epoxy cement is used at the holes where the windings enter the coil form. This will prevent water and dirt from entering the balun. Two coatings of exterior polyurethane varnish (or spar varnish) may be used as an exterior protective coating for

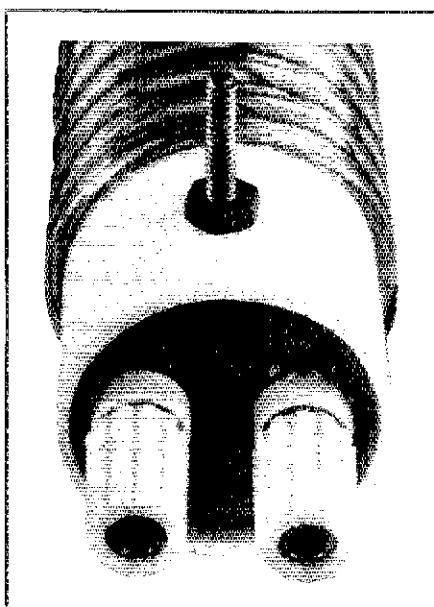


Fig 4—End view of the 1:1 balun of Fig 3. Plastic end plugs are glued into the tubing to accommodate the binding posts. A similar plug is used at the opposite end to contain the SO-239 connector.

the balun. Two long no. 6-32 screws are visible in Fig 3. They may be used for attaching L-shaped mounting brackets for installing the balun on a post or the side of a building. This balun is suitable for power levels up to 500 watts if the terminations are of the same ohmic value and less than 500 ohms each. Heating will occur at higher power levels. The greater the mismatch from one end of the balun to the other (such as with some multiband antennas), the lower the RF power should be, respective to coil heating.

A 1.5-kW Balun

I decided to experiment further with 1:1 baluns, and chose a high-power version for model no. 2. I located a 10-inch length of 2½-inch-OD phenolic tubing in my junk pile. The trifilar winding consists of three 85-inch lengths of RG-58 coaxial cable wound to provide 11 trifilar turns. The binding posts and SO-239 connector are mounted on the outer wall of the tubing.

I used the shield braid of the cable as the conductor. A photograph of this balun is shown in Fig 5. The balun is seen connected between 50-ohm RG-8X cable and 450-ohm ladder line. The tests were performed on a 75-m inverted V with a 0.5-wavelength feed line. Performance was good at 1.5 kW PEP output, and 600 watts of RF output during CW operation. No coil heating was noted. However, as suspected, when operating the same antenna at 7 MHz, where a high impedance was reflected to the balun (1000-2000 ohms), the balun became quite warm after a few minutes of 35-WPM CW at 600 W output. This causes the SWR to drift in accordance with balun heating. I had to keep compensating for the change in SWR by readjusting the Transmatch. Under these operating conditions, but at 300 W of output power, the balun remained cool and the SWR was

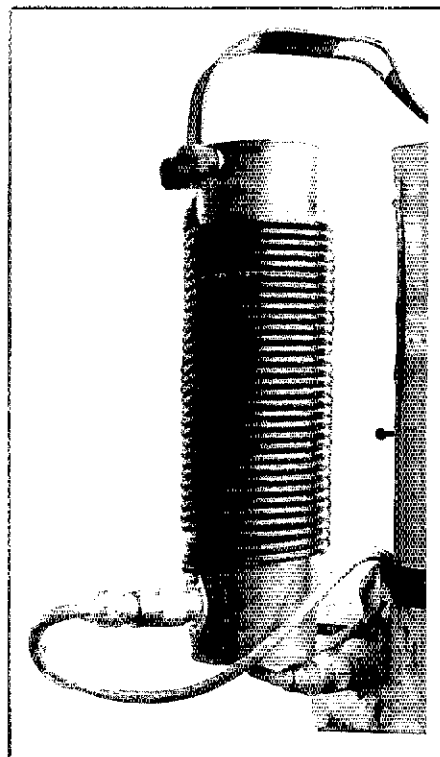


Fig 5—Photograph of the 1.5-kW 1:1 balun, shown mounted on a post for use with 450-ohm ladder line.

constant. This clearly illustrates the adverse effects of using a balun in a hostile environment of mismatch. These same effects will be observed when using commercial baluns incorrectly.

A Toroidal 1.5-kW Balun

I wanted to compare the performance of air-core versus toroidal-core 1:1 baluns, so I developed the unit seen in Fig 6. Again, I used speaker wire and a piece of hookup wire. The balun core consists of two Amidon T200-2 powdered-iron toroids.³

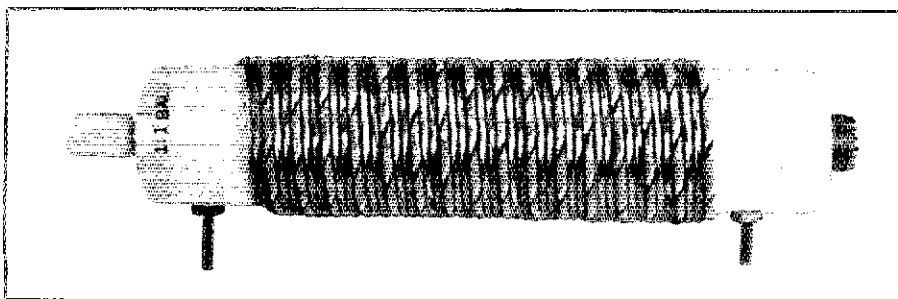


Fig 3—Photograph of the low-power 1:1 balun transformer. The no. 6-32 screws at the ends of the tubing are for affixing mounting brackets.

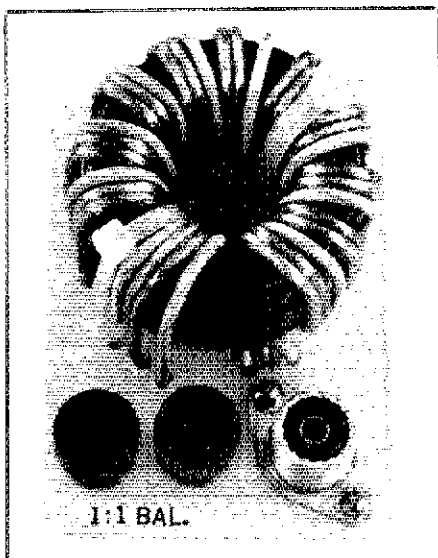


Fig 6—This is a 1:1 toroidal balun transformer. The wire is wound on a pair of stacked T200-2 toroid cores. A plastic base plate serves as the foundation for the unit.

They are cemented together by means of epoxy glue, then wrapped with vinyl electrical tape. The transformer contains 11 trifilar turns. A piece of Delrin® plastic sheeting serves as the foundation for this balun. Two nylon tie-wraps hold the toroid in place on the base unit. Do not use bare wire to affix the toroid, since the wires would create shorted turns around the core: This would destroy the Q. Nylon cord may be used in place of the tie-wraps. Weather-proofing is provided by dipping the toroidal part of the assembly in tool-handle compound (Fig 7). This is not necessary for indoor use.

This balun transformer, despite the light wire gauge, performed very well at 1.5 kW

... windings of conventional transformers should be terminated in resistive loads that are within the design transformation ratio.

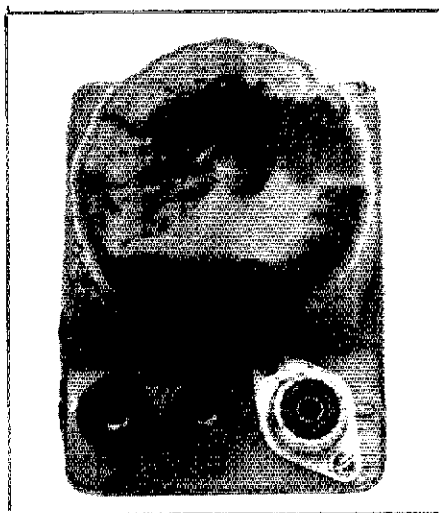


Fig 7—The balun of Fig 6 is seen here after the toroidal transformer was dipped in tool-handle compound. This offers protection against dirt and moisture for outdoor installation.

PEP output when in a line that presented approximately 50 ohms at each end of the balun. No heating was observed during SSB or CW operation. Tests on 40 meters while using the 80-meter inverted V and 450-ohm feed line produced balun heating and SWR drift at high power levels, as expected. This effect was somewhat reduced over that which was noted with the small air-core 1:1 balun. No doubt the difference is related to fewer turns of wire on the toroid (lower ac resistance).

Some Final Remarks

I constructed a 4:1 balun along the same lines as the unit in Fig 6. No. 14 enameled copper wire was used to minimize losses and heating. The heavier wire is recommended for the baluns in Figs 3 and 6, if you plan to construct a unit.

Baluns may also be wound on ferrite rods. Most commercial baluns contain these rods. In any event, make sure there is ample core size to handle the power from your transmitter. Detailed information about designing transformers and baluns with ferrite and powdered-iron cores is available in a book from Prentice-Hall, Inc.⁴ Good luck! If you use your baluns correctly, they will serve you well.

Notes

- ¹Barker & Williamson, 10 Canal St, Bristol, PA 19007, tel 215-788-5581.
- ²United States Plastic Corp, 1390 Newbrecht Rd, Lima, OH 45801, tel 419-228-2242. A catalog is available.
- ³Amidon Associates, 12033 Otsego St, North Hollywood, CA 91607.
- ⁴D. DeMaw, *Ferromagnetic Core Design & Application Handbook* (Englewood Cliffs, NJ: Prentice-Hall, Inc, 1981). Also available from Amidon Assoc, Inc (see note 3).



QEX: THE ARRL EXPERIMENTERS' EXCHANGE AND AMSAT SATELLITE JOURNAL

Do you know how to get the most out of your RF components in a given circuit layout? Are you successful in keeping parasitic inductances and capacitances to a minimum? Learn how to prevent the RF circuit's enclosure from becoming a waveguide. If you are going to build a VHF/UHF project, you can't afford to miss the solid-state construction practices series in *QEX*!

The February issue also includes articles on:

- "Analyzing Simple Matching Networks," by Mark Bacon, KZ9J
- "High-Pass Filters to Combat TVI," by Dick Jansson, WD4FAB, and Ed Wetherhold, W3NQJ.
- The 1986 *QEX* Index

QEX is edited by Paul Rinaldo, W4RI, and Maureen Thompson, KAIDYZ, and is published monthly. The special subscription rate for ARRL/AMSAT members is \$6 for 12 issues; for nonmembers, \$12. There are additional postage surcharges for mailing outside the US; write to Headquarters for details.

New Products

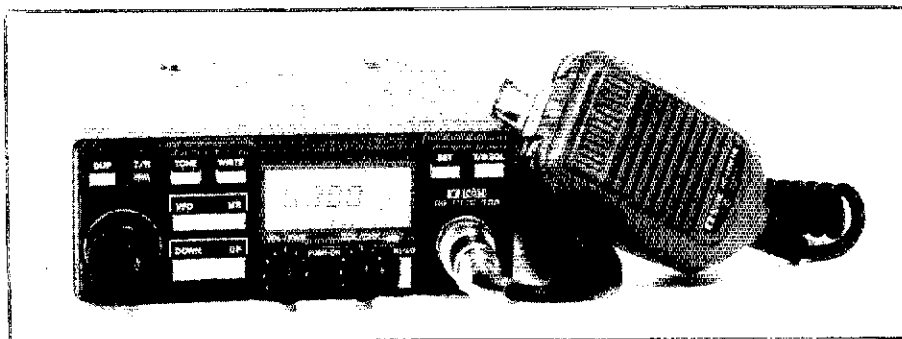
ICOM IC-38A 220-MHz COMPACT MOBILE TRANSCEIVER

□ ICOM has announced their IC-38A 220-MHz compact mobile transceiver that expands their existing IC-28A/H 2-meter and IC-48A 440-MHz mobile transceiver line. Features include: transmit 220-225 MHz, receive 215-230 MHz; 25-W output; 25 memory channels; scanning—scan the entire band or the memory

channels from the provided HM-12 microphone. It is easy to operate—only 11 front-panel controls. The unit has a large LCD readout with automatic dimmer circuit to reduce brightness, and an internal speaker.

Options include: IC-HM14 DTMF (dual-tone multifrequency) microphone; PS-45 13.8 V, 8 A power supply; HM-16 speaker/mic and HHS-15/HS-15SB flexible boom mic and PTT switchbox. Size is 5.5 × 2.0 × 6.1 inches (WHD).

Manufacturer: ICOM America Inc, 2380 116th Ave NE/PO Box C-90029, Bellevue, WA 98009-9029, tel 206-454-8155. Suggested list price is \$459.—Bruce O. Williams, WA6IVC



The Hidden Dangers of Electrostatic Discharge—ESD

You could be zapping your CMOS ICs without knowing it. With a bit of insight, and a lot of care, you can break the habit!

By David S. Hollander, N7RK

Product Marketing Engineer—Rectifier Products
Motorola Semiconductor Products
5005 E McDowell Rd
Phoenix, AZ 85008

One of the major problems plaguing electronic components today is damage from ESD—*Electrostatic Discharge*, more commonly known as static electricity. This ESD energy, in the form of voltage and current, can cause complete component failure or, worse, performance degradation that is difficult or impossible to detect. As circuitry becomes more complex and dense, and device geometries shrink, ESD has become a major concern of the electronics industry.

How does this affect the radio amateur? If you are an experimenter, you have probably worked with MOS (metal-oxide silicon) type devices, such as CMOS logic or power MOSFETs. You may have soldered the device into the circuit and found that it did not work, or that its performance was not what it was supposed to be. The circuit may have worked initially—then failed later for no apparent reason. The MOS device may have been destroyed or degraded because of ESD through improper handling.

Other equipment-related problems caused by ESD can manifest themselves as erroneous keyboard data entry on your PC or radio, changes in memory data, incorrect instructions and even total shutdown of the system. This article will attempt to explain ESD, its failure mechanisms, proper handling of sensitive devices and how you can set up your workbench and station to be safe from ESD.

ESD Generation

When two nonconductive materials are rubbed together to produce friction (such as scuffing a shoe across a carpet while walking), electrons from one material are transferred to the other. The accumulation of electricity on the surface of a material is caused by *triboelectric* charge, also known as electrostatic charge. Any time two nonconductive materials are flowing or moving with respect to each other, an electrostatic potential is generated.

The triboelectric series is shown in

Table 1
Triboelectric Series

Air	
Human Skin	
Glass	
Human Hair	
Wool	
Fur	
Paper	
Cotton	
Wood	
Hard Rubber	
Acetate Rayon	
Polyester	
Polyurethane	
Polyvinylchloride (PVC)	
Teflon®	

Table 1. Movement or flow from one material with respect to another will result in an electrostatic charge—the amount of the charge is a function of the separation of the materials as shown in Table 1. (The combination of glass and PVC is much worse than paper and wood.) Cotton is relatively neutral. Additional factors in charge generation are the intimacy of contact, rate of separation and humidity. Humidity can make the material surfaces partially conductive. Materials that tend to reject moisture are the most significant contributors to ESD.

ESD energy is electrical—it takes the form of voltage and current. The current is generally low, but the electrostatic voltage can be quite high. Under certain atmospheric conditions the voltage can be higher than 30 kV. When an electrostatic charge is built up in a human body and then discharged to cause a perceptible arc (generally a slight tingle), no damage is done to the human if the electrostatic voltage is below 2.5 kV. This value is referred to as the “discomfort threshold.” Although electrostatic voltages below that level are hardly noticeable to humans, they can wreak havoc on sensitive electronic

Table 2
Susceptibility to ESD

Device Type	Range of ESD Susceptibility (Volts; $k = 1000$)
Power MOSFET	100-200
JFET	140-10 k
CMOS	250-2 k
Schottky Diodes, TTL	300-2.5 k
Bipolar Transistors	380-7 k
ECL	500
SCR	680-1 k

devices. Table 2 shows the relative susceptibility of various devices to electrostatic voltages. As mentioned earlier, the effects can be disruption or shutdown of electronic circuitry, failure of a device before installation in the circuit, or a damaged device that results in a latent reliability problem that will likely occur at the least opportune time (Murphy's law).

Of the several factors that contribute to the generation of ESD, reduced humidity creates the most severe results. When the

Table 3
Typical Electrostatic Voltages

Means of Static Generation	Electrostatic Voltages (Volts; $k = 1000$)	
	Relative Humidity 10-20%	65-90%
Walking across carpet	35 k	1.5 k
Walking across vinyl floor	12 k	250
Worker at bench	6 k	100
Vinyl envelope per work instructions	7 k	600
Common poly bag picked up from bench	20 k	1.2 k
Work chair padded with polyurethane foam	18 k	1.5 k

relative humidity is 65% or higher, electronic equipment is affected very little. When the relative humidity is down around 20%, watch out! Over 300 times more electrostatic charge is created at 20% than at 65% relative humidity.

The level of electrostatic charge that one can accumulate on the body depends on one's size and skin properties. By agitating nylon or polyester clothing, static potentials as high as 6.5 kV can be generated. Table 3 shows the typical electrostatic voltage levels that can be generated by various actions at different humidity levels. From Tables 1, 2 and 3, it is apparent that sensitive electronic components can be easily damaged or destroyed if proper precautions are not taken.

ESD and MOS ICs

All MOS devices have an insulated gate that is subject to voltage breakdown. The gate oxide used in Motorola's devices is about 800 angstroms thick and breaks down at a gate-source potential of about 100 V. The high-impedance gates on the devices are protected by resistor-diode networks, however, these on-chip networks do not make the IC immune to electrostatic discharge. Laboratory tests show that devices may fail after one very high voltage discharge. They may also fail because of the cumulative effect of several discharges of lower potential. Static-damaged devices behave in various ways, depending on the severity of the damage. The most severely damaged are the easiest to detect because the input or output has been completely destroyed and is shorted to either V_{DD} or V_{SS} , or open-circuited. The effect is that the device is no longer functional. Less severe cases are more difficult to detect because they appear as degraded performance or intermittent failures.

ESD and Power MOSFETs

TMOS™ transistors (Motorola's trade name for their family of power MOSFETs) can be damaged also by ESD created by improper installation or handling. TMOS devices, however, are not as susceptible as CMOS. Because of their large input capacitances, they are able to absorb more energy before being charged to the gate-breakdown voltage. Nevertheless, once breakdown begins, there is enough energy stored in the gate-source capacitance to cause complete perforation of the gate oxide. With a gate-to-source rating of 20 V, maximum, and electrostatic voltages typically being 100 V-25 kV, it is easy to see why these devices require special handling procedures. Fig 1 shows curve tracer plots of a good device, and the same device degraded by ESD.

Classification of Static-Sensitive Components

The sensitivity of semiconductor devices to ESD as a function of exposure to the output of a charged network is shown in

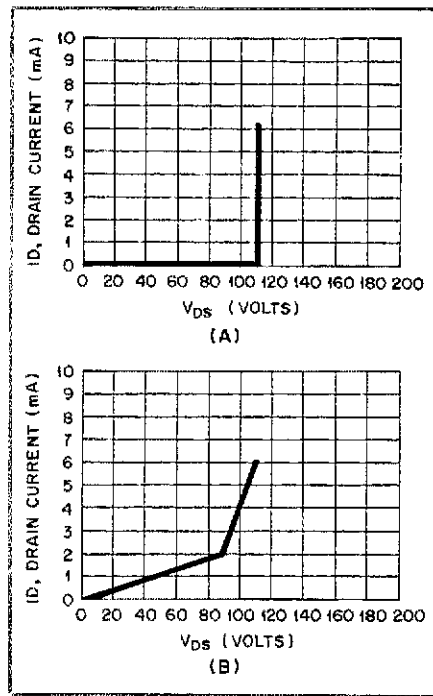


Fig 1—Curve tracer plots of a good device (A) and a device with a degraded gate (B). The device is an MTP12N10, a 100-V, 12-A power MOSFET.

Table 4. This table is based upon the specifications used for procurement and testing by the military services.¹

Through measurements and general agreement, the "human body model" is specified as a network that closely approximates the charge storage capability (100 pF) and the series resistance (1.5 kΩ) of a typical individual (see Fig 2). Discharge of this network directly into a device indicates that the model assumes a "hard" ground is in contact with the part. Although all pin combinations should be evaluated (a total of six combinations for a TMOS power MOSFET), preliminary testing shows that gate-oxide breakdown is the most likely failure mode, and that reverse-biased

¹Notes appear on page 40.

Table 4

Sensitivity of Semiconductors to ESD from a Charged Network

Device Sensitivity (C1 Peak Voltage) (Volts; $k = 1000$)	MIL-STD-883 Class	DOD-HDBK-263 Class	Typical Preventive Measures
0-1 k	A (sensitive)	Class 1	Careful case, key-board design, wrist straps, ionized air.
1 k-2 k	A	Class 2	Conductive flooring, conductive clothing.
2 k-4 k	B (nonsensitive)	Class 3	Antistatic carpet spray, wrist straps, conductive packing.
4 k-15 k	B	Class 3	Humidity adjustment.

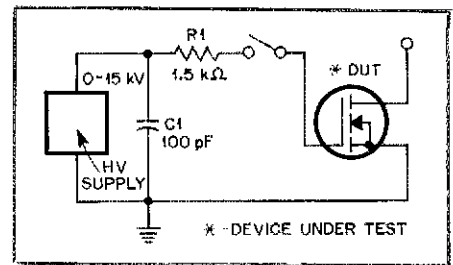


Fig 2—Equivalent circuit of the human body.

junctions are about an order of magnitude more sensitive to failure than forward-biased ones. The damage mechanism that can be identified through failure analysis of shorted or degraded samples is usually oxide puncture or junction melt-through.

Static Protection

Protection of sensitive electronic components involves the prevention of static buildup together with the removal of existing charges by dissipating or neutralizing this energy. The mechanism of charge removal from charged objects differs between insulators and conductors. Since charge cannot flow through an insulator, it cannot be removed by contact with a conductor. If the item to be discharged is an insulator (plastic box, clothing, and so on), ionized air is required. If the object is a conductor (metal tray, conductive bag, human body) complete discharge can be accomplished by grounding the object.

Many methods are used in the electronics industry. Carpets and rugs are made of special antistatic materials with coatings to dissipate static buildup. Equipment is sprayed with antistatic solutions, electronic materials with low triboelectric propensity are used and the type of clothing worn is carefully selected. Static-safe work stations are used and components are placed in conductive or antistatic packaging. In addition to all of these, relative humidity in the workplace is maintained above the critical value of 65%.

A well-designed and complete static-safe work station (Fig 3) should include a

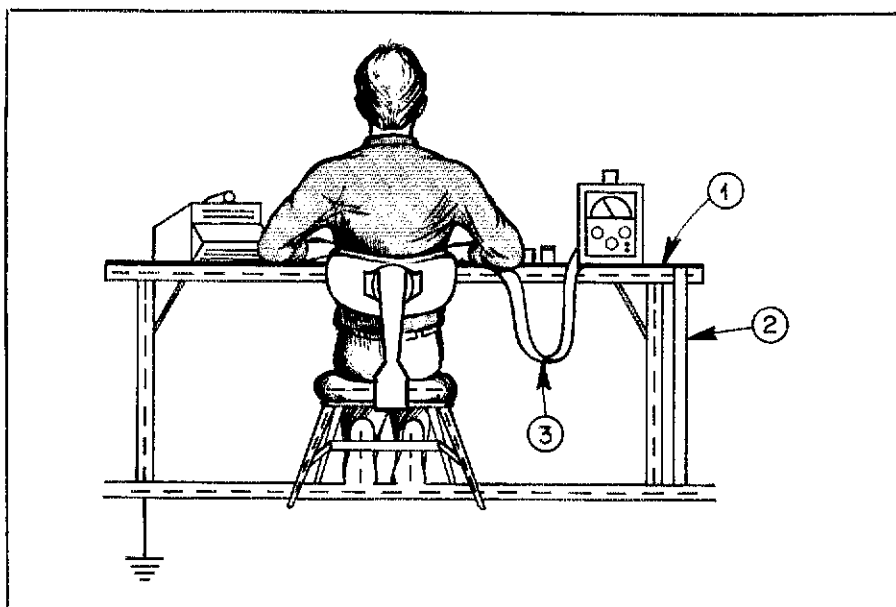


Fig 3—Typical ESD-safe work station. At 1, a 1/16-inch conductive sheet stock covering bench-top work area. At 2, strap to earth ground. At 3, grounded wrist strap in contact with skin.

grounded conductive table top, conductive floor mats, conductive containers for equipment storage, an ionized air blower to remove static from nonconductors and wrist straps for grounding the operators. In using the wrist straps, extra care must be taken to ensure that the electrical equipment is well grounded and there is no possibility of the operator coming into contact with electrically hot leads. Without these precautions, the operator may be exposed to electrical shock. All soldering irons or stations should be grounded. All nonconductive items such as styrofoam coffee cups, cellophane or plastic wrappers, paper, and so on, should be removed from the work area. Above all, familiarity with the causes of potential problems is the key to preventing ESD-caused failures.

How Can the Amateur Combat ESD?

Ideally, the amateur should take the same precautions as used in the electronics industry. This approach, however, may not be practical. Steps that can be taken to avoid ESD problems are as follows.

- Use a workbench with a grounded metal top or a grounded sheet of metal for a work surface.
- Ground all soldering irons or solder-desolder stations.
- Use a grounded wrist strap in contact with the skin.^{2,3}
- Place all MOS devices on a grounded bench surface *prior* to handling—one can be statically charged with respect to the bench surface.
- Check all power supplies for voltage transients. Connect low-impedance equipment to MOS devices only after the equipment is powered up and disconnect before power is turned off.
- Never insert or remove an MOS device

from a circuit with power applied.

- Use antistatic bags for storing or transporting assemblies to another location.
- Never exceed the device maximum ratings as shown in the data sheet.
- Keep the workbench free of objects such as paper, cigarette ashes, plastic, styrofoam and the like.
- Never use brush or spray cleaning to remove flux from a board.
- Observe all of the above precautions when replacing an MOS device during repair.

Within your station, all equipment should be connected to a good earth ground. If you live in a dry climate as I do, (you can't get much drier than Phoenix, Arizona!) attach a small grounded metal plate to the side of the desk or station console to discharge any static potential that may have built up while walking across the carpet. Touch this plate before you touch any of your equipment and you might find that your equipment has a longer life span.

Packaging

Packaging of MOS devices is critical. Any MOS components purchased for home projects should be received from the distributor/store packaged in antistatic or conductive packaging. The packaging can be conductive black foam (ICs generally are mounted in this) or antistatic plastic bags. Treated styrofoam is also used. Antistatic styrofoam is pink and may feel slightly oily to the touch. There should be antistatic warning labels on the package indicating that it contains a static-sensitive part and proper handling is required. A typical packaging label is shown in Fig 4.

MOS components should be stored or transported in antistatic packaging. *Never* insert an MOS device into a conventional

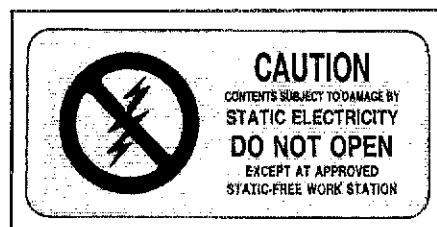


Fig 4—Typical packaging label for ESD-sensitive devices.

plastic bag, tray or styrofoam. Keep the devices in their original packaging until ready for use.

Conclusion

By following the previously described procedures and using the proper equipment, ESD-sensitive devices and equipment can be protected from ESD damage. The key items to remember are:

- Handle all static-sensitive components at a safeguarded work station (see Fig 3).
- Transport all static-sensitive components in static-shielded containers or packages.
- Be thoroughly familiar with proper handling procedures for static-sensitive components.
- Attach all the equipment in your station to a good earth ground.

Notes

- ¹Military specifications that cover static-sensitive components are MIL-STD-883B Method 3015.1, DOD-HDBK-263 and DOD-STD-1686.
- ²Wrist straps are available through ITT Pomona Electronics, 1500 E Ninth St, PO Box 2767, Pomona, CA 91766, tel 714-623-3463.
- ³Conductive Mats (RS 276-2400) and wrist straps (RS 276-2399) are available from Radio Shack.

Strays



QST congratulates...

Legislative Assistant Fred Matos, W3ICM, of Annapolis, Maryland, on receiving a Congressional Fellowship.

Burt Knight, KB1MK, of Concord, New Hampshire, on being elected to the New Hampshire state legislature.

Ed Mehnert, N3NN, on being named director of the US Air Force Communications Computer Systems Doctrine Office at Keesler AFB, Mississippi.

AMSAT President Emeritus Tom Clark, W3IWI, of Clarksville, Maryland, on receiving a commendation and medal from NASA for his work on Very Long Baseline Interferometry.

Trio-Kenwood TR-751A 144-MHz All-Mode Transceiver

The TR-751A is Kenwood's most recent offering to satisfy the need for a multimode 2-m mobile rig for the amateur community. Their last entry was the TR-9130, which was (and still is) extremely popular because of its flexibility. The TR-751A is a feature-packed rig. It will surely be as popular as the '9130. It offers the 2-m operator more than would have been dreamed possible just a few years ago.

The '751A features include a GaAsFET front end and a large and easy-to-read, back-lit LCD. There are dual VFOs, 10 memories and a CALL channel that store frequency, mode, repeater offset (for FM operation), subaudible tone (if equipped with the optional TU-7 encoder), frequency step and RIT offset (for SSB and CW only). Additional features include a back-lit analog S/RF meter, all-mode squelch, noise blanker, all-mode RF gain control, RIT and 25-W RF output. Options available include a voice synthesizer, TU-7 subaudible tone encoder and a modem unit for Digital Code Squelch (DCS) and Digital Channel Link (DCL).

A new "goodie" has been added to the list of "Kenwood exclusive" features. The '751A is the first multimode 2-m rig to be equipped with automatic mode selection. With this feature, the rig chooses the appropriate operating mode for the particular frequency you are on, based on the ARRL band plan. If you wish, you can defeat this feature and manually choose the mode. No matter where you are on the band, it only takes one or two key presses to choose the mode. On CW or LSB, two key presses of the same key are required. Two of the three mode-select keys control two modes each—one has FM and LSB, the other USB and CW. Pressing either key repeatedly causes the rig to alternate between the two modes.

The rig is supplied with a mobile mounting bracket and a heavy-duty dc power cord that is fused in both legs. The furnished microphone has a keypad on its back.

Front-Panel Controls and Indicators

Front-panel controls are well organized and easy to operate in all but the most severe mobile environment. See Fig 1. On the upper-left corner of the panel are two momentary-contact push buttons with dual identification, MHz/M.CH, F.LOCK and ALert. Directly below these are two more momentary push buttons identified as VOICE/TONE and FUNCTION. The FUNCTION switch has an LED indicator beside it. It toggles to control the functions of the MHz/M.CH and VOICE/TONE switches. When the FUNC LED is not lit, the MHz/M.CH buttons control up or down frequency tuning in 1-MHz steps. When the FUNC indicator is on, the DOWN MHz key functions as a Frequency LOCK and the UP MHz key controls the ALert feature. Enabling the ALert function causes the priority channel (memory channel 1) to be checked at about 6-second intervals. Additionally, the MHz/M.CH push buttons move up or down through the memory channels when the MR indicator is lit. The VOICE/TONE key activates either the optional VS-1 voice synthesizer (if the FUNC indicator is off) or the optional TU-7 tone encoder (if the FUNC indicator is on.)



The switch labels are color-coded to indicate the function that is performed when the FUNC indicator is lit. Exercising any function when the FUNC indicator is on turns off the indicator.

In the middle-left side of the panel are four push buttons: COM, LOW, NB and RIT. The COM switch activates the Common Channel or common frequency. It is factory preset to 145.000 MHz, but can be reset to any other frequency. Low/high power selection is effected with the LOW switch. The Noise Blanking and RIT are controlled by the other two switches. Two concentric dual-function knobs in the lower-left corner of the panel control VOLUME/SQUELCH and RIT offset/RF GAIN.

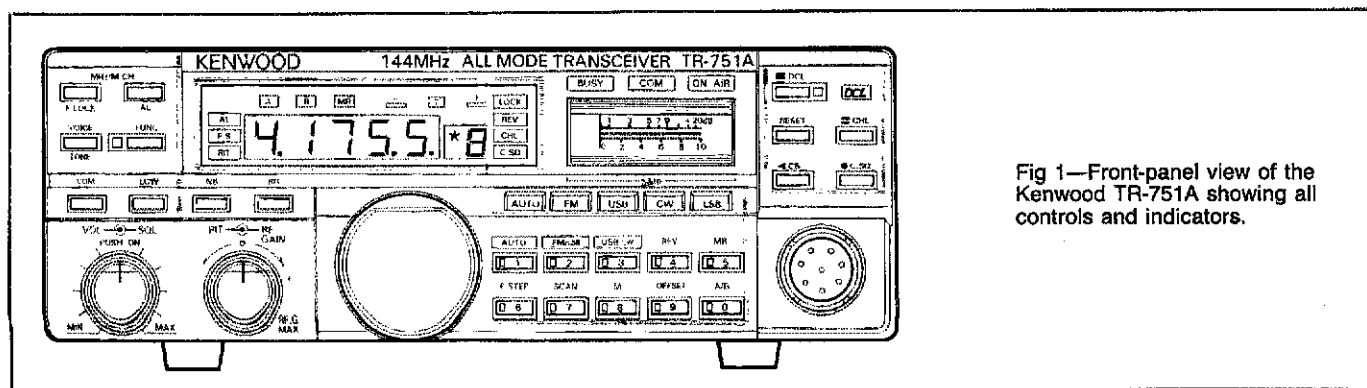


Fig 1—Front-panel view of the Kenwood TR-751A showing all controls and indicators.

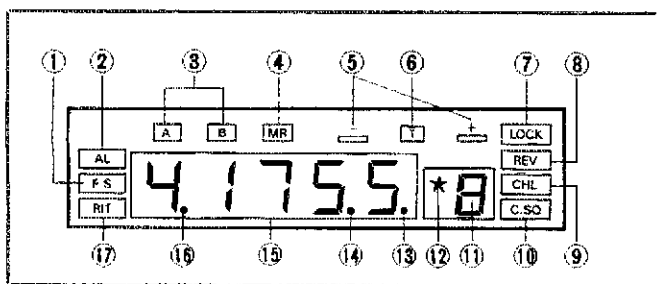


Fig 2—LCD group on the front panel. See text for explanation of indicators.

LCD Group

The large LCD panel in the top center of the front panel has several indicators in addition to the frequency readout. See Fig 2. The indicators on the LCD panel operate as follows:

- | | |
|------------------------|--|
| 1) F.STEP display: | On when F.STEP is on. |
| 2) AL display: | On when using ALert. |
| 3) VFO (A-B) display: | Indicates which VFO is selected. |
| 4) MR display: | On when MR (memory channel operation) is selected |
| 5) Offset display: | On when shift is set to "+" or "-" using the OFFSET key. |
| 6) Tone (T) display: | On when the subaudible TONE encoder is selected. |
| 7) LOCK display: | On when F.LOCK has been selected. |
| 8) REV display: | On when using the REVerse function. |
| 9) CHL display: | Flashes during open channel search by CHL key. On after channel linkage. |
| 10) C.SQ display: | On when using C.SQ (code squelch). |
| 11) Channel display: | Normally displays memory channel; displays code channel during digital code squelch operation. |
| 12) Standby indicator: | Specifies which codes will be actively used. |
| 13) 50-Hz display: | On when second digit is 5; off when it is 0. |
| 14) kHz dot: | On when 50-Hz step is selected. |
| 15) Frequency display: | Displays frequency, tone frequency, digital code and call sign. |
| 16) MHz dot: | Flashes during scan. |
| 17) RIT display: | On when using RIT. |

Just to the right of the LCD display panel is the S/RF meter and three indicators that show BUSY when the squelch opens in the receive state, COM when in the COM mode and ON AIR when transmitting. The S/RF meter operates as an S meter during reception to indicate signal strength, and indicates relative RF output during transmissions. The meter is set to indicate approximately "8" in the high-power mode.

Mode/Numeric Keypad

The Mode/Numeric keypad has 10 dual-function keys. Each has its own indicator. The first three keys (1, 2 and 3) control the operating mode, with the mode displayed on the five indicators above the keypad. In addition, the operating mode is audibly indicated by a Morse code letter through the speaker—"C" for CW, "U" for USB, "L" for LSB, "F" for FM and "A" for automatic mode selection. This feature can be defeated through a simple internal modification. I had no desire to defeat this signal because it is extremely valuable during mobile operation to know which mode you have selected. In addition to the audible mode indication, pressing any other key on the keypad causes a tone to be heard. The 10 keys (1 to 9 and 0) are used for numeric entries, but each key can also select a specific function.

- | | |
|-------------------------|--|
| AUTO (1): | Press this key to enter the AUTO mode; press any other mode key to cancel the mode selection. |
| FM/LSB (2): | Press the FM/LSB key to alternate between FM and LSB. |
| USB/CW (3): | Press the USB/CW key to alternate between USB and CW. |
| REVERSE (4): | This key reverses the transmit/receive frequencies during repeater operation. Press the REV key to turn the function on; press it again to turn the function off. |
| MR (Memory Recall) (5): | Pressing this key causes the MR indicator to light and the current memory channel information to appear. Press A/B (0) to return to VFO operation. |
| F.STEP (6): | The F.STEP key changes the tuning step. Several steps are available, depending on mode and position of the F.STEP key. |
| SCAN (7): | Press SCAN to initiate scanning; press it again to stop scanning. |
| M (Memory Enter) (8): | Press the M key to write a frequency into a memory or the COM channel. When the key is pressed, a series of beeps will sound for about 1.5 seconds. To enter a frequency, press the desired numeric key or the COM key while the beeps are sounding. |
| OFFSET (9): | The OFFSET switch cycles the desired transmitter offset for repeater operation. |
| A/B (0): | In the VFO mode, A/B switches operation between VFO A and B. In the MR mode, clears the MR state and restores VFO operation. In the COM mode, clears the COM state and restores VFO operation. |

The rig uses a standard Kenwood 8-pin microphone with UP/DOWN buttons for frequency and memory channel control, and it is connected on the lower right-hand side of the front panel. Above the microphone connector are five buttons that control the DCL and DCS functions. Refer to the Kenwood TM-2570 Product Review (Oct, 1986 QST) for details on the operation of these controls.

Rear Panel

The rear panel of the '751A contains the heat sink for the final amplifier, connections for the 13.8 V dc input, an external speaker jack, a CW key jack and an antenna connector. An auxiliary jack is provided for ALC input and for switching an external amplifier (max contact ratings: 30 V dc at 500 mA).

Operating the Rig

For the most part, the TR-751A is very easy to operate. This results from careful engineering and attention to ergonomic details that tend to make operating some rigs a pleasure, and others a real chore. The only problem I have with the '751A is operating the 10-key pad that controls mode and scan operation. Since this panel is not back lit, it is almost impossible to operate in the dark while mobile without memorizing the layout of the keys—when you press a key you can only hope that it is the right one. The most frequently used function on this keypad is the SCAN stop/start. Unlike some other Kenwood rigs, scanning with the '751A cannot be initiated with the UP/DOWN keys on the microphone. Scanning can be stopped, without putting a signal on the air, by pressing the PTT on the microphone.

SSB and CW operation with the TR-751A is really a pleasure. The excellent receiver sensitivity and a fantastic noise blanker are largely responsible for this. The noise blanker is extremely effective against ignition noise. On more than one occasion it made the difference between being able to copy a weak signal and losing the station completely in pulse-type noise.

Transmitted audio quality on SSB seems to be excellent, as I received many unsolicited compliments—including one fellow who said the rig had "the best audio I've ever heard on two meters." CW operation is also very enjoyable as the semi-break-in delay is set very comfortably (and is internally adjustable), and the sidetone is clean and easy to listen to. RIT adds to the enjoyability of SSB and CW operation, as does the F.STEP function. This provides 50-Hz

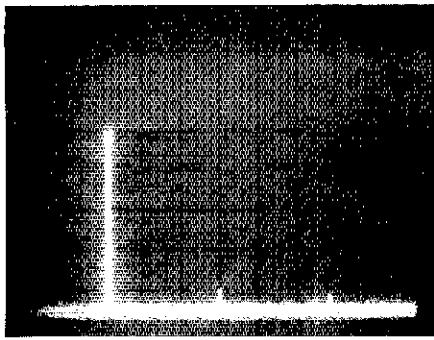


Fig 3—Spectral display of the TR-751A operating at 144.000 MHz with approximately 24 W output power. Vertical divisions are each 10 dB; horizontal divisions are each 50 MHz. The fundamental (pip at the left of the photo) has been reduced in amplitude approximately 30 dB by means of a notch filter to prevent spectrum analyzer overload. All harmonics and spurious emissions are at least 70 dB below peak fundamental output. The TR-751A complies with current FCC specifications for spectral purity.

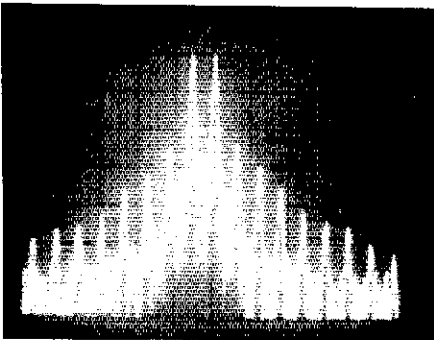


Fig 4—Spectral display of the TR-751A output during transmitter two-tone intermodulation distortion (IMD) test. Third-order products are 34 dB below PEP, and fifth-order products are 40 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The spectrum analyzer bandwidth was 0.1 kHz. The '751A was being operated in USB at approximately 26 W output on 146.91 MHz.

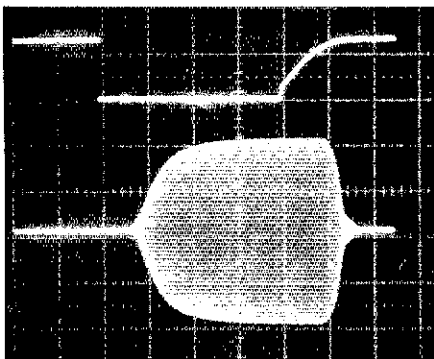


Fig 5—Keying waveform of the TR-751A. The upper trace shows the keying input; the lower trace is the RF output. Horizontal divisions are each 5 ms.

Trio-Kenwood TR-751A 2-Meter All Mode Transceiver, Serial No. 7050117

Manufacturer's Claimed Specifications

Frequency coverage: 144-148 MHz.
Modes of operation: USB/LSB (J3E) FM (F3E), CW.
Frequency display: Large LCD display.
Frequency resolution: 5 kHz (FM), 50 Hz (CW, SSB).
Frequency stability: Less than 400 Hz, 1 to 60 min; less than 50 Hz in each 30 min thereafter.

Transmitter

Power output: 25 W, high; 2-25 adjustable, low.
Spurious signal and harmonic suppression: Less than -60 dB.
Third-order intermodulation distortion: See Fig 4.
Keying waveform: Not specified.

Receiver

Receiver sensitivity: SSB and CW—less than 0.13 μ V for 10 dB S+N/N.
FM—less than 0.2 μ V for 12 dB SINAD.
Receiver dynamic range:

Squelch sensitivity: Less than 0.1 μ V.
Receiver audio output at 5% total harmonic distortion: More than 2 W.
Color: Gray.
Size (height, width, depth): 1.8 x 4.6 x 5.41 inches.
Weight: 4.8 lb.

Measured in ARRL Lab

Receive/transmit approx 142-149 MHz.
As specified.
As specified.
As specified.
Less than 100 Hz after 45 min.

Transmitter Dynamic Testing

23.3 W, min, high; 4.8 W, low, as factory adjusted.

-70 dB; see Fig 3.
See Fig 4.
See Fig 5.

Receiver Dynamic Testing

Minimum discernible signal (Noise floor) (dBm): -137.
Blocking dynamic range (dB): 114 (Noise limited at 144.020/144.040 MHz. Tested at 144.020 and 144.060 MHz).
Two-tone, 3rd-order intermodulation distortion dynamic range (dB): 84.
Third-order input intercept (dBm): -6.
Receiver quieting (μ V for 12 dB signal + noise + distortion/signal + distortion): 0.095.
Min 0.05 μ V, max 0.38 μ V.

2 W.

steps on SSB and CW, and 10-kHz steps on FM. I found the 50-Hz steps to be small enough to zero-beat any SSB signal that I encountered. RIT does not function on FM, nor is there any indication of the actual receive frequency when using RIT on SSB or CW—the only indication is whether RIT is on or off. This proved to be aggravating on a number of occasions, as it makes it impossible to tune a signal using RIT and then to switch to a VFO without having to guess where the signal is.

One other minor complaint I have about the rig is the inability to independently choose the AGC time constant on SSB and CW; it is automatically set for fast on CW and slow on SSB. There are occasions when I would like to use fast AGC on SSB, and vice versa. It would also be nice to be able to disable the AGC completely, but no provision has been made for this.

Most of my mobile operation with the TR-751A was on FM. Again, the rig has good transmitted audio, and the ability to choose 25 W or 5 W seemed to suit almost all of my repeater and simplex needs. The RF low-power output can be adjusted from almost nothing up to full power output. The review rig had about 10-W output in the low-power setting without any adjustment.

I found memory operation most useful on FM. The rig has eight memories for \pm 600-kHz splits or simplex operation,

and two more memories for odd splits. Channel 1 is the priority alert channel, Channel 7 is the starting point in the channel search in DCL operation, and Channel 0 contains the frequency limits for the program scan function. A few little things make FM operation less pleasant than with Kenwood's newer FM-only rigs, such as the inability to lock out a busy memory channel and the lack of provisions for adjusting the scan-hold time. These things are minor, however, when you consider that the rig is not intended solely for FM mobile use. Because the internal speaker is placed on the bottom of the cabinet, it often was necessary to turn the audio way up to be able to understand it. The rig does have plenty of undistorted audio for all but the noisiest mobile environments.

In portable operation, the TR-751A really shines. It comes with feet for the bottom of the cabinet, and is very convenient for mountaintopping. I used the rig to make a few QSOs from the top of Mount Greylock, in northwestern Massachusetts, during the ARRL September VHF QSO Party. Even in the heavy RF environment of a big multi-operator, multitransmitter contest effort, and with several other line-of-sight operations with big 2-meter signals, the rig held up well enough to hear some of the weaker signals while using only a small antenna system. The size and weight of the '751A make it ideal for

home, portable and mobile use.

The TR-751A worked right out of the box, and presented absolutely no problems during the review. The internal adjustment of the CW sidetone and feedback tone levels is easy and quick, as is installation of the optional modem unit for DCL and DCS operation. The TU-7 tone encoder and VS-1 voice synthesizer should be just as easy to install, based on their respective locations and mounting schemes, although neither were installed in the review unit.

The owner's manual is not the best in terms of clarity—the English translation seems to have been done a bit hastily—but it presents no problems in programming or operating the radio. In typical Kenwood style, the manual has good suggestions for installing and using the rig safely in mobile and fixed-station environments.

It is a bit expensive, but the Kenwood TR-751A is a fine radio, and should be considered seriously by anyone shopping for a 2-meter multimode rig for mobile, portable or home use. Manufacturer: Trio-Kenwood Communications, 1111 W Walnut St, Compton, CA 90220, tel 213-639-9000. Price class: TR-751A, \$600; MU-1 modem unit, \$35; TU-7 tone encoder, \$30; VS-1 voice synthesizer, \$45.—*Rus Healy, NJ2L*

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 for items presented in the Product Review or New Products columns.—Ed.]

The following ARRL-purchased Product Review equipment is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and reflect a discount from the purchase price.

Sealed bids must be submitted by mail and be postmarked on or before March 27. 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.

Please clearly identify the item you wish to bid 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 of the successful bid. No other notifications will be made, and no information will be given by telephone to anyone regarding final price or identity of the successful bidder.

Please send your bids to Kathy McGrath, Product Bids, ARRL, 225 Main St, Newington, CT 06111.

Ten-Tec Model 425 Titan HF linear amplifier, s/n 00268. (See Product Review, *QST*, Apr 1986.) Min bid \$1411.

Trio-Kenwood TS-440S HF transceiver, s/n 7050095, AT-440 automatic antenna tuner, VS-1 voice synthesizer, PS-50 power supply, YK-88C 500-Hz CW filter, IF-232C/IC-10 level translator and modem IC kit. (Sold as a package only; see Product Review, *QST*, Dec 1986.) Min bid \$897.

Trio-Kenwood TM-2570A 2-M FM transceiver, s/n 7011501. (See Product Review, *QST*, Oct 1986.) Min bid \$320.

Alinco ALM-203 2-m hand-held transceiver, s/n 05109025. (See Product Review, *QST*, Jun 1986.) Min bid \$146.

AEA PK-64 PAKRATT™ multimode data controller, s/n 1178. See Product Review *QST*, Jun 1986.) Min bid \$133.

Microlog Air-1 radio interface cartridge. No s/n. Min bid \$186.

HAL ARQ-1000 code converter, s/n 158. Minimum bid \$100.

ICOM IC-745 HF transceiver, s/n 3101, PS-35A internal switching power supply, IC-EX243 keyer, IC-EX242 FM module, IC-FL32 filter, IC-FL53 filter, IC-EX241 marker. (Sold as a package only; see Product Review, *QST*, Sep 1985.) Min bid \$800. [AR]

The Shopper's Guide to Packet-Radio TNCs

(continued from page 21)

Breaking the 1200-bit/s Barrier

Kantronics KPC-2400

The KPC-2400 Packet Communicator includes a modem that operates at 2400 bit/s. Using phase-shift keying (PSK), the 2400-bit/s signal rate is derived from a dibit (a group of two bits) data stream operating at 1200 bauds. The 2400 bit/s (1200 bauds) data rate may be used above 28 MHz. In addition to the 2400 bit/s modem, the unit also includes the 300- and 1200-bit/s modems used in the TNC 2-compatible KPC-2. The three modems are software selectable. The 2400 bit/s modem is available separately for installation in the TNC 1- and TNC 2-compatible units (\$150). Like the KPC-2, the KPC-2400 uses AX.25 Version 2, provides both a RS-232-C serial port and a Commodore-compatible TTL port, emulates HDLC in software and operates from 12 V dc.



Kantronics KPC-2400 TNC, the first TNC with a modem operating above 1200 bit/s.

What Can We Look for Next?

As stated before, new TNCs are appearing daily. There are a number of well-designed units being developed and used in other

countries. Japan has over 5000 active packet-radio stations, and there are several Japanese-designed TNCs and modems available. No doubt many of them will make their way to the US in the near future. Some to look for are the *Telereader TNC-20*, the *PAX-88 TNC* and the *AIWA APX-25*.

Conclusion

There is a good selection of TNCs available out there—something to suit everyone's needs and pocketbook. The listings in this article should help you determine if there is a TNC just right for you. So get out there and get a TNC—enjoy the packet-radio experience! [AR]

New Products

UNCLE BILL'S CODE COURSE (V2.0)

After two years of production and sales, Uncle Bill's Software has updated Uncle Bill's Code Course and simultaneously entered the shareware field. Uncle Bill's Code Course is written for the Commodore® C64 and C128 computers only. Shareware is the newest form of software distribution. Shareware programs are under copyright, and there is a fee for their use. But—no fee is expected until the user has tried the program and determined its usefulness.

Uncle Bill's software user fee is a modest \$5 per program. Information about shareware and user fees appears within the program, together with a copy routine that allows reproduction of the shareware software.

As with the original, Uncle Bill's Code Course (V2.0) is made available free of charge to any radio club. Clubs should provide a formatted disk and a self-addressed stamped mailer. Clubs may share the software as shareware with members, students or anyone they wish.

Individuals may purchase Uncle Bill's Code Course (V2.0) by sending \$7 to Uncle Bill's Software, PO Box 2403, Falls Church, VA 22042.—*Bruce O. Williams, WA6IVC* [AR]

TRY A SIGMA BEAM ON YOUR SMALL LOT!

[Editor's Note: An article describing JG1UNE's Sigma beam appeared in the Feb 1980 issue (p 280) of Japan's *CQ Ham Radio* magazine.]

□ A full-size beam antenna is great—if you have the space for one. Many of us, however, live in apartments and just don't have that space. Figs 1 through 4 describe the results of my experiments with a miniaturized beam antenna in a Σ (sigma) configuration. My antenna is mounted at the top of a tower, about 15 m above the building roof.

The Sigma beam is a compact antenna shaped like the Greek letter sigma; it is a

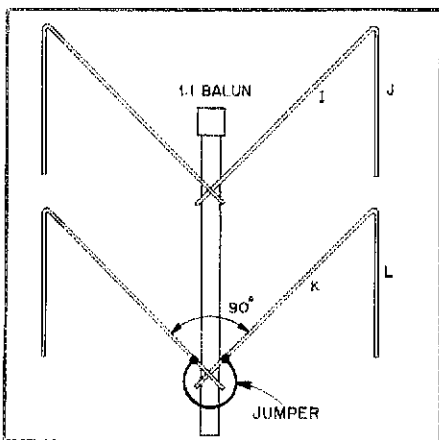


Fig 1—JG1UNE's Sigma beam. Tube sizes and lengths appear in Table 1.

V beam with the element ends bent to reduce its size. A list of materials for a 28-MHz antenna, constructed of aluminum tubing, appears in Table 1. Be sure to flatten the tube joints (after assembly!) to keep the element ends from rotating (see Fig 3B and Section A-A).

My beam was a little heavy when all elements were made of metal tubing. Also,

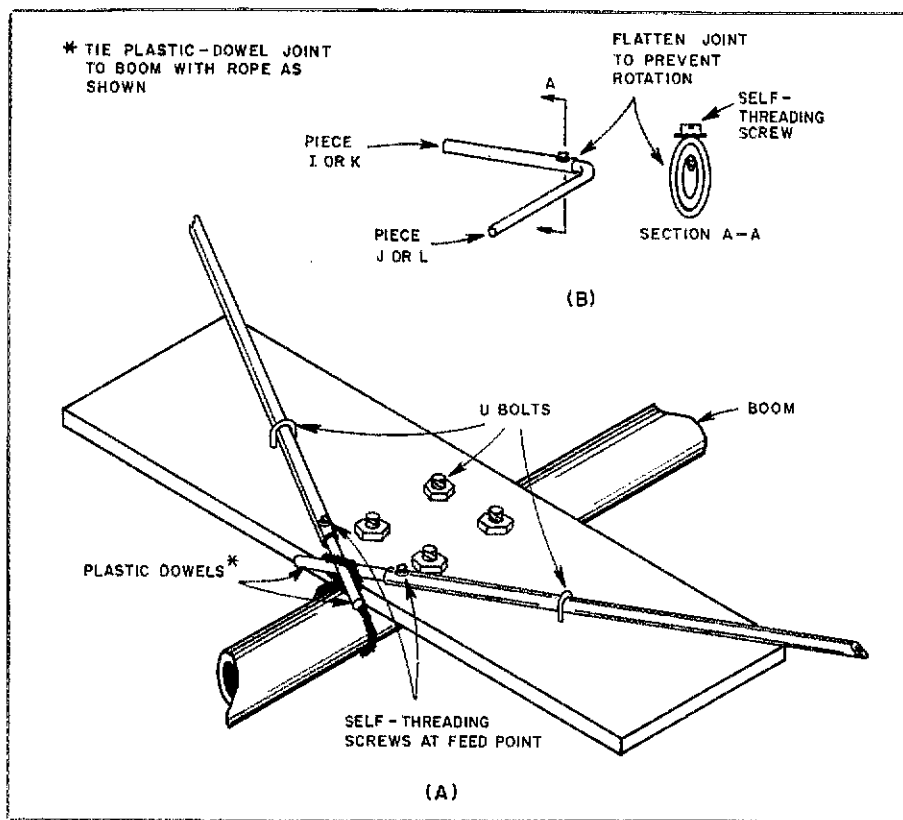


Fig 3—Details of the mounting-plate assembly (A) and element joint (B). Flatten the joint slightly after assembly to prevent rotation.

the tube joints are weak points, which are threatened by strong winds. The antenna weight can be reduced, and construction simplified, if we use straight bamboo or fiberglass spreaders to support wire elements. Two such antennas are shown in Fig 4. [This also eliminates any overlap problems where the element centers cross at the boom. Use nylon twine or some other insulating material for the lines at the element ends.—Ed.]

An SWR plot of my Sigma beam compares well with that of a full-size, two-element V beam. The two curves are nearly identical, with the SWR less than 1.7:1 from 28 to 29 MHz. The folded element ends seem to have little effect on the antenna impedance. My Sigma beam is fed through a homebuilt 1:1 balun.

I have contacted many Americans and Europeans while using this antenna and 40 W of output power. The V antenna has

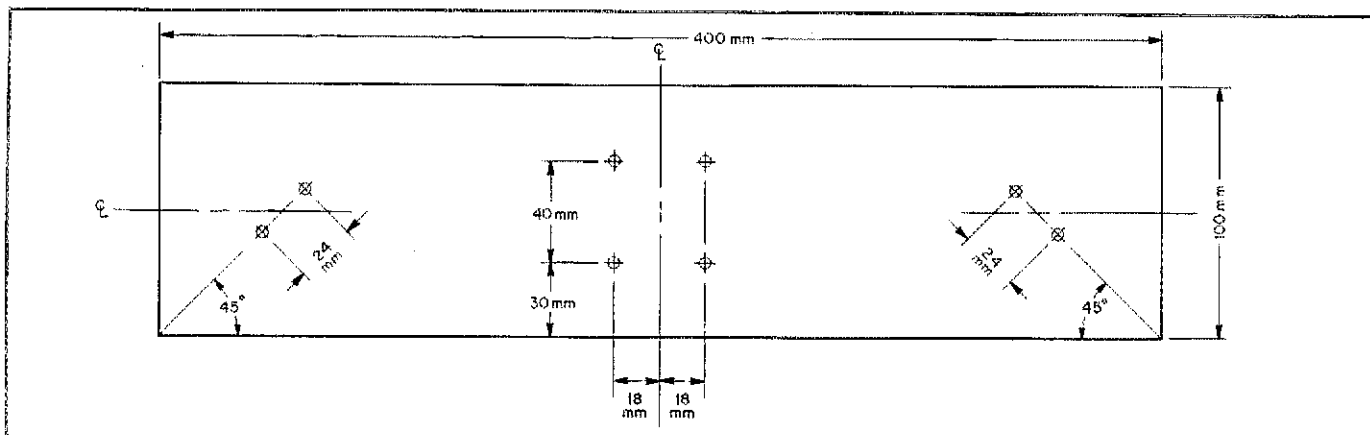


Fig 2—Drilling pattern for the mounting plate. [Dimensions are in mm; inches = mm \times 0.0394. Size holes and adjust locations to fit locally available hardware. The mounting plate may be hardwood rather than plastic, or plastic sleeves may be used to insulate the elements from a metal plate if a plastic plate is not available.—Ed.]

Table 1

Construction Materials for the JG1UNE Sigma Beam

Aluminum tubing:

- 2 pcs (I) —12 mm × 1.6 m†
- 2 pcs (K) —12 mm × 1.7 m
- 2 pcs (J) — 9 mm × 0.83 m
- 2 pcs (L) — 9 mm × 0.88 m

Boom: 32 mm × 1.0 m

Plastic dowel: 6 mm × 1.0 m

Acrylic plates: 2 pcs—100 mm × 400 mm × 5 mm

U bolts:

- 4 pcs—12 mm diameter
- 4 pcs—32 mm diameter

Self-threading screws: 6 pcs

Rope: 1.5 m

†Letters in parentheses are part identifiers as shown in Figs 1 and 4.

Inches = mm × 0.0394; feet = m × 3.2808.

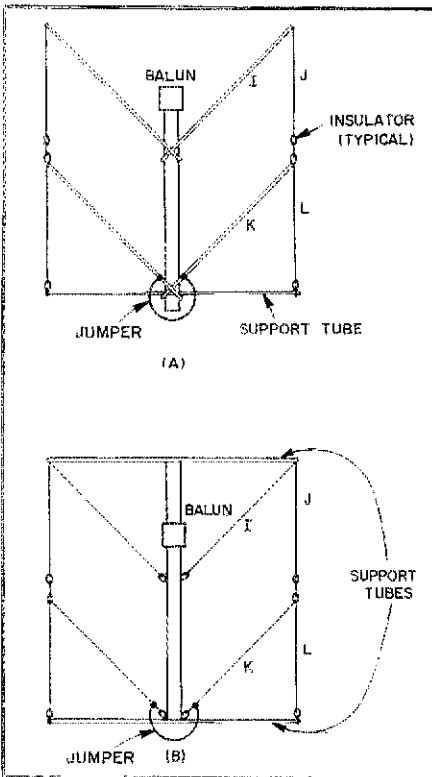


Fig 4—Variations on the Sigma beam that increase strength by reducing weight and mechanical complexity. Wire is used for the element end sections at A, while all conductors are wire at B. Wire lengths are the same as the tube lengths given in Table 1.

slight gain over a dipole, and I feel that the Sigma beam provides the performance of a V beam in a very compact package. There's no need to give up DXing because you live in an apartment. Try a Sigma beam!
—Aki Kogure, JG1UNE, Tokyo, Japan

A SIMPLE, MULTIBAND VERTICAL ANTENNA

□ The antenna in Fig 5 is based on a multiband vertical antenna described by Arthur S. Gillespie, Jr, W4VON, in the eighth edition

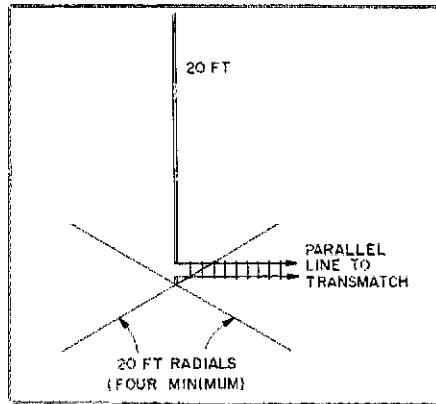


Fig 5—WB6AAM's multiband vertical-monopole antenna. Estimated gains for various amateur bands are shown in Table 2.

of *Hints and Kinks for the Radio Amateur*. I have used some alternative construction techniques and greater length to provide better multiband operation than W4VON's original.¹

Monopoles radiate in a toroid, or doughnut-shaped, pattern. The vertical radiation pattern of a $\lambda/4$ monopole is round; a large portion of the signal is radiated skywards at relatively high angles. A $5/8 \lambda$, or $\lambda/2$ monopole has a flattened-toroid pattern, with corresponding gain over the $\lambda/4$ at low angles. This gain is about 3 dB for $5/8 \lambda$ and 1.5 dB for $\lambda/2$. A $3/8 \lambda$ monopole shows little gain over $\lambda/4$.

It may look wrong—feeding an asymmetrical, traditionally coax-fed antenna with parallel feed line, but radiator and radials are all the same length and the circuit is very similar to a vertical dipole or an extended double “Zepp” with center feed. Parallel lines have far less loss than coax, especially under high-SWR conditions.²

The radiator can be any conductor: flagpole, round or square aluminum stock, wire and standoffs on a dry wooden pole, or TV-mast sections to name a few. A military set with mast sections, whip sections, insulator, base and guys would be a good field antenna.

Someone who lives where only TV antennas are allowed could try this idea: Use two 10-ft sections of TV mast and add a plastic insulating section (of a similar color) with a small TV antenna on the top. To add realism, add some TV standoff insulators and fake twinlead. (Remove the wire from the ribbon cable so that it does not interact with the antenna.) The radials can be thin wire or TV ribbon, close to the roof on standoffs. (Short each end of the TV ribbon—Fig 6.)

¹[Apparently, WB6AAM chose 20 ft as a convenient length from available materials. Antenna length, as shown in Table 2, is given with respect to a free-space wavelength. Since a Transmatch is necessary, the actual radiator and radial lengths are not critical.—Ed.]

²[The line will not be balanced, however, so we can expect some feed-line radiation. Remember that parallel feeders should be kept away from the earth, and other objects, with standoffs. Also, the feed-line length in an unmatched system is significant: If you experience difficulty matching the system on a given band, change the feed-line length by $\lambda/8$ for that band. Continue experimenting until you find a line length that can be matched on all bands.—Ed.]

Table 2

Estimated Performance of WB6AAM's Antenna†

Band	Antenna Length	Estimated gain over $\lambda/4$
10 m	0.58 λ	3 dB
12 m	0.51 λ	2 dB
15 m	0.43 λ	1.5 dB
17 m	0.36 λ	1 dB
20 m	0.28 λ	0.5 dB
30 m	0.20 λ	
40 m	0.15 λ	
80 m	0.08 λ	

†Gain shown is with respect to a $\lambda/4$ vertical monopole over a similar reflecting surface.

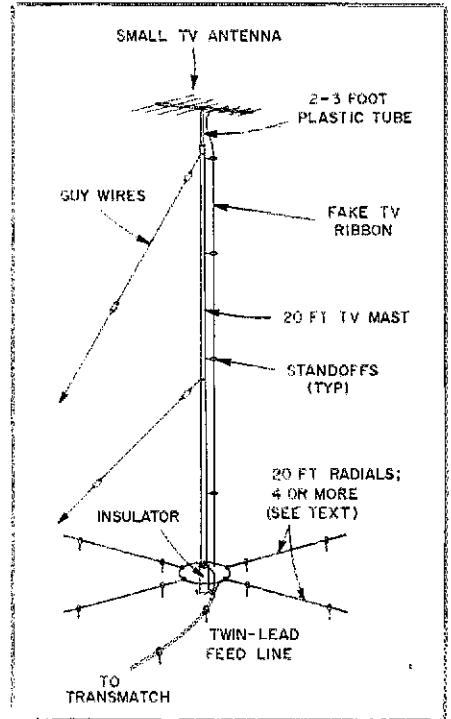


Fig 6—WB6AAM's antenna can be camouflaged easily as a commercial-TV installation. (For clarity, only one set of guy wires is illustrated.) [One could eliminate the top plastic tube and bond the TV antenna to the mast top as capacitive loading. This would make the antenna electrical length slightly longer than 20 ft.—Ed.]

My version of W4VON's antenna is $5/8 \lambda$ on 10 meters as I prefer the 10, 12 and 15-meter bands. The design could be changed for $5/8 \lambda$ on some other band. Remember, however, that the take-off angle steepens quickly as antenna length exceeds $3/4 \lambda$. As the length increases to λ , the vertical radiation pattern becomes more complex—resembling a cloverleaf, rather than a toroid. Multiple lobes of energy appear skywards as the length increases, with only minor lobes near the horizon. A 10-meter OSCAR user might take advantage of such a pattern, but terrestrial contacts won't be very strong.—James G. Coote, WB6AAM, Los Angeles, California

How About Used Gear for 80- and 40-Meter CW?

Equipping your first ham station can be a lot of fun—and it doesn't have to cost an arm and a leg.

By Larry Lisle, K9KZT

Over the last few years, I've helped many newcomers get on the air, and I'd like to pass on what I've learned about some of the fantastic bargains that are available in used tube-type ham gear. Now, some newcomers might turn up their noses at the idea of tubes in a solid-state world, but the fact of the matter is that it's been only recently that solid-state equipment could equal or exceed the performance of the better tube receivers. As for transmitters, a clean signal sounds the same to the person on the other end no matter how it's generated!

Of course the tube gear is bigger and heavier, but it's also a lot cheaper. So, if you've got the best part of a kilobuck to spend on a small transceiver with all the bells and whistles, by all means go ahead and trot down to the nearest ham emporium. You'll probably come away with a fine outfit that will take care of all your ham needs for many years. If you don't have a kilobuck and just want to make contacts, I'll tell you how to do that.

To make things simple, what we're talking about here is equipment for 80- and 40-meter CW. Some of the equipment described will work fine on the higher bands, but some—older receivers especially—run out of gas pretty fast above 40. (Of course, with the sunspots on vacation, this isn't that big a deal right now!)

Where to Buy Used Gear

By far, you'll find that you can make the best deals in used gear with other hams—guys and gals at the local club, or people they know. Put the word out that you're in the market for used gear. A nice thing about dealing with locals is that if you have any questions, they're around to answer them.

A second possibility is buying equipment by mail through ads in the ham magazines

or elsewhere. You'll be dealing (usually) with other hams, but they're often a goodly distance away, and you have to buy sight unseen. I've had good luck doing business this way, but there are no guarantees!

A third possibility, and where most of the action really occurs, is at hamfests. (See Hamfest Calendar, this issue, for times and places of upcoming 'fests.) At most hamfests, you can buy what you need to get on the air for somewhere between \$50 and \$100! Such gear won't make you the local DX champ, but you can have a lot of fun with what you'll find on somebody's card table or tailgate. For another \$50 or so—a total of \$100 to \$150—you can wind up with some really decent gear that hams *drooled* over 30 years ago.

One of the best things you can take with

you to a hamfest is an older ham who remembers the kind of equipment we're talking about in this article. Such long-time hams can help identify good deals and compare specifications and features.

Preparing a Shopping List

Let's characterize some of the equipment you may be looking to buy. It's not possible to cover everything, obviously, but at least this will give you some idea of what to look for.

What about a Receiver?

Receivers come in two flavors: general coverage and ham-bands only. Older general-coverage receivers usually cover

Novice Notes:

• Where to Buy

• What to Buy

• Getting a Good Deal

• Operating Tips

• Finding More Info

Mary Fischer, KA9VLE, and her dad, Jim, KA9WBA, share a Heath HW-16 transceiver and a HG-10 VFO. This was a very popular outfit 20 years ago. (photos courtesy K9KZT)



everything between about 540 kHz and 30 MHz or so with one dial, while a second dial—the bandspread—is used to tune slowly over (spread) the part of the band you're interested in. Sometimes, the bandspread dial is calibrated for several ham bands; it may be marked only with divisions from 0 to 100.

Ham-bands-only receivers usually cover only the high-frequency (HF) amateur bands that were in existence at the time it was made. (By HF I mean 3 to 30 MHz. Relatively few older ham-bands-only receivers cover the medium-frequency [MF] 160-meter band between 1.8 and 2.0 MHz.) Ham-bands-only receivers are a little easier for a new ham to figure out, and they tend to work better for ham-band reception than a general-coverage receiver with bandspread.

On the other hand, a general-coverage receiver can be used to listen to anything

within its tuning range, such as 160 meters, the "WARC" bands at 10, 18 and 24 MHz, WWV, shortwave broadcast stations, and so on. A general-coverage receiver may be more useful to you later in your ham career as a backup receiver or for monitoring the bands from another part of the house. Listening to the shortwave broadcast bands can be a fun hobby in itself!

Important in your choice of a receiver is its *selectivity*—that is, how well it can pick the signal you want out of a crowd of closely spaced similar signals. You can learn more about selectivity in *Tune in the World with Ham Radio* and other ARRL publications. For now, though, we can look at selectivity in older receivers this way: Some receivers will hear many signals but not be able to discriminate between them. Others may be more selective for CW signals than for voice signals. And some receivers will have selectivity good enough for both CW and voice work. Generally speaking, the better the overall quality of the receiver, the better its selectivity. And the better the quality of a receiver, the higher will be its price! But don't let this range of selectivity choices scare you. Any functioning receiver can be used to have a lot of fun on the air—and any receiver is better than *no* receiver! For more on how to get the most out of an older receiver, see the accompanying sidebar, "Notes on Operating Older Equipment."

One more note on selectivity: A number of years ago, a receiver accessory called the *Q-multiplier* was popular because it could enhance mediocre selectivity. Some receivers had them built in; these sets usually worked pretty well. If a receiver you're considering has one, ask the seller how to get the most out of it. Two receivers in particular—the Drake 2-B and 2-C—had outboard Q-multipliers available as matching accessories. These receiver/Q-multiplier teams do a great job, but so do the "unmated" 2-B and 2-C receivers on their own. Aside from these exceptions, I suggest that you not buy a receiver and "unmatched" outboard Q-multiplier today. Instead, put the funds you would spend for both into a better receiver.

How about some more manufacturer names and receiver model numbers? Okay, take a look at Table 1. You'll see several of the receivers there at just about any hamfest, although the price for a particu-

lar radio may vary from that shown in Table 1. Used equipment doesn't have an intrinsic value, and there's really not much of a collectors' market for it. Prices vary between the asking price and what a buyer is willing to pay.

How about a Transmitter?

Good used CW transmitters for 80 and 40 meters are somewhat less complicated to talk about than receivers. Keep in mind that Novices had fewer privileges in years gone by. For instance, a Novice of 30 years ago was limited to crystal frequency control. He or she couldn't use a variable-frequency-oscillator (VFO). Changing operating frequency meant plugging in a *crystal*—a special piece of quartz mounted in a plastic or metal holder—for each frequency. (You may hear older hams refer to crystals as "rocks"; a ham operating under crystal control is sometimes said to be "rockbound.") A new Novice usually bought or built a simple two-stage crystal-controlled transmitter consisting of an oscillator and power amplifier. Upgrading to General was a big deal, not only because of increased frequency and mode privileges—with a General ticket in hand, you could use VFO frequency control *at last!*

Well, you *can* have lots of fun with just a couple of crystals. Just to see if crystal control was feasible under today's conditions, a few years ago I started using a simple crystal-controlled homemade transmitter running 15 watts output. Since

Table 1
Used Receivers You May Find

Here, grouped according to their selectivity characteristics, are some typical used receivers you may encounter in your travels. Each listing also tells you whether a particular receiver covers ham bands only (HB) or affords general-coverage reception (GC). The right column shows the price paid by the author for each receiver within the last few years. Equipment in better-than-average condition may command a higher price. For more about selectivity, see the text and the sidebar, "Notes on Operating Older Equipment."

Wide Selectivity

Gonset GR-212 (GC)	\$20
Hallicrafters S-20R (GC)	\$15, \$19
Hallicrafters S-40B (GC)	\$25, \$45
Hallicrafters S-129 (GC)	\$35
National NC-125 (GC)	\$25
(has built-in audio filter)	

Good Selectivity for CW

Hallicrafters SX-16 (GC)	\$25
Hallicrafters SX-42 (GC)	\$25
Hallicrafters SX-99 (GC)	\$25
Hammarlund HQ-129X (GC)	\$25, \$95
Hammarlund HQ-140X (GC)	\$60
Hammarlund HQ-145X (GC)	\$90

Good Selectivity for CW and Voice

Drake 2-B (HB)	\$15*
Drake 2-C (HB)	\$85
Hallicrafters SX-101 (HB)	\$65
Hallicrafters SX-115 (HB)	\$80
Hallicrafters SX-117 (HB)	\$65
Hallicrafters HQ-170 (HB)	\$50, \$55

*The author got an exceptionally good deal on this one. The price for this receiver could run as high as \$100+.

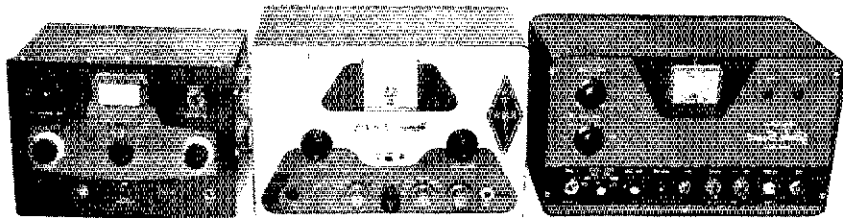
There are many other fine used receivers available, such as those made by Collins, Heath, RME and TMC. This list reflects the author's personal experience in trying to get the best performance out of relatively few dollars. There's almost always a better deal if you're willing to hunt it down!

Table 2
Used Transmitters You May Find

Here are some of the transmitters the author has purchased in the last few years. The right column shows the price(s) he paid for each. Equipment in better-than-average condition may command a higher price.

Heath DX-20	\$5
Heath DX-35	\$5
Heath DX-40	\$15, \$20, \$22, \$30
Heath DX-60	\$10, \$15
Johnson Adventurer	\$20
Johnson Challenger	\$15
World Radio Globe Scout	\$5, \$5

External VFOs are sometimes available with these rigs; prices run anywhere from \$1.50 to \$25.



Here are three popular beginner's transmitters from 30 years ago (l-r): a World Radio Labs Globe Scout, a Heath DX-40 and a Johnson Viking Adventurer. They're easy to operate and will do a good job even with simple antennas.

then, I've worked 42 states and have had hundreds of enjoyable contacts. Conclusion: A VFO makes life easier, but you can have fun without it. It takes just a few special operating techniques to get the most out of crystal control. See the accompanying sidebar entitled "Notes on Operating Older Equipment" to learn more.

You'll come across many good deals in simple crystal-controlled rigs at hamfests. For a good starting list of what to look for, see Table 2. Next, we'll discuss how to get good value for your dollar when you buy.

Getting a Good Deal

Even though you're a buyer, considering the seller's point of view can help you come up with a good piece of gear for less money. Just a few dollars can make the difference between a successful sale and the dreary job of lugging a piece of unsold gear back home. For instance, recently I saw a nice Hallicrafters SX-101 receiver bearing an \$80 price tag. The seller was offered \$65, but turned it down. Whew! An SX-101 weighs around 75 pounds, and I'm not sure I'd want to haul it home again for the sake of 15 bucks! Luckily, many sellers see it the same way, and you can use this to your advantage: Gear of all descriptions often sells for less during the closing hours of a hamfest because sellers don't want to cart the stuff back home.

If you've set your sights on a piece of gear and end up haggling over a few dollars, settling on a price a bit above your "firm" maximum may actually save you money. If you pass up the gear this time, the next hamfest may be a long drive—and a long time—away. The cost of going to another hamfest could be applied to the gear in front of you *now*, and you will have the receiver you want *now* instead of later—later, that is, assuming you see such a gem again. . . .

Once you start to zero in on a tempting buy, though, what about determining its quality? It turns out that you already have most of the necessary equipment.

Use Your Common Senses

Here are a few quick and simple things you should do before buying any used equipment:

Look for rust, burn marks, mice traces and missing parts, and at the condition of the power cord.

Smell for burn odors or mustiness.

Feel whether the controls move freely, and note whether or not dial indicators follow the movement of associated controls (restringing a dial cord can be a bear!).

Ask the seller if the outfit works okay.

Tell the seller that it's for a beginner.

Be careful about testing energized electrical equipment when standing on damp ground!

Testing a Receiver

If you can, turn on the receiver and listen to it in operation. This requires that 117 V ac current be available to power it, but that's not all. The first accessory you'll need is a pair of headphones. Some receivers have a high-impedance headphone output (near 2000 ohms); others have low-impedance headphone output (4 to 16 ohms, the same as a speaker). I suggest bringing *two* pairs of headphones along on a receiver shopping expedition, one high-impedance and the other low. Equip each pair with a 1/4-inch phone plug.

You'll also need some sort of antenna for your tests. For this, attach a phono plug to one end of a piece of wire about 15 feet long. Attach a banana plug to the other end of the wire. One of these plugs will fit the antenna receptacle on most receivers. For receivers using screw terminals as antenna connectors, bring along a short wire with

Where to Find Out More About Used Gear

- Ham Trader Yellow Sheets, PO Box 2057, Glen Ellyn, IL 60138. \$3 for a five-issue minisubscription.

- A. L. Brand, Ham Equipment Buyer's Guides, Vol 1, 1948-1972. 900 Pictures, 166 Pages, \$15. Available from Barbara Brand Wixon, 189 Kenilworth, Glen Ellyn, IL 60137.

- Hi Manuals, PO Box 802, Council Bluffs, IA 51502. Catalog \$1.

- If you're in the market for more-modern equipment, see "Using QSTs to Choose an Old HF Rig," February 1987 QST, page 20, and Chapter 7 of the 1987 edition of *Tune in the World with Ham Radio*, available from ARRL (\$8, book only; \$10 with code-practice cassette).

- The 1971 and earlier editions of *The ARRL Handbook* contained a catalog section of advertisements from many ham manufacturers. (Back issues of QST and other ham magazines are a good source of ads, too.) Such ads are a valuable source of information about receivers and transmitters popular just before a given *Handbook's* cover year. Time spent rummaging at hamfests for copies of old *Handbooks* and ham magazines may be well worth your while if you need information about a transmitter or receiver of several decades ago.

an alligator clip at each end. You can connect your test antenna to screw terminals with this.

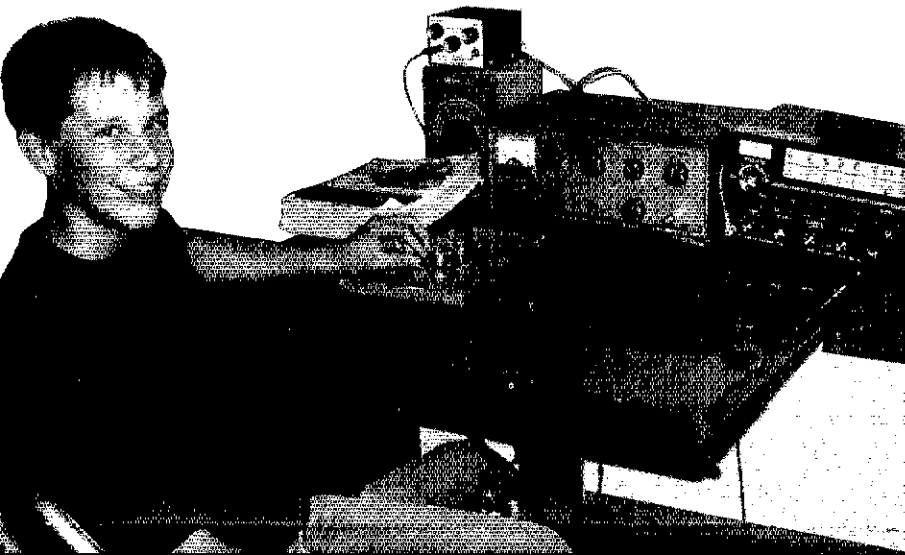
With a 15-ft antenna, you should be able to hear some activity on 40 meters at any time of the day. On general-coverage receivers, you should be able to hear WWV on 10 or 15 MHz, and shortwave broadcast stations at a number of spots throughout the HF spectrum. This tells you at least that the receiver hears signals—the basic test for your bargain receiver!

Testing a Transmitter

Transmitter checkout requires 117 V ac energy, too. You'll also need an indicating dummy antenna load, a key and a crystal for a frequency in the 80- or 40-meter band.

Why an *indicating* dummy load? Well, most commercial dummy loads are just large resistors mounted in cans or boxes. They don't tell you at once if your transmitter is really working. You can get around this by making your own indicating dummy load out of a 60-W incandescent lamp bulb, a socket, wire, an alligator clip and a banana plug. Buy a ceramic lamp socket from your local hardware store or home improvement center; a socket with screw terminals will make the job easier. Next, obtain four 1-foot pieces of wire, one phono plug, one banana plug and one alligator clip. Solder two pieces of wire to the phono plug, one to the center pin and the other to the other shell. Attach the

Jim Alsbury, KA9TKY, uses an Eico 720 transmitter with a Knight VFO. His receiver is a Drake 2-B backed by an Autek audio filter. By careful shopping, Jim put together a very nice station for about \$60.



Notes on Operating Older Equipment

Receiving Tips

The crystal filters in many older receivers work well for CW but not for SSB. Such a filter may have several controls, but you'll know your receiver has a filter like this if you spot a PHASING control. The peak of one of these older crystal filters is very sharp—just fine for CW—but the skirts are relatively wide. This means that the desired signal will stand out when you tune it for a peak, but you'll still be able to hear strong signals adjacent to the peaked signal. This is an advantage sometimes in DX work or contests.

To adjust a PHASING crystal filter, follow these steps: (1) Turn off the receiver's beat-frequency oscillator (BFO) and turn on the automatic volume control (AVC). (2) Set the crystal filter SELECTIVITY control to its sharpest position and tune for maximum S-meter reading on the received signal. You will probably have to turn the receiver's RF GAIN control to maximum for the S meter to work right. (3) Turn the RF GAIN fully down. (4) Switch the AVC off and turn the BFO on. (5) Adjust the AF GAIN to control to maximum; adjust RF GAIN for comfortable listening volume. (6) Tune the BFO PITCH control until the signal comes in at the tone you like to copy—say, around 750 Hz. (7) Now, leave the BFO pitch control alone. Slowly adjust the receiver tuning in one direction to make the signal pitch travel down in pitch, through zero beat, and back up in pitch until you've tuned it in at the same pitch you had it before. It should sound much weaker now. This is called "tuning to the other side of zero beat." This weaker signal on the other side of zero beat is called the *audio image*. (8) Adjust the PHASING control until the audio image is weakest—it may even disappear. That's it! You have adjusted your crystal filter for maximum selectivity. Because you're hearing the signal on only one side of zero beat and not the other, you're enjoying what's known as *single-signal reception*.

Once you've adjusted your crystal filter in this way, leave the BFO PITCH control where it is and do all your tuning with the receiver's tuning control. Keep the AF GAIN at or near maximum and adjust the volume of the received signal with the RF GAIN control.

If you've settled on a used receiver without a crystal filter, don't despair—a bit of ingenuity can help you pick out signals better than you might have thought possible. Here's a little trick I've used for years: Tune the signal you're trying to copy to the lowest beat note you can hear. For instance, let's say that the station you want to hear is only 300 Hz away from an interfering signal. If you tune the receiver so that you hear these signals at beat notes of 1000 and 1300 Hz—300 Hz apart—they're very difficult to separate. However, if you tune in the signals so they produce beat notes of 50 and 350 Hz—still 300 Hz apart—it's a lot easier! Why? Because your ears and brain, acting as an audio filter, can do a better job separating two tones when the *percentage* frequency difference between them is greater. Compared to 1300 Hz, 1000 Hz is a frequency separation of only 23%. Compared to 350 Hz, a 50-Hz tone represents a frequency difference of 86%. Your ears will thank you! If you tune your receiver just right, you may even be able to put an interfering signal right at zero beat and get rid of it entirely.

It's possible to improve the selectivity of any CW receiver with the addition of an out-board audio filter. Such filters are usually wired between receiver and headphones or speaker. Hint: An audio filter is easy to build and makes a nice first building project. You can also purchase one new or used.

Transmitting Tips

With crystal frequency control, you can't tune your transmitter into another operator's receiver as you can with a VFO. There are two ways to deal with this. One is to call CQ. Sooner or later, you'll get a nibble! There's a more relaxed way to use crystal control, though: Just tune your receiver to your transmitting frequency and turn up the AF GAIN so you can hear action on the frequency while you do something else around the house. I guarantee that on the Novice bands you won't have to wait too long before you hear a CQ on your frequency. Of course, it helps to have several crystals so that you can move away from a contact in progress or plunk yourself down near someone calling CQ. But it also helps to have a good supply of patience, skill, timing and luck. Remember: Novices of yesteryear qualified for Worked All States and even the DX Century Club using crystal control. You can get a healthy start on qualifying for these awards—not to mention just having a lot of good conversations—long before you move up to VFO control.

Good Plain Sense

In studying for your Novice and other licenses, you've already learned about electrical safety during thunderstorms and other serious weather. Remember that older gear can be damaged by lightning, too. Just because it may use vacuum tubes, it's not indestructible! Also, it's a good idea not to let old equipment run unattended, and to unplug everything when you "pull the big switch."

alligator clip to the third piece of wire, and attach the banana plug to the fourth. At this point you have three assemblies: two wires connected to a phono plug, one wire terminated in a banana plug, and one wire terminated in an alligator clip.

Now, attach the phono-plug wires to the lamp socket, one wire to each terminal. Next, attach the banana-plug wire to one socket terminal—it doesn't matter which. Attach the alligator-clip wire to the other terminal. Finally screw in a 60-W incandescent bulb. Now you have a 60-watt indicating dummy load. The alligator clip and banana plug allow connection to the "UHF" coaxial connector common to many rigs. The phono plug allows connection to rigs in which a phono jack is used as an antenna connector.

Any straight key will do for transmitter testing. The main requirement is that its connecting wires end in a 1/4-inch phono plug. It's a good idea to carry the key in a plastic bag. You can use this bag to cover the key during testing to make sure you don't come into contact with any voltages present at the key.

Once you're considering a particular purchase, let the seller demonstrate the rig, and watch how it tunes up. The dummy load lamp should light when the key is pressed. When vacuum tubes are keyed, the key may have considerable voltage across it, so slip your plastic bag over the key for insulation. Similarly, be sure you don't come into contact with any of the connections to the dummy load while the transmitter is putting out RF. And don't let unused dummy load wires short-circuit to the transmitter chassis while the transmitter is operating.

Sometimes, there's no opportunity to check out equipment because the nearest source of line voltage may be some distance away. A volt-ohm-milliammeter (VOM) can be used to measure the resistance across the line cord to check the condition of the power transformer primary. (A very useful multirange meter, the VOM can be obtained for a minimum of about \$10 from many electronics stores—Radio Shack, for instance). The resistance between the two flat prongs on the power plug should be very high with the rig's power switch OFF. It should be very low when the power switch is ON. Next, measure the resistance between each flat prong of the power cord and the metal transmitter cabinet. It should be very high with the power switch in either position (OFF or ON).

If you can't make an operational or resistance check, get a look inside the cabinet, if possible. Check the plates of variable capacitors to confirm proper operation. (In a variable capacitor, rotating plates [the rotor] should not touch the stationary plates [stator].) Variable capacitors are expensive and hard to replace. This kind of check isn't as good

(continued on page 76)

What's a Special Service Club All About?

Do you have a bunch of go-getters in your club? You may deserve recognition as an ARRL-affiliated Special Service Club.

By Rich Moseson, N2BFG

Former Affiliated Club Coordinator,
19 Linden Ave, Bloomfield, NJ 07003

As I visited the radio clubs across the Eastern New York Section, I often talked about Special Service Clubs, and I was often asked what sets an SSC apart from other clubs. After all, the reasoning goes, lots of clubs give licensing courses; lots of clubs sponsor repeaters. Why are some Special Service Clubs while others are just plain ordinary clubs?

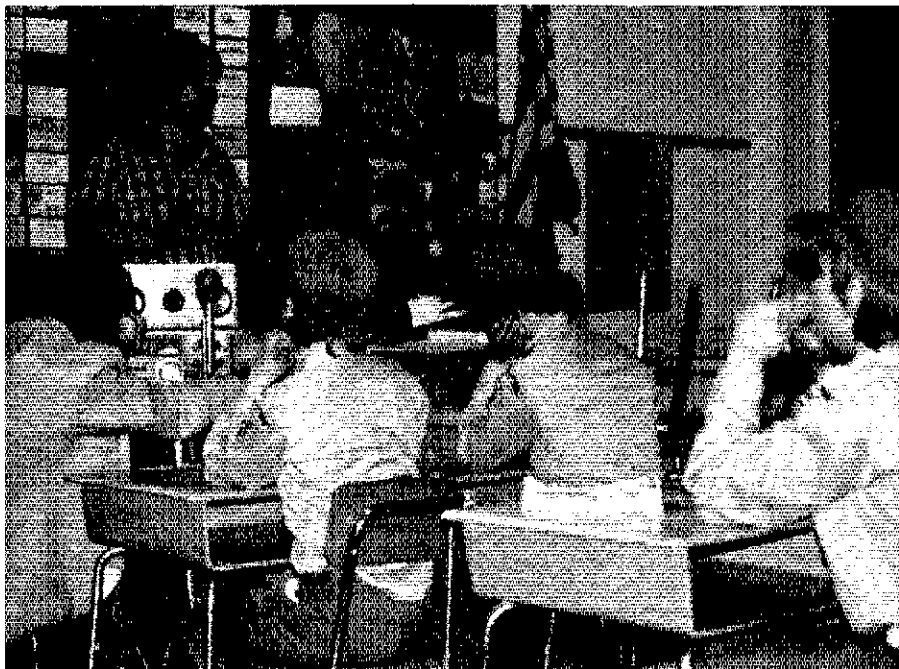
My answer is usually about commitment, the commitment of a club to provide a wide range of services from public service and publicity to education and technical advancement—plus the commitment to keep providing those services. It's also a commitment by the club to be the semi-official representative of Amateur Radio in its community.

In exchange, the ARRL provides special services to the club: lists of new licensees and automatic referral of new ARRL members for membership recruitment; authority to certify applications for certain awards; listing of the club's meeting date, place and time in each year's *Repeater Directory*; a free subscription to the *ARRL Letter*; authority to use the distinctive SSC logo; and more.

But these explanations don't really answer the question in concrete terms. Just what does a Special Service Club do? I'll try to provide some better answers with illustrations from my own club, the Westchester Emergency Communications Association (WECA).

First, a little background. WECA is one of nine radio clubs in Westchester County, a northern suburb of New York City. It is primarily a public-service club, but it supports a wide variety of activities, reflecting the diversity of the club's 145 members. (How does a club attract and keep so many members? Keep reading!)

The glue that holds WECA together is its repeater network—voice repeaters on 2 meters, 220 and 440 MHz, and a recent addition, a 2-meter packet digipeater. Its major activities: public-service events ranging from the New York City Marathon to Mamaroneck's annual "turkey trot," a Thanksgiving-time fun run.



Special Service Clubs bring Amateur Radio to science-oriented audiences. Pictured are N2DVQ (with the hand-held radio) and N2BFG (crouching, lower left) taking ham radio on the road to a Scout Troup. (Susan Moseson photo)

But there's much more that sets WECA apart from the other clubs in Westchester County, much more that makes it a Special Service Club. Let's take a look at some specific activities in each of the ARRL's six broad categories for SSCs. (To become and remain an SSC, a club must establish and operate at least one program in each of the first five categories and at least three programs from the sixth, "miscellaneous activities.")

Public Relations

WECA's public relations effort covers four main areas: local media, ham media, local officials and local action. Obviously, some of these overlap—and all club activities that involve the general public are public relations in the broad sense. Recognizing this helps identify those activities on which we want to focus special attention.

We send news releases to the local media primarily to announce meeting programs,

licensing courses, FCC exams, election results, etc. We also use news releases to notify the media of upcoming activities, such as Field Day or ham radio in space missions, which they may want to cover.

Sometimes, there isn't time to write and mail a news release. That's when the public relations effort moves to the telephone. Local papers and broadcasters love to hear about significant amateur involvement in breaking news stories or their local involvement in national or international stories. We got excellent coverage on local hams helping get information out of Mexico City after the earthquake there, on activities after our own minor quake and during the latest hurricane to hit our area. Mailing this information to anyone but the weeklies would have meant missing the boat on being covered.

Then there are stories that are of less general interest. For example, a talk given by club members to a Federal Emergency Preparedness Conference, a joint search

with the Civil Air Patrol for the source of transmissions from an "emergency locator transmitter," or the time a club member became the first US YL to win a prestigious Swedish operating award. These were sent as news releases of general interest to all of the Amateur Radio magazines and newsletters. Others, such as this article, are written specifically for one publication—in this case, *QST*.

Part three of WECA's publicity program is the education of local officials about Amateur Radio in general and WECA in particular. These people include local government officials and heads of agencies for which we can or do perform public-service work. We provide these people with two brochures, the ARRL's *Ham Radio in Your Neighborhood: A Community Resource* and our own *This is WECA*, which introduces our club and its activities. (A slightly different version of the same brochure is available for prospective members.)

Finally, we've established a roving task force to keep an eye on local zoning laws, and put together a group of hams to fight for fair antenna ordinances. While this may not seem like public relations at first, it is simply an extension of part three—educating local leaders as to the value of Amateur Radio and establishing our club as "the representative of Amateur Radio" in our community.

Emergency Communications

Emergency communications is WECA's middle name, and we take the responsibility seriously. We work closely with the local ARES/RACES organizations and, in fact, our members form the core of both groups. In addition, the county emergency coordinator (EC), who heads ARES, is in charge of WECA's public-service activities and is our primary liaison to served agencies. The county government's communications officer, in charge of the local RACES organization, is also on our board of directors, under terms of a written agreement that establishes WECA as the county's primary source of backup emergency communications.

Within our dual ARES/RACES role, our members regularly turn out in force for a variety of public-service activities, including evacuation drills for our local nuclear power plant. And, when Hurricane Gloria and a small earthquake rolled through our area in 1985, we were on the air in minutes, providing communications where and as needed.

Our emergency-communications function is evident in everyday operations as well. Our 2-meter repeater has an autopatch equipped with emergency autodial, permitting anyone who encounters an accident or other emergency to immediately call it in to proper authorities. And, to ensure regular representation of our service area in the appropriate National Traffic System network (to quote the SSC Guidelines), we sponsor our local VHF traffic net and provide

regular liaisons to section and higher-level nets.

Training

The most basic part of any training program is licensing courses. Now that the Volunteer Examiner program is in full swing (see Exam Information, Feb 1987 *QST*, page 83, for details) exam sessions encourage licensing and upgrading, making the work of our instructors even more important for the health of the Amateur Radio Service. In the past year, we've run three Novice courses, a Tech/General course and an Advanced/Extra course. All were well-publicized and well-attended.

We provide "continuing education" for our club members through technical programs at club meetings and a new program, dubbed "Things Elmer Never Told You," which occasionally surfaces to cover basic operating techniques. Most recently, it was the basis for our hamfest forums.

In addition, we conduct periodic hidden-transmitter hunts and other on-air training activities, including all of our "routine" public-service events. The value of that training has been obvious during real emergencies. Finally, we're in the process of setting up an equipment bank to help new hams get on the air.

Technical Advancement

WECA has always tried to provide technical leadership and training, through advanced licensing courses, meeting programs and operating opportunities. Several years ago, the club pioneered the use of "data-under-voice," which permitted RTTY and voice users to share the same frequency without interference. Today, we have moved to the new frontier of packet radio, having put a digipeater on the air while encouraging members to experiment with this new mode. We have also produced a brief videotape tour of our repeaters, along with a demonstration of a spectrum analyzer actually testing the output of the 2-meter repeater.

Other Activities: Operating

The SSC Guidelines call for at least one other "substantial" program in an area of significant club interest. The SSC Manual suggests: (1) a program to combat deliberate interference; (2) club participation in Field Day and at least one other ARRL operating activity; (3) encouraging proper "operating etiquette" with new and aspiring hams; (4) sponsoring a repeater; (5) sponsoring a traffic net; (6) sponsoring traffic net training, and (7) managing a QSL bureau.

We do all of the above, except the last one:

(1) Our "twit"-finders not only track down those who "transmit with intent to interfere," but provide training for club members interested in learning about direction-finding techniques; (2) Field Day is a major club activity and a source of good publicity (Sunday feature story in 1985);

(3) "Things Elmer Never Told You" includes a segment on repeater etiquette; (4) we sponsor four repeaters; and (5/6) the net manager of our club-sponsored National Traffic System local net conducts regular training, on and off the air.

Miscellaneous Activities

These are different from "other activities" (which are specifically operating-oriented) in that your club has more flexibility and must run three programs in this category. WECA does more than a dozen. Among them:

- monthly meetings
- a permanent club address
- dissemination of ARRL bulletins on the 2-meter repeater
- providing liaison, as needed, with local government
- a slide show on club activities
- publication of a club newsletter
- pursuit of Amateur Radio coverage in the local media
- our *What is WECA?* brochure for local officials and prospective members
- hosting Scout groups for the yearly Jamboree on the Air
- providing counselors for Radio Merit Badge
- conducting "Ham Radio on the Road" demonstrations (WECA originated this nationwide program.)

- sponsoring a ham radio-oriented youth group (WECA has recently received a charter as sponsor of the first Young Astronaut Program chapter in Westchester County)
- working to get Amateur Radio into the schools (the Young Astronaut Program will provide a major push in this regard)
- sponsoring an annual hamfest with forums, FCC exams and a League information/sales table.

That rounds out the ARRL's list of activities required for a club to become and remain an ARRL Special Service Club. I believe WECA is a special example of an SSC in action. But as its publicity director, I'm prejudiced. As an Affiliated Club Coordinator, though, I saw many other active clubs throughout my Section—clubs that are and are not SSCs. WECA and a few others significantly *exceed* the requirements for being an SSC. Others just meet the minimum requirements, but still make important contributions to the Amateur Radio Service and their communities.

What really counts is the effort—and the commitment to provide whatever services and programs are needed to meet the needs of your members, your community and the Amateur Radio Service. I hope that, through the above examples, it will now be easier—for me and for others—to answer the question, "Just what does an SSC do?" And that you'll invite your Section Manager or Affiliated Club Coordinator to explain how you, too, can be recognized as an ARRL Special Service Club.

Next Steps into the ARRL Visitors' Center

Amateurs have voiced their support. Fund-raising efforts kick into action.

By Phil Sager, WB4FDT

Regulatory Information Branch Manager, ARRL

“WHEREAS, at its July 1986 meeting the ARRL Board of Directors approved in principle the refurbishing of the Maxim Memorial Station, WIAW, and construction of an associated Visitors' Center . . . and the reasons for proceeding with this important project are as persuasive now as they were in July. . . BE IT RESOLVED . . . that the officers and staff . . . develop and implement . . . a plan for the raising of funds for construction, maintenance and related improvements to the property. . .”

In these words taken from Minute 61 (page 60, this issue), the ARRL Board of Directors approved the second phase of the plan to renew the WIAW station and expand its usefulness through construction of a Visitors' Center and Museum at Headquarters. The plan includes the creation of a “Committee for the Museum”—volunteers of prominence and vision—to ensure that the focus of the project is on the future while using the lessons of the past to inspire our leaders of tomorrow.

Why is the project needed? Will its costs raise dues? Why spend money enshrining old radio gear? Don't we have more important things to spend the money on?

Neither construction nor operating costs will be drawn from membership dues or existing resources.

These are some of the questions raised by members since the Board launched the idea in July 1986.

Yes, why do we need this project? And if we do, why right now? Most importantly, the Maxim Memorial Station building is nearly 50 years old. Except for the World War II years, when the building stood dank and cold “for the duration,” WIAW has been in almost daily use. Perhaps a hundred thousand have visited it, leaving marks of wear. New England's famous weather episodes (as for instance, three snowstorms in the week these lines were written) have implanted their own scars. Yet a face-lift alone would preserve

inadequacies that have come to light. When the Mexico earthquake emergency arose in 1985, the “Command Center” at Headquarters had to operate “split site”—radios in WIAW, telephones out back in the main office! An “all purpose room,” connected to the station and preequipped with extra phone lines makes lots of sense. WIAW exists also as the king of “Show and Tell” by which Cub Scouts and Brownies, middleschoolers and technical students can be exposed to our fascinating world. Yet, the presence of more than a few visitors at any one time itself disrupts what we are demonstrating. A reconfiguration separating sight from sound would make the station more effective for all its purposes.

1914 was the year ARRL was founded. In 1917, its members marched off to war, preserving democracy and Amateur Radio for the time. 1919 was a rebirth of raucous spark. In 1921, we reached across the Atlantic and held our first National convention back home. Today, the surviving participants in these events are in their 80s and 90s. If we want the benefit of their counsel, if we want to see what *their* Amateur Radio was like, to know how



Two concepts of how the proposed ARRL Visitors' Center might look. In the left photo is one design of the Center viewed from the northwest, showing the main entrance (center) and the back of WIAW. The other design is viewed from the southwest, with WIAW and the Center on the right and a small part of the Headquarters building at the extreme left.

we got to *ours*, if we want the oral and written records of their accomplishments, now is the time! A library is needed, not just to store amateur magazines, but to preserve amateur writings over the past and future decades and to record historical research.

A renewed WIAW, an emergency command center, a meeting place, a showcase of Amateur Radio—milestones of the past and guidelines for the future.

Artifacts, too, are slipping away. Some are in private collections. Some sit sedately in cases in the foyer of the Headquarters' main office building, but their story is badly told in that venue. A visitor's first impression of our administrative Headquarters is a view of a collection of antique radios—just the opposite of the progressive image today's organization deserves. What is needed: space for a hands-on, living exhibit, decade by decade, documenting the contributions of amateurs in the development of electronic communications. It's a story well worth telling, full of illustrations, where the work of one individual made a

difference in human progress. "Who can estimate the value," ARRL Executive Vice President Dave Sumner, K1ZZ, asks, "of the inspiration that young visitors may gain when they see that those who left a mark on history were just like themselves?"

Last year some 2000 visitors toured Headquarters. Almost 62% came from outside the New England area, and many were unlicensed. Presently, we can only offer them a tour of the office building, a browse through some display cases of older equipment and a tour of WIAW. The new Center should draw many visitors to Headquarters, and become a true "Center" for the promotion and recruitment of new amateurs.

Responding to these needs, the ARRL Board of Directors, at its July 1986 meeting, approved the idea, in principle, of creating a Center on the League's property in Newington. The Board, in effect, gave the okay for the ARRL staff to proceed with the next phase of the project, to determine if adequate funding is available. The projected cost of the WIAW refurbishing and center construction is \$2.7 million, including an allowance for inflation and for related improvements to the property. How will this be financed? It is the view of the ARRL Board of Directors that the Center should be able to stand alone financially, through contributions. Neither construction nor operating costs will be derived from League membership dues or existing resources.

Will ARRL be able to raise \$2.7 million? At the direction of the Board, Headquarters conducted a survey of all possible

funding sources, including a random-sample mailing to ARRL and non-ARRL members. Of those responding, 71% voiced support for the Center. Even a small number of contributions were received, although no money had been solicited. The survey indicates there should be enough voluntary financial support to fund the Center.

"Who can estimate the value of the inspiration that young visitors may gain when they see that those who left a mark on history were just like themselves?"—K1ZZ

The Board has further stipulated that, until 10% of the fund-raising goal has been reached, no funds be expended on any further architectural or engineering development on the project.

A plan is now being developed to initiate the fund-raising effort. Will you help? Future issues of *QST* will provide contribution information. With *your* help, we'll receive that 10% and have the center open in time for the targeted date, the ARRL's Diamond Jubilee in 1989. □

Novice Enhancement: It's Here!

(continued from page 16)

further information. The Rules cannot become effective until at least 30 days after they appear in the *Federal Register*.

Using our "cracked crystal ball" to draw up a time line, we can *speculate* that the FCC's Novice Enhancement Rule Making will be released formally in the *Federal Register* sometime in February, and become effective no sooner than late March or early April, probably on a Friday evening. Since it takes time to develop a revised syllabus of study topics, revised question pools will also take time to release. As a result, all publishers of Amateur Radio license examination study guides will be busy this summer making revised study materials available.

Stay tuned to WIAW Bulletins and the *ARRL Letter*, plus next month's *QST*, for updates on the developing Novice Enhancement story. Meanwhile, spread the word that Novices and Technicians are in for a lot more fun in the near future! □

Strays



I would like to get in touch with...

veterans of the 574th-565th SAW BNS. Contact Angel Zaragoza, W6ZPR, 1571 9th St, San Bernardino, CA 92411.

hams with RVs interested in a get-together in Orange, Texas. Ray Broussard, WB5WWO, 5095 Laurel, Beaumont, TX 77707.

anyone with 6-m AM capability interested in joining a net on 50.400 MHz, 0000Z-0500Z Sundays. Ray Taylor, N6NQR, 2428 E St, Apt C, San Diego, CA 32102.

anyone who experiments with TVRO receivers to receive weather-satellite pictures directly. George Ketter, WØFHF, Box 96, Stella, NE 68442.

anyone with manuals for a Monsanto Counter-Timer, Model 1500A, and an Alfred Microwave Leveler, Model 705. Donald Galarneau, W7KCK, 7117 N Seward, Portland, OR 97217.

anyone interested in experimenting with facsimile on HF and/or 2 meters. Bill Gorgone, WA2OWI, 115 Colombo Ave, Copiague, NY 11726.

anyone who has converted a Drake TR-7 to QSK. Gary Smith, KA1J, 112 N Landry Rd, New Iberia, LA 70560.

anyone with information on the "pocket watch" that fits into the front panel of a Wireless Set, No. 19, circa WW II. Chris Bisaillon, VE3CBK, 91 Varley Dr, Kanata, ON K2K 1H5, Canada.

any hams who are also amateur astronomers. Fred Schumacher, KB6LQD, 750 Bounty Pl, Manteca, CA 95336.

anyone with a manual/schematic for a Setchell Carlson TV monitor, Model 10M915. F. R. Martin, KC5KW, 4631 Hannett Ave NE, Albuquerque, NM 87110.

ARRL Board Meets in Hartford...

...and turns to its ARRL member-volunteers for their expert counsel in a number of areas.

By Steve Place, WB1EYI
Manager, Volunteer Resources

The 1987 Annual Meeting of the Board of Directors of the American Radio Relay League was held at the Parkview Hilton in Hartford, Connecticut on January 16-17. Representatives of each of the 16 regional ARRL Divisions were present. Attending a Board Meeting for the first time as Directors were Stephen A. Mendelsohn, WA2DHF, Hudson Division; Rush S. Drake, W7RM, Northwestern Division; Marshall Quiat, AGØX, Rocky Mountain Division; and Jim Haynie, WB5JBP, West Gulf Division. Attending for the first time as Vice Directors were Paul Vydareny, WB2VUK, Hudson Division; Robert Weinstock, KN1K, New England Division; William R. Shrader, W7QMU, Northwestern Division; and Hugh Winter, W5HD, Rocky Mountain Division.

In following the actions of your elected representatives in the official Minutes of the meeting that follow, bear in mind that a lot of the behind-the-scenes work is done in committees and in drafting motions before and during the meeting. Board members who make few motions themselves generally contribute in countless other ways to the smooth functioning of the League's decision-making team.

The 1987 Annual Meeting was characterized by a spirit of teamwork. From the first bang of the gavel, the Board turned time and time again to the experts among ARRL's member-volunteers, acting on their recommendations and tapping their wisdom born of experience. And our volunteers didn't let us down!

Emergency Message Traffic...

With thanks for a job well done, the Board accepted the report of the ARRL Blue Ribbon Committee on Emergency Message Traffic and directed the Executive



Your ARRL Board of Directors in session. (photos courtesy N4MM)

Vice President to implement its recommendations. In specific actions, the Board approved in principle the establishment of a permanent public-service steering committee to be called the "Amateur Radio Public Service Communications Committee (APSCOM)." It will be tasked with studying procedures for unifying all voluntary Amateur Radio public-service activities under ARRL, developing plans for organizing, training and deploying emergency communications response teams, and developing a system of "Gateway Stations."

In a related matter, the Board directed that a proposal be developed for facilitating NTS message handling and other traffic via packet radio, drawing on the excellent work of volunteers from every relevant special-interest corner of the League. These actions should have far-reaching positive effects on our ability to respond in widespread disaster situations.

Advisory Committee Restructuring...

In an effort to work even more effectively with ARRL's volunteer advisors, the Board adopted several recommendations of the Special Study Committee on Advisory Committees. It approved in principle the formation of small "working groups" within ARRL Advisory Committees, established an expert "ARRL Public Relations Committee" that will replace the present Public

Relations Advisory Committee at the end of the 1987 term and directed a study of the interrelationships among the ARRL Awards Committee, DX Advisory Committee and Contest Advisory Committee.

A Wealth of Field Expertise...

In other actions, an "Education Task Force" of Amateur Radio volunteers who are expert in the field of education was established to review the curricula for teaching all classes of license using currently available education techniques, and to study innovative ways of establishing Amateur Radio clubs in schools. The Board also established a joint Amateur Radio/Press "Ad Hoc Committee on Ethics and the Media" to draft a suggested set of ethics guidelines concerning appropriate interaction between Amateur Radio operators and the media during emergency and nonemergency communication situations.

Organizational...

The Board directed that the process of refurbishing the Maxim Memorial Station, WIAW, and constructing an associated Visitors' Center continue; staff is instructed to present this forward-looking project to the Amateur Radio community and to proceed with a comprehensive fund raising campaign (see the related article on page 53). The Official ARRL Call-Sign Badge Program was expanded to include

*The names and addresses of all Directors appear on page 8 of this QST under the headings of their respective Divisions.

active ARRL member-volunteers who serve as QSL Bureau Managers and workers, Technical Advisors, Volunteer Examiners, Volunteer Counsel and AIRS volunteers (details will be published in an upcoming *QST*).

The Board also expressed its strong support of fiscal-1987 plans to introduce a new service for ARRL members—the timely notification of license-renewal deadlines—reopened the application process for sponsorship of the 1989 National Convention, directed that an organization chart of Headquarters be made available to the membership, and ratified a 1987 fiscal budget in which \$231,000 is slated for a variety of new-ham recruitment programs.

Following This Article

A table summarizing the actions taken by the ARRL Board of Directors appears with this article. As this provides only a thumbnail description of what happened, we urge you to read the entire text of those items that interest you in the official Minutes, which immediately follow.

Table 1

Board Committees

Executive Committee (Minute 40)

Larry E. Price, W4RA, Chairman
Paul Grauer, W0FIR
Clyde O. Hurlbert, W5CH
George S. Wilson, III, W4OYI
Frank M. Butler, W4RH
Jay A. Holladay, W6EJJ
David Sumner, K1ZZ

Administration and Finance Committee (Minute 52)

Edmond A. Metzger, W9PRN, Chairman
Hugh A. Turnbull, W3ABC, Alternate Chairman
Thomas B. J. Atkins, VE3CDM
Leonard M. Nathanson, W8RC
Allan L. Severson, AB8P, Secretary

Membership Services Committee (Minute 52)

Marshall Quilat, AG0X, Chairman
Rush S. Drake, W7RM, Alternate Chairman
Gay E. Milius, Jr., W4UG
Jay A. Holladay, W6EJJ

Publications Committee (Minute 52)

Tod Olson, K0TO, Chairman
Howard Mark, W0OZC, Alternate Chairman
Jim Haynie, WB5JBP
Fried Heyn, WA6WZO

Volunteer Resources Committee (Minute 52)

Rodney J. Stafford, KB6ZV, Chairman
Stephen A. Mendelsohn, WA2DHF, Alternate Chairman
Thomas W. Frenaye, K1KI, Secretary
William J. Stevens, W6ZM

Table 2

Summary of Board Actions

<i>Minute</i>	<i>Purpose</i>	<i>Disposition</i>
ARRL Organizational (Regarding Articles of Association and By-Laws)		
39	Suspend para 4, Advisory Committee Rules and Regulations	Adopted
81	Study qualification procedures for election to ARRL Board	To Committee
Other ARRL Organizational Matters		
18	Ratification of the budget	Adopted
40	Election of Executive Committee	Completed
42	Election of ARRL Foundation Directors	Completed
46	1988 National Convention, new date and hotel	Adopted
47	Reopen applications to sponsor 1989 National Convention	Adopted
48	Blue Ribbon Study Committee	Adopted
49	Amateur Radio Public Service Committee (APSCOM) approved in principle	Adopted
52	Appointment of Standing Committees of the Board	Completed
53	Appointment of other committees	Completed
54	ARRL Travel Policy, revised	Adopted
58	Study criteria Hamfest and Convention site/sponsor selection	To Committee
61	Proceed with planning Maxim Memorial Station and associated Visitors' Center	Adopted
62	Staff organization chart	Adopted
65	Notification of license-renewal deadlines, member service	Adopted
66	Study ARRL's producing an official ARRL-member QSL card	To Committee
67	Study/revise Advisory Committee Rules and Regulations	To Committee
70	ARRL Public Relations Committee to replace PRAC	Adopted
73	Education Task Force, established	Adopted
75	Study ARRL Awards Committee standard operating procedures	To Committee
77	Study increasing club rebate for new ARRL members, renewals	Lost
78	ARRL Field Organization 'Call-Sign Badge Program, expansion	Adopted
82	1987 Directors' Division budgets	Adopted
83	Committees' 1987 budgets	Adopted
84	QSL Bureau Manager travel budget	Adopted
85	National Traffic System travel budget	Adopted
86	1987 ARRL Foundation administrative budget	Adopted
87	Supplemental authorizations for additional 1986 expenses	Adopted
Amateur Radio Operations		
44	Promote 10.368 GHz as narrowband calling frequency	Adopted
57	Fund DXAC meeting on future of DXCC	Adopted
59/71	Facilitate message handling via packet radio	To Committee
80	Packet-radio band-plan report, deadline	Adopted
Publications/Media		
45	Past Presidents' names/terms to be listed in <i>QST</i> annually	Adopted
55	Study feasibility of a TV series to promote Amateur Radio	To Committee
68/74	Study increasing radio-club coverage in <i>QST</i>	To Committee
Miscellaneous		
30	Commend ARRL Committee on Digital Communication	Adopted
31	Sixth ARRL Amateur Radio Networking Conference scheduled	Adopted
50	Study club-officer surety insurance option	To Committee
56	Committee to draft ethical guidelines for media contact	Adopted
76/89	Study ways to expand general public's awareness of AR	Adopted
90	Commend ARRL QSL Bureau volunteers	Adopted
91	ARRL vote on admission of Liechtenstein to IARU	Adopted

Moved and Seconded ...

MINUTES OF THE 1987 ANNUAL MEETING
OF THE BOARD OF DIRECTORS
THE AMERICAN RADIO RELAY LEAGUE, INC
January 16-17, 1987

AGENDA

- 1) Roll Call
- 2) Moment of Silence
- 3) Consideration of the agenda for the meeting
- 4) Approval of Minutes of 1986 Second Meeting
- 5) Supplementary oral reports by the Officers
- 6) Receive reports and consider recommendations of the committees
- 7) Election of Executive Committee
- 8) Appointment of committees
- 9) Election of Foundation Directors
- 10) Directors' motions
- 11) Authorizations of certain expenses for 1987

1) Pursuant to due notice, the Board of Directors of the American Radio Relay League, Inc., met in annual session at the Parkview-Hilton Hotel in Hartford, Connecticut, on January 16, 1987. The meeting was called to order at 8:30 AM EST, with President Larry E. Price, W4RA, in the Chair and the following directors present: Thomas B. J. Atkins, VE3CDM, Canadian Division; Frank M. Butler, Jr., W4RH, Southeastern Division; Rush S. Drake, W7RM, Northwestern Division; Thomas W. Frenaye, K1KI, New England Division; Paul Grauer, W0FIR, Midwest Division; Jim Haynie, WB5JBP, West Gulf Division; Fried Heyn, WA6WZO, Southwestern Division; Clyde O. Hurlbert, W5CH, Delta Division; Howard Mark, W0OZC, Dakota Division; Stephen A. Mendelsohn, WA2DHF, Hudson Division; Edmond A. Metzger, W9PRN, Central Division; Gay E. Milius, Jr., W4UG, Roanoke Division; Marshall Quiat, AG0X, Rocky Mountain Division; Rodney J. Stafford, KB6ZV, Pacific Division; Hugh A. Turnbull, W3ABC, Atlantic Division; George S. Wilson, III, W4OYI, Great Lakes Division.

Also in attendance as members of the Board without vote were Jay A. Holladay, W6EJJ, First Vice President; Leonard M. Nathanson, W8RC, Vice President; William J. Stevens, W6ZM, Vice President; Tod Olson, K0TO, International Affairs Vice President; and David Sumner, K1ZZ, Executive Vice President. Also in attendance at the invitation of the Board as observers were the following Vice Directors: Thomas W. Comstock, N5TC, West Gulf Division; Evelyn D. Gauzens, W4WYR, Southeastern Division; John C. Kanode, N4MM, Roanoke Division; James Knochenhauer, K6ITL, Pacific Division; James M. Mozley, W2BCH, Atlantic Division; Lionel A. Oubre, K5DPG, Delta Division; Wayne Overbeck, N6NB, Southwestern Division; Richard Ridenour, KB0ZL, Midwest Division; Allan L. Severson, AB8P, Great Lakes Division; William R. Shrader, W7QMU, Northwestern Division; Paul Vydareny, WB2VUK, Hudson Division; Robert Weinstock, KN1K, New England Division; Richard Whiting, W0TN, Dakota Division; and Hugh Winter, W5HD, Rocky Mountain Division. There were also present Harry J. Dannals, W2HD, President Emeritus; Honorary Vice President Robert York Chapman, W1QV; Secretary Perry Williams, W1UED; Past Director Lys J. Carey, K0PGM; Counsel Christopher D. Imlay, N3AKD; Canadian Counsel B. Robert Benson, Q.C., VE2VW; John F. Lindholm, W1XX, Membership Communications Services Manager; Stephen C. Place, WB1EYI, Volunteer Resources Manager; John H. Nelson, W1GNC, Deputy Publications Manager; and Karl H. Muller, W3UBQ, Senior Staff Advisor for Planning and Operations.

2) The assembly observed a moment of silence in recollection of those who have passed away since the previous Meeting of the Board, especially ARRL Controller Michael Zeigler.

3) The Chair introduced new Directors Stephen A. Mendelsohn, WA2DHF, Hudson Division; Rush S. Drake, W7RM, Northwestern Division; Marshall Quiat, AG0X, Rocky Mountain Division; and Jim Haynie, WB5JBP, West Gulf Division. Mr. Mendelsohn introduced Vice Director Paul



Roanoke Director W4UG discusses a point with Rocky Mountain Director AG0X.

Vydareny, WB2VUK, Hudson Division; Mr. Frenaye introduced Vice Director Robert Weinstock, KN1K, New England Division; Mr. Drake introduced Vice Director William R. Shrader, W7QMU, Northwestern Division, and Mr. Quiat introduced Vice Director Hugh Winter, W5HD, Rocky Mountain Division.

4) On motion of Mr. Milius, seconded by Mr. Mendelsohn, the agenda was adopted as presented.

5) On motion of Mr. Wilson, seconded by Mr. Butler, it was VOTED that the Minutes of the 1986 Second Meeting are approved in the form in which they appeared in the September 1986 issue of QST.

6) Moving now to agenda item 5, reports of the Officers were presented. In his written report, Mr. Price mentioned his efforts to make contact and exchange views with ARRL members, importantly through attendance at ARRL sponsored conventions—ten of them in 1986. Mr. Price met with three of the four standing committees during 1986, and plans to do so from time to time in the interest of improved communications and coordination of effort. International travel included the President's visit to the Deutscher Amateur Radio Club convention in Friedrichshafen, Federal Republic of Germany and to the headquarters of the International Telecommunication Union in Geneva in July, and to the International Amateur Radio Union Region 2 Triennial Conference in Buenos Aires in October. Mr. Price also reported on the meeting of the Ad Hoc Committee on the Strengthening of the Canadian Radio Relay League (CRRL); the Annual Meeting of CRRL; and a meeting of the ARRL Legal Strategy Committee. The number of ARRL members and the number of amateur radio licensees both were higher in 1986, though neither was as high as we had hoped. The President is responsible, under By-Law 31, for liaison with the Government, with the assistance of staff and counsel; accordingly, a report of his



N5TC, West Gulf Vice Director, as Chairman and Board Liaison, presents the far-reaching report of the Blue Ribbon Committee on Emergency Message Traffic.

December Washington contact trip was included. In extensive oral remarks, the President reported on the League's successful efforts to modify the Electronic Communications Privacy Act of 1986 so the Act would not adversely affect amateurs. The President requested that an article be prepared for QST to inform the members on this activity. Mr. Price also traced the course of PR Docket 85-196, through which the Federal Communications Commission intends to turn over maintenance of the examination question pools to the Volunteer Examiner Coordinators. The League is awaiting Commission action on its petitions for a stay of the effective date and for reconsideration. Finally, Mr. Price discussed litigation arising from an amateur enforcement matter.

7) The Board was in recess from 10:20 to 10:50 PM.

8) First Vice President Holladay presented his written report, and touched on its highlights orally. Recruiting efforts showed a small but encouraging growth in the Amateur Radio Service during 1986. The most important challenge is to continue recruiting of amateurs from all age groups, and improve retention of these amateurs. Attention must also be given to the recruiting and training of Amateur Radio volunteers, building on gains already registered by the Volunteer Resources Committee of the Board and the Volunteer Resources Group at HQ. Mr. Holladay also reported on efforts to establish a small museum and amateur radio station in memory of Don Wallace, W6AM, on part of his former property in Rancho Palos Verdes, California. Mr. Holladay's work on the Executive Committee and Special Study Committee on Advisory Committees was also mentioned, along with a brief report on celebrations marking the 60th anniversary of the Japan Amateur Radio League and the 25th anniversary of the OSCAR satellite series.

9) Vice President Nathanson's written report covered his service on the Administration and Finance Committee and as chairman of the Legal Strategy Committee, two very active parts of the League structure. Attendance at amateur banquets as speaker has provided the Vice President with insights on the grass-roots support for Amateur Radio and the League, satisfyingly evident from the number and quality of unpaid volunteers in the Amateur Service. Volunteer monitoring, volunteer examining, advisory committees and club recruitment all seem healthy. Challenges in the area of private issuance of secondary call signs and of the preservation of Amateur Radio's past remain ahead.

10) Vice President Stevens' written report focused on transition to that office after eight active years as Pacific director. His work with the Volunteer Resources Committee and as chairman of the Committee of Tellers, which oversees ballot counting in ARRL Director and Vice Director elections, was related, along with a report on the 25th anniversary of the OSCAR program. During a holiday in the Orient, Mr. Stevens made presentations on Amateur Radio at Kiwanis meetings in Singapore and Hong Kong. The Vice President also called attention to the desirability of a planned recruiting program among retirees and Senior Citizens. A separate report was filed concerning the Committee of Tellers.

11) Next was the report of Mr. Olson as Vice President for International Affairs. Virtually all of the objectives of the League for the year in the international arena were achieved in 1986. The Region 2 Triennial Conference in Buenos Aires affirmed a member society's right to sole representation before its own administration; revised the Region 2 dues structure; selected the ARRL as host for the 1989 Triennial Conference; adopted the AX.25 protocol as the preferred interim standard for packet radio in the region and sought cooperation between the hemispheres in the promotion of packet; approved 160- and 10-meter band plans consistent with ARRL positions; and elected ARRL Director Butler to the Region 2 Executive Committee. The regional meeting also adopted HF band plans, allotting space for RTTY/AMTOR/Packet. "Reverse ID" for reciprocal stations (eg, HK3/W1UED instead of W1UED/HK3);



At the center table (l-r): Directors W5CH, W4OYI, WA2DHF, W0FIR, K1KI, W7RM (slightly obscured) and KB6ZV.

YYMMDD (that is, year-month-day) order for QSL card dates; and a World QRP day were also endorsed.

12) The Executive Vice President, Mr. Sumner, presented an extensive written report covering preparations for the arrival of the Novice Enhancement program; creation of a media plan to spread the word to the general public; drafting of a Novice (Element 2) syllabus encompassing the expected new privileges; improvement in Morse-code training material for *Tune in the World*; the Archie comic book and associated Archie Radio Club; an updated promotional video program, *The New World of Amateur Radio*, under the direction of Roy Neal, K6DUE; better initial information for prospective amateurs; improved course material for instructors; and improvements in relations with clubs. The sum of \$231,000 has been budgeted by ARRL alone for amateur radio recruiting activities in 1987; the effort is also being supported by other funding provided by some companies active in the Amateur Radio industry. Other subjects covered at length were ARRL publications, membership promotion, personnel, finances, the near-completion of Project Goodwill, the International Travel Host Exchange, observance of the Bicentennial of the US Constitution, the proposed visitors' center, and a survey report requested by the Board in July. During the course of the above, Mr. Holladay took the Chair for Mr. Price from 11:28 to 11:44 AM.

13) An apology for absence of the Treasurer because of the press of his business affairs was offered on behalf of Mr. McCobb.

14) The extensive report of Counsel Imlay covered automatic transmitter identification systems (ATIS) as proposed by the FCC in General Docket 86-337; maintenance of question pools, FCC Docket 85-196; the ARRL petition to enhance Novice privileges, PR Docket 86-161; cable television terminal devices, General Docket 85-301; the FCC's "reduced power hours" policy in RFI cases; additional 40-meter privileges proposed for only those Novices operating in Hawaii, Alaska, Pacific and Caribbean Island areas, PR Docket 86-397; the ARRL request for implementation of the 18.068-18.168 MHz band; revision of the spread spectrum rules; and the biological effects proposals of the Environmental Protection Agency. The report also covered local antenna and interference matters.

15) At this point, the Board was in recess from 12:23 to 1:39 PM for luncheon, reassembling with all persons hereinbefore mentioned present, except Mr. Muller, on assignment for Board business.

16) Canadian Counsel Benson presented a short report concerning Tariff Board matters potentially affecting the importation of amateur gear into Canada; meetings with the Department of Communications and the Radio-Amateur du Quebec, Incorporated concerning license restructuring in Canada; various local antenna cases; and the drafting of proposed amendments to the ARRL Articles of Association and By-Laws to reflect the eventual complete autonomy of the Canadian Radio Relay League.

17) Mr. Grauer, as president, presented the report of the ARRL Foundation. The Barry Goldwater Scholarship Fund reached \$61,000 and continues to grow. Other scholarship activity was also covered in the report. Funds of the Founda-

tion reached \$205,661, and there were no administrative expenses charged to its holdings in 1986.

18) Turning now to Agenda Item 6, Mr. Metzger, as chairman, presented the report of the Administration and Finance Committee. On his motion, seconded by Mr. Nathanson, the 1987 ARRL Budget was adopted as presented.

19) Past Director Carey presented the brief report of the Membership Services Committee concerning the Golden Jubilee of the DX Century Club, two alternate approaches to a telephone bulletin service, insurance matters, and a study of certificates for 25 and 40 years of membership in the League in addition to the pins presently available.

20) Mr. Frenaye, as alternate chairman, presented the report of the Publications Committee. It reported cancellation of the proposed newsstand publication; articles prepared for it will be placed elsewhere. The committee advised against making a reprint of the first year of *QST* as a 75th anniversary commemorative, but recommended that a 75-year history of Amateur Radio be commissioned instead. The new policy of payment for *QST* material has increased the flow of technical articles but, as yet, not the input of general-interest stories.

21) The report of the Volunteer Resources Committee was presented by Mr. Stafford, as alternate chairman. Three matters referred to the committee at the July meeting were reported on: review of criteria for Special Service Clubs, with a final report to be ready at the Second meeting; ARRL QSL cards; and expansion of the ARRL call-sign badge program to include QSL Bureau Managers and workers, Technical Advisors, Volunteer Examiners, Volunteer Counsel, and AIRS volunteers. A questionnaire is being developed to determine ways of increasing activity in radio clubs that would be of interest to members under 18 and to amateurs licensed less than a year. The Committee recommended against changing Public Service Honor Roll criteria at this time, since no clear consensus emerged from the study of that subject.

22) Mr. Price, as chairman, reported for the Executive Committee. A study of Article 9 regarding amendments to the Articles and Bylaws, requested at the July meeting has not yet pointed in a clear direction for change and will be continued.

23) Mr. Atkins, as chairman, reported for the Ad Hoc Committee on Strengthening the CRRL. No meeting was held during the second half of the year. Language to amend the ARRL Articles of Association and By-laws to reflect further steps in the autonomy of the CRRL will be presented by the committee at the July meeting.

24) Mr. Butler, as liaison, presented the report of the Ad Hoc Committee on Spread Spectrum. Articles have been generated for *QEX* on behalf of the Committee. One technical development has been on hold awaiting an interpretation of an FCC rule, but a solution of sorts seems to be in sight.

25) The final report of the Blue Ribbon Committee on Emergency Message Traffic was presented by Mr. Comstock, as chairman. Packet radio and similar digital techniques are the fastest growing part of Amateur Radio; it is possible now to handle a national emergency using these modes, and messages are routinely being exchanged by elements of the National Traffic System (NTS). A test of an HF packet network will be proposed to

the FCC soon, with a group of stations requesting special temporary authorization for up to 1200 baud service under automatic control. A new national public service and emergency steering committee should be established with representation from ECAC, the NTS, AMSAT, the Board and served agencies such as the Federal Emergency Management Agency. During the course of the above, Mr. Muller returned to the meeting at 2:29 PM.

26) Mr. Holladay, as chairman, presented the extensive report of the Special Study Committee on Advisory Committees. In brief summary, the Committee found that there were two types of advisory committees, one on which expertise in the subject is paramount (eg, biological effects of rf energy) and one in which operator interest is ascendent, thus calling for a large, broadly based committee chosen on a divisional basis. Such committees include the DX and Contest Advisory Committees. The study group concluded, however, that it might be desirable for a working group of each advisory committee, consisting of five members chosen on a regional basis, to be funded for an in-person meeting each year. The Public Relations Advisory Committee, on the other hand, should be reconstituted as an expert body; it need not have a member from each division. ECAC should be expanded to cover all public-service communications and should be renamed appropriately as the Public Service Advisory Committee. The VHF/UHF and VHF Repeater Advisory Committees would be expanded in scope and revitalized. The report also covered relationships between the various bodies, ways to improve performance, and additional permanent or short term committees which might be helpful. The report was received with applause.

27) The Board was in recess from 3:06 to 3:31 PM, at which time the agenda was suspended so that Mr. Mark could inform the Board about an article appearing on page 12 of *LinkUp*, January 1987, mentioning amateur packet work of Dr. Gary Garriott, WA9FMQ, Pat Snyder, WA8TTW and Vice Director Whiting (applause).

28) Mr. Turnbull, as chairman, presented the report of the RFI Task Group, the major activity of which was taking part in the work of the Ad Hoc Committee on Public Law 97-259 of ANSIP's Committee C-63. The ARRL petition for mandatory labelling of consumer devices to indicate whether or not measures to improve immunity to rf energy had been incorporated was twice denied by the FCC. However, there is interest in other forms of consumer education, which will be explored. An ARRL petition for forfeiture against Pacific Gas and Electric Company for long term interference to two amateur stations was also denied by the Commission. The RFI Task Group recommended that the working relationship with the National Cable Television Association be continued, even though activity was low in 1987.

29) The report of the Committee on Biological Effects of RF Energy was presented as prepared by its chairman, Past Director Ray Wangler. Its main business during the year was studying the proposals of the Environmental Protection Agency in its Docket A-81-43 concerning a national standard for exposure levels to rf energy.

30) Mr. Olson, as Liaison, presented the report of the Committee on Amateur Radio Digital Communication. The report covered international developments in packet radio; VHF development in the US, including a trend toward higher speeds; HF packet network development through special temporary authorizations for automatic stations; and protocol development. On motion of Mr. Olson, seconded by Mr. Stafford, the following resolution was unanimously ADOPTED:

WHEREAS, the following amateurs have diligently and significantly contributed to the development of Packet Radio through their participation as members of the ARRL Committee on Amateur Radio Digital Communication,

The Board of Directors of the ARRL now therefore does recognize and thank: Paul Rinaldo, W4RI, Doug Lockhart, VE7APU, Wally Linstuth, WA6JPR, Hank Magnuski, KA6M, Harold Price, NK6K, Terry Fox, WB4FI, Phil Karn, KA9Q, Eric Scaze, K3NA, Lyle Johnson, WA7GXD, and Marshall Quiat, AC0XX, for their many years of service on the Digital Committee. Well done! (Applause.)

31) On motion of Mr. Heyn, seconded by Mr. Milius, it was unanimously VOTED that the Sixth ARRL Amateur Radio Computer Networking Con-

ference be held on August 29, 1987, in the Los Angeles area.

32) Mr. Nathanson, as chairman, presented the report of the Legal Strategy Committee covering such subjects as: tower fall ratios of freestanding and guyed towers; a draft model amicus brief; distribution of materials to Volunteer Counsels; the Electronic Communications Privacy Act; the right of amateurs to monitor radio frequencies; eligibility requirements for candidates for League office; restrictive covenants; individual legal problems; the maintenance of question pools in the volunteer examining program; and the dismissal of the League's RFI labelling petition.

33) Mr. Oubre, as liaison, reported briefly for the VHF Repeater Advisory Committee; it had no assignments and thus made no recommendations.

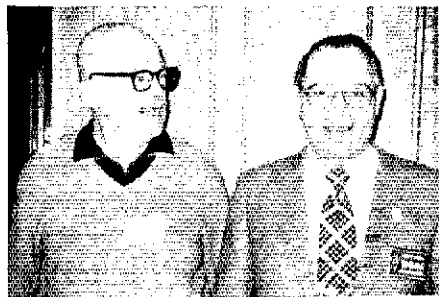
34) Mr. Kanode, as liaison, presented the report of the Contest Advisory Committee. It included a study of the club competition system which should be retained but fine-tuned; minor adjustments to DX contest rules and Sweepstakes; and prohibitions on nonradio means for alerting in the HF contests only.

35) Mr. Drake, as liaison, presented the report of the DX Advisory Committee covering incomplete work in progress.

36) The extensive report of the Emergency Communications Advisory Committee was presented as prepared by outgoing Chairman Joel Kandel, K14T. Among other topics, the report discussed local memoranda of understanding; insurance for volunteers; packet-radio developments; videotape training materials; choice of frequencies for emergencies; future geostationary satellites; EC report forms; and packet radio traffic formatting.

37) Mrs. Gauzens, as liaison, presented the report of the Public Relations Advisory Committee. Its topics included the Archie comic book; progress toward a slide show for served agencies; preparations for a public information guidebook; and the updated video feature, *The New World of Amateur Radio*.

38) Mr. Overbeck, as liaison, reported briefly for the VHF/UHF Advisory Committee, recommending that the Board adopt 10.368 GHz as the narrowband calling frequency in the 3-cm amateur band.



W5HD is surprised to catch N4MM without his camera! For several years N4MM has been one of the unsung heroes of ARRL Board meetings: The photographs that accompany this and several previous Board articles are largely his handiwork. Tnx John!

39) Mr. Mendelsohn asked unanimous consent that the agenda be suspended, for the purpose of a motion related to the Advisory Committees. There being no objection, on his motion, seconded by Mr. Butler, it was unanimously VOTED that paragraph four of the Rules and Regulations Concerning Advisory Committees is suspended, pending final acceptance of the report of the Special Study Committee on Advisory Committees. Suspension of the paragraph will permit reappointment of chairmen of Advisory Committees who have completed two terms.

40) Moving now to Agenda Item 7, the Chair appointed Mr. Severson head teller and Messrs. Overbeck and Comstock as tellers for the election of four directors to the Executive Committee. Nominations being declared open, Mr. Atkins nominated Mr. Turnbull. Mr. Metzger nominated Mr.

Grauer. Mr. Mark nominated Mr. Hurlbert. Mr. Mendelsohn nominated Mr. Butler. Mr. Grauer nominated Mr. Wilson. Mr. Heyn nominated Mr. Frenaye. On motion of Mr. Metzger, seconded by Mr. Mendelsohn, it was VOTED that nominations are closed. Nine votes being needed for election, at the end of the first ballot, the tellers declared Messrs. Grauer, Hurlbert and Wilson elected as members of the Executive Committee (Applause). On completion of the second ballot, Mr. Butler was declared elected (Applause).

41) Without objection, the naming of standing committee members was deferred until the first order of business on the morrow.

42) Mr. Metzger, as chairman, presented the report of the official availability committee for the ARRL Foundation. On motion of Mr. Quiat, seconded by Mr. Milius, the following slate of Directors of the ARRL Foundation was unanimously ELECTED, for the term shown: Mr. Mark, two years; Mr. Grauer, three years; Mr. Drake, three years; and Mr. Ralph V. Anderson, KØNL, three years.

43) The Board was in recess for dinner from 4:55 to 8:15 PM, reconvening with all persons hereinbefore mentioned present. Also present was Phillip M. Sager, WB4FDT, Regulatory Information Branch Manager.

44) On motion of Mr. Wilson, seconded by Mr. Mendelsohn, it was unanimously VOTED that 10.368 MHz be promoted as a narrowband Calling Frequency in accordance with the VUAC recommendation.

45) On motion of Mr. Mendelsohn, seconded by Mr. Butler, it was VOTED that the names of Past Presidents of the American Radio Relay League be printed in *QST* once each year. In addition to the names, the years of their respective terms shall be indicated.

46) On motion of Mr. Drake, seconded by Mr. Quiat, it was VOTED that the date for the 1988 National Convention is approved as September 9-11 at the Red Lion Inn, Jantzen Beach, Portland, Oregon.

47) On motion of Mr. Stafford, seconded by Mr. Hurlbert, the following resolution was ADOPTED: WHEREAS, the ARRL Board of Directors at its July 1986 meeting reviewed the application of the Vegas Valley ARC to sponsor the 1989 ARRL National Convention and found the applicant to be qualified and eligible under the guidelines established by the Board at its January 1986 meeting; and

WHEREAS, the Board selected Las Vegas as the site for the 1989 Convention; and

WHEREAS, the organizers of the event have, since the July 1986 Board meeting, encountered unforeseen difficulties in proceeding with plans for the 1989 convention; and

WHEREAS the organizers very much regret that because of these unforeseen difficulties they must withdraw their sponsorship of the 1989 convention, THEREFORE, BE IT RESOLVED that:

a) The application of the Vegas Valley ARC is withdrawn.

b) The Executive Vice President is directed to publicize the fact that the ARRL Board of Directors is seeking applications to sponsor the 1989 National Convention under the guidelines determined by the Board of Directors at its 1986 Annual Meeting.

c) Applications to sponsor the 1989 National Convention shall be accepted until June 1, 1987 and a site shall be selected by the Board no later than the July 1987 Board meeting.

48) On motion of Mr. Butler, seconded by Mr. Frenaye, it was VOTED that the Board of Directors accepts the report of the Blue Ribbon Committee and directs the Executive Vice President to implement the recommendations of the report. The committee is hereby discharged. The Board of Directors is most appreciative of the hard work and dedicated efforts of each committee member.

49) On motion of Mr. Butler, seconded by Mr. Wilson, it was unanimously VOTED that the Board of Directors approves in principle the establishment of a permanent national public-service steering committee to be called the Amateur Radio Public Service Committee (APSCOM). The Volunteer Resources Committee will determine the composition and proposed funding for APSCOM and report its findings to the Board at its July 1987 meeting.

50) On motion of Mr. Grauer, seconded by Mr. Mendelsohn, it was VOTED that the Membership Services Committee study the offering of surety insurance for club officers, the amount of such



WA2DHF and K5DPG pause for the camera during a coffee break.

coverage not to exceed \$10,000.

51) On motion of Mr. Quiat, seconded by Mr. Butler, it was VOTED that the Board recess for the night at 8:57 PM. The Board reconvened the following day at 8:45 AM, with all persons hereinbefore mentioned being present except for Mr. Benson, who had departed from the meeting and Mr. Hurlbert; Mr. Oubre took the seat for the latter.

52) Returning to agenda item 8, Appointment of Committees, Mr. Price announced appointments to the Standing Committees of the Board as follows:

Administration and Finance—Mr. Metzger, Chairman; Mr. Turnbull, Alternate Chairman; Mr. Atkins; Vice President Nathanson; Vice Director Severson, Secretary.

Membership Services—Mr. Quiat, Chairman; Mr. Drake, Alternate Chairman; Mr. Milius; Vice President Holladay.

Publications—Mr. Olson, Chairman; Mr. Mark, Alternate Chairman; Mr. Haynie; Mr. Heyn.

Volunteer Resources—Mr. Stafford, Chairman; Mr. Mendelsohn, Alternate Chairman; Mr. Frenaye, Secretary; Vice President Stevens.

53) Mr. Price then announced the following appointments of Chairmen and Board Liaisons of other committees:

Digital Communications—Mr. Rinaldo, Chairman; Vice Director Comstock, Board Liaison.

Biological Effects of RF Energy—Vice Director Mozley, Chairman.

Strengthening of CRRL—Director Atkins, Chairman.

Spread Spectrum—Mr. David Borden, K8MMO, Chairman; Director Butler, Board Liaison.

Special Study Committee on Advisory Committees—Vice President Holladay, Chairman.

Legal Strategy Committee—Vice President Nathanson, Chairman; Director Stafford, Alternate Chairman.

RFI Task Group—Director Turnbull, Chairman.

DX Advisory Committee—Mr. John Parrott, W4FRU, Chairman; Director Drake, Board Liaison.

Contest Advisory Committee—Mr. Douglas Grant, K1DG, Chairman; Vice Director Kanode, Board Liaison.

Public Relations Advisory Committee—Mr. Richard Moseson, N2BFG, Chairman; Vice Director Gauzens, Board Liaison.

VHF Repeater Advisory Committee—Mr. Karl V. Pagel, N6BVU, Chairman; Vice Director Oubre, Board Liaison.

VHF/UHF Advisory Committee—Mr. H. Paul Shuch, N6TX, Chairman; Vice Director Overbeck, Board Liaison.

Emergency Communications Advisory Committee—Mr. Robert A. Josuweit, WA3PZO, Chairman; Vice Director Vydareny, Board Liaison.

54) Continuing then with agenda item 10, Directors' motions, on motion of Mr. Metzger, seconded by Mr. Grauer, it was VOTED that the ARRL Travel Policy (Administration and Finance Committee 15 January 1987 draft) supersedes the present Directors' Workbook ARRL Travel Policy.

55) On motion of Mr. Wilson, seconded by Mr. Mendelsohn, it was VOTED that the Public Relations Advisory Committee study and make any

appropriate recommendations concerning possible preparation of a TV series designed to arouse the interest of a viewer in becoming a ham and helping him to become one.

56) On motion of Mr. Mendelsohn, seconded by Mr. Atkins, it was unanimously VOTED that an Ad Hoc Committee of no more than four people be formed for the purpose of drafting a suggested set of ethical guidelines for use during amateur radio/media contact. Such committee shall consist of one member of the Board of Directors of the League, one member of the Public Relations Advisory Committee, and two members of the press. Guideline input should be sought from the press and other interested parties as well as from the Public Relations Advisory Committee. Such input shall be accomplished through solicitation in *QST*. The Committee shall report a draft set of guidelines to the Board at the Annual Meeting of 1988, and a final set of recommended guidelines at the 1988 Second Meeting of the Board. The guidelines, once adopted, shall be promulgated to the organization by notice in *QST*, the *Field Forum* and ARRL Press Kit.

57) On motion of Mr. Drake, seconded by Mr. Milius, it was VOTED that the DX Advisory Committee be funded for up to \$3000 for an in-person conference of the three subcommittee chairmen and the chairman in mid to late 1987 to finalize a draft of proposed recommendations to the Board on the future of DXCC. During the course of the above, Mr. Hurlbert joined the meeting at 9:24 AM and resumed his seat.

58) On motion of Mr. Quiat, seconded by Mr. Frenaye, it was VOTED that the Volunteer Resources Committee study and prepare criteria for selection of sites and sponsors for League sponsored and approved conventions and hamfests.

59) It was moved by Mr. Butler, seconded by Mr. Heyn, that the ad-hoc Digital Committee meet with NTS Staff to explore modification of existing NTS message formats for digital networks. After discussion, it was moved by Mr. Wilson, seconded by Mr. Mendelsohn to amend the motion by striking the text and substituting therefor: "Reports from the Digital Committee, the Emergency Communications Advisory Committee and the Blue Ribbon Committee have all suggested that a steering committee be charged with developing, among other things, a traffic handling plan to lead us into the 21st century. The Digital Committee is charged with synthesizing these recommendations." After further discussion, on motion of Mr. Haynie, seconded by Mr. Mark, it was voted to POSTPONE consideration until after the lunch recess.

60) The Board was in recess from 9:36 AM to 10:23 AM.

61) On motion of Mr. Metzger, seconded by Mr. Grauer, the following resolution was ADOPTED: WHEREAS:

a. At its July 1986 meeting the ARRL Board of Directors approved in principle the refurbishing of the Maxim Memorial Station, WIAW, and construction of an associated Visitors' Center at the Newington Headquarters, and instructed the officers and staff to proceed with the next phase of planning; and

b. One aspect of this planning was a survey of possible funding sources, the results of which suggest that there is sufficient financial support by ARRL members and nonmember amateurs to fund the construction project; and

c. The reasons for proceeding with this important project are as persuasive now as they were in July; and

d. The purposes of the project must now be effectively communicated to the Amateur Radio Community; and

e. There appear to be no major impediments to proceeding to the next stage of plan development; therefore,

BE IT RESOLVED by the ARRL Board of Directors, in annual meeting assembled,

a. that the officers and staff are authorized to develop and implement, in close consultation with the Administration and Finance Committee, a plan for the raising of funds for construction, maintenance and related improvements to the property;

b. that the plan shall include a vigorous program to explain to members and other potential contributors the special significance of this project to future generations of radio amateurs;

c. that the plan shall also include the creation of a "Committee for the Museum" made up of



KN1K and W7QMU observe the proceedings as Vice Directors from the outer table.

individuals qualified to render advice to ensure that the focus of this aspect of the project is on the future;

d. that no further funds shall be expended on architectural or engineering development until 10% of a fundraising goal shall have been achieved, and then only those necessary expenses preparatory to the solicitation of proposals for bid and only upon the recommendation of the Administration and Finance Committee and approval of the Executive Committee;

e. that progress shall be reviewed by the full Board prior to initiation of the bidding process; and

f. that the Executive Vice President is instructed to provide monthly progress reports to the Board via Directors' Letters, and to the membership via *QST*.

Messrs. Stafford and Milius requested to be recorded as voting against the resolution.

62) On motion of Mr. Mark, seconded by Mr. Haynie, it was VOTED that the Executive Vice President make available to the membership a staff organization chart depicting the major HQ departments. Each department's major functions should appear below the department's identification box. This aid is to be made available free of charge upon request.

63) It was moved by Mr. Mendelsohn, seconded by Mr. Heyn, that the Executive Vice President is requested to study the cost effectiveness of a national incoming WATS line, with use to be limited to prospective hams for initial contact as part of the recruiting effort that will take place in conjunction with Novice Enhancement, and for members to order publications. After discussion, Mr. Mendelsohn WITHDREW the motion with the consent of his second.

64) At this time, Mr. Hurlbert rose on a point of privilege of the Assembly. On his motion, seconded by Mr. Mendelsohn, it was VOTED that the Board go into Executive Session at 11:15 AM. On motion of Mr. Nathanson, seconded by Mr. Stevens, it was VOTED that the Board arise from Executive Session at 11:29 AM.

65) On motion of Mr. Frenaye, seconded by Mr. Wilson, it was unanimously VOTED that the Board strongly supports plans in the new budget to provide a new service to members, the timely notification of license renewal deadlines, and further, requests that the Membership Services Committee monitor progress on implementation.

66) On motion of Mr. Stafford, seconded by Mr. Milius, it was VOTED that the Membership Services Committee study the feasibility of ARRL's producing a distinctive official QSL card for purchase by ARRL members. During the course of the above, at 11:33 AM, Mr. Holladay assumed the Chair for Mr. Price, Mr. Vydareny took the seat for Mr. Mendelsohn, Mr. Severson took the seat for Mr. Wilson, Mr. Oubre took the seat for Mr. Hurlbert, Mr. Winter took the seat for Mr. Quiat, and Messrs. Price, Mendelsohn, Wilson, Hurlbert, Quiat and Olson left the room.

67) On motion of Mr. Mark, seconded by Mr. Heyn, it was VOTED that the Board approves in principle the formation of advisory committee working groups as recommended by the Special Study Committee on Advisory Committees. The Special Study Committee, in conjunction with the Volunteer Resources Committee, is directed to prepare the necessary revisions to the Advisory Committee Rules and Regulations for review at the

July Board meeting. During the course of the above, Mr. Sager departed at 11:38 AM and Mr. Comstock took the seat for Mr. Haynie at 11:42 AM.

68) It was moved by Mr. Stafford, seconded by Mr. Milius, that the Publications Committee of the Board of Directors of the American Radio Relay League study the feasibility and the advisability of including more coverage of the activities of ARRL affiliated clubs and Special Service Clubs in *QST*. The Publications Committee is to report its findings to the Board of Directors at the Second Meeting of 1987. ARRL staff is directed to prepare a brief guide outlining the requirements for publication of articles or items submitted by affiliated clubs to *QST*. Staff is directed to distribute the guide to all affiliated clubs along with a solicitation of reports and photos of club activities. After discussion, on motion of Mr. Vydareny, seconded by Mr. Metzger, it was voted to POSTPONE discussion until a later time. During the course of the above, those Board members who had previously left the room returned.

69) Mr. Price took the Chair at 12:02 PM and declared the Board to be in recess for lunch. The Board reconvened at 1:20 PM with all persons hereinbefore mentioned present with the exception of Mr. Chapman who had departed from the meeting.

70) On motion of Mr. Mark, seconded by Mr. Heyn, it was VOTED that in accordance with the recommendation of the Special Study Committee on Advisory Committees, and in order to provide improved support for the League's public-relations efforts, an ARRL Public Relations Committee shall be established, with members appointed by the President. This committee shall replace the present Public Relations Advisory Committee at the end of the 1987 term. The Board thanks and commends the members of the Public Relations Advisory Committee for their important contributions to Amateur Radio public relations activities. During the course of the above, Mrs. Gauzens took the seat for Mr. Butler at 1:28 PM.

71) On motion of Mr. Wilson, seconded by Mr. Mendelsohn, it was VOTED that the Board now consider the matter of message traffic via packet radio that was earlier postponed (Min. 59).

On motion of Mr. Wilson, seconded by Mr. Heyn, it was VOTED to amend the original motion by striking the text and substituting therefor the following: "Moved, that the Committee on Amateur Radio Digital Communication be charged to develop for Board ratification a proposal for facilitating NTS message handling (both regular and emergency), plus ancillary amateur-to-amateur message and data traffic via packet radio. The investigation should consider changes in message formats, system software or any other area which may be necessary to achieve the objectives. The Committee should incorporate the concepts developed by the Blue Ribbon Committee, Emergency Communications Advisory Committee, National Traffic System Area Staffs and providers/creators of existing software and hardware. The Committee is directed to report to the Board no later than the 1988 Annual Meeting."

The question then being on the motion as amended, it was ADOPTED. During the course of the above, Mr. Butler returned to his seat at 1:43 PM.

72) It was moved by Mr. Mendelsohn, seconded by Mr. Butler, that the Public Relations Advisory Committee study the feasibility of establishing a "hometown" news service at either the sectional or divisional level, to be reported back by the 1988 Annual Meeting. After extended discussion, Mr. Mendelsohn WITHDREW the motion with the consent of his second.

73) On motion of Mr. Mendelsohn, seconded by Mr. Heyn, it was VOTED that an Education Task Force is established. Its purposes shall be:

a) to review and update curricula for the teaching of all classes of amateur radio license using techniques currently available in the education discipline;

b) to explore and report innovative methods of establishing amateur radio clubs in elementary, and junior and senior high schools; and

c) to execute requests of the Board.

The Task Force shall consist of one Director or Vice Director as Liaison to the Board, a staff liaison member, and not more than six volunteer members selected from League membership. All members shall be appointed by the President. Initial funding for 1987 shall be \$500.

74) On motion of Mr. Stafford, seconded by Mr.

Milius, it was VOTED that the Board resume consideration of the matter of club coverage in QST that had earlier been postponed (Min. 68).

Then, on motion of Mr. Milius, seconded by Mr. Heyn, it was VOTED to amend the original motion by striking the text and substituting therefor the following: "Moved, that the Publications Committee study the feasibility and the advisability of including more coverage of the activities of ARRL affiliated clubs and Special Service Clubs in QST. The Publications Committee is to report its findings to the Board of Directors at the Second Meeting of 1987."

The question then being on the motion as amended, it was ADOPTED.

75) On motion of Mr. Stafford, seconded by Mr. Frenaye, the following resolution was ADOPTED:

WHEREAS, the Special Study Committee on Advisory Committees has recommended that the role of the ARRL Awards Committee relative to the DX Advisory Committee and the Contest Advisory Committee be clarified, and that the standard operating procedures for the Awards Committee be reviewed, therefore,

IT IS AGREED, that

a) the Membership Services Committee is directed to study the role of the Awards Committee and its relationship to the DX Advisory Committee and the Contest Advisory Committee, and

b) the Membership Services Committee is directed to review the standard operating procedures for the ARRL Awards Committee with the objective of incorporating a mechanism whereby any inconsistency between the conclusions reached by the DX Advisory Committee or the Contest Advisory Committee and the Awards Committee is resolved.

76) It was moved by Mr. Stafford, seconded by Mr. Milius, that the Executive Vice President study the feasibility of acquiring, either by lease or purchase, a trailer/van to be outfitted with an amateur radio exhibit and an operating amateur radio station. Staff is to study the alternative methods of moving the trailer/van throughout the United States in order to maximize public exposure to such van including visits to fairs, schools, gatherings of public safety officials, conventions of nonamateur organizations, etc. After discussion, on motion of Mr. Metzger, seconded by Mr. Quiat, the motion was TABLED. Mr. Heyn requested to be recorded as voting opposed to the motion to table.

77) It was moved by Mr. Heyn, seconded by Mr. Stafford, that the Administration and Finance Committee is directed to study the feasibility of increasing the financial rebate to Special Service Clubs for new ARRL memberships and renewals. It was then moved by Mr. Frenaye, seconded by Mr. Butler, that the motion be amended by striking the words "Special Service Clubs" and substituting therefor the words "affiliated clubs." After discussion, the motion to amend was LOST; the question then being on the original motion, it too was LOST.

78) It was moved by Mr. Heyn, seconded by Mr. Milius, that the ARRL Call-Sign Badge Program for ARRL Field Organization appointees be expanded to include the following: QSL Bureau Managers and workers, Technical Advisors, Volunteer Examiners, Volunteer Counsel and AIRS volunteers. The eligibility standards and the procedures for obtaining badges for these additional volunteers shall be as set forth in the Volunteer Resources Committee report delivered at the January 1987 ARRL Board of Directors Meeting.

After discussion, it was moved by Mr. Grauer to amend the motion by striking the words "Volunteer Counsel," but the motion to amend was LOST for lack of a second. It was then moved by Mr. Butler, seconded by Mr. Wilson, to amend the procedures as set forth in the Volunteer Resources Committee report by stipulating that the certification of Volunteer Examiners for the badge program be accomplished at ARRL Headquarters. After discussion, the motion to amend was LOST. It was then moved by Mr. Hurlbert, seconded by Mr. Grauer, that the matter be referred back to the Volunteer Resources Committee for further study, but the motion to refer was LOST. The question then being on the original motion, it was ADOPTED.

79) The Board was in recess from 3:08 PM to 3:32 PM.

80) On motion of Mr. Haynie, seconded by Mr. Stafford, it was VOTED that the Membership Services Committee deliver its recommendations on



Intent on the discussion are Directors W4OYI, WA2DHF, W0FIR, K1KI and W7RM.

the packet band plan as per Minutes 45a and 45h of the 1986 Annual Meeting no later than the July 1987 Board meeting.

81) On motion of Mr. Frenaye, seconded by Mr. Wilson, it was VOTED that the Executive Committee review the procedures used in evaluating the qualifications of candidates for Director and Vice Director to hold office under the Articles of Association and By-Laws.

82) Moving now to item no. 11(a) on the Agenda, Administrative Expenses for Directors for 1987, on motion of Mr. Stevens, seconded by Mr. Turnbull, it was VOTED that the Executive Vice President is hereby authorized to reimburse the Division Directors for actual expenses incurred by them during the year 1987 in the proper administration of ARRL affairs in their respective divisions, and in accordance with Board policy, up to the amounts as follows:

Atlantic Division	\$11,500
Central Division	8,000
Dakota Division	4,500
Delta Division	10,000
Great Lakes Division	11,000
Hudson Division	8,500
Midwest Division	6,500
New England Division	9,500
Northwestern Division	13,000
Pacific Division	10,500
Roanoke Division	10,500
Rocky Mountain Division	7,000
Southeastern Division	11,000
Southwestern Division	11,900
West Gulf Division	9,500

83) On motion of Mr. Haynie, seconded by Mr. Mendelsohn, it was VOTED that the Executive Vice President is hereby authorized to reimburse the following Committees, Task Groups and Task Forces created by the Board, for expenses incurred by them during the year 1987 in the proper execution of their duties, and in accordance with Board policy, as follows:

Ad Hoc Committee on Strengthening of CRRL	\$ 6,000
Ad Hoc Committee on Spread Spectrum	-0-
RFI Task Group	2,500
Committee on the Biological Effects of RF Energy	3,500
ARRL Committee on Amateur Radio Digital Communication	17,000
Legal Strategy Committee	15,000
Special Study Committee on Advisory Committees	3,000

84) On motion of Mr. Milius, seconded by Mr. Turnbull, it was VOTED that to continue the Board's policy of reimbursing QSL Bureau Managers of the League for certain travel in furthering ARRL organizational objectives, the Executive Vice President is hereby authorized to pay during the year 1987 a total amount not to exceed \$4,000 under terms prescribed by the general pattern established by the Board.

85) On motion of Mr. Butler, seconded by Mr. Quiat, it was VOTED that, to continue the Board's policy of reimbursing National Traffic System officials above the section level for certain approved expenses in furthering ARRL organizational objectives, the Executive Vice President is hereby authorized to pay during the year 1987 a total

amount not to exceed \$12,000 under terms prescribed by the Field Services Manager following the general pattern established by the Board.

86) On motion of Mr. Heyn, seconded by Mr. Quiat, it was VOTED that, to continue the policy of the Board to assume the administrative expenses of the ARRL Foundation, the Executive Vice President is hereby authorized to pay during the year 1987 a total amount not to exceed \$2,000 in accordance with ARRL standing policies with respect to travel, accounting procedures and auditing.

87) Moving now to item no. 11(f) on the Agenda, Supplemental Authorizations for 1986, on motion of Mr. Turnbull, seconded by Mr. Atkins, it was VOTED that the recommendation of the Administration and Finance Committee is approved and that the Executive Vice President is authorized to reimburse the Central Division by an amount not to exceed \$709.98 and the Dakota Division by an amount not to exceed \$100, for additional 1986 expenses.

88) On motion of Mr. Nathanson, seconded by Mr. Frenaye, the following resolution was unanimously ADOPTED:

WHEREAS, Mike Kaczynski, WIOD, and Becky Lindholm have toiled with diligence and in excess of the required devotion,

BE IT RESOLVED, that Mike Kaczynski, WIOD, and Becky Lindholm be commended for the excellent word processing of motions and cooperation with the Board during the Annual Meeting of January, 1987, and

BE IT FURTHER RESOLVED, that the Board wishes Mike every success in his future career (applause).

89) On motion of Mr. Drake, seconded by Mr. Frenaye, the matter of the trailer/van mobile exhibit was lifted from the table (Min. 76). On motion of Mr. Drake, seconded by Mr. Haynie, it was unanimously VOTED to amend the motion by striking the text and substituting therefor the following: "Moved, that the Executive Vice President is encouraged to explore with amateur radio industry representatives how the League and the industry representatives might cooperate in providing expanded opportunities for the general public to gain knowledge about Amateur Radio, including but not limited to, a mobile van display." The question then being on the motion as amended, such motion was ADOPTED.

90) On motion of Mr. Milius, seconded by Mr. Stafford, it was unanimously VOTED that the Board sincerely thanks the volunteers who work in the ARRL QSL Bureaus for their dedication and efforts (applause).

91) On motion of Mr. Olson, seconded by Mr. Butler, it was unanimously VOTED that the Secretary is directed to cast the ARRL vote on IARU proposal No. 183 (concerning the admission of Liechtenstein as a member of the IARU) in support of admission.

92) There followed an opportunity for all present to make final comments. There being no further business, on motion of Mr. Turnbull, seconded by Mr. Mark, the Board adjourned *sine die* at 4:28 PM. Total time in session as a Board: 11 hours, 56 minutes; direct authorization: \$212,209.98.

Respectfully submitted,
Perry Williams, WIUED
Secretary

CEP

Written Examination Credit: Effective February 13!

Just as we went to press, an FCC news release announced that it had received the go-ahead from the Office of Management and Budget (OMB) for the proposed changes in the FCC Form 610 needed to implement written examination credit. The new rules (see January *QST*, p 50) go into effect February

13, 1987. The July 1985 version of the FCC Form 610 will remain in use until revised forms are available.

Unfortunately, relying on earlier FCC announcements, some VEs have issued credit to candidates who passed written elements.

The FCC processing office in Gettysburg has informed ARRL HQ that Gettysburg cannot honor any kind of written-element credit until they receive the go-ahead from the FCC's Washington office, and that applications that indicate credit for written elements will be returned to the coordinating VEC.

FCC CHAIRMAN FOWLER TO RESIGN IN SPRING

Mark Fowler, FCC Chairman for nearly six years, has announced he will step down "in the spring." Fowler has served longer than any other Chairman at FCC. According to articles in the *Wall Street Journal* and *Broadcasting Magazine*, Fowler has been a vocal advocate of deregulation, especially in the broadcast industry, where the FCC has dropped rules requiring TV stations to air news, public affairs and children's programming.

The two candidates most often mentioned as his successor are FCC Commissioners Dennis Patrick and Mimi Dawson. Both are Republicans who would not require confirmation by the Democratic controlled US Senate because their terms as Commissioners have not expired. Fowler, 45, has not announced his future plans.

HAZARD "BUZ" REEVES, K2GL, SK

Electronics pioneer Buz Reeves, K2GL, 80, died suddenly December 23, 1986. Reeves founded numerous companies, the best known of which was Cinerama, which created the cinematic sensation of the 1950s of the same name. Cinerama also developed stereo magnetic recording film. During the 1970s, this company received two Academy Awards for these technical developments. The X-ray cutting process developed by another one of Reeves' companies to churn out perfect crystals is responsible for today's numerous uses of quartz crystals. Because of the importance of these crystals to communications during World War II, the company was awarded several citations by the military.

Reeves assembled one of the top Amateur Radio stations in the world. At the time of his death, the station consisted of 12 operating positions, each with its own linear. The antenna farm consisted of over a dozen towers, most 100-200 feet tall with several dozen beams and quads, including a 3-element rotatable 80-meter beam, several 2-element 80-meter quads, and four 6-element stacked 20-meter beams. Over the years, the station has used the call signs K2GL, K2GM, WA2ZAA and, most recently, N2AA. The station has won top honors in the multioperator, multitransmitter category of such major international contests as the

ARRL DX Contest and the *CQ* World Wide DX Contest.

A strong ARRL supporter and a frequent benefactor of the ARRL Foundation, Reeves had donated \$10,000 to the Goldwater Scholarship fund.

W4QR RECEIVES ROANOKE DIVISION AWARD

Harold "Robbie" Robinson, W4QR (ex-W3RE), has been awarded the 1986 ARRL Roanoke Division Service Award. The award is given annually to recognize those amateurs who have accumulated a long and impressive record of sustained service to Amateur Radio in the ARRL Division covering Virginia, West Virginia, North Carolina and South Carolina. Robbie first got on the air in 1919 as 2QR and has been licensed continually for almost 68 years. While living in the Washington, DC area after WW II, he founded several Amateur Radio clubs. In 1957, he founded the Foundation for Amateur Radio (FAR), a nonprofit organization of Washington DC-area Amateur Radio clubs that sponsors or administers more than 20 scholarships. He served as FAR President in 1965. Robbie now resides in Hampton, Virginia.

IS THE VE PROGRAM WORKING? YES, SAYS FCC

In a recent news release, the Commission said that between the start of the Volunteer Examiner Coordinator (VEC) program on December 1, 1983, until October 31, 1986, VECs had coordinated 6784 sessions, in which a total of 86,533 persons took an amateur examination. Approximately 60% of the applicants passed at least one examination element. The FCC also noted that VECs and VEs were doing outstanding work in screening the applications sent to FCC. From October 1985 through October 1986, fewer than 0.5% of the applications were defective. Also, 97% of the applications were forwarded to FCC within the 10-day time period allowed.

ARRL OPPOSES NOVICE 40-METER EXPANSION IN KH/KL/KP

The ARRL has filed comments *against* the FCC's Notice of Proposed Rule Making, PR Docket 86-397, which would authorize additional frequencies in the 40-meter band

to Novices and Technicians in Alaska, Hawaii, and Region 2 Pacific and Caribbean insular areas. Amateurs who operate 40 meters at night know that communications above 7100 kHz are difficult because of interference from HF broadcast stations transmitting in Regions 1 and 3. The ARRL said that it had previously endorsed authorizing telephony operation at 7075-7100 kHz for US amateurs adjacent to Region 3 and in the Caribbean, since this authorization would allow them to avoid the broadcast interference, and in time of emergency, to take part in the various regional and international nets that operate in that band. All nighttime communications for Novices on 7100-7150 kHz are difficult, whether in the 48 contiguous states or in Hawaii, Alaska, Pacific or Caribbean areas, and there is no compelling reason to make a special exception for any area.

In conclusion, the League said that now was not the proper time to consider this expansion of Novice privileges, since the FCC's Novice Enhancement announcement, which will expand Novice privileges significantly, is expected soon.

CHANGES AT GETTYSBURG FCC

The General Radio Branch and the Aviation and Marine Services Branch have been merged at the FCC's Gettysburg, Pennsylvania license-processing facility. The new unit is called the Special Services Branch and is headed by Marcus Stevens. The FCC's contact person for amateur VEC matters at Gettysburg remains Larry Weikert.

FCC COMMENTS ON EPA RF EXPOSURE STANDARDS

The FCC has filed its comments on Environmental Protection Agency Docket A-81-43 concerning ways of limiting the public's exposure to RF radiation. The Commission commented that it does not have the expertise to recommend any RF exposure threshold to protect the public from RF fields. The FCC noted there is also considerable disagreement among the experts as to the significance of academic research pertaining to RF exposure. However, the Commission said that it was presently using the standards of the American National Standards Institute (ANSI) and that, based on past experience, the ANSI guidelines appear to be satisfactory

for evaluating practical situations.

The Commission noted that the lack of uniform federal guidelines in this area had already led to a proliferation of local and state guidelines that may be inconsistent, unreasonable, and not supportable from the standpoint of protecting safety and health. The Commission urged EPA to recommend a specific exposure standard, one which would not be so stringent as to be unduly disruptive to the broadcast industry.

ARRL REPLIES TO CTIA COMMENTS

The Cellular Telecommunications Industry Association (CTIA) submitted comments to FCC in a rule making regarding Cellular Telephones, that stated in part: "The national organization of ham radio operators did not oppose the Privacy Act." The League has now submitted a reply comment asserting that "Both in official Board of Directors policy actions and in oral and written testimony before... [Congress] the League indicated its dissatisfaction with the Bill." The League further said that the Congressional prohibition on monitoring certain radio frequencies does nothing to protect the privacy of communications by cellular telephone users, and that cellular users should be informed of that fact. Furthermore, the League states "restrictions on frequency access by owners of radio receivers are misguided, and unfair. Privacy should be maintained through encryption, or at least a label telling the user his communications are not private."

SCHOLARSHIPS AVAILABLE

The Dayton Amateur Radio Association (DARA) and the Atlanta Radio Club have a number of \$1000 scholarships available.

The DARA scholarships are available to any FCC-licensed amateur graduating from high school in 1987 and planning to continue his or her education. There are no restrictions on the course of study, and applicants are not restricted to those pursuing four-year degrees; those working toward associate degrees or planning to attend an accredited trade or technical institution will also be considered. Information can be obtained by writing to DARA Scholarship Committee, 317 Ernst Ave, Dayton, OH 45405.

The Atlanta Radio Club offers up to three \$1000 scholarships, available to any licensed amateurs who are graduating from high school and entering an accredited college or university for the first time in 1987. Candidates will be judged on their grades, citizenship and leadership qualities, Amateur Radio achievements and financial need. For an application form write to Phil Latta, W4GTS, 259 Weatherstone Pkwy, Marietta, GA 30067.

HQ STAFF UPDATE

Billy Lunt, KR1R, has been named the new Contest Manager, replacing Mike Kaczynski, W1OD, who has resigned from the ARRL staff to attend air traffic controllers school in Oklahoma City. Lunt had been serving as Assistant Contest Manager. Mary Schetgen, N7IAL, has been named Assistant Contest Manager. Schetgen had worked for the Circulation Department at HQ and was in charge of *The ARRL Letter* circulation. Bruce

Kampe, WA1POI, has resigned his position as Amateur Auxiliary and ARRL Interference Reporting System Coordinator to work in the broadcast industry. Bruce had also worked as a WIAW operator and as conductor for the Correspondence column in *QST*.

MEMBERSHIP INCREASES

Year end US ARRL membership figures are in, and they show an increase of 3174 members, or 2.36%. The Pacific Division registered the largest gain (over 4%), followed by the New England, Southwestern, Roanoke and Rocky Mountain Divisions with gains of over 3%.

REAGAN SIGNS FCC'S \$95 MILLION BUDGET

President Reagan's signing of the omnibus spending bill for fiscal 1987 appropriates \$95 million for the FCC and includes provisions for implementing a fee-collection program for broadcast and some other radio services beginning April 1. There will be no fees for the Amateur Radio Service. The Commission expects to collect about \$35 million from the fees, all of which will go into the US Treasury. The fee schedule will be modified every two years based on the percentage change in the Consumer Price Index. Last year, FCC operated under a budget of \$90.3 million.

FCC POLICY ON NAME CHANGES

Some states, particularly California, have recently made it easier for individuals to change their name. Unfortunately, FCC has recently had several cases of persons filing a license application denoting a name change in order to assign the license to a different individual entirely. Thus, the Commission has begun to require court documents or a notarized affidavit as proof of the name change. There is no specific FCC rule on this subject, except for a general provision that the FCC can request such additional information as it deems necessary.

NEW BOOK AVAILABLE

For the past several months, the Government Printing Office (GPO) has been sold out of the book, *Code of Federal Regulations (CFR)*, "Title 47, Parts 80 to End." This is the book which contains FCC rules for the Maritime, Aviation, Private Land Mobile, Amateur and other radio services. The new 1986 edition should be available beginning this month from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402, for \$20. The ordering number is 822-007-00160-7. The ARRL publishes *The FCC Rule Book*, which is usually more up-to-date than the CFR. *The FCC Rule Book* contains Part 97, frequently asked questions and their answers pertaining to FCC rules, FCC-approved rule interpretations, and much more. It is available from HQ for \$4 plus \$2.50 shipping and handling, or from your local dealer.


FCC DENIES PETITION FOR RECONSIDERATION IN REPEATER DOCKET

FCC has denied a petition for reconsideration

in Docket 85-22 concerning frequency coordination of repeaters. The petition, filed on May 2, 1986 by Joseph Wolos, WA1OCK, requested that FCC define "local" and "regional" coordination. He also urged FCC to include a "due process" right to appeal coordinators' decisions, and requested that FCC standardize the ARRL band plans.


The Commission replied that it saw no need to formally define "local" and "regional" coordination in the amateur rules, since these terms are descriptive rather than determinative. Concerning the right of an appeal, the FCC stated that it does not require coordination of a repeater as a prerequisite for amateur licensing, nor does it separately license amateur stations for repeater operation. Thus, the decisions of repeater coordinators do not have a role in the amateur licensing process, so the lack of an appeal does not deny the due process right. Finally, FCC stated that they had considered the question of band plans and had decided that, in general, they favor voluntary band plans over Commission-imposed subbands in the Amateur Service. "Rule-mandated band plans may result in inflexibility, increased enforcement burdens, and greater regulatory burdens," FCC explained. For these reasons, FCC denied Wolos's petition on January 15, 1987.

FCC FINES COMPANIES MARKETING UNCERTIFIED PHONES

The San Diego FCC office has notified two companies that they are apparently liable for civil fines of \$2000 each for the unlawful marketing of long-range cordless telephones. The fines were issued to Crazy Guys Stereo and Video, of Chula Vista, California, and Samhill Enterprises, Inc, of New York. The FCC notices informed the companies that they apparently violated FCC regulations requiring that cordless telephones be certified by the FCC before sale. The Commission noted that the model being marketed could not be certified due to its design. The advertised range of the device was 60 km. Certified cordless telephones generally have a range of less than 200 meters. 

Exam Info

NEW FORM 610

The FCC has informed ARRL/VEC that it will release a newly modified Form 610 later this year. Currently, only Form 610s dated June 1984 or later can be accepted. Until the new Form 610 is released, candidates should use existing applications. Appropriate changes to Form 610s, eg, to reflect a candidate's written-element credit, are to be made only by the Volunteer Examiners at test sessions where the applications are submitted. Additional information on the Volunteer Examiner Program can be found on page 83 of Feb 1987 *QST*. Jim Clary, WB9IHH, ARRL/VEC 

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

MY FIRST CONTACT

□ I have been reading with amusement and pleasure the accounts in November *QST* of hams' first QSOs.

Although I work mainly CW, my first QSO was made on SSB and it was made quite by accident. With a 20-meter dipole strung up in the garden, my new TS-520SE perched on top of the hi-fi and the instruction book in my left hand, I commenced to tune up. All went well and in no time at all I was ready to adjust the modulation level. Picking up the microphone, I spoke my call sign a couple of times and, as I released the switch, there he was! OK2PBM calling me! I can tell you there has never been such a panic in this house as there was during the next few minutes, but when the dust had settled, I was truly bitten by the ham "bug." The chair in front of the rig almost became my second home.

In the seven years since that day, I have had the privilege on more than a dozen occasions to give another ham either a first QSO or a first trans-Atlantic contact. I wouldn't exchange those precious moments for all the DX in the world.

If there is someone out there trembling on the brink, remember that the person on the other end is not a hardened professional stamping with impatience, but he is a fellow ham. He is a human being who is sharing the moment with you and wishing you much success.

In February 1980, I answered a CQ call from WB2PYV (now KR2E). I was not his first contact by any means, but we set up a schedule. I have just completed CW QSO number 564 with him. We have never met, and chances are we never will; but when I list my friends, he comes very near the top of the list.—*Stan Simpson, G4ITM, Hastings, United Kingdom*

THE FUN OF QRP

□ With regard to Correspondence in November *QST*: I agree with Mack Avery, WASZKL, about the use of a kW. I believe that the use of a kW is often unnecessary, and it can be used abusively. It is poor operator practice to run a kW when 100 watts would often be more than adequate. I have worked Arizona QRP; the other ham was running 100 mW, yet we both had solid copy. With 100 watts, I have easily worked Australia, Europe and Africa. At the age of 15 and a ham of 1½ years, I have found Amateur Radio to be a great hobby.—*Bill Shuler, KBAPPE, Monetta, South Carolina*

THE REAL MCCOY ON THE HANDBOOK

□ I just received my 1987 ARRL Handbook, and to say I was impressed is putting it very mildly. The Technical staff of ARRL deserves high praise for a job very well done. In an age when slipshod work appears to be the

norm, it is a real pleasure to see such excellence and thoroughness.—*Lew McCoy, WIICP, Silver City, New Mexico*

GOOD OLE TUBES

□ I noticed in the December issue of *QST*, in the Technical Correspondence column, that there was an article concerning ALC for tube amplifiers! Tubes! In this day and age, hurrah! Let's not forget that tubes still exist. Have a solid-state New Year.—*Stan Gibilisco, WIGV, Sarasota, Florida*

599 BUT WEAK

□ I am not a contester, but I believe in "live and let live." All hams should get their fair share of the bands. However, I have detected that the contesters have been ripping off an unfair share of the ionosphere. One has only to listen to the signal reports contesters exchange (consistently 599 or 59) to realize that there is a conspiracy at work. Evidently some "insider" is snapping up all the weekends with good propagation for use in the contests.

Seriously, though, it is meaningless to require a signal report as part of any contest exchange. Clearly, such a rule is abused. In ham radio, the name of the game is *communication*. Information theory tells us that if the probability of an event is unity, that is, it's a certainty to occur, then no information is acquired when the event occurs. A 599 report in a contest conveys no information and simply slows the QSO rate. Exchange of an ARRL Section, state/province or zone number contains more information although there is a high degree of redundancy with the call sign. If you are a bystander looking for DX, the zone is helpful. The date of your first license conveys real information. Actually, the call sign contains almost all the information which is exchanged. The recipient must decide which of the 900,000 amateurs worldwide he is copying. So your information content is about 20 bits!

So how about it radiosport fans; let's have meaningful contest exchanges.—*Brice Wightman, VE3EDR, Ottawa, Ontario*

THE TANDEM MATCH

□ I have no quarrel with the material published in *QST*, and once in a while an article is outstanding. This was the case with KA3BLO's wattmeter. He has made significant advances in diode detectors and signal processing circuitry, and he has combined them into a new look at an old instrument with the Tandem match in January *QST*. Congratulations on a good job!—*R. A. Dehn, W2JVF, Schenectady, New York*

BACON AND EGGS WELL DONE

□ This is to say both "thanks" and "a job well done" regarding the article entitled

"Bacon and Eggs" by Mike Riley, KX1B, in January *QST* Public Service column.

I remember penciling in on the questionnaire which recently appeared in his column stating that I'd like to see more articles of this sort. If this effort was in response to that, fine! Whatever the reason, the article was a typical "Riley special."

We used to see such articles from Bob Halprin, K1XA, which were very well thought of by the public service and NTS people. We can only hope that articles like "Bacon and Eggs" will continue to promote the efforts of volunteers who make up the NTS and ARES teams.—*Luck Hurder, KY1T, N Eastham, Massachusetts*

CHRISTMAS CITY, USA

□ During the 1986 Christmas season, I had the pleasure of operating special-event station WITRB from Christmas, Florida. Despite several visits from Mr. Murphy, I had the privilege of completing several hundred Christmas greetings with the very young, the very old, the Novice, the old-timer, local stations, DX stations, and mobiles. It was truly ham radio at its best.

A permanently decorated 40-foot Christmas tree in Christmas, Florida is a symbol of love and goodwill—the Christmas spirit every day in the year. So is ham radio!—*Lou Hoekstra, WITRB, Christmas, Florida*

PLANES AND HTs DON'T MIX

□ I have returned from a business trip to Australia and New Zealand and wish to relate an experience which other hams who travel by air might want to read and heed.

Wanting to partake in the reciprocal operating agreement which the US has with these two countries, I took a newly acquired 2-meter HT along. All went well, and the experience of operating abroad was most pleasurable. As I have done dozens of times in the US, I carried my HT in a briefcase rather than putting it in a suitcase and checking it as baggage. At the Auckland airport, the security guard would not allow me to take the HT aboard the plane. He cited that its use might interfere with safe aircraft operation.

My HT was packaged in a security bag and tagged for LAX as I boarded the aircraft. This was the last that I saw of my radio! Apparently, the aircraft security guards have the authority to confiscate items which they feel might constitute hazards to the safety of the flight.

I guess the message is clear: If you take an HT or any other radio equipment on a plane trip, put it in your suitcase or you will risk losing it. Otherwise, leave your equipment at home and be content to work through the repeaters in your home town.—*George "Bud" Saum, KØGS, Agate, Colorado*

GW3AHN—DXCC Honor Roll, QRP

Some time ago, your editor requested of a number of DXCC Honor Roll members information as to their DX backgrounds, achievements, goals, etc. At that time, GW3AHN was unable to contribute. Now, newly retired and having been influenced by the July report on QRP maestro W2QHH, GW3AHN has been able to respond. We're delighted to share with you Tom's recent letter on his lifelong DX activities.

Firstly, I would like to congratulate Howy, W2QHH, on his fine achievements with QRP. He has shown that QRP can hold its own amongst the kilowatts of US stations. He is a man after my own heart, as I also have managed a little success with QRP, but from perhaps a little better QTH than his "1500-ft hole."

My location is 150 feet ASL, about 3 miles from the sea, with a fair takeoff. My restriction is not having the available room for putting up antennas in a purely suburban area. My available "patch" is only 40 ft x 35 ft, so that precludes 264-ft wires, and even any wire much longer than a half wave on 20. I've operated from this particular location since 1957. When I was first licensed in 1946 (and until 1957), I did manage a 68-ft Windom as the main antenna, and sundry ground planes for 15 and 10 meters. From 1957 to the present, I've used beam antennas of my own design. The present "antenna farm" consists of a G4ZU-type 3-element beam for 10 and 15 (one I've found works well also on the new bands of 17 and 12 meters), together with a 2-element beam for 20. Sundry other pieces of wire appear from



GW3AHN, in the early '70s as now: A modest station combined with persistent superlative operating equals the DXCC success story.

time to time, and all antennas have been home constructed.

I came on the air in November 1946 with a home-brew 6V6-807, with about 20 watts input, and a "straight" 1-V-1 receiver (also homemade). A VFO and a 6-tube Superhet were added in 1949. The TX was modified into an all-band TX in 1952, and was used until 1960 with an input of 25 watts on CW, narrow-band FM (to combat TVI) and AM. Sideband was commenced in 1960 using a modified Viceroy all-tube TX at 25 watts input CW and the equivalent power on sideband. The RX was rebuilt and upgraded to a 10-tube superhet a little later. The Viceroy TX has since been rebuilt many times and is

still used as the main transmitter on 10, 15 and 20 meters. Only on a few occasions has the power exceeded 25 watts, and then only in a few contests. In 1981, a Yaesu FT-101ZD was purchased for operating on the new WARC bands, power restricted to 20 watts input. It is also used occasionally on 40 and 80, at low power.

Over 100 countries have been worked on 80, 40 and 30 meters, but 5 only on 160 due to antenna restrictions; 20 meters, 364 worked (361 confirmed); 15 meters, 361 worked; 10 meters, 318 worked; 17 meters, 85 worked; 12 meters, 75 worked. My call first joined the mixed Honor Roll in September 1970, at the top rung with 322/343. DXCC (mixed) no. 805 was achieved in 1949. 120 countries were worked on 15 meters, using narrow-band FM in 1956/57. CQ all-phone WAZ no. 25 was received in 1958 (this before separate certificates for SSB were issued). 300 countries were worked on AM by 1962. Present Honor Roll Standings: mixed, 316/361 (joint top in the British Isles with G3AAE); phone, 316/358 (top for the British Isles).

In calendar 1980, a special attempt was made to work as many countries as possible with 5 watts output, and a total of 271 was achieved. Probably the first EU/US QSO on 12 meters took place between N4MM and this station on June 23, 1985 at 1138Z.

The writer's present objectives are to get to the 100-country mark on 12 and 17 meters as soon as possible, and then make a special effort to increase the country score on 160, even though it might require a move of QTH to achieve this aim!

9N1MC

Krishna B. Khatri, Chief Engineer in the Ministry of Communication, Panchayat Plaza, Prithvi Path, Kathmandu, Nepal (see photo) notes that there are only three hams in Nepal: 9N1MC, 9N1MM and 9N1RN. If any other calls appear, they're pirate. Krishna adds that a station, 9N1HCK, was licensed to operate for just a few days Jul 30-Aug 4, 1986. 9N1MC handles his own cards and is generally active 0900-1400Z, preferring 10, 15 and 20.



9N1MC, Chief Engineer of Nepal's Ministry of Communication (see text).

PY1ZAE

Hal Harris joined Silent Keys December 9 after a short illness. W9VA notes that Hal was active from Fernando de Noronha and Trindade (as PYØZAE), and was licensed as K3CCJ (and NW4C). Among his amazing operating feats was receiving the ARRL 5BDXCC Award in October 1981 with cards from only 100 different stations, each station worked on 5 bands. (Since then, he had brought his single-station 5BDXCC total up to 180—some of these were 6-banders, including 160 meters.) Hal was most interested in meeting and sharing his station with visiting hams, providing valuable PY licensing assistance. He'll be deeply missed by DXers around the world.

BY4RN

N4IA and XYL Kathleen recently returned from another visit to China, after attending the November Nanjing International Radar Conference. While there, Bob visited BY4RN and was permitted to operate the station. BY4RN first began operations Dec 25, 1985 and has, so far, made just a few hundred contacts with the three operators, Zhou (OM) and YLs Gu and Jin. The club is using an FT-107 barefoot, with a tribander; operations are limited to 10, 15 and 20. While there, N4IA worked CX, JA, UL7 and several UAØ stations, noting that the pileup forms quickly!



BY4RN, November 1986 (l-r): Jin, Gu, N4IA and Zhou (see text).

50-YEAR ANNIVERSARY

The following is a special New Year's tale by James Steffensen (ex-OZ2Q).

In my pocket diary for 1937, I have written as follows under Monday, January 4: 7T, 7BR, 4FT, 8H, "5I," 3QZ here. This gathering was the first of a series which is still carried on, and is a proof of faithful friendship and mutual attachment. That call "5I" stood for not-yet-licensed OZ80, who received his license shortly afterwards.

We met by turns in each other's homes, and this came to 15 meetings in 1937. The group was soon joined by OZ5Q, OZ7XA and OZ7BO,

while OZ3QZ and OZ8H left us after a few years. Our meetings were carried on all through the war and the German occupation of Denmark. After the war, we were joined by OZ7DE and SM7HZ, and later by OZ6K and OZ4U. In 1972, we were bereaved of OZ7BO, but his XYL was still considered as belonging to the group (since 1984 she has been the XYL of OZ7T).

In principle, we now meet monthly on the first Friday evening (except July and August). Today, our group is comprised of an average of 10 active hams and one former (this writer). The conversation covers widely differing subjects. At one time, years ago, the discussions were chiefly centered on the merits and demerits of various makes of automobiles, but shortwave radio generally dominates, and the latest equipment of the host of the evening is discussed and sometimes demonstrated.

Although I have completely lost touch with the development of radio technique, I always look forward with great pleasure to the next meeting with old friends. In the course of these 50 years, we have held over 500 such hamfests. We have always stuck unflinchingly together with never a harsh word among us. Thanks a lot, all of you!

THE CIRCUIT

□ **Peter I:** If the 3Y1EE/3Y2GV operation became a February reality, lucky contactees should QSL via LA6VM. (This column discussed Peter I in October 1983.)

□ **GB2SDD:** The National Day of Wales takes place March 1, with this special-event station furnishing all-band interest. Cards (SASE please) via R. R. Jones, GW4HOQ, "Bryn-Yns," 13 Strawberry Pl, Morrision, Swansea, West Glam SA6 7AG, Wales.

□ **Bhutan:** The Deputy Minister (Communication and Tourism) notes that the Amateur

Service should be reintroduced, and that PTT officials are currently working to establish the framework for rules regulations (to include permission for visiting hams). This good news thanks to the peripatetic W6YO. Jules notes that the legendary Pradhan, A51PN, has been transferred to Phuntsholing, on the southwest border.

□ **DX Convention:** Last call for the 1987 International DX Convention, to be held April 3-5 at the Grosvenor Hotel in Visalia. Convention chairmen are K6ANP and WW6F (ex-N6BLN). Don't miss it!

□ **Cocos-Keeling:** VK9YC makes note of the operating vacation of a lifetime at this rare, isolated, unique group of coral islands in the Indian Ocean. For further information: Cres Thursby-Pelham, VK9YC, 107 Melvista Ave, Nedlands, Western Australia 6009, tel +61-9-386-4745, or write directly to him at Oceania House, Home Island, Cocos (Keeling) Islands, Indian Ocean 6799. [I'm ready!—Ed.]

□ **BYSRA:** KI6ML says that op Hong likes either 14,026 or 14,036.

□ **Mellish:** Ken, K4ADN, is still looking for operators for a late-summer trip to VK9MW, Mellish. Ken hopes to be at the International DX Convention (above), to further discuss his plans.

□ **CT3:** N5RM hopes to operate CQWPX CW from Madeira and would welcome information/advice.

□ **YB0ACL:** Jack shut down in May of '83, but cards continue to come to his former manager (WA4RRB). If you need a pasteboard, address your request promptly to Jack Sproat, W4LCL, 2791 Florida Mango Rd, No. 301, Lake Worth, FL 33461. (This address will be valid until May, when he transfers to Amman, Jordan for 2 years.)

□ **Clubs:** New officers of the Northern Illinois DX Association include Pres W9NUF, VP

W9DWQ, Secy K9RHY, Treas WA9MAG. The club can be reached via Box 519, Elmhurst, IL 60126.

□ **Paris:** Visiting Amateur Radio licenses are now done over-the-counter while you wait! Have a copy of your current license, fill out the 3 forms and supply \$12 US for a license good for 90 days. Paris has a repeater on 145.1/145.6 and packet on 144.675. The Paris International ARC welcomes you. Contact Chuck Martin AB4Y, CPU A-316, APO NY 09777, tel 46-05-69-33.

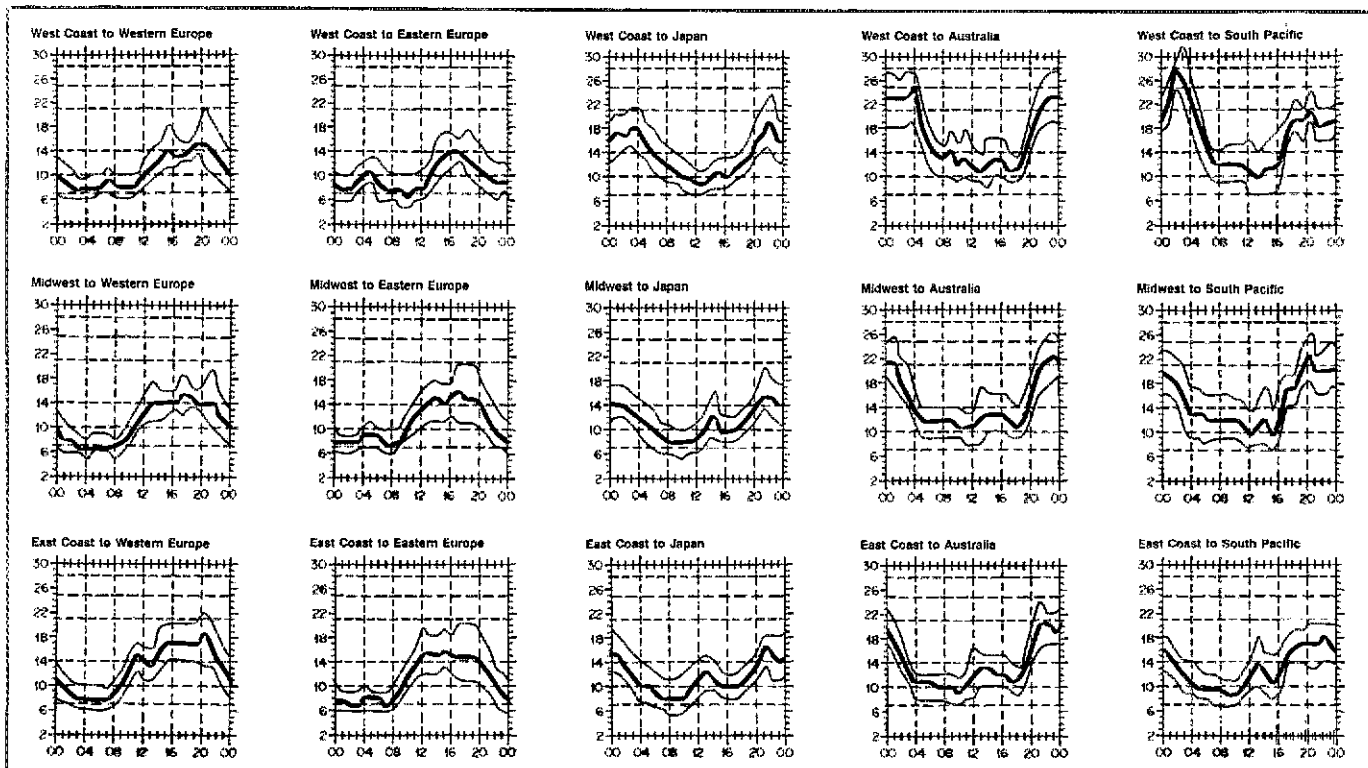
□ **DL1JW/VP5:** Hubert worked about 2000 contacts on CW from Grand Turk Oct 6-18, enjoying super hospitality by VP5GT (I&C President) and XYL VP5SL. Cards to: DL1JW, Kolbergerstr 12, 6550 Bod Kreuznach, Fed Rep of Germany. (tnx WA7ARU)

□ **LU1TFH:** WB7PCT reports this call is active in the 15-meter Novice segment by an Argentine-born American, who is a Baptist camp director. The QTH is Lozano, in the province of Jujuy at the corner of LU, CE and CP. Dave, LU1TFH, is an avid mountain climber, and claims to be the only CW operator in the LU province.

□ **W7TB:** Lew returned at year end from a South Pacific jaunt: Nov-early Dec—FO0WLW, ZK1XU, ZK1TB, 3D2TB. Lew notes that QSL routing for all, including ZL0AAZ for Mar '86, via W7TB.

□ **Aves:** The Association of Radioamateurs of Venezuela (ARV) will celebrate its 20th anniversary by operating 4M0ARV Mar 19-22, 160-2 meters. QSL via 4M0ARV, PO Box 3636, Caracas 1010-A, Venezuela.

□ **KH3:** KL7LF is scheduled to be QRV for a year on Johnston Island. Joe, one of Alaska's most active operators, expects to operate 10-80, primarily on sideband. He also plans to operate Novice-band CW, RTTY and AMTOR, and to hit the contests heavily. Cards may be sent through the Alaska QSL Bureau or direct to the



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for 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 OTF). See April 1983 QST, page 63, January 1977

Troster's Tips for Easy Listening

QRT

You are the DX station op and, sure, every once in a while you get the urge to do something besides munch away at a DX pileup. There is that interesting little town, or a beautiful beach, or supper, or gas for the generator, or you're even tired of radio. So you decide to QRT for a while. Go ahead. You are the boss. QRT. But don't just quit cold and disappear. Say something brilliant like "QRT for supper." Then add, "Back in 20 minutes." Or you might say, "QRT until tomorrow 0800/7005."

You are keeping your audience informed. Everybody is fairly happy (that is except the fellows who are just beginning to get the good skip on you—never fails). At least the DX chasers calling you know what to expect. And most DX chasers are people, too (really). They do not thrive on uncertainty.

Most important to you, the DX station operator, is to be sure to do what you say you are going to do. If you said, "Back in 20 minutes," do your best to be there as announced. Or if you said, "tomorrow 0800/7005," be there even if you have to wake up or leave that beautiful beach. What's that? You would rather flake out on the beach some more? Come on; you think this is some sort of vacation or something?

You are the DX station operator, and the whole world is QRX. Get to work. Drop your glass and grab the brass!

[Your conductor recalls many moons ago hearing a real QRQ Russian stop dead in the middle of a 20-meter contact, spelling out carefully "Dinner ready, wife kill." The message was clear, and I hung around for about an hour. Sure enough, there was UA9OH and the start of a beautiful ham friendship.]

KL7VZ CBA. (tnx KL7VZ)

□ **Volunteer:** KE4AP would like to volunteer as a QSL manager, having aided 9Q5DM 1974-77. Contact Larry D. McJunkin, 833 Mt Pleasant Rd, Chesapeake, VA 23320. Likewise, AA6EE is active on CW and wants to help some deserving DX buddy. Contact Duane Heise, 16832 Whirlwind La, Ramona, CA 92065.

□ **Help!** N19U needs QSL advice for: 1976, KZ5VV D2AZB; 1979, 3D6BP D4CBS. SM7AAZ needs CR8BY info (for a 1972 Timor operation).

□ **No. 6:** This issue represents six years of How's DX? for your editor. A special thanks is in order

for you, the reader, for furnishing advice, suggestions, feedback, items, photos and general support. More of all of the above would be welcomed!

QSL Corner

Administered By Joan Hushin, KA1IFO

ARRL-MEMBERSHIP OVERSEAS QSL SERVICE

Send outgoing cards to: American Radio Relay

League, QSL Bureau, 225 Main St, Newington, CT 06111 USA.

This is an "outgoing" service that allows ARRL members to send DX QSL cards to foreign countries at minimum cost and effort. While QSLing direct to foreign amateurs is faster, it is also more tedious. Time spent searching for addresses in the foreign *Callbook*, addressing and stuffing envelopes and mailing could be better spent operating DX. And, the cost of IRCs, Airmail postage and envelopes can be prohibitive.

An unlimited number of QSLs may be sent for distribution 12 times per year. The fee is just \$1 per pound or portion thereof (155 QSL cards average a pound). Recommended size of QSL cards is 3½ × 5½ inches (90 mm × 140 mm).

The ARRL-Membership Overseas QSL Service operates *only* in an "outgoing" capacity. To receive QSLs from DX stations, see "The ARRL DX QSL Bureau System," December 1986 *QST*, page 57, or send an SASE to ARRL QSL Bureau, 225 Main St, Newington, CT 06111.

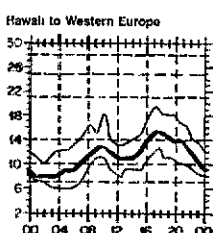
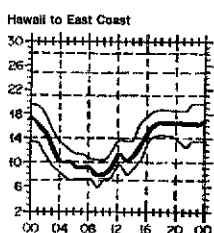
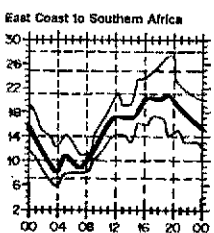
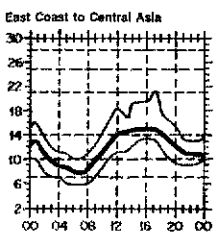
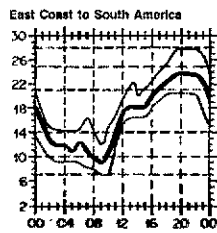
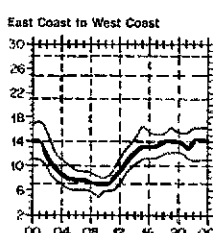
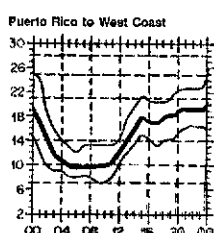
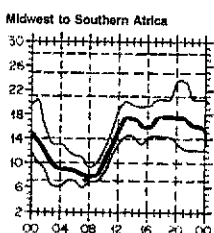
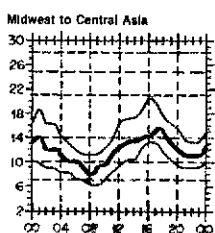
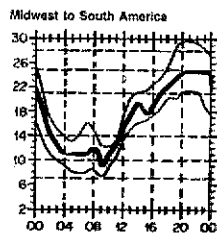
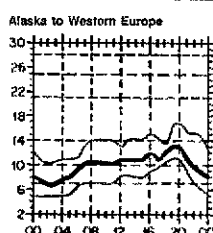
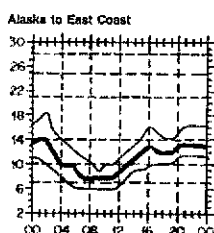
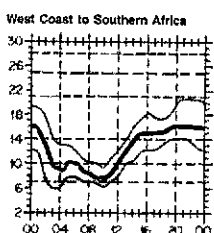
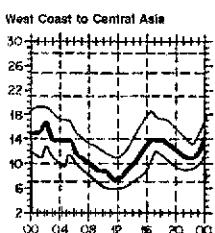
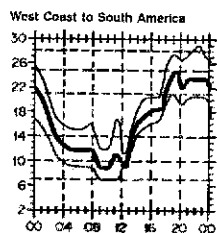
US amateurs may send SWL reports to foreign shortwave listeners. Unlicensed (associate) members may send SWL cards to foreign amateurs. QSL managers: Write for details.

Note: The ARRL QSL Service should not be used to exchange QSL cards within the 48 contiguous states.

Requirements

- 1) Presort your DX QSLs alphabetically by call-sign prefix (AP, C6, CE, DL, F, G, JA, LU, PY, 5N, 9Y, and so on).
- 2) Enclose the address label from your current copy of *QST*. The label shows that you are a current ARRL member.
- 3) Enclose payment of \$1 per each pound (or

(continued on page 71)



QST, page 58, September 1977 *QST*, page 35, and January 1979 *QST*, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for March 16 to April 15, 1987, assume a sunspot number of 11, which corresponds to a 2800-MHz solar flux of 73.

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 list. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300 and 5-country increments above 300. The totals shown below are exact credits given to DXCC members from December 1 through December 31, 1986. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

CT4KQ/159 DL1EAL/153 DL3DAF/132 EA8ABG/218 F9HU/133 HA5AHS/117	HB9BIO/169 HB9YP/100 HP1XOL/101 IK1HJS/118 K2ECN/120 IK6ADR/149	IK6APR/199 JE1REU/222 JH1ILX/111 JE2GMO/125 JA3BFO/161 JF3RVO/180	JA6VI/132 JR6LLN/232 JY9UJ/100 SM0DRB/242 SP3OE/104 TR6LD/133	VE1CBK/103 VE6EJ/102 VP5JEX/101 VU2TTC/129 YQ3DCC/107 YQ5BQ/148	YU1SZ/164 KA2YFT/151 KJ2G/106 W2AWB/109 W2QPP/108 K4LDJ/114	KI4KJ/108 WB4FDT/100 KF5LL/220 KF5LM/158 NX5H/104	W5UW/100 W5VHP/118 KD6QE/201 KD7CC/125 WA7ECU/209	KA8GBB/100 N6FGD/104 W6GRP/104 K9TCC/108 KE0ET/104
---	--	--	--	--	--	---	---	--

Radiotelephone

EA8ABG/203 E11CG/105 G6AHC/100 IK1HJS/118 I4VH/152 I4RYU/117	IB1YW/108 IK8GCS/127 IK8ADR/139 IK8APR/198 JA1RBQ/110 JE1REU/104	JH1OCC/107 JA3BFO/181 JF3RVO/180 JA6MWF/114 JR6LLN/226 OZ1JQW/101	OZ5OT/110 SM0DRB/236 SP4LVG/183 TG9ET/110 VE1CBK/100 XE1AFQ/103	YC2CJJ/110 YQ2BOK/112 YQ3DCC/106 ZL3AGW/108 K1YZG/106	KN1M/163 N11CP/114 K2QFX/102 KA2YFT/148 K3SN/106	NE4L/102 KF5FH/103 KF5LL/220 KF5LM/158 WC5QJ/112	KD6QE/197 W6PRS/106 WB6MZQ/130 K7CAJ/131 KD7CC/123	W7KSK/100 W7CVF/101 K9TCC/101 K9CVO/103 KE0ET/104
---	---	--	--	---	--	--	--	---

CW

DL1EAL/111 EA8ABG/156 F6IIA/139	GU4RUK/100 HB9BIO/109 HB9BIO/133	H1MUP/106 IK2DJV/180 JE1REU/194	JE2GMO/107 K17KJ/125 VE3CUI/164	VU2TTC/103 KA1FVY/101	KN1M/155 KA2UTV/102	W2PTF/101 NE4L/118	WA4GAX/104 NT5G/100	W5AC/124 K0CJU/129
---------------------------------------	--	---------------------------------------	---------------------------------------	--------------------------	------------------------	-----------------------	------------------------	-----------------------

160 Meters

OK1DOT/102 OK1JDX/102 W7IUW/100 K8ZH/102

Satellite

DL2KBS

5BDXCC

VK2IO WA1ZCC ISMXX	DJ2ZS W8JN ØER	KJ9I NU4N	KX9B JA5FDJ	KKØU OE3OOG	WB3CJW DJ2YE	W6LVY KS5M	SV1SL K2TWI	EA5AD DL8NBE
--------------------------	----------------------	--------------	----------------	----------------	-----------------	---------------	----------------	-----------------



Endorsements

Mixed

CX4GL/124 DJ6BN/310 DK5QK/314 DK6WF/202 DL6PI/241 DL7ALM/150 DL8NBE/196 EA1SQ/261 F5VU/328 F6GKH/324 F8DZU/310 F9EXV/312 F9FNU/250 F9GUG/252 G3YMC/254 HB9RX/327 H1XK/335 I2DEZ/332 I2ZGC/319 IN3RZY/298 I5VJWR/254 IV3RS/343 I7WLL/334 IT9NQ/287 IT9TQH/292 IT9ZY/357	JA1KRW/131 JH1FDP/287 JA1OYV/320 JA2VK/311 JA3DM/150 JJ3FQZ/208 JA4FWM/316 JA5NG/301 JH5AU/233 JA8BIO/325 JA9HV/254 KL7KJ/270 LA2GV/308 ON4TX/306 OZ1FAO/270 PA3DKX/180 SM3DXC/315 SM5CSS/271 SM6AY/278 SM6DY/K316 SM7FHJ/129 SM1AST/316 VE1YX/320 VE3DR/312 VE3KJ/321 VE6BB/179	VO1CA/292 XE1GBM/312 YU3DJR/194 YU3TE/299 YU3TFC/267 ZL4AV/321 6Y5EE/218 AK1N/276 K1B/292 K1DII/226 K1JII/225 K1MZB/126 K1YR/289 KB1NS/128 KN1R/271 KN1M/222 KT1J/272 NA1AJ/306 NA1N/175 W2HB/316 W1CTM/150 W2KJ/295 W1KDD/175 W1OHA/340 W1SDU/135 W1SP/349	W1UN/325 W1WFF/301 WA1WTP/298 K2GAT/300 K2QWE/301 KA2AOT/151 KA2CYN/250 KB2E/297 KB2HZ/304 KB2RV/310 KB2Z/302 KD2SY/290 KM2V/328 N2JY/311 N2KW/314 N2MF/313 N2C/259 NI2V/260 NK2W/150 W2HB/264 W2IRV/354 W2KJ/249 W2SEC/160 W2SY/330 W2TE/303 W2VP/266	WA2LWA/203 WA2TMP/201 WA2VUY/307 KG4W/312 WB2GAI/128 WB2KPE/308 WB2QJY/288 K3GYD/320 KB2E/298 K3KA/314 KB3KV/298 KB3YJ/203 K3L/243 KT3H/174 N3CZJ/129 W3DO/297 W3KH/300 WB3MA/150 AA4H/307 AA4N/307 K4BYK/304 K4BPB/310 K4TJY/301 K4UTE/329 K4YT/326 KA4AYO/258 KA4S/319	KA4UPI/190 KB4LX/269 KE4RX/309 K64W/312 K4HL/150 K4AM/302 N4AXR/310 N4BLX/305 N4RR/316 ND4Y/250 NE4L/167 NE4R/317 W4CPZ/330 W4DJJ/311 W4KA/319 W4ZWZ/296 WA4DAN/309 WD4R/296 AE5B/319 K5QY/310 K5RE/310 K5HSQ/311 K5YCP/320 K5COP/289 N5GM/316 W5EFA/310	W5ERY/304 W5KFN/320 W5MUG/336 WB5DA/348 W5SL/231 W5VJZ/308 W5Y/295 WB5SD/311 WB5DP/202 WD5AM/266 AA6AA/313 AE6U/303 K6CBL/320 K6DG/291 K6EID/309 K6JAD/323 K6BCL/155 N6AHU/311 N6BFA/285 N6CJ/318 W6AUG/320 W6MJJ/325 W6OSP/279 W6TCT/292 WA6AJY/292 WA6OGW/318	WA6WZO/319 WD6DKG/290 K7UT/320 KA7KMP/268 KX7J/284 KY7M/260 W7KSK/151 W7OEV/327 W7ORH/331 W7BL/225 WB7ZAM/266 W7CLU/305 K8ES/259 K8CBL/320 K8DG/291 N8FZ/215 NG8S/265 NN8R/175 W8KBZ/277 W8LJP/286 W8LJ/317 W8YJ/330 WA8JOC/284 K9AGB/327 K9QXY/313 K9XJ/326 K9Z0/315	KA9CFD/203 K9QOB/306 KW9K/311 KX9B/242 N9BW/315 N9CK/304 N9RF/309 W9AL/125 WB9HIP/310 WB9ZBE/305 AC9M/310 K9CS/314 K9DEC/286 K9FD/175 K9IIR/212 K9KTP/316 K9RWL/307 K9CDN/267 K9QJ/322 W9AL/250 W9JCB/307 W9UJ/300 W9LSD/287 W9YVA/224 WA9YJ/310
---	---	--	---	--	---	--	---	--

Radiotelephone

CN8AK/287 CP8HD/252 CT1XK/315 DK8MZ/312 DL1MM/216 DL5NAO/179 DL8NBE/188 EA1ABT/270 EA3AAV/138 EA5AD/287 EA6DH/204 EA8L/315 F3PD/127 F6OK/313 F5VU/328 F6GKH/323 F8DZU/310 F9EXV/310 F9FNU/250 F9GUG/251	I2DEZ/327 I2ZGC/319 IV3RYN/310 I4USC/313 K8EGC/313 IT9TQH/291 IT9ZGV/343 JA1KRW/131 JA1OYV/320 JJ3FQZ/208 JA4FWM/315 JA5NG/285 JA8ADQ/334 JA8BIO/323 JH8GWW/278 KL7KJ/268 PY4L/202 SM3DXC/293 SM5CSS/251	SV1VS/151 VE1YX/320 VE2DRN/176 VE4AT/304 XE1GBM/312 ZL1AMN/319 6Y5EE/218 AK1N/269 K1OM/319 K1MEM/314 K1YR/252 KM1R/259 NI2C/236 KT1J/264 N1AJC/305 N1AVI/224 W1AB/272 W1ICV/295 W1KSZ/310 W1OHJ/220	W1SP/348 WA1SMI/259 WA1WTP/297 WA1ZCC/306 K2GAT/300 K2DM/266 KB2HZ/301 KB2RZ/302 KD2BW/157 KM2V/327 N2KW/310 NI2C/236 W2FDE/131 N2FZ/335 W2KZ/230 W2SY/265 W2VP/266 W2XL/222	WA2VUY/307 WB2KPE/308 K3E/226 K3GJ/209 K3KA/313 K3LDE/222 K3FY/316 KB3KV/298 K3KE/227 K3L/234 K5RSQ/297 K5LJK/321 NG5L/276 N6CJ/285 NM5Q/203 NZ5E/225 W5AC/255 W5A'Z/313 W5EFA/309 W5ERY/299	N4BLX/305 N4CRU/304 N4JF/301 NE4R/306 W4BL/316 W4DJJ/306 WA4SIB/308 WA4DAN/305 WC4B/175 AE5B/319 K5RSQ/297 K5LJK/321 NG5L/276 N6CJ/285 NM5Q/203 NZ5E/225 W5AC/255 W5A'Z/313 W5EFA/309 W5ERY/299	W5NDP/262 W5OHF/250 W5SL/156 W7HX/198 WB5SD/302 WD5AM/286 AA6AA/313 K6DG/291 K6DT/323 K6JAD/323 K6TEH/225 N6AHU/310 N6BFA/285 N6CJ/285 W6AUG/320 W6MJJ/325 W6OSP/279 W6TCT/292 WA6AJY/292 WA6OGW/318	KC7TO/299 KX7J/283 N7XN/177 W7HX/198 W7OEV/313 WB7CLU/304 WB7WQE/262 K8MG/306 N8FZ/211 N8S/253 W8GUS/306 W8KBZ/260 W8LJP/286 W8LJ/302 W8PJA/317 W8PR/325 WA8SKM/175 A9U/285 K9DXO/319	K9LKA/306 K9Z0/303 KC9SF/151 KD9QB/306 KF9J/282 N9BW/303 WD9MH/314 W9IT/281 W9KQD/323 WA9QT/124 WB9HIP/306 K9FD/175 K9IIR/128 K9KTP/316 K9RWL/307 K9CDN/267 K9QJ/322 W9AL/250 W9JCB/307
--	--	--	---	---	--	---	---	---

CW

DF4QW/173 DJ2BW/314 DJ8LQ/229 DK1GF/176 DL1TL/270 DL6EN/316 DL6PI/152	EA4BV/125 EA8IR/159 G3YMC/213 IT9TQH/265 JH5AU/156 OZ1FAO/256	PA3DKX/178 SM3DXC/264 SM5CSS/202 SM6AY/278 SM6CS/300 SM6DYK/285	K1EFI/282 W1AB/287 WA1WTP/157 N2KW/308 N2MF/289 W2MJI/306	W2SEC/158 W2XL/151 K3E/286 K3GJ/204 K3KA/300 K3A/176	N4JF/307 N4RR/285 W4DJJ/299 W5MUG/180 W5VJZ/204	AA6AA/310 K6DT/295 K6EID/227 W6AUG/226 W6PT/315 W6TCT/306	W7LR/303 NG8S/180 W8AH/316 W8DA/278 W8KBZ/188 W8PR/253	W8LU/272 KX9B/171 W9KQD/299 K9DEC/271 K9RWL/268 N9RF/311
---	--	--	--	---	---	--	---	---

RTTY

JA8ADQ/205 W6GC/140 N1ØM/132

DXCC Notes Honor Roll Reminder: Those wanting to upgrade their standings or make Honor Roll must have their cards into HQ no later than March 31, 1987 to be listed.

Annual Listing Corrections

Mixed: K1KYW/339, W2VP/252. Phone: F3DJ/347, NY5L/301, W6KPC/336.

Information, Cooperation and Action: The Keys to Solving RFI

Almost all amateurs have encountered radio frequency interference (RFI). RFI comes in many forms, but we amateurs are most familiar with television interference (TVI)—the number one enemy of amateurs. RFI occurs, or has potential to occur, whenever a susceptible electronic device is surrounded by a field of RF (radio frequency) energy. In this month's column, we shall examine the problem of RFI.

The electronic device receiving unwanted RF energy could be a television set, stereo system, video cassette recorder (VCR), FM receiver, smoke detector, telephone or some other piece of sensitive home electronic equipment. RFI can occur when an electronic device behaves or responds in an undesirable manner because of a radio-frequency field. Nobody likes RFI, but most amateurs must deal with it sooner or later.

Q. How are RFI problems caused?

A. RFI problems are caused by incompatibility between various electronic systems. The problems generally lie in the following areas:

1) System component design, insufficient shielding or filtering, and/or failure to observe proper installation practices. These are the most probable factors if the device responds to unwanted signals.

2) The proximity of the receiver to the source of the unwanted signal and its lack of immunity in rejection of unwanted signals.

Q. Why is RFI such a big problem?

A. Today, we face an interference problem of huge proportions. During fiscal year 1986, the FCC received over 63,000 complaints of RFI to home-entertainment equipment (97% of these complaints involve a service other than the amateur service). The magnitude of the RFI problem can be attributed to three factors:

1) Rapid growth in the electronics industry has increased the probability of a consumer device being located near an RF source.

2) The use of electronic devices (including TVs, VCRs, radios, video games and audio tape equipment) by the public has grown at a tremendous rate in recent years so that now, many more devices are subject to interference.

3) Failure of manufacturers in many cases to incorporate in the design of home electronic equipment sufficient filtering or shielding to provide immunity from nearby radio transmitters using these frequencies.

Q. If RFI is such a big problem, why hasn't legislation been enacted with regards to RFI?

A. Congress has enacted RFI legislation! After 10 years of lobbying by the ARRL, the Communications Amendments Act of 1982 (PL 97-259), was signed into law by President Reagan on September 13, 1982. This law is known as the Goldwater Bill by amateurs because then-Senator Barry Goldwater, K7UGA, was largely responsible for its introduction and passage. The legislative history of the bill, which gave the FCC juris-

isdiction over RF susceptibility of home electronic equipment, states, in part: "This law clarifies the reservation of exclusive jurisdiction over RFI matters to the Federal Communications Commission. Such matters shall not be regulated by local or state law, nor shall radio transmitting apparatus be subject to local or state regulation as part of any effort to resolve an RFI complaint. The FCC believes that radio operators should not be subject to fines, forfeitures or other liability imposed by any local or state authority as a result of interference appearing in home electronic equipment or systems. Rather, the Committee's intent is that regulation of RFI phenomena shall be imposed only by the Commission." For the time being, the FCC has opted for voluntary standards in place of formal rules and regulations.

Q. What does the Goldwater Bill mean for the radio amateur?

A. The Goldwater Bill gave the FCC the authority to regulate the RFI of home electronic equipment. The FCC didn't have that authority before this legislation was enacted. The FCC and the ARRL are both active in an industry group, in cooperation with the American National Standards Institute (ANSI), which is studying "RF immunity issues." This group, called the Ad Hoc Committee on Public Law 97-259 of the Accredited Standards Committee C-63, has set an RFI rejection standard for certain home electronic equipment. The voluntary standard provides for TVs and VCRs to reject the field strengths of unwanted signals of not less than 1 volt per meter. While this standard is not sufficient for full-power amateur stations under "worst case" conditions, it will cover the majority of cases.

Q. Who is ultimately responsible for resolving RFI problems?

A. RFI may result from (1) harmonics, (2) spurious emissions, and (3) fundamental overload. Fundamental overload may produce RFI when the device receiving the interference is inadequately shielded, has unfiltered leads or is located very close to the RF source. If, however, the transmitter is being operated in a completely legal manner and the radiated RF energy on its fundamental frequency is within the limits of FCC regulations, then the interference is probably caused by design deficiencies in the affected device. Typical solutions include filtering and shielding. If the interference is caused by a licensed operating transmitter, its owner has the responsibility to be in compliance with the FCC's rules and regulations. While it is useful to determine in each particular case whether the problem is in the amateur gear or the neighbor's home-entertainment equipment, the best approach to resolving RFI problems are those which arise in a "no fault" cooperative environment. This is crucial. If blame is the main

atmosphere, it's unlikely that the RFI problems will be resolved satisfactorily.

Q. What can be done to cure RFI?

A. RFI, in general, will always be a problem, but individual RFI cases can be solved, or at least made bearable for all parties concerned. In trying to be helpful, the amateur may find that his explanations are not welcome. Technical expertise should always be guided by diplomacy and tact in dealing with RFI problems. Cooperation between the parties involved is the most important factor involved in finding a solution. Although RFI is a technical problem, it is also a people problem. Turning that problem into an opportunity depends on three factors: information, cooperation and action. *Information* is needed to know what to do. The *cooperation* of the persons involved is essential to resolving the problem. Some kind of *action* is required to eliminate the RFI. The sooner that happens, the better for everyone involved.

Q. What sources of help are available in resolving RFI problems?

A. The manufacturer of the device is often cooperative in helping the consumer solve RFI problems. A call or letter is well worthwhile. If no action is taken by the manufacturers, a letter should be sent to Electronic Industries Association (EIA), 2001 Eye St NW, Washington, DC 20006. The FCC should be contacted only as a last resort.

Several books on RFI are available. One of the best RFI publications is the FCC's *Interference Handbook*, available for \$2.50 from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402. The ARRL publishes a very good book entitled *Radio Frequency Interference*. This book includes some of the FCC text and it is available from HQ for \$4 plus \$2.50 shipping and handling. This same information is also contained in the ARRL's comprehensive *Field Resources Directory* (FReD), which is available for \$10 plus \$2.50 shipping and handling. *QST* publishes articles about RFI quite frequently.

You say you want someone to help you one-on-one in curing your RFI problem? Contact your ARRL Section Manager and he will refer you to an ARRL Assistant Technical Coordinator in your area.

Simply put, Amateur Radio is sometimes blamed for causing interference, regardless of the source of the interference. Many complainants believe that they are being interfered with by "that ham down the street," when in fact an amateur station may not be involved at all. Latest FCC figures show that only 3 percent of RFI complaints result from amateur operation. When a complainant's expensive TV or stereo is experiencing RFI,

(continued on page 74)

Fun, Games and (Hopefully) Technical Challenges on OSCARS

Viewed as "sport," Amateur Radio inspires some to reach new heights. But taking this "radiosport" competition to the OSCAR satellites raises both new challenges and risks.

OSCAR transponders are especially vulnerable to the abuses intense competition seems to foster. Consequently, AMSAT has carefully limited on-satellite competition. Power "hogging" of limited transponder power by ardent contesters is the basic problem; it's the essence of what precludes "contests" on OSCARS.

Competition also means awards. Awards programs differ from contests in meaningful ways.

First, contests tend to be short, high-intensity events. Awards (eg, DXCC) tend to be of lower intensity and are usually long-term pursuits.

Second, contests pit operators against each other in a dueling environment. Awards present arbitrary milestones (eg, 100 countries). The absence of head-to-head combat seems to reduce abuse levels.

There is a third class of competition, which I call techno-sport. It lends itself nicely to satellites and embraces the essence of the Amateur Space Program. Techno-sport emphasizes technical acumen over physical endurance, mind-food over monastic chanting and ken over kilowatts! The now-defunct Frequency Measuring Test (FMT) and the Fox 'n' Hound (F 'n' H) hidden-transmitter events are familiar examples.

The FMT challenged the participant to determine precisely the frequency of a CW signal. The

more accurate the judgment, the higher the award. Today's F 'n' H events pit clever foxes against portable, sophisticated equipment and are more fun than ever.

The desire to instill sound engineering principles and advanced techniques through the incentive of competition, combined with its fundamentally benign character, is the motivation for AMSAT's developing a series of techno-sport competitions. The first techno-sport competition held on AMSAT-OSCAR 10 (AO-10) in 1985 was a receive-sensitivity test. The participant merely copied a moderately weak CW signal transmitted through AO-10. If the characters were copied correctly, the participant was awarded a certificate. If a still weaker signal was received, the competitor would receive an endorsement to the award. Each time a weaker signal was copied, a more prestigious endorsement would be granted. This form of competition is simple and technically stimulating, too. It promotes improved "ears" through better station engineering, essential in OSCAR use.

AMSAT's receive-sensitivity test is called the KZRO Memorial Station Engineering Award. In the ZRO Test, the participant monitors AO-10's downlink. A calibrated CW signal sends a five-digit number group in 10-wpm Morse code. The participant notes it. Then the test director reduces the signal power level by half (-3 dB). A different code group is sent. The participant notes it. Power is cut in half again. This process is repeated until nine different power levels are sent: Z₀ through Z₈. The lowest level

is 24 dB below the first signal (see Table 1).

Conducting the test is also a challenge. Fig 1 shows the equipment used in the transmitter chain. The power meter is used only to gauge general power levels. Its accuracy ($\pm 5\%$) is insufficient for the test. In the future, a directional coupler and a precision Boonton microwattmeter with digital readout will be used. The isolator stabilizes the impedance the attenuator output sees. Attenuator accuracy hinges on the maintenance of a 50-ohm line, and the accuracy of the entire test depends on the accuracy of the attenuator.

Choosing the test time is as important to the accuracy of the ZRO Test as the instrumentation. The critical factors are satellite location, perspectives and attitude (orientation). Test fairness must be assured in three ways:

- 1) Each participant must have the same downlink energy to work with (uniformity).
- 2) No test session should be easier than another (precision repeatability).
- 3) Increments must be close to -3 dB (accuracy).

To assure uniform illumination levels, the test session is scheduled at (or near to) apogee, the highest point on the satellite's orbit. During this time, the difference in path length (and path loss) between participants is minimal. Also, when the satellite is at apogee, the differences attributable

(continued on page 88)

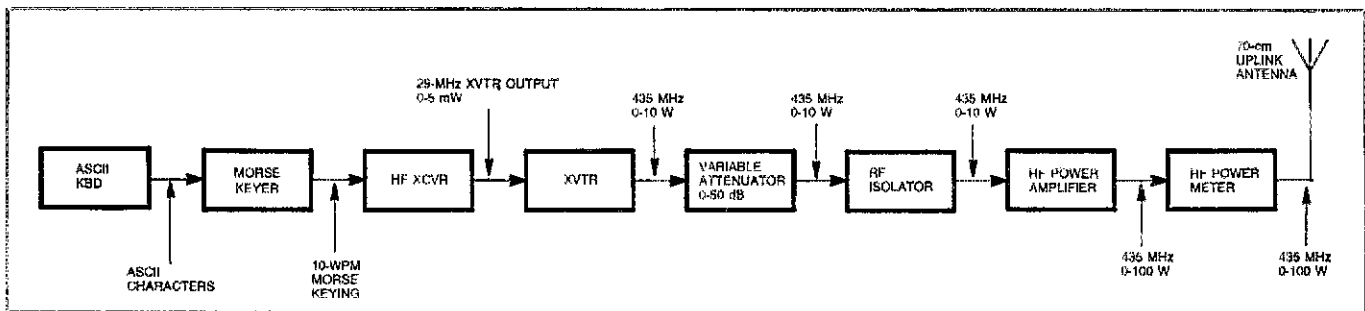


Fig 1—ZRO Test transmit chain.

Table 1
ZRO Test Typical Operation Levels

Z Level	Relative Level (dB)	Measured RF to Feed Line	EIRP*
0	0	20 W (13 dBW)	316 W (25 dBW)
1	-3	10 W (10 dBW)	158 W (22 dBW)
2	-6	5 W (7 dBW)	79 W (19 dBW)
3	-9	2.5 W (4 dBW)	40 W (16 dBW)
4	-12	1.25 W (1 dBW)	20 W (13 dBW)
5	-15	625 mW (-2 dBW)	10 W (10 dBW)
6	-18	312 mW (-5 dBW)	5 W (7 dBW)
7	-21	156 mW (-8 dBW)	2.5 W (4 dBW)
8	-24	78 mW (-11 dBW)	1.25 W (1 dBW)

*Antenna Effective Isotropic Radiated Power, assuming 1.0-dB feed-line loss and 13.0-dB gain.

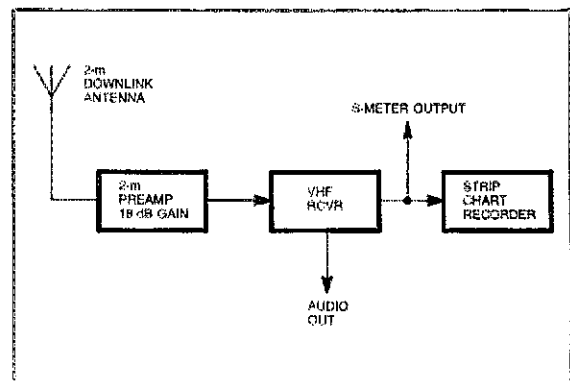


Fig 2—ZRO Test receive chain.



President: Richard L. Baldwin, W1RU
Vice President: Carl L. Smith, W6BWJ
Secretary: David Sumner, K1ZZ
Assistant to the Secretary: Naoki Akiyama, N1CIX/JH1VRQ

Regional Secretaries:
 John Allaway, G3FKM
 Secretary, IARU Region 1
 10 Knightlow Rd
 Birmingham B17 8QB
 England

Alberto Shaio, HK3DEU
 Secretary, IARU Region 2
 9 Sidney Lanier La
 Greenwich, CT 06830
 USA

Masayoshi Fujioka, JM1UXU
 Secretary, IARU Region 3 Association
 PO Box 73, Toshima
 Tokyo 170-91
 Japan

The International Amateur Radio Union—since 1925 the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communications.

This and That from Here and There

Singapore

Singapore Telecoms has released the 10.1, 18.068 and 24.89-MHz bands for use of Singapore licensed amateurs, effective January 1, 1987. All three bands have been designated for secondary use by 9V1 amateurs until July 1, 1989, after which the 18- and 24-MHz bands will become primary for the Amateur Service in Singapore. Congratulations to the Singapore Amateur Radio Transmitting Society for their successful efforts in arranging for these allocations.

CEPT Common License

As you have heard us say before, one of IARU's goals is a common license worldwide. Great progress is being made in the CEPT (European Conference of Posts and Telecommunications Administrations) countries of Europe. Now, eight of them have implemented CEPT recommendation T/R 61-01. As a result, their radio amateurs may use Amateur Radio transmitters on a temporary basis within the borders of the eight countries, either on all frequencies or just on VHF, depending upon their class of license. Affected prefixes include DL, HB9, HB0, LA/JW/JX, LX, OE, OZ/OX/OY and PA. Thanks to DL1FL for keeping us posted.

Guatemala

CRAG (Club de Radioaficionados de Guatemala), the IARU member-society for



Whenever our sister society in Canada, CRRL, holds a hamfest or convention, there's generally an IARU booth, either separately or as an adjunct to the CRRL booth. Here's Jean Labelle, VE2ED, at the Quebec Hamfest last summer. He had an opportunity to answer many questions about IARU and its goals.

Guatemala, reports that Chile and Guatemala have entered into a reciprocal-licensing/operating agreement. The agreement was signed in Guatemala City on October 13, 1986 by Vice President Roberto Carpio Nicolle of the Republic of Guatemala and Ambassador Miguel Jacob Helo of the Republic of Chile. Ambassador Jacob is an amateur himself,

signing CE3HJ when at home and TG9XYZ while posted in Guatemala.

The Netherlands

The Dutch Administration has formally advised that "On the occasion of [the] Region I Conference of the International Amateur Radio Union to be held in Noordwijkerhout, [the] Netherlands, the Administration of [the] Netherlands has authorized an amateur station in Noordwijkerhout to use the call sign PA6IARU for the period 9 to 20 April 1987."

Korea

The Korean Amateur Radio League (KARL) has successfully approached its administration with a request for authorization of special Amateur Radio activities on the occasions of the '88 Olympic games, to be held in Seoul. A special station will be operated by KARL in 1988, signing 6K88SOG. The station will be authorized to conduct international third-party traffic on behalf of the athletes. Athletes who are licensed amateurs in their home countries may operate the station. In addition, individual Korean amateurs will be using the special prefix HL88 at the time of the Olympic games. (Although there's no connection in the type of activities involved, the IARU Region 3 triennial conference and the annual meeting of the IARU Administrative Council will also be held in Seoul shortly after the Olympic games.)

QSL Corner

(continued from page 67)

less) or cards—approximately 155 cards weigh 1 pound. In other words, \$1 is the *minimum charge* whether you send 1 card or 155 cards. Please pay by check (or money order) and write your call sign on the check. Do not send cash.

4) Include only the cards, address label and check in the package. Wrap the package securely and address it to the ARRL Outgoing QSL Service, 225 Main St, Newington, CT 06111.

5) Family members may also use the service by enclosing their QSLs with those of the primary member. Include the appropriate fee with each individual's cards and indicate "family membership."

6) Blind members who do not receive QST need only include the appropriate fee along with a note indicating that the cards are from a blind member.

7) ARRL affiliated-club stations may use the service when submitting club QSLs by indicating

the club name. Club secretaries should check affiliation papers to ensure that affiliation is current. In addition to sending club station QSLs through this service, affiliated clubs may also "pool" their members' individual QSL cards to

effect an even greater savings. Each club member using this service must also be a League member. Cards should be sorted "en masse" by prefix, and a QST label enclosed for each ARRL member sending cards.

Countries Not Served

A5	Bhutan	KH5	Palmyra and Jarvis Is	TZ	Mali	3C	Equatorial Guinea
A6	United Arab Emirates	KH7	Kure Is	V4	St Christopher and Nevis	3V	Tunisia
A7	Qatar	KH9	Wake Is	VP2E	Anguilla	3W	Vietnam
BV	Taiwan	KP1	Navassa Is	VR6	Pitcairn Island	3X	Guinea
C9	Mozambique	KP5	Desecheo Is	XT	Burkina Faso	4W	North Yemen
D6	Comoros	P5	North Korea	XU	Kampuchea	5A	Libya
ET	Ethiopia	SU	Egypt	XW	Laos	5H	Tanzania
HZ	Saudi Arabia	T2	Tuvalu	XX9	Macao	5R	Madagascar
J5	Guinea-Bissau	T3	Kiribati	XZ	Burma	5U	Niger
KC4	US bases in Antarctica	T5	Somalia	YA	Afghanistan	5X	Uganda
KC6	Belau	TJ	Cameroon	ZA	Albania	7O	South Yemen
KC6	Micronesia	TL	Central African Rep	ZD7	St Helena	7Q	Malawi
KH1	Baker and Howland Is	TN	Congo	ZD9	Tristan da Cunha	8Q	Maldives
KH3	Johnston Is	TT	Chad	ZK2	Niue	9G	Ghana
		TY	Benin	ZK3	Tokelau	9N	Nepal
						9U	Burundi

The Club Challenge Continues...

Snow flurries usually blanket the Connecticut landscape in December, but this year I didn't even notice because so many active clubs snowed me under with Club Challenge for the '80s League membership applications.

It took a great effort by each of the winning clubs in the 1986 competition. Every club is an ultimate winner in this competition, however, as the ARRL gives a \$5 rebate for every new League membership garnered through your club.

Approximately 25% of all ARRL-affiliated clubs participated in the 1986 Club Challenge for the '80s. If your club hasn't participated in the past, 1987 could be the year that results in a new HF transceiver for your club station! A list of all the rules for the 1987 Club Challenge has been mailed to all actively affiliated clubs.

Congratulations to the following top scorers in the 1986 Club Challenge:

Large Clubs (Over 75 Members)

Club Name	New Members	Section
1) West Coast ARC	69	ORG
2) PHD ARA, Inc	30	MO
3) Santa Clara County ARA	18	SCV

Medium Clubs (26-75 Members)

1) Edmond ARS	50	OK
2) RCA ARC	35	SNJ
3) North Seattle ARC	15	WA

Small Clubs (25 or Fewer Members)

1) Georgia Tech Radio Club	40	GA
2) Frontier ARS	20	NV
3) Eight clubs tied	3	

Each first-place club will receive a new HF transceiver from a major manufacturer. Second-place prizes are yet to be determined for the 1986 competition.



(courtesy Paul Porazinski and Rick Pinchera)

Renewing SSCs

The following renewing Special Service Clubs are listed alphabetically by name, city, state and number of club members:

ARC of Augusta, W4DV, Augusta, GA (31); Arrow Communications Assn, Ann Arbor, MI (T45); Bill Gremillion Memorial RC, Newnan, GA (61); Birmingham ARC, Birmingham, AL (437); Central Kansas ARC, Salina, KS (70); Chautauqua County Amateur FM Assn, Jamestown, NY (72); Cubs ARS of Sedro Woolley High School, Sedro Woolley, WA (38); El Paso ARC, El Paso, TX (177); Foothills ARC, Inc, Jeannette, PA (69); Fort Wayne RC, Inc, W9TE, Fort Wayne, IN (192); Great South Bay ARC, Babylon, NY (81); Greater Cincinnati ARC, Cincinnati, OH (550); Greater Fairfield ARA, Weston, CT (118); Greater Toledo ARC, Inc, Toledo, OH (57); Hampden County Radio Assn, Inc, W Springfield, MA (203); Hattiesburg ARC, Inc, Hattiesburg, MS (45); Knickerbocker ARC, Port Washington, NY (16); L'Anse Creuse ARC, Utica, MI (174); Larkfield ARC, Commack, NY (230); Long Island Mobile ARC, Inc, Long Island, NY (571); Lower Columbia ARA, Inc, Longview, WA (53); Metropolitan ARC, N Little Rock, AR (51); Mid-Atlantic ARC, Villanova, PA (117); Monroe County Communications Assn, Monroe, MI (40); Motor City RC, Wyandotte, MI (97); Murgas ARC, Wilkes-Barre, PA (102); Nashua Area RC, Nashua, NH (226); Newport County RC, Newport, RI (49); Ogden ARC, Ogden, UT (51); Paul Bunyan Wireless Assn, Pequot Lakes, MN (23); Pilot Knob ARC, Leavenworth, KS (38); Platinum Coast ARS, Melbourne Beach, FL (220); Portage ARC, Inc, Mantua, OH (85); Radio Central ARC, Miller Place, NY (207); Ramapo Mountain ARC, Pequannock, NJ (82); Reservoir ARA, Celina, OH (31); Rockford ARA, Rockford, IL (102); Shelby County ARC, Alabaster, AL (45); Silver Springs RC Inc, Ocala, FL (198); Steel City ARC, Inc, Carnegie, PA (132); Tu-Boro RC, Flushing, NY (33); Two Rivers ARC, Inc, W Mifflin, PA (59); Triple States Radio Amateur Club, Adena, OH (700); Vicksburg ARC, Inc, Vicksburg, MS (70); Virginia Beach ARC, Virginia Beach, VA (179); Wabash Valley ARA, Inc, W9UUU, Terre Haute, IN (90); Wantagh ARC, Wantagh, NY (51); Wheaton Community Radio Amateurs, Wheaton, IL (194).

New SSCs

The following new Special Service Clubs are listed alphabetically by name, city, state and number of club members:

ARC of El Cajon, El Cajon, CA (150); Anoka County RC & Emerg Services Inc, Blain, MN (75); Big Island ARC, Hilo, HI (84); Brazosport ARC, Lake Jackson, TX (61); Des Moines Radio Amateur Assn, Des Moines, IA (195); Evergreen Amateur Radio Services, Port Ludlow, WA (35); Fort Venango Mike & Key Club, Cranberry, PA (66); Frontier ARS, Las Vegas, NV (9); Fulton ARC, Oswego, NY (49); Lake County ARA, Painesville, OH (115); Miami County ARC, Peru, IN (14); Michiana ARC, South Bend, IN (109); Montgomery ARC, Inc, Montgomery, AL (112); Northwest Arkansas ARC, Prairie Grove, AR (180); Pacific Radio Amateur Transmitting Society, Kane'Oh'e, HI (13); Palomar ARC, Vista, CA (321); Raleigh ARS, Inc, Raleigh, NC (126); Sierra Foothills ARC, Auburn, CA (103); Tippecanoe ARA, Inc, Lafayette, IN (32); Woodbridge Wireless, Inc, Woodbridge, VA (131); Worthington ARC, Worthington, MN (28).

Strays



QST congratulates...

the following radio amateurs on 60 years as ARRL members:

- G. E. Mertz, W3LI, of Philadelphia, Pennsylvania
- Myron Hexter, W9FKC, of Highland Park, Illinois

Bo Bo Pike, W0HV, of Independence, Missouri, on being installed into the Square Dance Callers Hall of Fame.

Youth Forum '86

The 1986 ARRL National Convention, which took place in San Diego this past September, attracted a larger number of young people than usual. The reason? A new forum, with a format different from any other, was added to the schedule of events. The new forum was one designed just for young people. Attendance was estimated to be more than 200 kids, some having received their licenses, but most not. This fact made no difference, however, as the program was aimed at all young people whether or not they had been licensed. The convention personnel came up with a great idea to make sure young people would have the opportunity to attend. They distributed 600 tickets to area teachers, good for free admission to the forum and convention.

The moderator for the forum was Dr Anthony "Tony" England, W0ORE, who was on Spacelab 2 and the SAREX Challenger Shuttle mission. Dr England introduced the panelists, led the discussions and contributed his own experiences in Amateur Radio.

One of the panelists was Gordon West, WB6NOA. Mr West is the 1985 Herb S. Brier Instructor of the Year. It is a well-deserved award, as through his school he has licensed over 4000 people. He did what he does best: convince people that ham radio is not only educational, but fun.

Harold Price, NK6K, spoke on the widening applications for computers with emphasis on Amateur Radio uses. As he pointed out, not only do we use computers for packet operation, but computers often control our rigs and repeaters as well. This is something we take for granted, but would not have been considered possible 10 years ago.

Jerry Boyd, KG6LF, Chief of Police for Coronado, spoke on his main interest: public service. His stories of how Amateur Radio has saved the day in both natural and man-made disasters held the audience's attention—not an easy thing to do with a group of youngsters who had already been sitting for about an hour.

This column conductor was asked to speak to the group because I am about the age the forum was trying to target, and I am an active



The Santa Barbara ARC ARES van is a big hit with young attendees. (W6UZL photos)



The Youth Forum audience reflects the interest that Amateur Radio can generate.



Bob Zakoski, WA6MTF, Convention Youth Activities Director, chats with Mary Duffield, WA6KFA, a Santa Cruz teacher noted for her work in promoting international communication and cooperation among youth.

amateur. I detailed my ideas for generating more interest in Amateur Radio among youth. More one-to-one contact is needed. This is what brings people into the hobby and keeps them interested. Dr England took the floor after all the panelists had finished and wrapped up the speaking portion of the meeting.

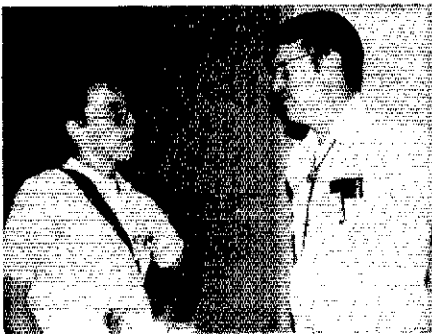
The audience then split into two groups. One group went to the Tiki Hut, where radio systems of all types were arranged and operating. This offered great hands-on experience to the kids, who got to fiddle with all the knobs and dials while asking questions of the operators there.

The other group remained in the convention hall, and a question-and-answer session was opened. At first, a majority of the questions were for Dr England, regarding his experiences in space. But as the discussion continued, it gradually shifted back to ham radio, giving the other panelists a chance to share more information.

Once both groups had visited the Tiki Hut and participated in the question-and-answer sessions, there was a break in the program, which gave people a chance to stretch. Many of the participants took this chance to get Dr England's autograph or picture.

The Forum had been scheduled to run three hours; all the interest caused it to run overtime. Both Bob Zakoski, WA6MTF, Director of Youth Activities for the convention, and Walt Hicks, W6UZL, Convention Chairman, deserve credit for the great job they did on planning and organizing the Youth Forum.

I taped the speeches and some of the discussion at the Youth Forum. If you would like a copy, just send me a blank tape and 50 cents to cover postage and handling.



Dr Tony England, W0ORE, addresses a question posed by a forum participant.



CRRL Officers and Directors

President: Thomas B. J. Atkins, VE3CDM
Vice President and Secretary: Harry MacLean, VE3GRO
Treasurer: William Loucks, VE3AR
Honorary Vice President: Noel B. Eaton, VE3CJ

Directors: Ron Hesler, VE1SH
Claude Brunet, VE2ZZ
Raymond W. Perrin, VE3FN
William A. Gillespie, VE8ABC
David Fancy, VE7EWI
Counsel: B. Robert Benson, QC, VE2VW
Suite 1600, 2020 University Ave
Montreal, PQ H3A 2A5

CRRL Headquarters Office: Box 7009, Station E
London, ON N5Y 4J9, Tel 519-225-2188
General Manager: Raymond Staines, VE3ZJ
CRRL Outgoing QSL Bureau: Box 113, Rothersay,
NB E0G 2W0
Bureau Manager: Donald Welling, VE1WF

Bringing People Together...

Roy Parrett, VE7TG, never thought he'd end up as a marriage broker or a family-finder, but he did. Roy is an electronics instructor at LPC, Lester Pearson College, in Victoria, British Columbia. LPC specializes in bringing together students and teachers from all over the world. Its goal is international understanding. And for the past seven years, Roy has been helping to achieve that goal by sharing his enthusiasm for Amateur Radio.

It was that enthusiasm, instilled by Roy through his Amateur Radio classes, that led to the marriage of two LPC graduates, Nina Pejnovich of Lima, Peru, and Juan Carlos Martines of Caracas, Venezuela. Juan returned to Venezuela in 1983, and Nina to Peru in 1984, but the courtship, started in Roy's classes, continued over the air. Soon, Nina and Juan were visiting each other in their respective countries. When they became engaged, Roy was among the first to be notified and to receive a picture.

Another student, Ximena van Gelder, had come from Ecuador. She had never met her father, but had reason to believe that he lived in New Jersey or New York state. Using the college station, VE7LPC, she began asking American amateurs to look in phone books for her father's name. Her father was finally located in Syracuse, New York. The first thing she did after graduation was visit him. Now, working on a medical degree in Ecuador, Ximena has a happy relationship with a father she never knew.



Ximena van Gelder (centre, foreground) found a father she had never known through Lester Pearson College Club station VE3LPC. Also shown (l-r) are Marcela Garcia, of Colombia; Juliette Warren, C6ADG, at the mike; Marco Perkovic, OA4BIK; club sponsor Roy Parrett, VE7TG; Bert King, VE7BIK; and Al Wilson, VE7AXW. (VE7TG photo)

Says Roy, "This is the sort of spin-off that makes volunteer work in Amateur Radio very special."

THIRD-PARTY-TRAFFIC AGREEMENTS

□ The following countries have concluded third-party-traffic agreements with Canada: Antigua and Barbuda, Australia, Bolivia, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, El Salvador, Grenada, Guatemala, Haiti, Honduras, Israel, Jamaica, Mexico, Nicaragua, Paraguay, Peru, Trinidad and Tobago, United Kingdom, United States, Uruguay and Venezuela. Note that the United Kingdom agreement applies to certain special-event stations only.

CRRL NEWS

□ CRRL Awards manager Garry Hammond, VE3XN, has also been appointed CARF Awards Manager. Garry now is checkpoint for IARU's Worked All Continents Awards, ARRL's Worked All States Awards, CARF's Canadawards, CRRL's Worked All QST Awards, and more. Got a question about awards? Contact Garry at 5 McLaren Ave, Listowel, ON N4W 3K1.

□ Last fall, Dick Reiber, VE3IBV, organized a "QST QSO Party." The idea was to get all of CRRL's key bulletin stations, those with "QST" call signs, on the air at once, to give amateurs a chance to make contacts for the Worked All QST Award. In spite of little publicity, it was a success and it's going to be done again. Listen for "QST" stations operating CW April 4 and 5 on the bottom 50 kHz of the following bands at the times indicated: 20 m—1700 UTC, 15 m—1800 UTC, 10 m—1900 UTC, 40 m—2000 UTC and 80 m—2100 UTC. Listen for "QST" stations operating phone on April 11 and 12 on the following frequencies at the times indicated: 14.11-14.15 MHz—1700 UTC, 14.2 MHz up—1800 UTC, 21.25 MHz up—1900 UTC, 28.4 MHz up—2000 UTC and 3.76 MHz up—2100 UTC.

□ There's a new "QST" station on the air. VY1 Incoming QSL Bureau Manager Bill Champagne, VY1AU, has become trustee of VY1QST. Thanks, Bill!


NOTES FROM ALL OVER

□ At press time, the law firm that was working on the Jack Ravenscroft case was still waiting for the transcript of Jack's trial. The transcript is needed to prepare an appeal. Meanwhile, the Jack Ravenscroft Susceptibility Fund has been audited. As of 1986 September 30, cash receipts consisting of donations, exchange on foreign currency and interest totaled \$62,330.96. Cash disbursements consisting of legal fees, office supplies and bank service charges totaled \$24,683.59. Excess of receipts over disbursements—and the amount on hand to finance the appeal—was \$37,647.37.

□ As a result of work by CRRL Ontario Director Ray Perrin, a resolution by the City of Nepean, asking the Association of Municipalities of Ontario and the Federation of Canadian Municipalities to petition DOC to give municipalities some clear regulatory control over the size and placement of antennas, specifically excludes antennas that form part of federally licensed installations. That means *amateur* installations.

□ RABC, the Radio Advisory Board of Canada, will hold a special conference, *Spectrum 20/20: A Symposium on Spectrum Usage: Future Directions in Canada*, in Montreal on May 12-13. CRRL and CARF will represent radio amateurs.

□ CRRL and CARF will jointly sponsor the next National Amateur Radio Symposium, to be held in Saskatoon later this year, in conjunction with the Saskatchewan Hamfest.


□ Calgary will be hosting the 1988 Olympic Winter Games. Prior to those games, an Olympic Torch Relay will pass through communities in every part of Canada. Radio amateurs are needed to provide communications support. Can you help? Contact Don Cole, VE6EY, 923 Whitehall Way NE, Calgary, AB T1Y 3G1, tel 403-280-4177. 

Washington Mailbox

(continued from page 69)

he is probably not interested in knowing the technical cause of the interference: he simply wants the interference stopped. Many people are confused by the distinction between Amateur Radio and CB. Once you explain to your neighbor what Amateur Radio is, he may be more understanding. The FCC recognizes the cooperation amateurs give in resolving RFI cases.

RFI problems can be solved; the keys are *information, cooperation and action*. The ultimate solution is the incorporation of the required RF immunity during the initial design by the manufacturers and their meeting the voluntary standards. Although the FCC has the authority to mandate standards, it has decided to try the voluntary route first. The Electronic Industries Association has an ongoing program with its member manufacturers toward this goal.

[Note: Questions in this column are typical of those asked of the FCC and other agencies. Questions and answers that appear are prepared by ARRL staff and have been reviewed by the FCC's Field Operations Bureau for agreement with current FCC interpretations and policy.] 

The Dreaded CTCSS and You!

RCA calls it "Quiet Channel" (QC). GE calls it "Channel Guard" (CG). Motorola calls it "Private Line" (PL). Whatever it is called, it is essentially a form of Continuous Tone Coded Squelch System (CTCSS), "any one of 37 standard tones established by the EIA that range from 67.0 to 250.3 Hz. This group is generally referred to as the subaudible tone group—subaudible because the tones are set at a very low deviation (usually around 500 Hz in a 5-kHz system) and because the corresponding receiver generally has a high-pass filter installed in the audio chain to prevent the tone from reaching the speaker."

Commercial two-way radio has used CTCSS successfully as a means of protecting and expanding the use of commercial FM repeaters for many years. On the other hand, Amateur Radio has not taken full advantage of CTCSS to solve its FM repeater interference problems. With more and more repeaters going on the air every day, new interference problems arise, so it is time that amateur repeater operators consider using CTCSS to eliminate interference.

Cochannel Repeater Problems

Two repeaters on the same frequency with overlapping coverage cause a variety of problems for their users. A common problem is that a user of one repeater may transmit through both repeaters at the same time when

he intends to transmit through one repeater only, thus, interfering with the users of the repeater he is not intending to use.

Another problem occurs when a user of one repeater receives both repeaters at his operating location when he wishes to receive only one repeater. When both repeaters are transmitting simultaneously, the stronger repeater will "capture" the weaker repeater. Assuming the user wishes to receive the stronger repeater, there is no interference problem because the stronger repeater will be received loud and clear over the weaker repeater. However, if the user wishes to receive the weaker repeater, the stronger repeater will interfere with his wishes.

A related problem occurs when a user receives both repeaters at his operating location and does not wish to listen to the activity on the other repeater. Whenever "his" repeater is off the air, he must listen to the chatter on the other machine unless his receiver's squelch shuts up the problem.

CTCSS to the Rescue

CTCSS may be applied in different ways to eliminate all of these problems. Total CTCSS control occurs when the repeater receiver requires a continuous tone encoded signal to activate the repeater transmitter. The repeater transmitter in turn regenerates both the receiver audio and the CTCSS signal to open the squelch circuits of mobile and base receivers within the system. Only users with the proper CTCSS encoders and decoders can access and receive the repeater. As a result,

users of the other repeater on the same frequency cannot transmit through this repeater and users of this repeater cannot receive the other system at any time.

Partial CTCSS control occurs when the repeater receiver requires CTCSS, but the subaudible tone is not retransmitted. This repeater is still protected from users that are outside the major coverage area, but does not help users trying to listen to only one repeater at one time.

Anti-CTCSS Control occurs when the users of the other system are using CTCSS and the receiver of the local repeater is also equipped with a CTCSS decoder. This decoder detects the CTCSS user, but does not allow him to be transmitted by the repeater. Transmissions by users within the intended system are repeated as normal without the need for CTCSS.

CTCSS Opens Repeaters

Unfortunately, many people have the misconception that CTCSS makes their system a "closed" repeater. This is not true. Using CTCSS, the technical committees of respective repeater groups can open cochannel repeaters on a noninterference basis.

Subaudible tone encoding systems can be a realistic method for reducing cochannel interference. Although not the be-all and end-all solution, when used with antenna pattern adjustments and user education, CTCSS can help.—*Ivan Dahl, WB6TIA, from the newsletter of the Northern Amateur Relay Council of California (NARC)*

¹M. Wilson, ed, *The 1987 ARRL Handbook* (Newington: ARRL, 1986), p 14-16.

THE PACKET RACKET

I am writing one week after Christmas, and you know what that means? By now, some of the local hams have finally hooked up their brand-new TNCs, figured out the commands and are sending packets on 145.01 MHz. Most likely, their packets are directed at W1AW-4 or one of the other dozen local packet bulletin board systems (PBBS) and they are downloading the PBBS operating procedures or an antiquated (new yesterday, out-of-date today) digital repeater map. At the same time, some of the other newcomers are trying to exchange packets with other newcomers across town. However, not much information is being transferred because everyone is trying to do everything on the same frequency, which results in packet collisions, which result in packet retransmissions, which results in new TNCs gathering closet dust within a week or two.

The packet racket is on 145.01 MHz, but some folks are finally trying to do something about it. Various frequency coordinators are trying to come to grips with the problem and have recommended that certain frequencies be set aside for certain packet-radio applications. PBBS, digital repeater and local user-to-user applications all have their own recommended frequencies.

If your coordinator has made such recommendations, it will be beneficial to all if you follow the recommendations. On the other hand, if your coordinator has not made such recommendations, it is time to get in touch with your

coordinator and find out what the coordinator plans to do about the problem. If he has no plans or lacks the knowledge to deal with the problem, perhaps you can lend a hand and, if you are lucky enough, you may find yourself as a member of the frequency coordinator's packet radio subcommittee. Either way, your cooperation is essential to the continued health of amateur packet radio.

REPEATER LOG

According to November 1986 reports received,

repeaters were involved in the following public-service events: 303 vehicular emergencies, 39 public-safety events, 25 medical emergencies, 15 drills/alerts, 7 fire emergencies, 3 criminal activities, 3 power failures, 3 search-and-rescue events and 3 weather emergencies.

The following repeaters were involved (followed by the number of events):

WA1DGW 27, W2VL 41, WA2ZWP 5, N4AGN 3, WA4BVW 32, WA6BJY 5, WD6DIH 11, KA6BEK 52, W6FNO 213, K8DDG 8, W0BLK 4.

Mini Directory

As a convenience to our readers, here is a list of items of particular interest and when they most recently appeared in QST.

Advisory Committee Members	May 1986, p 48	License-Renewal Information	Jan 1987, p 58
Club Contest Rules	Jan 1987, p 81	Major ARRL Operating Events and Conventions—1987	Jan 1987, p 57
DX Contest Awards Program	Feb 1987, p 82	QSL Bureaus	
Frequency/Mode Allocations	Jan 1987, p 58	Incoming	Dec 1986, p 57
Golden Jubilee of DXCC Award	Sep 1986, p 60	Outgoing	This issue, p 67
Hamfest Calendar Rules	Sep 1986, p 84	Reciprocal-Operating Agreements	Dec 1986, p 53
Ham Radio-Related Landline BBSS	Nov 1986, p 58	Third-Party-Traffic Agreements	Dec 1986, p 53
International DX Contest Rules	Dec 1986, p 80		

How About Used Gear for 80- and 40-Meter CW?

(continued from page 50)

as actually seeing the equipment working, but it's better than making no checks at all. If the innards of the equipment look clean, the rig has probably been well cared for.

Usually, though, I just ask if the rig is okay. If the seller says "yes," and the price is right, I buy. I've hardly ever been stung. Hams tend to be honest, and when they know the equipment is for a beginner they are really helpful. I've even heard sellers go out of their way to tell a Novice that another piece of gear would be more

suitable for a beginner! Still, caveat emptor.

Parting Shots

Be sure to ask your seller about the instruction manual for any equipment you buy. If the manual isn't available, this can be a bargaining point you can use to lower the price a bit. Manuals for many makes of older equipment are available for around \$7 to \$10 by mail (see the accompanying sidebar, "Where to Find Out More About Used Gear").

Before you leave the hamfest, you may be able to pick up additional necessary supplies. These include wire for your antenna and feed line; insulators; ground

rods; plugs and connectors; spare tubes; an antenna relay; a low-pass filter; and older editions of *The ARRL Handbook* and other radio publications. Poke around and have fun!

Don't let the cost of new equipment scare you off the air. Your local hamfest may be just the place to find all the equipment you need to have a lot of fun on the 80- and 40-meter Novice bands. See you there!

When Larry Lisle, K9KZT, isn't scouring hamfests for equipment bargains, he teaches 5th grade science at St Rita School in Rockford, Illinois. For a look at Larry's success story on turning out Novices who are turned on to Amateur Radio, see "Ham Radio—A Class Act in School," Jan 1986 QST.

Strays



I would like to get in touch with...

Alaska hams interested in contacting Oregon via VHF over-water tropo duct experiments. David Palmrose, NY7C, 9200 SW 91st 8-L, Portland, OR 97223.

anyone with a manual for Linear Systems (Sideband Engineers) LST 275, commercial SB34. Darryl Dippel, WA5AAO, Box 335, La Grange, TX 78945.

anyone with information on the activity or past membership of the Sabana Seca ARC, KP4USN (ex-KP4BFF, ex-KP4UH). Donald Munson, KB4RAC, Box 921, Naval Base, Sabana Seca, PR 00749.

hams who are also Texas Exes, and have experience with school clubs and advice on fund-raising techniques, public service and other activities. Curt Black, WR5J, President Univ of Texas ARC, Texas Union Box 170, Austin, TX 78713.

operators in HF direction finding, US Coast Guard, 1945-1946, at Poyners Hill, NC, Cape May, NJ, Glynco, GA and Pensacola, FL. Ted Phelps, W8TP, 6289 Olde Orchard Dr, Columbus, OH 43213.

W1AW Schedule

October 26, 1986—April 5, 1987 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
GBT	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, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 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.

On Monday, Wednesday and Friday, 1400 through 2200 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz; on Wednesday at 2300 UTC they are beamed south.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.

Fast code practice is 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 July 1986 QST, pages 9 and 84," indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 84.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Wednesdays at 2330 UTC, an IARU Region 2 bulletin in English and Spanish on 45.45-baud Baudot is sent on the regular teleprinter frequencies, beamed to Central and South America. The 2300 UTC Teleprinter Bulletin transmission is also beamed south on Wednesdays.

On Tuesdays and Saturdays at 2330 UTC, Keplerian Elements for active amateur satellites will be sent on 45.45-baud Baudot on the regular teleprinter frequencies.

W1AW CW and voice bulletins are sent on OSCAR 10, Mode B, subject to reactivation of the transponder. Look for CW on 145.840 MHz and SSB on 145.962 MHz.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1600 UTC transmissions, and 2300 UTC on ThFSn. During other transmission times, AMTOR is sent only as time permits.

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.

NEXT MONTH IN... QST

- Results, Messiest Shack Photo Contest
- Profile: Roy Neal, K6DUE

Beginning on Microwaves

I have received a few letters recently asking advice on the "easiest" way to get started on microwaves. This is not an easy question to answer since the term "microwaves" covers a large part of the RF spectrum. The amateur microwave bands differ greatly in their propagation characteristics, and equipment ranges from all solid state to mostly plumbing! As reported elsewhere in this month's column, 1296 MHz can be a real DX band. Contacts of several-hundred miles can be made even in the absence of an opening. Most 1296-MHz operation is from fixed home stations. Commercial equipment for 1296 and 2304 MHz is available from a number of suppliers, so getting started there is easy.

Higher in the amateur microwave spectrum, most work at 3.4 GHz and above is connected with portable locations. With simple equipment, contacts are usually limited to line-of-sight, which can be 100 km or more. Under exceptional conditions, however, contacts in excess of 1000 km have been made. Of the higher microwave bands, 10 GHz is probably easiest. There are several easy approaches and a fair amount of commercially available equipment.

The simplest 10-GHz station requires only an RF source/mixer, a modulated power supply, a small horn antenna and a broadcast FM receiver. The RF source/mixer assembly is usually a Gunn diode or a Doppler module based on a dielectric resonance oscillator (DRO).

DRO modules are intended for use as intruder alarms and are usually pretuned to 10.525 GHz, but they can almost always be

tuned to the 10-10.5 GHz amateur band. A DRO module contains both an RF source and a mixer diode. In the intended application, RF emitted from the module strikes a moving object and is reflected back into the module. This reflected energy will be shifted slightly from the transmitted frequency by the Doppler effect. It will mix with the outgoing signal in a mixer diode to produce a difference signal. The difference signal is in the AF range for objects moving at normal speeds. If, however, the module receives RF energy not from reflections of its own output, but from a second module tuned at a frequency 100 MHz lower, then these two signals will mix to produce an output at 100 MHz. A broadcast FM receiver can be used for amplification and demodulation of the 100-MHz signal. The RF source can be frequency modulated by varying slightly the voltage supplied to it.

Doppler modules seem to be appearing at flea markets more often. Mitsubishi used to make a nice FET DRO module, but production has now ceased. If anyone knows of a current source of low cost modules, I would be pleased to share that information with the readers of this column.

A better RF source/mixer assembly is the Gunnplexer module produced by Microwave Associates. These modules are optimized for communications use rather than motion detection and contain a separate varactor diode for modulation. They are somewhat more expensive than Doppler modules, but they do perform better. Gunnplexer modules

(and complete systems) are available from Advanced Receiver Research, Box 1242, Burlington, CT 06013, tel 203-582-9409. Prices start at around \$90.

For narrowband 10-GHz work, a recent product of interest is the SSB Electronics 10-GHz to 144-MHz linear transverter. Although more expensive than the Gunnplexers, the transverter offers great DX possibilities. For more information, contact Hans Peters, VE3CRU, Box 6286, Station A, Toronto, ON M5W 1P3, Canada, tel 416-759-5562.

Recommended reading for those interested in starting microwave activity includes the following books:

- *VHF/UHF Manual*, published by the RSGB and available from ARRL. This publication covers all aspects of operation through 24 GHz and includes information on low-cost systems for 10 GHz.

- *The Microwave Newsletter Technical Collection*, published by RSGB and available from ARRL. It contains articles about the bands above 1296 MHz, including construction of wideband and narrowband 10-GHz systems.

- *The Gunnplexer Cookbook* by Bob Richardson. Currently out of print, this book deals with the operational aspects of 10-GHz Gunnplexers, including circuits for modulation, AFC, calibration and video transmission.

- *The 1987 ARRL Handbook*. You should have this one anyway! Recent editions deal with all aspects of microwaves, including 10-GHz Gunnplexers.

10-GHz REPORTS

Information is still coming in concerning activity in the ARRL 10-GHz Cumulative Contest, held last fall. The results of that contest appear elsewhere in this issue. Roger Webb, WB4WTC, reports activity in Virginia and North Carolina. His best contact was on the first weekend of the contest when he worked WB4YJC over a 189-km path from Mount Mitchell to Hanging Rock Mountain, NC. WB4YJC, who hiked for over an hour to reach the summit of Hanging Rock, used a homebuilt 10-mW polaplexer and an 18-inch dish. WB4WTC used a 10-mW ARR Gunnplexer and a 25-inch dish, as shown in the accompanying photograph. Other stations participating in the contest were WA4PGI, KB4XX, KB4NT and WA4IVF.

Chuck Swedblom, WA6EXV, reports in the San Bernardino Microwave Society newsletter that WB6DNX is operating an X-band beacon on 10.265 GHz from Santiago Peak. The beacon is operational 24 hours a day.

THANKSGIVING OPENING

As reported last month, there was an excellent opening on the lower microwave bands last Thanksgiving. Al Ward, WB5LUA, has written with details of some of his DX contacts during this opening. On Nov 28-30,



WB4WTC used this setup on Mt Mitchell, North Carolina to work WB4YJC on Hanging Rock Mountain, 189 km away.

1986, he worked K9HMB, WB8BKC, N0IS, W8YIO, K8WW, W2DRZ, N180, W3QIZ, WA3TTS, WB3CZG, K0SMI and K0TLM on 1296 MHz. The best DX was WB3CZG, at 1280 miles. During the same opening, KD5RO also worked WB3CZG for a new US DX record of 1286 miles. Al comments that he now has 26 states and 80 grid squares on 1296 MHz.

On 2304 MHz, WB5LUA reports working K9HMB (Illinois) at a distance of 787 miles, and W8YIO (Michigan) at a distance of 933 miles. This gives Al a total of 11 states and 26 grid squares on 2304 MHz. Unfortunately for Al, KD5RO also worked W8YIO on 2304 for a new DX record, as reported last month! Al comments that it's tough to set new records when the major openings are to the northeast and his local "competition" lives south and southwest of his QTH!

There was also Dallas-area activity on 3456-MHz during the opening as described by Kent Britain, WA5VJB. Kent's 3456-MHz power amplifier was out on loan, but signals from W7CNK in Oklahoma City, OK were so strong that he tried transmitting with just the mixer/filter output and received a 5x7 report on SSB at a distance of 189 miles! Kent then added 13-dB attenuation and got a 5x2 report. The output of the mixer was measured at 0.25 mW, and the attenuation reduced this to about 0.012 mW for the 189-mile QSO—almost 16,000,000 miles per watt! At this range the free-space path loss is 153 dB. Allowing for antenna gain and W7CNK's receiver sensitivity, the path loss at that time was running about 165 to 170 dB. Thus the tropo enhancement came within 15 dB of the free-space path loss. Some opening! [REX]

The World Above 50 MHz

Conducted By Bill Tynan, W3XO
Send reports to PO Box 117, Burtonsville, MD 20866,
or call 301-384-6736 to record late-breaking information.

Updating the Terrestrial DX Records

The last time the terrestrial DX records were carried in this column was in September 1984. Since that time, some changes have taken place, and I have acquired a new computer program to replace the spherical earth model I was using on a hand calculator. Thanks to WSSXD and WBSCCJ of Silicon Solutions, Houston, Texas, I now have a program that takes into account the true shape of the earth and runs on my IBM-compatible computer. Where I have been provided with geographical coordinates, or grid references down to the last two characters, I have recalculated the previously listed distances using the new program.

While several individuals and organizations regularly compile records for specific areas of the world, such as North America, Europe or Australia, as well as maintain separate listings for each propagation mode, it has always been the custom of this column, as originally established by WIHDQ, to list world records without regard to the propagation mode. The premium on QST space, as well as the difficulty of obtaining all the needed information, dictates that this custom be continued.

As the title of the accompanying table states, and as has always been this column's policy, the records listed are for terrestrial propagation. Thus, EME contacts, as deserving as they may be, are not counted. Particularly deserving are those that stretch nearly halfway around the world, thus requiring horizon shots and affording very little common moon time. The distances listed are calculated based on the closest distance between the two stations, as determined by their geographical coordinates or grid locators without regard to the distance actually covered by the signals in getting from the one station to the other. This approach heads off arguments such as "our contact was long path," "bent path" or "mountain bounce," etc.

I believe that the distance calculations, using the new computer program, are accurate—their accuracy depending mainly on the precision of the coordinates or grid locators provided to me. As far as I can determine, the records listed are up to date; but, as always, I am open to comments and corrections if errors have been made or if someone has information regarding new records. I am especially indebted to W1JR for his help in providing information on several recent records.

The preliminaries out of the way, now to the current records.

No new world records are known to this conductor for 6 meters, 2 meters, 1½ meters or 70 cm since those published in September 1984. The small differences from the distances listed at that time are, as stated above, due to recalculation with the new computer program.

For our new 33-cm band, W1JR informs me of a Christmas Eve contact between W2PGC FN02or and K3SIW/9 EN52wa, which certainly appears to represent a record. This occurred during a major tropo opening over much of the eastern half of the country,

Terrestrial World DX Records

Band	Call Signs	Distance	Date
6 m (50 MHz)	JH5HTP/6 and PY5BAB/5	12,413.7 mi (19,977.9 km)	Mar 11, 1982
2 m (144 MHz)	I4EAT and ZS3B	4882.9 mi (7858.2 km)	Mar 31, 1979
1½ m (220 MHz)	KP4EOR and LU7DJJ	3677 mi (5917 km)	Mar 9, 1983
70 cm (420 MHz)	KH6IAA/KH6 and KD6R	2554 mi (4111.2 km)	Jul 28, 1980
33 cm (902 MHz)	W2PGC and K3SIW/9	480.8 mi (773.7 km)	Dec 24, 1986
23 cm (1240 MHz)	WB6NMT and KH6HME	2532.5 mi (4075.7 km)	Aug 13, 1986
13 cm (2300 MHz)	VK6WG and VK5QR	1170 mi (1883 km)	Jan 17, 1978
9 cm (3.4 GHz)	VK5QR and VK6WG	1171 mi (1884.6 km)	Jan 25, 1986
5 cm (5.7 GHz)	G3ZEZ and SM6HYG	610.3 mi (982.2 km)	Jul 12, 1983
3 cm (10 GHz)	I0SNY/EA9 and I0YLI/E9	1031.5 mi (1660 km)	Jul 8, 1983
1.24 cm (24 GHz)	I4BER/6, I4CHY/6 and I3SOY/3, IW3EHQ/3	179.6 mi (289 km)	Apr 25, 1984
63 mm (47 GHz)	HB9AMH and HB9MIN	33 mi (53 km)	Jun 11, 1984



The layout at KC5GB and KH2BH Spring, Texas. John and Cathy are active on all bands from 160 m through 70 cm, with 1½ m as their latest project. For those wanting skeds for the state or grid (EL 29), call 713-376-1616.

reported later in this column. Especially since activity on 33 cm is just getting started, I am particularly anxious for comments with regard to any and all work done on this band, especially concerning any contacts over greater distances than that listed.

The outstanding tropo event that occurred late in November produced new North American overland records for the 70 cm, 23 cm and 13-cm bands, but no new world records. The best 23-cm DX I know of during the opening was between WB3CZG and two Dallas-area stations, WB5LUA and KD5RO—a distance of about 1,290 miles. Since KD5RO is about 6 miles south of WB5LUA, he gets the nod on this one. WB3CZG also worked these and other nearby stations on 70 cm, including WA5VJB at approximately 1320 miles. On 13 cm, contacts between W8YIO Manchester, MI and WB5LUA McKinney, TX (at about 934 miles) and KD5RO (about 940 miles) apparently top all previous overland work on this band anywhere in the world. Here again, KD5RO wins by a 6-mile-long nose.

A new 23-cm record has recently been claimed by WB6NMT and KH6HME, slightly bettering the mark previously set by N6CA and KH6HME.

The 13-cm world record remains where it has been for nine years, with VK6WG and VK5QR for their overwater work across the Great Australian Bight.

According to information received from

SM5AGM, the keeper of the Region 1 records, the 9-cm record previously reported as held by two New Zealand stations was eclipsed in July 1983 by G3LQR and SM6HYG. However, W1JR informs me that the holders of the 13-cm record, VK5QR and VK6WG, have again demonstrated what their part of the world is capable of producing in the way of tropospheric propagation by setting the current mark for this band as well.

SM5AGM also notes that the Region 1 5-cm record is held by SM6HYG JO58rg and G3ZEZ JO01ms. Since the distance, as calculated by my program for their two grid locators, is considerably in excess of the 267 miles previously listed for K5PJR and K5FUD, I must conclude that the two Europeans hold the current world record for the band.

No changes have come to my attention for the 3-cm (10-GHz) band, but SM5AGM's information lists a new European record for the 1.24-cm (24-GHz) band between two Italian teams and an apparent record for the 47-GHz band by a pair of Swiss. Since I have no information pertaining to contacts on this band in other parts of the world, I must consider that this represents the world record.

ON THE BANDS

6 Meters—It's not often that I hear from central British Columbia. VE7BEE Pentiction writes to assure all of us that there is VHF activity in that rather isolated location. Orin says that, in addition to himself, VE7EKH and VE7ASY are active on both 6 and 2 meters with VE7EIK and VE7EHQ joining them on the higher band. Their club station, VE7PRC, is active during the VHF contests. Here's a chance for some really rare grid squares that might be workable during E_s or aurora.

In a letter to W4OO, G4UPS (formerly ZD8TC) summarizes last year's 6-meter E_s activity in Europe. One of the points Ted makes is the number of Continental stations prepared to listen on 6 meters and reply via 28.885 MHz. This might be a hint for some of us during the coming season.

K6QXY writes that his *big* 6-meter monster is up and producing moon echoes. The array, designed by W6UXN, consists of four 1.75-wavelength 10-element Yagis spaced 28 by 24 feet. Bob is now actively looking for 6-meter EME skeds. Any takers?

2 Meters—Tropospheric propagation is normally considered a spring, summer and fall occurrence. Usually, about the only parts of our country where atmospheric bending occurs to any great extent during the winter months is along the Gulf and Pacific Coasts. So, news of a late December tropo session that affected a large portion of the eastern half of the country, including the northern Midwest to western New York, was quite surprising indeed. One of many reporting the event was KD9JQ northwest of Chicago in EN52. Chuck says that the Saturday before Christmas brought a very respectable opening to Kentucky, Tennessee, Arkansas and Virginia. Worked were WD4GSM EM86, N5HTY EN46 and KJ4GK EM75. He picked up two new grid squares, which, when added to the six he gained during the big Thanksgiving opening, brings his total to 139. KD9JQ runs home-brew equipment producing 300 W to an 11-element beam at 42 feet.

AA4XB near Birmingham, AL reports on an opening to Florida that began for him around 1500Z December 26. Bob says that he worked a dozen Florida stations in EL87, EL88, EL89, EL90 and EL98. He notes that particularly strong signals were heard from WA4CHA, W1HDQ/4, N4ORT, KB4QBY and WB2GGP/4. With the latter station, he tried an experiment reducing power to the 1-W level and still maintained readable signals over the 450-mile path. WD4AHZ Sarasota, FL also comments on the same opening, noting he worked 29 stations, including 4 new grids and 2 new states, Kentucky and Indiana. Not bad for the last week in the year! Ron also upped his 70-cm state and grid totals, adding both of the Carolinas. One station worked on that band, N4ELN EM80, was running 10 W to a 2-meter Yagi.

K1FJM/4 tried the showers this year with just 75 W but, nevertheless, was able to complete two of the skeds tried. KJ4JQ Anderson, SC also reports success. During the Geminids, he contacted WA1OUB New Hampshire, W9IP/2 northern New York and WA3HMK

Pennsylvania. W2RS Glen Rock, NJ is another who has praise for the Geminids this time around. Ray reports working W5HUQ/4 Florida EM90, VE1RG FN65, WB8CPW Michigan EN64 and KQ0Z Missouri EM37. Ray runs moderate power, 150 W to an F9FT. The moral should be clear: You don't have to have super power and a huge array to have fun and work new states via meteors, especially during the major showers.

WA2FXB northern New Jersey has been trying to stretch the meteor scatter range a trifle. Up to 1200 miles, it is quite easy to make contacts, but beyond that it gets a lot tougher. In an attempt for slightly greater DX, Sid has been scheduling several stations in Puerto Rico during the recent showers. While no two-way contacts have yet been claimed, traces of signals have been heard at each end. Keep trying, Sid.

The Higher Bands—The unseasonable tropo toward the end of 1986, while producing many thrills on 2 meters, was nothing short of a bonanza for the bands farther up in the spectrum. Many reported 1 1/4-meter contacts, and that band probably saw more activity than it does in the VHF contests. Many new at the band took advantage of the conditions to get a good start on their states and a leg up on VUCC. For example, during the big Thanksgiving opening of 1986, WB9MSV Dunlap, IL EN50 came up with 15 new states and 33 grids. This was accomplished with 15 W to a 14-element KLM at 50 feet. The 70-cm band experienced what could almost be described as a frenzy of activity, with 33 cm, 23 cm and even 13 cm also coming in for a considerable amount of attention. One of the many reporting, W2PGC near Buffalo, worked K5UR Arkansas and W5DFU Oklahoma on 70 cm, the latter being worked also on 23 cm. As mentioned earlier in this column, Sam apparently also set a new 33-cm DX record by working K3SIW/9 on Christmas Eve. Another active on several of the higher bands during that memorable opening

was NO0Y Wichita, KS. On 70 cm, W0RAP Iowa EN42 and KA9SPD Wisconsin EN53 went into the log December 23—joined the following day by KD5RO near Dallas EM13, K9HMB Illinois EN52, WB8BKC Michigan EN72 and WB9WMM Illinois EN51. On 23 cm, W0RAP and K9HMB were worked for two new states. This adds to the three states NO0Y worked during the previous month's opening.

WA3AXV near Philadelphia comments on the Thanksgiving opening. Ron says his area did not get the strong signals that were present to the north of him. Nevertheless, the conditions lasted for longer than any he has witnessed—over 24 hours. The highlights for him were working W9ZIH in Illinois and W8YIO Michigan on 13 cm. K2UYH Trenton, NJ used the same opening to up his 23-cm states total to 25 by virtue of contacts with WA9WFD Wisconsin, K9UIF Indiana and WB4NXY Kentucky. In addition, Al worked many stations on 70 cm, including K5UR and K5YY Arkansas EM35. He noted that the beam heading for them was about 10 degrees north of the direct path. The second of these contacts was at 1311Z November 28. At 1500Z, VE1UT was coming in S9+ on 70 cm, but by 1600Z it was all over.

One who was very excited and pleased by the Thanksgiving-time opening was newcomer to VHF, W8DN Celina, OH. On 70 cm, Mike is running just 40 W to a 20 x 20 circular antenna at 50 feet. The combination was plenty for the occasion, netting him some 40 contacts from Oklahoma to New Jersey. He said that many of the stations he worked were running only 10 W, but doing very well.

There are many more reports on both of these two tremendous tropo openings. I wish I had space enough to put each one in print. They are all very useful and appreciated, whether or not they make it into the column. I read them all and use them to gain an understanding of the length and geographical coverage of major propagation events, such as those that took place in the last month of 1986. Keep them coming.

70-cm Standings

For WAS holders, listings are WAS number, call, state, call areas worked and grids worked. For others, call, state, US states worked, number of call areas worked and grids worked. Call areas are the 10 US call areas plus KH6 and KL7, plus each VE and XE call area, plus DXCC countries not located within the continental limits of the US, Canada or Mexico. Grids are those Maidenhead designators worked since the VUCC Award was instituted January 1, 1983. Those not showing some indication of activity or interest within the past two years are subject to being deleted. They will be reinstated upon presentation, in writing, of a statement that they are still interested in being listed in the 70-cm Standings. It is not necessary to have worked any new states or grids in order to remain listed or be reinstated. Compiled January 9, 1987. Deadline for the next update is July 5, 1987.

WAS Holders				K2OVS NY 16 6 13				K4KAE SC 14 6 —				K5DHU TX 14 5 44				W9YCV WI 8 4 13							
1 W0YZS*	MO	—	—	N2WK	NY	15	9	41	WB4RUA	GA	14	3	28	W5D5BY	TX	14	4	—	K0TLM*†	MO	47	24	91
2 K2UYH*†	NJ	55	—	N2BJ	NY	15	6	32	K4LHB	VA	13	6	—	N5BBO	TX	12	3	58	W0P1W*	CO	28	10	—
3 K5JL*†	OK	48	—	W3RUE	PA	30	10	56	WA4OFS	FL	10	3	20	W5ASH	TX	11	4	38	K0DAS	IA	26	7	—
4 WB5LUA*	TX	41	—	W3IP	MD	27	7	—	WA4OWC	FL	10	—	—	W5UWB	TX	10	3	16	W0FY	MO	24	8	46
5 W5FF*†	NM	28	—	WB3LJK	MD	24	10	50	NI4Z	FL	9	3	—	W5NZS	OK	6	—	50	K0ALL*	ND	23	12	—
6 W1JR*†	MA	49	152	K3QCM	DE	23	—	54	KB4CRT	FL	9	2	31	W6ABN*	CA	43	34	—	WB0DRL	KS	21	6	74
7 W0RAP*†	IA	34	157	K3HZO	MD	22	10	51	WD4AHZ	FL	9	2	31	N6AMG*	CA	9	16	—	W0RT	KS	21	5	54
8 WB0TEM*	IA	—	—	W3ZZ	MD	22	9	58	WD4FAB	FL	9	—	25	K6JYO	CA	9	6	—	W0VB	MN	17	6	—
9 KA0Y*	IA	—	—	WA3FJY	PA	22	9	45	KA4CRT	MS	8	2	16	K6QXY	CA	4	3	—	KF0M	KS	16	5	80
10 WA4MV1*	SC	26	—	AET3	PA	21	7	—	WB4SLM	GA	6	2	13	WA8HXM	CA	4	2	—	KC0QR	NE	15	6	62
				K3IUU	PA	19	5	—	NA4I	GA	5	1	9	W4WD/7	UT	38	33	—	WA0TKJ	KS	15	5	50
				W3XO	MD	13	5	12	W0RRY/5*	OK	43	35	—	W7JF*†	MT	34	25	—	WB0DGF	NE	10	3	25
				AC3T	DE	12	5	17	K5FF*	NM	38	29	—	W7HAH*	MT	25	20	42	W6JRP	MO	9	4	15
				WA3DMF	MD	10	5	13	W5SAFY*	TX	38	28	138	—	—	—	—	WA0NOK	MO	9	3	—	
				W5HUQ/4*†	FL	36	39	—	W5UKQ*†	LA	30	11	—	K8WW*	OH	45	34	—	WB0ZKG	IA	9	3	—
				WB4NXY	KY	29	8	90	K5UR	AR	27	9	128	W8IDU*	MI	41	11	—	K00G	NE	7	2	17
				KC4EG	KY	28	8	65	K5SW	OK	27	9	98	N180	OH	31	10	119	N0BTN	NE	4	2	7
				WA4PCS	KY	27	9	—	W5HN	TX	26	8	62	WB8BKC	MI	30	9	73	—	—	—	—	
				W4FJ*	VA	25	8	—	W5RCI	MS	25	7	—	WB8PAT	OH	23	9	—	KH0HME	HI	2	2	6
				W4ISS	GA	25	8	—	KB5MR	OK	21	5	71	WA8MIL	MI	20	9	55	VE1UT	NS	14	6	—
				WA4CQG*	AL	25	8	—	W5DFU	OK	20	8	58	WB9SNR	IL	34	11	77	VE3LNX	ON	18	6	50
				W54F	GA	23	8	58	W5HMK*	TX	19	6	—	W9ZIH	IL	33	11	—	VE4MA*†	MB	45	43	—
				K4QF	AL	21	—	—	K5JRH	TX	17	4	—	WB9MSV	IL	25	5	91	DL9KR*	49	57	192	
				WA5BC	VA	20	7	—	W5SXD	TX	16	5	27	NC9F	IL	20	9	51	G3SEK*	19	38	152	
				W31Y/4	VA	19	7	—	K5WE	OK	15	4	35	K9SM	IL	16	7	16	—	—	—	—	
				WD4DGF	TN	15	6	29	WA5VJB	TX	15	4	—	KB9NM	WI	9	3	—	—	—	—	—	

*Some Contacts via EME †Worked All Continents —Information not supplied

Floridoras Celebrate 30th Anniversary

This year's Orlando Hamcation will be the setting for an anniversary celebration of the Florida YLs. Thirty years ago, when Fran Foley, W4BIL, and Shirley Hill, W4WPS, met regularly on the air to exchange news, other YLs would pass by the frequency and join in the routine schedules. From those meetings the idea to form a YL association was born. During the Orlando Hamfest, in Rock Springs on April 28, 1957, the group met and formally became known as the Florida YLs.

The first officers were President W4BIL, Vice President W4BWR and Secretary/Treasurer W4GXZ. Since the first Certificate Award Custodian, W4WPD, was selected, the group has given out over 450 certificates. Today, members can earn certificates by contacting five active Floridoras on any band. Contacts toward the certificate are not permitted on the official net.

An early advocate of the Floridoras was Art Benzee, W4FE. In fact, it was Art who coined the term Floridoras, which became the group's official name. For that contribution, the YLs officially adopted Art as their "godfather." W4FE became a Silent Key and, in order to commemorate his support of and interest in the Floridoras, the members applied to the FCC to use his call in memoriam. The request was granted on May 1, 1966. The station's first trustee was K4RHL, followed by WB4FXQ. Today, the memory of W4FE lives on each Tuesday, when the YLs gather on 3.933 at 1400Z to exchange news and weather reports and to conduct business, as well as to promote fellowship among its members.

The eye-catching "Floridora Girl" became the official emblem of the group in 1965, thanks to the talented hand of Dorothy Davidson, K4LFA. Her creation was copyrighted, and all rights were given to the Floridora YL Radio Club by the artist. Today's members display the symbol on jewelry as well as their organization's stationery.

When the Floridoras gather to celebrate their important anniversary, they will boast a membership that currently totals 80 YLs. During the past 29 years, over 400 women have applied for and been granted membership in the Floridoras. Today, several of the charter members continue their active participation in the organization, including W4BWR, W4WPD, K4OEP, W4GGQ and W4KOH. Membership is open to any licensed YL who owns or rents property in Florida for at least three months of the year. Floridoras are regular contributors to the YLRL Scholarship Fund.

To commemorate the group's 30th reunion, the Floridoras are planning a luncheon and annual meeting on March 14 at the Omni Hotel in Orlando. Featured speakers will be W4WYR and W1YL/4. The YLs will sponsor a booth at the Orlando Hamcation that will feature handmade crafts. Those interested in attending the 30th anniversary celebration may obtain more information by writing to Thelma Bolvin, WB4AUR, 1827 Normandy Blvd, Deltona, FL 32738.



Floridoras YLs' party, 1958. Back row, standing (l-r): KN4SMW, KN4UIZ, W4UF, K4RGR, K4QOS, W4PIK, W4KOH, K4LEG, W4BIL. Second row (l-r): W4BWR, a guest, K4RED, K4BQI, W4ZVW, W3CUL. Front row (l-r): W4HRC, W4KZT, K4IDQ, K4PPX, K4RNS, K4OJD, a YL junior op.



WB4AUR (left) and K4UIZ work together to make the Floridoras' 30th anniversary a memorable reunion.



EAST MEETS WEST SSB CONTEST 1800-2200Z March 21, 1987

Eligibility: All licensed women operators throughout the world are invited to participate.

Procedure: Call "CQ YL East" or "CQ YL West." Those considered East are: 1st, 2nd, 3rd, 4th, 8th and 9th call districts, VE1-3, Europe, Africa, South America, Caribbean and Central America (except Mexico). Those considered West are 5th, 6th, 7th, 10th, KL7 and KH6 call districts, VE4-8, Asia, Oceania, Australia, New Zealand and Mexico. Those classified East may count only those classified West, and vice versa.

Operation: All HF bands may be used. No crossband operation. Net contacts, repeater contacts and contacts with OMs don't count. Stations may be worked and counted once on each band.

Exchange: Station worked, RS, QSO number, name and state/province/country. Entries in log must also show date, time and band.

Scoring: Score one point for each different YL worked. Western YLs may count only Eastern YLs, and Eastern YLs may count only Western YLs.

Awards: Winner will receive YLRL postcards.

Logs: Please print or type logs. Do not send a carbon copy of your log. All logs must be signed by the operator. No logs will be returned. Indicate claimed score in the log. Logs must be received by April 21, 1987 by the Vice President, Mary Lou Brown, NM7N, 504 Channel View Dr, Anacortes, WA 98221.

Suggested Frequencies: 80 m—3.940-3.970; 40 m—7.240-7.270; 20 m—14.280-14.310; 15 m—21.380-21.410; 10 m—28.580-28.610.

It is with deep regret that we record the passing of these amateurs:

WA1CGX, Robert C. Crispin, Braintree, MA
*W1FA, Florian O. Forcier, Poughkeepsie, NY
W1FZW, Harry V. Dailey, Rockland, ME
KA1GJM, Phil Livingstone, Calais, ME
W1GKE, Toiva M. Jarvinen, Rockland, MA
W1IAR, Albert M. Dexter, Jr., Old Lyme, CT
K1KON, Anthony Gallonio, Norwalk, CT
KA1LMD, Richard E. Denny, Sr., East Providence, RI
W1QDJ, Arthur W. Ellis, Templeton, MA
WA1UWT, Lewis Harvey Phelps, Jr., Riverside, CT
W2BKH, Homer H. Geisenhoner, Albany, NY
W2BMK, Arthur J. Hesse, Brentwood, NY
*W2DFK, Leonard L. Brown, Glen Head, NY
KA2FTH, Henry L. Gellner, Oradell, NJ
WB2LAT, Carson Seay, Vineland, NJ
WB2NCE, Robert S. Boyd, Bloomfield, NJ
W2NRA, William Nastuk, Tenaflin, NJ
KD2OJ, Jack Saks, Williamsville, NY
K2QHI, Michael Stefanik, Garfield, NJ
*W2UTH, Henry A. Blodgett, Victor, NY
W3FRC, William W. Dykes, West Chester, PA
K3HQX, Frank Jennings, Sellersville, PA
W3VCN, Charles L. Cranfill, Wanchese, NC
W3VP, William J. McCarthy, Ellicott City, MD
WA3WKI, Francis J. McGolin, Ellicott City, MD
*W4BV, Charles M. Lewis, Treasure Island, FL
W4EFV, Judson Vanderhoof, Melbourne, FL
K4FAV, Frank A. Ukockis, Clearwater, FL
KC4LK, Larry L. Schuster, Sr., Prestonsburg, KY
WA4LPC, Gordon N. Hughes, Elsmere, KY
KA4MWL, Jerry L. Worthington, Flatwoods, KY
K4NA, Irving L. Weston, Fort Lauderdale, FL
W4NJX, Richard P. Fulcher, Arlington, VA
W4PJH, Anson H. Coffey, Charlottesville, VA
W4PHM, Arthur M. Peterson, Seminole, FL
W4SSF, Lester E. Webb, Jr., Bellevue, KY
W4SV, Paul L. McGinty, Boynton Beach, FL
W4TFB, Donald E. Morrison, Leigh Acres, FL
W4TTZ, Thomas Blaney, Atlanta, GA
K4WYT, Robert B. Folsom, Elba, AL
KD4ZE, Clifton M. Craig, Raleigh, NC
N5APK, John Miller, Mooringsport, LA
W5CHU, Edgar G. Bowden, Fort Worth, TX

W5DVA, John L. Oliver, Alamogordo, NM
*W5ETM, T. M. Blackmon, Lovington, NM
W5FGF, S. A. Worley, Uvalde, TX
W5SGFE, Wallace H. Strevell, Waco, TX
KA5RAO, Don T. Edwards, Corpus Christi, TX
N6AHC, Robert W. Schaeneman, Stockton, CA
W6BCY, John C. Hallyburton, Sr., Sunnyvale, CA
W6BHM, Wallace R. Bowles, Oroville, CA
N6BTT, Walter E. Stafford, Redondo Beach, CA
N6CKI, Harvey Somers, Balboa, CA
KB6HKN, Vernon J. Radcliffe, Santa Rosa, CA
W6KDK, Stephen J. Foley, San Francisco, CA
WA6MAE, Ronald C. Smith, Sr., San Diego, CA
W6NEL, Jack M. Story, Cucamonga, CA
W6OFL, E. Al Holgerson, Saratoga, CA
*W6OOH, Donald R. Klos, Tustin, CA
W6TQY, Newell Field, Hawthorne, CA
W6VQV, Robert E. Russell, Encinitas, CA
W7BFQ, Albert T. LaPlante, Enumclaw, WA
WB7BYK, Lysie M. Lewis, Mesa, AZ
WA7DKP, Chet Chapman, Mossyrock, WA
K7DRG, Florentine H. Rettig, Shelton, WA
W7DZN, Irving S. Smith, Colville, WA
N7FCN, Howard J. Compton, Soap Lake, WA
WA7LXB, Fred R. Healy, Peshastin, WA
W7MBO, Roy E. Terry, Belfair, WA
KA7MZL, Richard O. Willis, Satsop, WA
K7VVQ, Thorwald O. Jorgenson, Spokane, WA
KB7ZK, Phillip D. Cathey, Elk, WA
W8CBI, Emory S. Bancroft, Morenci, MI
W8CHJ, Arthur F. Schuelke, Hartland, MI
N8CLD, Emmett Doty, Kalamazoo, MI
KA8FGI, Norman B. McKenzie, Rochester, MI
W8GW1, Robert W. Branscomb, Medina, OH
W8JIN, James W. Ringland, Cincinnati, OH
W8JZV, Linn P. Towsley, Stanwood, MI
WD8LRT, Edward D. Jaikins, Bloomfield Hills, MI
W8LSC, George Jeffers, Letart, WV
W8MDN, Albert Bain, Heath, OH
WA8NNY, Albert Paetzold, Virginia Beach, VA
W8OZX, Irving W. John, Toledo, OH
K8RAX, Thomas E. Engle, Honeoye, NY
K8WMT, Rudy H. Eppley, St. James City, FL

K9AIH, Francis Long, Belvidere, IL
W9HDJ, Arthur R. Hetzer, Stevens Point, WI
W9KVE, N. Darwin Covert, Evansville, IN
K9RFJ, Jess H. Leahy, Indianapolis, IN
W9RLW, Leslie K. Laird, Mount Prospect, IL
WB0BVA, Orville M. Cox, Springville, IA
W0DSP, Andrew G. Woolfries, Cedar Falls, IA
W0EYN, B. W. Marschner, Fort Collins, CO
KA0HMB, George J. Slinkard, Bridgeton, MO
W0LHB, Clarence Madland, Park River, ND
K0LPM, Raymond G. McDonald, Omaha, NE
*W0RIU, Charles M. Philpott, Plymouth, MN
W0TBR, Herman Van Leeuwen, Pringhar, IA
K0TWT, Gerhard B. Kjelden, Clear Lake, SD
K0UTN, Percy R. Bartelt, Detroit, MN
VE1AKW, George W. Phalen, Dartmouth, NS
VE3BK, Steve Cyka, Windsor, ON
VE3CUJ, W. Schofield, Willowdale, ON
*VE3FWB, George F. Beaumont, Burlington, ON
VE3GTI, Mildred E. Graham, Belleville, ON
VE3IAR, Edward M. Doane, Scarborough, ON
VE3KEM, George G. Weston, Prescott, ON
VE3LEU, Horst Walker, Scarborough, ON
VE3RD, Palmer A. Thompson, North Bay, ON
FE3IJ, Robert Vanier, Joue les Tours, France
G3CUH, E. H. Butcher, Essex, Great Britain

*Life Member, ARRL

In order to avoid unfortunate 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.

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. □

50 Years Ago

March 1937

□ The Ohio River didn't wait for spring this year to produce a major flood, but amateurs once again were ready and came to the fore to provide emergency communications. Central Division Director W9ZN provides a preliminary report on activity primarily in Ohio and Kentucky. Full report next month. F.C.C. has ordered that 160 and 80 meters be used only for disaster relief communications.

□ Separately, Communications Manager Handy evaluates initial reports and ponders the idea of an "emergency coordinator" appointment for each major population area.

□ TV is years away, but broadcast interference and harmonic emissions are troublesome problems. W8ABX and W3EMM separately experimented with a Faraday shield setup between the tank and antenna coils, and found it a general cure for such spurious radiations.

□ George Grammer's 75-watt exciter-transmitter for 80-40-20 uses bandswitching, but still has plug-in coils so that a choice may be made for a different three-band set.

□ The optimum combination of inductance and capacitance in a tank circuit depends, among other things, on plate voltage and power input, so W1QP outlines the principles, together with easy-to-read charts for both single-ended and push-pull amplifiers.

□ President Roosevelt proposes to abolish the Federal Communications Commission and return its functions to the Department of Commerce as in days of yore. Congress is unlikely to relinquish communications control by such action.

□ We hams can learn a lot as by-products of

hamming, particularly about geography from our DXing. W1JPE adds to the educational aspects with a home-built "earth-model," consisting of a small globe and indicators which show the best propagation paths for any hour, any day of the year.

□ I.A.R.U. News lists major international operating awards and their rules—Worked All Continents, Worked British Empire and "DSM" (German Transmitting-Master).

□ Expanding on his basic article in last November QST, covering horizontal antenna directivity, W1DF adds a few points on harmonic operation and the effects of tilting.

□ A statistical analysis of our journal compared with all other U.S. radio publications shows undeniable leadership; e.g., QST provides more words of reading matter than any other mag—43% more than the nearest competitor! It is pointed out this results from our non-profit status, where "profits" are plowed back to make it a better journal, rather than going into owners' pockets.

25 Years Ago

March 1962

□ The Board of Directors, seeking a solution to the problem of overcrowding at Hq., has now approved its Housing Committee's proposal to move from West Hartford and construct a new building, expressly designed for League purposes, on the seven acres surrounding W1AW in Newington.

□ The editorial explores alternatives for financing: Deplete our financial reserves? Issue bonds? Or how about a building fund supported by member contributions?

□ Florida's susceptibility to hurricanes has prompted state amateurs to build especially efficient emergency communications setups. W4MLE describes the organization and operation, with particular data on its outstanding performance in the recent Simulated Emergency Test.

□ Launched December 12, Oscar I ceased operation December 30. But, the space age for amateurs is here for certain. W6SA1 expects OSCAR II this spring and outlines the type of reports that are needed to make the second flight even more useful. W6VKP goes into considerable detail, complete with explanatory diagrams, on how we can make our own orbital predictions from Doppler measurements.

□ W1ICP describes a simple unit which provides 50-kc. marker points so that the Novice, in particular, can be sure to stay inside assigned sub-bands.

□ The second and sixth call areas are still growing fast, and FCC will be issuing WB prefixes in those districts shortly.

□ W5QZK avoided having to build another power supply for mobile work in his new 12-volt automobile by using "hybrid" tubes where 12 volts is the plate supply rating.

□ A camera "gadget" bag makes a convenient carrying case for W6YBT's 2-watt, all-transistor, portable 6-meter station.

□ The 6939 twin pentode tube is one of few tubes that work well at 432 Mc., and K2BTM has chosen them for the tripler and amplifier in his 5-watt unit.

□ W9LHF has devised an "autocall" system which responds only to a specific sequence of four selected audio tones, which you can choose from 24 possibilities. While waiting for a schedule to show up, you can do other things until the bell rings.

□ The Radio Corporation of America has issued a list of transistor types recommended for amateur applications. —WTRW □

Vive la Révolution!

"Amateur Radio public service is undergoing a revolution." These words were spoken by ARRL Vice Director Tom Comstock, N5TC, during his presentation as Chairman of the Blue Ribbon Committee (BRC) to the ARRL Board of Directors last July. Tom realized that our ability to serve the public was undergoing a drastic change—for the better!

The ARRL Board of Directors accepted the final report of the Blue Ribbon Committee on January 16, 1987, and directed Executive Vice President Sumner to implement the recommendations of the committee. The Board also approved in principle the formation of the Amateur Radio Public Service Committee (APSCOM) as defined in the reports from the BRC and BRC subcommittee number one. Both reports follow:

SUBJECT: Final Report, Blue Ribbon Committee on Emergency Message Traffic

TO: Members of the Board of Directors
American Radio Relay League

Gentlemen:

With one exception, which will be explained later, the Blue Ribbon Committee established by Minute 66 of the 1986 Meeting of the ARRL Board has completed its work. Our report is as follows:

Activities Since the July 1986 Interim Report

Our July 1986 Interim Report listed the major findings of the Committee and noted the formation of two subcommittees to provide recommendations on ways to implement the Committee's findings. The recommendations of Subcommittee 1 are contained in attachment 1. Unfortunately, the Chairman of Subcommittee 2 recently became seriously ill and that report has been delayed. Upon completion, the report will be forwarded to the Executive Vice President for his consideration.

General Comments

At the July 1986 Board meeting, I stated that Amateur Radio is on the threshold of its most dramatic period of change—a period in which the nature of our avocation and the interests of those who participate in it will change drastically in response to changing technology. The six months since that Board meeting have provided ample illustration that this change is already taking place at a very rapid rate. Some examples are as follows:

1. The amateur community is rapidly becoming interconnected on both HF and VHF frequencies by high speed digital communications. Both formal and informal traffic is routinely being passed around the nation, largely untouched by human hands. I and many other traffic handlers are routinely handling third-party traffic by digital means.

2. ARRL will soon present to the FCC a proposal to test the feasibility of a national linking of HF packet stations, authorized to automatically forward data without a control operator being present. If the test is successful, the basis for a formal national packet network will be established.

3. AMSAT has proposed a geostationary satellite, having as its primary purpose public-service communications. If the satellite becomes a reality, then continuous, reliable, high speed emergency communications will be available and our ability to respond to emergencies in this hemisphere will increase tremendously.

4. During the recent emergency in San Salvador, satellites were used.

5. Packet radio is now being used to communicate with hurricane-hunting aircraft.

6. Amateurs all over the country are now using packet radio in responding to real and practice emergencies.

The above examples illustrate how technology has provided us with the tools to expand our capabilities to support emergencies. You, as the national leaders of Amateur Radio, have a unique opportunity to lay the groundwork for implementing this technology. The Committee urges you to do so by adopting measures that will promote current technology by encouraging the membership to participate in current communications techniques, and by attracting into public-service activities those who have skills in digital communications techniques.

Specific Recommendations

The Committee recommends that the following actions be taken:

1. The ARRL Board of Directors should approve in principle the establishment of a permanent national public service and emergency communications steering committee called the Amateur Radio Public Service Communications Committee (APSCOM). The Volunteer Resources Committee should be tasked with determining the composition and budget of the APSCOM and report its findings to the Board at its July 1987 meeting. See the Subcommittee 1 report for details.

Once formed, the APSCOM, using the guidelines stated in the Subcommittee 1 report, should be tasked with the following responsibilities:

- Studying procedures for unifying all voluntary Amateur Radio public service activities under ARRL;
- Developing plans for implementing emergency and equipment teams; and
- Developing a system of "Gateway Stations."

2. ARRL should support in every way possible the establishment as soon as possible of a geostationary satellite with packet radio capabilities devoted to public-service communications.

3. ARRL Headquarters should develop and regularly exercise a written plan for actions it should take under various emergency contingencies. In particular, the Headquarters' role as a provider of information to the public and to field organizations should be clearly delineated.

4. The National Traffic System should incorporate digital communications and modern networking concepts.

5. The field organization structure should be changed so that the activities of the

National Traffic System are better coordinated and more responsive with those of the Section Managers, Section Emergency Coordinators, and Section Traffic Managers.

6. ARRL should take action to attract "computer hams," who generate high volume daily traffic, into public-service activities such as traffic handling.

7. ARRL should take action to improve the effectiveness of emergency training by implementing the following concepts:

- Broaden the training base so that each person involved in an emergency would know about and appreciate the functions of others.
- Provide newcomers with more opportunities to practice.
- Develop required standards of performance by establishing certification programs based on performance.
- Develop a better system of reward for training.
- Emphasize the utilization of modern communications media such as video tapes and television.

In Conclusion

This report is the culmination of a year of careful study by the members of the Committee and many other dedicated amateurs. We believe that the resulting recommendations, if implemented, will improve the capability of amateurs to perform in times of emergency.

I appreciate the opportunity provided to me by President Price and the Board to be a part of the work of this Committee. It was one of the most stimulating activities I have been involved in and it was a personal privilege to associate with the outstanding persons who made up this Blue Ribbon Committee.

Respectfully submitted,
Thomas W. Comstock, N5TC
Chairman

October 24, 1986

TO: Vice-Director Tom Comstock, N5TC,
Chairman, Blue Ribbon Committee
(BRC)

FM: Mike Riley, KX1B, Chairman, BRC
Subcommittee Number One

SUBJECT: Our final subcommittee report to
the BRC

After spending months reviewing the thought-provoking material presented to the BRC, it is evident that our final report should be considered as an unquestioned beginning toward improving the League's national emergency communications posture—and commitment. Maintaining status quo should not be our goal. Improvements can, and should be made.

This subcommittee will respond to each of our tasks in the order they were given.

A. RECOMMEND PROCEDURES FOR COMBINING ALL EMERGENCY ACTIVITIES (ARES, RACES, SKYWARN, ETC.,) UNDER ARRL:

- This subcommittee RECOMMENDS that:
 - A group with representation from our Board of Directors, the Emergency Com-

munications Advisory Committee, our Field Organization led by elected Section Managers, the National Traffic System, the ARRL Ad Hoc Digital Committee, AMSAT and HQ be formed into a national Amateur Radio Public Service Communications Committee (APSCOM) which will be recognized as our premier national public service and emergency communications steering committee;

b. The APSCOM will be allocated funding for two in-person meetings and administrative expenses on an annual basis.

c. The ARRL Volunteer Resources Committee will, in consultation with ARRL HQ, determine the composition and annual budget of the APSCOM and report its findings to the July, 1987 ARRL Board of Directors meeting. APSCOM members should be appointed to one-year terms of office by the ARRL President no later than January 1, 1988.

2. a. This proposed committee will meet with our counterparts of served agencies and the Federal Government in Washington during 1988 to discuss, (1) how Amateur Radio can best serve their needs, and (2) the possibility of ARRL administering all voluntary Amateur Radio public service-oriented efforts on a national basis.

b. At least one follow-up meeting would be scheduled between the representative groups in 1989. Additional meetings in Washington would be scheduled annually by the APSCOM. The other APSCOM yearly meeting would be held at a centrally located major airport hub (such as Dallas or Chicago).

3. The results of the initial meeting, with recommendations, would be formally presented to the ARRL Board of Directors by the Board member appointed as the APSCOM liaison no later than the July, 1988 Board meeting with subsequent committee reports being provided in January, 1989 and on a semi-annual basis thereafter.

COMMENTS:

The combining of our public-service activities under the ARRL demands increased knowledge of these governmental agencies we wish to serve. These agencies have never adequately expressed their expectations of Amateur Radio nor cooperated in an overall plan for our Service. While they have never hesitated to call upon us during domestic or international emergencies, our knowledge of the operation of these groups and their communication interface with Amateur Radio is almost totally lacking.

We also realize that the information learned from these served agencies should be readily accessible by a national ARRL voluntary public service steering committee. This group would be representative of all League members and nonmember amateurs who have an interest in public service.

Presently, our public-service program is accepted as a closed society within the League. One either is or isn't involved with public service. The Amateur Radio Service has been tasked by the FCC with serving the public. The recommendations of this subcommittee would finally unify our response and provide a forum for discussion at the national level.

A proposed national steering committee of this design would have the unique ability of harnessing the knowledge of our many volunteers and members (including, for example, Affiliated Club Coordinators, Public Information Officers, Technical Coordinators, satellite users, contesters, DXers,

Section Managers, NTS Area Staff members, digital communications experts, local ARES Emergency Coordinators, our Washington Liaison and HQ staffers) into one unified national-level committee with one commitment—serving the public.

Once formed, the initial roundtable discussion between the Amateur Radio Public Service Communications Committee (APSCOM) and interested agencies at the national level would be the first meeting of its kind in the history of the League. Our relationship with our counterparts in Washington would be improved and new and reliable lines of communication would be opened between the League and those we desire to assist during emergencies.

B. RECOMMEND PROCEDURES FOR ESTABLISHING EMERGENCY COMMUNICATIONS/EQUIPMENT TEAMS.

The concept of emergency communications/equipment teams is not new to amateurs. Several local groups within the nation have developed extremely successful and highly motivated ARES-sponsored teams. Those who have begun these "jump teams" will be the first to admit that months, even years were spent developing these groups at the local level.

Although the task given this subcommittee is international in scope, we are deeply indebted to those who have taken the initiative and considered, developed, then successfully implemented this concept at the local and statewide levels. Many of the following recommendations have been modeled after these operational and highly motivated emergency communications and equipment teams who've realized a need and taken the initiative.

This subcommittee RECOMMENDS that:

1. The concept of emergency communications/equipment teams be on the agenda of the proposed meeting between the Amateur Radio Public Service Communications Committee (APSCOM), interested organizations and the Federal Government (recommendation a.2.).

2. That the Amateur Public Service Communications Committee (recommendation a.1.a.) implement emergency communications and equipment teams along the recommended guidelines of this subcommittee, in consultation with the proposed AMSAT Phase-4 Geostationary satellite committee, the Ad Hoc Digital Committee, ARRL HQ and the IARU, to ensure international cooperation and reciprocity.

This subcommittee recommends the following guidelines:

a. These teams should be structured to include operators, technical support members, bilingual liaisons and an overall administrator/liaison to government officials, local Amateur Radio organizations and served agencies.

b. Adequate and continued funding for the training of these teams should be provided at the local level. National support, guidance, and training exercises will be provided by the ARRL. International support and coordination will be requested from the IARU and sister organizations, with emphasis on reciprocal hosting of foreign teams in the US should the situation arise.

c. Reliable transportation for these teams should be provided for or coordinated by the League though the League would not be responsible for the equipping of these teams unless equipment was donated by

vendors through the League.

d. These teams should not be limited in their emergency response by a dependency upon any one communications mode or system; these teams should be as flexible as the law allows. Primary emphasis will be placed upon high-volume message-handling utilizing the latest technologies available. Forthcoming geosynchronous satellite communications should be integrated into their communications strategy.

e. These teams should be reasonably self-sufficient for 48 hours.

f. A continual recruitment program directed toward amateurs from the various and diverse areas of our Service should be initiated by the League. Operating skills of contesters and DXers should be enlisted.

g. Membership on these teams should be directly related to continual improvement of emergency communications skills. Evaluation of individual and group skills on a quarterly basis including exercise performance evaluations by an appropriate administrative body should be planned.

h. Emergency communications/equipment teams should augment the National Traffic System and Amateur Radio Emergency Service.

i. Contact with local level field organization and agencies personnel at the local and section levels should be encouraged.

j. ARRL should provide adequate liability insurance coverage to members of these teams organized within the United States.

3. The proposed Amateur Public Service Communications Committee (recommendation a.1.) will present its findings in response to recommendation b.2. before the ARRL Board of Directors during their July, 1989 meeting.

...to be continued

Field Organization Reports December 1986

ARRL Section Emergency Coordinator Reports

Thirty-three SEC reports were received, denoting a total ARES membership of 17,857. Sections reporting were: AB, AR, BC, GA, IA, IN, KS, LAX, MI, MN, MO, NE, NH, NFL, NLI, NV, OH, ONT, OR, ORG, PAC, SD, SDG, SK, SFL, VA, VT, WA, WI, WNY, WMA, WPA, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	140	89.70	1160	2394
TCC Central	87	93.50	645	1378
TCC Pacific	115	92.74	1584	2305
Summary	342	91.98	3389	6077
Cycle Four				
TCC Eastern*	170	94.44	1453	2936
TCC Central	110	90.90	694	1409
TCC Pacific	142	91.00	1577	3131
Summary	422	92.11	2147	7476

* TCC Eastern operates both cycles 3 and 4.

TCC Roster

N1BHH W1CE N1DHT K1E1C W1EFW WA1FCD K1GRP
KN1K KA1MKJ N1NH KT1Q W1QYY KA1T KW1U W2CS

N2DC WB2EAG WA2FJJ W2FR W2GJ W2GKZ NN2H KB2HM N2C W2LWB W2MTA KU2N W2PKY W2RQ WA2SPL KA2UBD N2XJ W3AT0 AA3B N3COY N3DPF KK3F K3NNI W3QP KQ3T KB3UD AA4AT WA4CCK N4EXQ WD4FTK N4GHI WB4HML WA4JDH WA4JL WA4JTE N4KB WNAKKN K4MTX WB4PNY K4ZK N5AMK N5BB N5BT W5CZT N5DFO A5J W5GHP K5GM W5JCV A5JK W5KLV KD5KQ W5VQK KD5RC KA5PT W5SFRX ND5T N5TC W5TFB K5TL W5TNT W5VMP K5SW N5QSW KD5YD KU6D W6EOT W6INH K6LL W6F8 K8UYK W6VZT KA7CPT KB7FE NN7H W7EP W7GHT W7L YA KA7MUL KF7R W7TGU W7VSE N8GJO WD8LDY W8PJM W8QHB AF8V KA8WNO N8XX WB8YD N8BGE W9CBE W9EHS W9JUL KA9RII WB9UUV A8HA K8E8I K8C8D K8QJ KA8EPEY K8EZ KJ8G W8GRW W8H N8JA WA8OYI K8OU A8BY VE3AWE VE3FAS VE3GSQ VE6CHK

177 WB2UVB
168 WB5SFX
168 KA3DLY KA8EPEY
159 N4EXQ
157 KA1JXH
155 N2ABA
146 WA4QXT
141 KA4TLC
140 W9YCV
139 KA9FFO
138 KD7ME
136 WF6O
134 KB4WT
132 WB7WOW W9FZV WX4H
98 K4JST
131 K5MXQ
129 K2VX
128 VE3ORN
126 VE4AJE AA4MP AA4HT
125 WB2RBA N4KRA WB4WII KC4VK N3GT
95 K2ZYI WB1C8P W8OYH
119 N1CVE K4ZK
118 W7VSE KA8CPS
116 KA2MYJ W9EHS
93 KA1KTH K8WP
115 AA4AT W7GHT NW7K N2FKA W8KQC N8EVC
114 N2EIA W2MTA VE4RO N3AZW
113 WA4CCK KA4GUS W4ANK
112 N2XJ WA4PFK WD8LDY
111 WB1GXZ KT1Q WA2SPL
110 W9HBI K9CNP
110 WA1FOD
109 N08A W4PIM N0FOO
107 WB2VUK WB4HRK W8FPA
108 KB1AF N7FXJ KV5X
87 N3COY ACSZ K9SL KA8NLI K8UQY
105 K2ZM W1RWG

WA4RUE KB5ADE N7BHL
104 WA2VJL WD5GKH
103 W9JUL AG9G K8UYK
102 KA1ON N5AMK W85YD W6MCO VE3DFO WB8KWC
101 KA2UBD N4KSO W8INH W8JGW
83 WA1JVV N4PL
82 KBZBM N8BKE K84BZA
81 W2RRX
80 NG1A N9BBL W86DOB
98 K4JST
131 K5MXQ
129 K2VX
128 VE3ORN
126 VE4AJE AA4MP AA4HT
125 WB2RBA N4KRA WB4WII KC4VK N3GT
95 K2ZYI WB1C8P W8OYH
119 N1CVE K4ZK
118 W7VSE KA8CPS
116 KA2MYJ W9EHS
93 KA1KTH K8WP
115 AA4AT W7GHT NW7K N2FKA W8KQC N8EVC
114 N2EIA W2MTA VE4RO N3AZW
113 WA4CCK KA4GUS W4ANK
112 N2XJ WA4PFK WD8LDY
111 WB1GXZ KT1Q WA2SPL
110 W9HBI K9CNP
110 WA1FOD
109 N08A W4PIM N0FOO
107 WB2VUK WB4HRK W8FPA
108 KB1AF N7FXJ KV5X
87 N3COY ACSZ K9SL KA8NLI K8UQY
105 K2ZM W1RWG

K4IWW KB7FE K3RXK N8FVA N8EFA
69 WB2NLU N1EDD KF4G KA9RII WB4TZR
88 W5SDD NN2EQM NN4I WB5J WB2QMP N6CVF VE3VV WA4EYU WA3GYW NR8C
67 KA9RNY W4RME WF4Y WA3UNX
66 AA4GL KA8PKY W4FMZ N8GCC KF7R
65 KA8CB KP4DJ W8SQBZ N5HOC K84JPN A180 K2YAI KA2DQA N4JRE K3JL KA1KML N9CBI
78 K14BR AA4TE W5VMP
63 WB4JHC W8OJD NQSW K4ZN
62 KA1HPO/T K8PCK K5EVI W8NJR KA8TNT
61 K2ATJ W8LDY KA1LMR K8RDN W8DHB K8JUZ
60 N1AKS WA5MNR K4UPN N8DZA K8DWI N8BX K8DXL KJ3E
74 KA2CQX/T
55 W1CE N4MMM/T KA5QVY/T
54 K4VWK N4JL KA7AID WA3YLO K8BKU
72 WA6QCA W5KLV KA4FZL W9XKG
48 K8FJ KA8ZRN/T
45 WB4HXS/T KA8CTW/T
44 N2EVG/T
42 KA2VX/T W8DYS/T
70 W4HON

Call	Orig	Rev'd	Sent	Div'd	Total
N8BQP	33	1200	53	761	2047
W3VR	323	589	911	55	1878
N4GHI	59	835	762	76	1732
K4EUK	126	668	767	70	1631
N2ZU	447	359	769	15	1590
KA4AMC	732	33	758	13	1536
N4EXQ	24	653	554	90	1321
WB9YYP	0	747	103	409	1259
WA4TGF	615	10	615	0	1240
W9JUL	3	617	618	2	1240
KK1A	52	552	374	230	1208
WF6O	1	605	541	35	1182
K8UYK	43	556	550	14	1162
WA0HJZ	0	675	26	428	1127
KW1U	0	611	496	6	1113
KB9LT	53	486	527	44	1110
N3AZW	34	508	504	50	1096
KB4WT	0	559	493	28	1070
WA4QXT	76	421	465	45	1007
K1BC	0	407	596	0	1005
KA0TXX	31	461	253	239	984
WD4IIQ	440	43	440	43	966
W7VSE	2	481	460	12	955
N4PL	159	297	414	29	926
VE3GSQ	36	442	432	12	922
K4DOR	89	350	411	28	878
KA7MUL	1	416	446	11	874
WA2SPL	5	357	454	10	826
NC9T	9	387	411	10	817
KT1Q	1	432	371	10	814
KA8CPS	36	379	327	59	801
WB1OSW	---	---	---	---	793
WX4H	11	395	375	3	784
KA1MDM	2	389	367	17	775
WB2EAG	8	389	340	23	760
WA1TBY	3	345	383	10	741
K4ZK	39	317	359	18	733
KA2UBD	5	332	374	5	716
K4MTX	1	345	368	2	716
W3QKN	0	393	380	0	713
KN1K	1	410	270	25	706
KK3F	0	350	340	10	700
WB2UVB	369	151	67	108	695
WB4PNY	0	305	386	0	691
WA4PFK	31	338	294	20	683
W7AMM	97	301	364	21	683
AA4HT	172	230	300	40	672
WB2OWO	152	165	329	23	671
N5AMK	1	361	300	1	663
AA4AT	32	311	303	14	660
KA8WNO	0	322	323	6	653
WA2HSB	17	322	304	4	647
WB5YDD	78	287	221	43	629
W3ATC	2	312	304	10	628
KA4TLC	47	251	290	37	625
WC4P	164	136	277	27	604
A8BY	0	297	296	5	601
W3IWI	0	300	296	0	596
K4NLL	36	246	281	26	589
WD8LDY	43	219	317	6	585
KA1LMR	60	173	277	74	584
K8RDN	0	438	41	260	583
W8DHB	33	247	278	4	562
K8JUZ	0	284	286	3	563
WB8KFN	12	284	230	17	543
W4NFK	38	241	225	35	539
KF4JA	149	118	235	37	539
K8DKU	0	267	251	19	537
KA1T	0	260	264	4	528
K8JDI	6	254	259	8	527
AA4BN	3	253	265	3	524
W5TNT	12	287	218	9	524
K8BKU	18	251	249	14	522
KA9RII	18	224	271	5	518
W1CE	1	242	223	35	511
WD8BSZ	47	110	257	0	514
K4VWV	95	156	246	12	508
W5YBV	---	---	---	---	505
K8TVG	---	---	---	---	503
AA4FG	196	59	222	25	502

BPL for 100 or more originations plus deliveries:

Net Name	Sess	T/c	Check-ins
Amateur Radio Telegraph Society	54	585	243
Clearing House Net	31	630	502
Early Bird Net	31	801	---
Empire Slow Speed Net	31	102	360
Golden Bear Amateur Radio Net	31	293	2082
Hit and Bounce Net	31	407	494
IMRA	27	1759	2024
Mission Trail Net	31	163	864
New England Novice Net	25	32	86
NYSPTEN	30	110	542
Southwest Traffic Net	31	359	1713
West Coast Slow Speed Net	30	48	374
20ISSBN	28	353	1197
75 Meter Interstate SB Net	31	1031	1492
7290 Traffic Net	50	1315	3041

National Traffic System

Net	Sess	T/c	Avg Rate	% Rep	% to Area
Cycle Two					
Area Nets					
EAN	31	1974	63.67	1.144	99.5
CAN	31	1300	41.94	.878	100.0
PAN*	62	1281	20.66	.808	97.8
Region Nets					
1RN	62	994	18.03	.553	100.0
2RN	57	671	11.77	.536	75.8
3RN	31	410	13.23	.347	96.2
4RN	62	1366	22.03	.645	84.5
RN5	62	1304	21.03	.627	89.0
RN6	62	524	8.45	.466	100.0
RN7	62	1007	16.24	.825	94.2
8RN	62	775	12.50	.385	99.0
9RN	---	---	---	---	100.0
ECN	---	---	---	---	96.7
TEN	62	962	15.50	.585	76.7
TWN	53	537	10.13	.520	73.5
ARN	31	133	4.29	.139	100.0
TCC					
TCC Eastern	140	2394	---	---	---
TCC Central	87	1378	---	---	---
TCC Pacific	155	2305	---	---	---
Cycle Three					
Area Net					
EAN	31	1139	36.74	1.257	94.0
Region Net					
1RN	---	---	---	---	100.0
2RN	29	190	6.55	.386	72.4
3RN	26	54	2.07	.228	67.9
4RN	35	114	3.26	.250	62.0
8RN	---	---	---	---	80.6
ECN	---	---	---	---	93.5
Cycle Four					
Area Nets					
EAN	31	2351	75.84	1.743	96.3
CAN	31	1652	53.30	1.470	100.0
PAN	31	1474	47.55	1.172	99.4
Region Nets					
1RN	55	354	6.44	.427	80.0
2RN	60	286	4.76	.346	97.2
3RN	62	1283	20.70	.670	100.0
4RN	62	1294	20.87	.830	86.2
RN5	62	698	12.03	.694	95.0
RN6	62	566	8.97	.602	83.0
RN7	55	507	9.22	.420	78.0
9RN	62	720	11.81	.580	89.5
TEN	62	483	7.80	.451	78.6
ECN	54	283	5.24	.454	72.2
TWN	58	406	7.00	.410	95.9
TCC					
TCC Eastern	170	2936	---	---	---
TCC Central	110	1409	---	---	---
TCC Pacific	142	3131	---	---	---

* PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AR, AL, AZ, CT, DE, EB, ENY, EPA, GA, IA, IL, IN, KS, KY, MDC, ME, MN, MO, NC, ND, NE, NH, NJ, NY, OH, OK, ONT, OR, OHG, RI, SB, SC, SDG, SF, 6FL, SNJ, STX, SW, TN, UT, VA, VT, WA, WIN, WMA, WNY, WPA.

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 PSRR certificate from HQ.

371	204	182	178
KK1A	K2YQK	N4GHI	WD9DZU

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.

Call	Orig	Rev'd	Sent	Div'd	Total
W3CUL	717	1481	1997	106	3901

Independent Nets

Net Name	Sess	T/c	Check-ins
Amateur Radio Telegraph Society	54	585	243
Clearing House Net	31	630	502
Early Bird Net	31	801	---
Empire Slow Speed Net	31	102	360
Golden Bear Amateur Radio Net	31	293	2082
Hit and Bounce Net	31	407	494
IMRA	27	1759	2024
Mission Trail Net	31	163	864
New England Novice Net	25	32	86
NYSPTEN	30	110	542
Southwest Traffic Net	31	359	1713
West Coast Slow Speed Net	30	48	374
20ISSBN	28	353	1197
75 Meter Interstate SB Net	31	1031	1492
7290 Traffic Net	50	1315	3041

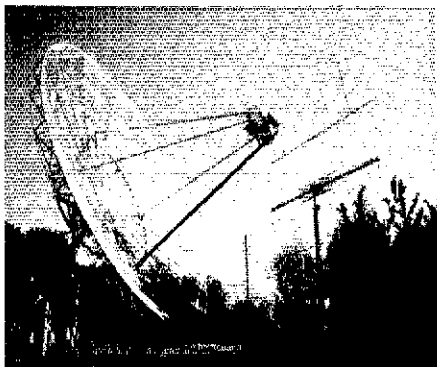
Results, Tenth Annual ARRL International EME Competition

The moon creates a DX dragnet.

By Michael B. Kaczynski, W1OD and
Contest Manager, ARRL HQ

Billy Lunt, KR1R
Assistant Contest Manager, ARRL

The story you are about to read is true. The calls have not been changed to protect the innocent. The caper? The tenth ARRL International EME Competition. Station number one: location, Manvel, TX; operator, David Blaschke, W5UN; antenna system, 32 Yagis. Station number two: QTH, Saint Paris, OH; operator, Gary Crabtree, KB8RQ; antenna system, 32 Yagis. Those are just the facts, ma'am.



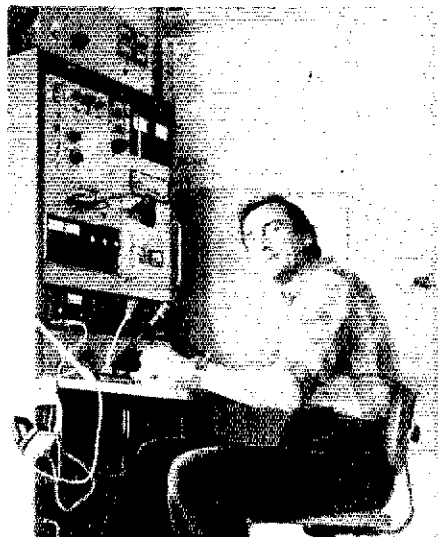
HB9SV used these antennas for his second-place single operator, multiband finish.

As you may have gathered from the introduction, the tenth running of the ARRL International EME Competition was far from average. Not one, but two single-operator, 144-MHz stations managed to hurdle past all other 2-meter entrants while blasting through the megapoint barrier. Quite the feat, considering that both contest weekends coincided with the high path loss of lunar apogee!

When contest time arrived, all systems were go (well, almost). W5UN reported fireworks in his 8877 final caused by a shorted high-voltage supply. Even with this technical problem, Dave managed to set an all-time-high single-op QSO total of 278 QSOs and 56 multipliers (including 42



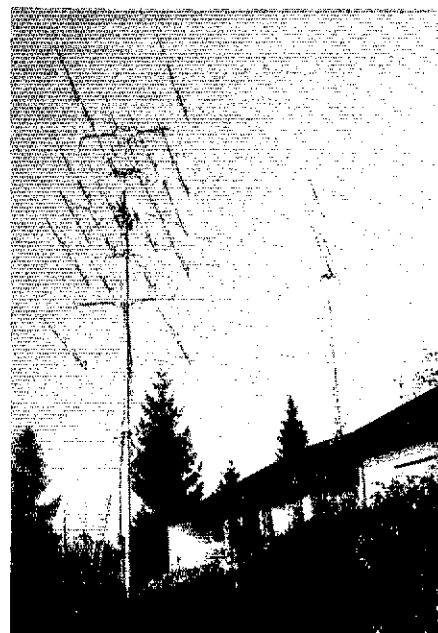
HB9RM putting the final touches on his equipment before taking top honors on 1296.



F2TU at the controls of his compact rack-mounted station.

countries) for a total of 1,556,800 points. KB8RQ was second, with 204 QSOs and 51 multipliers, for a total of 1,040,400 points. Gary threatens to put up a new array this summer, to give W5UN some competition this fall. YU3WV took advantage of northern declination and 24 12-element slot Yagis to finish third. NSBLZ finished an impressive fourth with his 12-Yagi array. A total of 63 amateurs entered the 144-MHz single-band category, our perennial favorite.

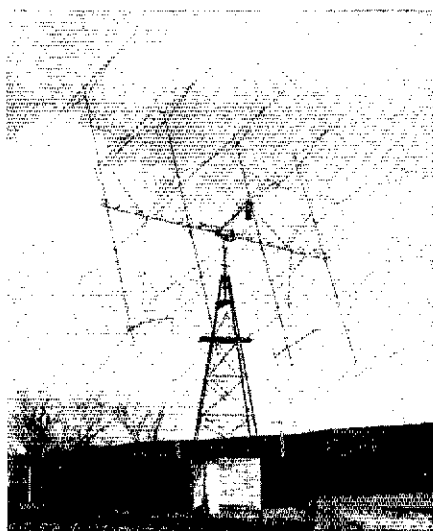
Only one single-op Statesider managed to finish in the top 4 on 432—Charlie, WØRRY/5. A 264,000-point effort would be a true accomplishment with a good-sized dish, but to work 80 QSOs and 33 multipliers with eight K2RIW Yagis is nothing short of spectacular! Even 'RRY's super effort, however, wasn't enough to take the top slot from last year's band leader, DL9KR. Jan's 16 × 20-element



The 8 × 17-el 144-MHz and 8 × 21-el 432-MHz arrays that produced 66 contacts and 33 multipliers for single op HB9CRQ.



VE1ALQ smiles for the camera after a seventh-place finish on 2 meters.



Single-operator, single-band, 144-MHz, fifth-place finisher EA2LU used this array from Europe.

Yagi array provided 90 stations in 25 countries a two-way contact. DF3RU and DJ6MB confirmed European supremacy on 432 EME by finishing third and fourth, respectively. New Englander K1FO rounds out the top five.

With about 450 watts and a home-brew 20-foot dish, HB9RM edged OE9XXI out by one QSO for the top slot on 1296. The only other entry on single band 1296 was

DJ2US finishing in the third slot.

The multioperator class is a European favorite, hosting 9 of the 12 entries. OZ1EME finished at the top of the field with a score of 310k, 94 QSOs and 33 multipliers all on 144 MHz. Another European multiop, YU1AW and crew, was the number two overall finisher and first-place multiop, multiband entry. Third place overall and first place on single-band

432 was Statesider NC11 (+AA2Z) with 214,400 points, 67 QSOs and 32 multipliers.

Thanks again to all for sending in the great pictures and Soapbox comments. Wish we could print them all!

Will be looking forward to seeing all the familiar calls and lots of new ones in the Eleventh ARRL International EME Competition next year. Watch for the dates to be announced later in *QST*. Maybe this will be your turn for that new record! 73.

SOAPBOX

I enjoyed the contest very much this year. Highlights for me were working UL7BAT via the "long path" (western moon) for a new country, and working JA9EYI, the only Japanese station heard (W5UN). I just completed the new antenna a couple of weeks before the contest. Everything held up real well, with 50 new stations, 1 new state and 5 new countries (N5BLZ). Murphy stayed away this year, and I had super echoes both weekends. Unfortunately, there was a one-way path to Europe, as I heard/worked very few of the smaller stations. These unpredictabilities is what makes EME interesting and challenging (WA6MGZ). I hope everyone had as much fun as I did, and I'm already making plans for next year (VE1ALQ). Conditions in November were good. Wish I could have operated the October weekend. See ya next year (WA0TKJ). There is nothing like EME, and the ARRL EME Contest is certainly the high point for the year (AF9Y). Murphy gave me a hit when my vertical rotor broke during the Nov weekend and forced me to steer by hand (DJ9BV). Propagation was not so good with deep QSB, but polarization was comparatively stable (JA6CZD). Unfortunately, I could not operate the first weekend since I was on my honeymoon (Oops, sure hope my wife doesn't read this!). AA2Z was crazy enough to fill in and did a FB job! (NC11).

Scores

Scores list: call, score, stations heard, stations worked, multipliers, band (A—50 MHz, B—144 MHz, C—220 MHz, D—432 MHz, E—1296 MHz, F—2304 MHz).

Single Operator, Multiband

N4GJV	388,400-	62-	37-23-B
		51-	47-23-D
		3-	3-3-B
HB9SV	273,000-	45-	46-21-D
		21-	21-15-E
		17-	17-13-B
		42-	42-20-D
		4-	4-3-E
SM3AKW	225,800-	17-	17-13-B
		42-	42-20-D
		4-	4-3-E
FD1FH	162,400-	10-	10-7-B
		46-	46-22-D
K4QIF	142,800-	54-	54-24-D
		12-	12-11-E
SM6PYP	142,800-	6-	5-5-B
		43-	29-16-D
		19-	12-10-E
		2-	2-2-B
		25-	25-16-D
		19-	18-13-E
HB9CRQ	117,800-	87-	57-26-B
		9-	8-7-D
F2TU	112,000-	26-	26-15-D
		14-	14-13-E
VE788G	22,100-	3-	3-3-D
		14-	14-10-E
DJ8QL	20,400-	13-	13-6-D
		4-	4-4-E
WDSAGO	4,800-	11-	6-5-B
		4-	2-1-D
W4CDW	1,600-	3-	3-3-B
		1-	1-1-D

Single Operator, 144 MHz

W5UN	1,556,800-	282-	278-56-B
KB6RQ	1,040,400-	204-	204-51-B
YU3WV	640,700-	185-	149-43-B
N5BLZ	508,400-	124-	124-41-B
EA2LU	329,000-	94-	94-35-B
WA6MGZ	323,700-	80-	83-39-B
VE1ALQ	216,000-	60-	60-36-B

WA0TKJ	176,900-	66-	61-29-B
AF9Y	168,000-	60-	60-25-B
SM5DGX	156,600-	54-	54-29-B
SM2CKR	145,800-	52-	52-26-B
OK1MS	141,000-	47-	47-35-B
DK2PH	133,400-	46-	46-29-B
W7HAH	126,900-	47-	47-27-B
YU7AA	115,500-	55-	55-21-B
W7ID	103,240-	43-	43-24-B
W5SUS	96,200-	37-	37-26-B
W7FN	92,400-	67-	42-22-B
WB0CMN	86,400-	32-	32-27-B
SM8FUO	67,200-	32-	32-21-B
ZS6ALE	54,000-	30-	30-18-B
DJ7UD	58,900-	31-	31-19-B
LA9BM	50,400-	28-	28-18-B
SM2CEW	42,800-	48-	25-17-B
K23J	41,400-	23-	23-18-B
WB2NPE	34,000-	33-	20-17-B
I2FAK	33,600-	21-	21-16-B
K9SR	33,000-	22-	22-15-B
WA2GSX	30,000-	20-	20-15-B
K9HXW	27,300-	21-	21-13-B
OK1KRA	27,300-	21-	21-13-B
WA4CQG	26,800-	19-	19-14-B
W9RWH	23,400-	18-	18-13-B
SP5CJT	22,400-	53-	16-14-B
F8DRO	19,800-	15-	15-13-B
W4TDD	18,000-	41-	15-12-B
K3SLZ	14,000-	14-	14-10-B
W2PGC	13,000-	13-	13-10-B
H68HO	9,100-	13-	13-7-B
SM5CPD	8,800-	11-	11-8-B
KF8M	8,000-	35-	10-8-B
AF1T	6,300-	22-	9-7-E
HG0G/P	4,800-	8-	8-6-B
WB0Z	3,800-	6-	6-6-B
OK3KMY (OK3LQ, opr)	3,200-	11-	8-4-B
WB8VM	3,000-	6-	6-5-B

AA4FQ	1,800-	4-	4-4-B
WB4WTC	1,800-	4-	4-4-B
W5UWB	1,800-	4-	4-4-B
GM4JJ	1,200-	10-	4-3-B
H8BET	1,200-	16-	4-3-B
WA1OUB	2,000-	9-	5-4-B
K2GAL	900-	4-	3-3-B
K3W	900-	4-	3-3-B
K3GN	900-	3-	3-3-B
VE5EQO	600-	3-	3-2-B
WA3TTS	400-	6-	2-2-B
WB8MSV	400-	6-	2-2-B
W2MPK	400-	2-	2-2-B
JA9EYI	100-	4-	1-1-B
WD4AHZ	100-	3-	1-1-B
W2RS	100-	2-	1-1-B
K7CJW	100-	1-	1-1-B
WA4CFS	0-	1-	0-0-B

Single Operator, 432 MHz

DL3KR	315,000-	90-	90-35-D
W8RRY/S	284,000-	80-	90-33-D
DF3RU	226,300-	73-	73-31-D
DJ6MB	193,400-	75-	68-28-D
K1FO	148,200-	57-	57-28-D
KS4ZU	103,400-	47-	47-28-D
DJ9BV	101,200-	46-	46-28-D
JA6CZD	90,300-	43-	43-21-D
F8HYE	61,200-	32-	32-16-D
SM6EUP	43,500-	29-	29-15-D
JA48LC	29,900-	23-	23-13-D
KL7HE	29,400-	21-	21-14-D
OH2DG	28,000-	20-	20-14-D
K9RW	26,800-	31-	19-14-D
W8RAP	19,800-	29-	18-11-D
E5KFA	11,700-	21-	13-9-D
XE1XA	10,800-	12-	12-9-D
W1JR	9,000-	10-	10-9-D
WA1WXV	3,000-	6-	6-5-D
JA9BOH	400-	8-	2-2-D

Single Operator, 1296 MHz

HB9RM	35,200-	22-	22-16-E
OE9XXI	33,800-	21-	21-18-E
DJ2US	6,300-	12-	3-7-E

Multioperator, Multiband

YU1AW (+YU1BB, YU7AU)	259,000-	20-	20-14-B
		50-	50-23-D
OK1KIR (OK1s BNS, DAI, DAK, DCI, DKW, oprs)	124,000-	11-	11-9-B
		17-	16-11-D
		13-	13-11-E
		1-	0-0-F

Multioperator, 144 MHz

OZ1EME (OZs 1FTU, 2GZ, SIQ, oprs)	310,200-	94-	94-33-B
F8SQ (+F2MA, F6s CER, CTW)	201,600-	63-	63-32-B
HG1W (HG1s YA, YU, HG2RD, oprs)	140,400-	52-	52-27-B
EA3DXU (EA3s AQJ, AYX, BB, BTZ, oprs)	94,500-	35-	35-27-B
OE1DJUD (+DJ3ST, DL8DAT)	46,800-	28-	28-18-B
WA7KYJ (+W8KJY)	18,500-	27-	15-11-B

Multioperator, 432 MHz

NC11 (+AA2Z)	214,400-	67-	67-32-D
(SM5H (5s CTE, TDJ, oprs)	94,500-	45-	45-21-D
OH2TI (OH1s EU, OC, OH2s BGN, OH6s DD, EH, OC, oprs)	83,600-	38-	38-22-D
JH8YSI (JA8s CZG, HVL, HKV, RWF, oprs)	3,000-	11-	6-5-D

Results, First ARRL 10-GHz Cumulative Contest

What's this? A contest where the top scorers got lots of exercise and fresh air and worked the same station more than once?

By Mark J. Wilson, AA2Z
Senior Assistant Technical Editor, ARRL



There were a number of unusual aspects to the X-band contest, held over two weekends last September and October. For example, virtually all of the entrants went portable. It was hard to do well from home. There were no multipliers, and the rules encouraged working the same station from as many different locations as possible. As usual, the more DX you worked, the higher your score. More QSOs, however, did not guarantee a win. WA6EXV, second-highest scorer overall, had half as many QSOs as top scorer W6OYJ. Yet eight other entrants had a QSO total the same or greater than WA6EXV's.

When we first discussed a 10 GHz-contest, the naysayers prophesized "We'll be lucky to get a dozen logs." Ha! The final total was 52 official entries. We received logs from all but the third, eighth and ninth US call areas. Most of the activity—about 60 percent of the total—centered in Southern California and around Dallas, Texas. These two areas are headquarters for groups actively involved in microwave experimentation: the San Diego Microwave Group, the San Bernardino Microwave Society and the North Texas Microwave Society.

Despite bad weather in several parts of the country, there was a lot of DX worked. K2DNR and KB7CI worked the farthest: 229 km. Fifteen entrants made QSOs at distances of 100 km or greater. WA6EXV worked 17 stations at 100+ km, while WA6QYR worked 16.

QSO totals were incredible. Nine entrants had 20 or more QSOs, led by WA5BNH with 41, W6OYJ with 40, WA5VJB with 36 and KD5HM with 31. At least three stations—

WB2ELB, WA6EXV and WA6QYR—worked five different grid squares for VUCC during the contest period.

The title photo shows one of the contest highlights: a chance to explore scenic countryside. Imagine what the tourists must have thought when they encountered a bunch of San Diego Microwave Group X-banders on Mt Soledad near the California coast. Contacts were made from here to a number of DX locations including Heap's Peak (about 154 km distant) and Palos Verdes (146 km). Shown (l-r) are WB6IGP, N6IZW, WA6MHZ and W6OYJ. The unattended 4-ft dish belongs to WB6WYR, who took the title photo.

In a HF contest, reading the equipment descriptions is usually boring—everyone uses one of a handful of commercial transceivers and amplifiers. At 3 cm, anything is fair game. For example, KF5N used "a 5 mW Doppler module and an \$8 AM-FM radio modified to tune to 30 MHz." N6XQ made 29 QSOs (best DX 155 km) with "10 mW out of a Solfan burglar alarm with a home-brew 30 MHz IF and home-brew 24-in square dish." The average power level used was less than 100 mW, yet KF6C had a 10-W TWT(!). Antennas ranged from small horns to 4-ft dishes. By far, the most popular way to get on 10 GHz was with wideband MA/COM Gunnplexers, yet at least nine entrants indicated that they could work narrowband FM, CW or SSB. There were just about as many ways to get on the air as there were entrants.

Practically everyone who commented on the rules for this contest focused on the time frame. W1XP summed it up nicely: "Forget Friday night." Several entrants suggested

adding more weekends and scheduling the event earlier in the year. As this is being written, we are sending a survey to those who participated in the first contest to determine the best times and dates for the 1987 event. Rules for the Second ARRL 10-GHz Cumulative contest will appear in an upcoming issue of *QST*.

SOAPBOX

Fantastic! My first contact was real DX—58 times better than I had ever done before (VE3BFM/W1). There was surprisingly little difficulty working the roving station. Liaison was on 144,150 which, when transverted, ended up on 10,368.150 MHz. Actually, the LO was so unstable that the operating frequency would slide simply by squeezing the case that held the LO chain. Thanks for a fun but exhausting contest! (WB2ELB). The first weekend tested our resolve with intermittent heavy rain. Up on the Rock, our first contact was made under umbrellas,



WA5VJB and his eight separate 10-GHz stations. Does Kent get the award for bringing out the most rigs?

Coming Conventions

March 13-15
Southeastern Division, Orlando, FL

March 20-21 (CANCELED)
Michigan State, Muskegon

March 21-22
Roanoke Division, Charlotte, NC

March 28-29
Nebraska State, Kearney

March 28-29
Kentucky State, Elizabethtown

April 4-5
Delta Division, N Little Rock, AR

April 10-12
Missouri State, Kansas City

ARRL NATIONAL CONVENTIONS

July 10-12, 1987—Atlanta, Georgia

July 21-24, 1988—Portland, Oregon

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. This must be done by your Division Director for Sanctioned Hamfests, and, additionally, by the Executive Committee for Conventions. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, tel 203-666-1541.

Admission is \$5 in advance, \$6 at the door. Tables are \$10 one day, \$15 both days. Flea market is \$5 one day, \$8 both days plus admission ticket. Activities include: walk-in testing, ARRL and other related forums, food, free parking, flea market and new dealers. Nearby motels. Talk-in on 52 and 146.38/98. For advanced tickets and setup reservations, contact Hubert Hensley, WD4GDA, PO Box 342, Vine Grove, KY 40175, tel 501-877-2234.

NEBRASKA STATE CONVENTION

March 28-29, Kearney

The Midway ARC will host their 11th annual spring convention, held at the Holiday Inn. Featured

speakers are Dr John Champa, K8OCL (AMSAT); Lyle Johnson, WA7GXD (TAPR); Chuck Conner, K0NG (Microwave); ARRL Midwest Director Paul Grauer, W0FIR, and ARRL Laboratory Supervisor Jon Bloom, KE3Z (subject: packet radio). Activities include a flea market, women's bazaar, ARRL/VEC testing, commercial exhibits, ARRL Forum, NE Section Officials' Meeting alternative activities, NE Army MARS Meeting and a Saturday evening banquet with Roger Welsh (Nebraska folklore), the featured humorist. Registration information available from MARC, PO Box 1231, Kearney, NE 68848-1231.

ROANOKE DIVISION CONVENTION

March 21-22, Charlotte, North Carolina

The Mecklenburg ARC is sponsoring their 1987 Charlotte Hamfest & Computerfair at the Convention Center on 4th St & College St. Doors open at 9 AM-5 PM Saturday, 9 AM-3 PM Sunday. Admission is \$5 in advance, \$6 at the door. Activities: Forums, contests, exams, dealers, manufacturers, flea market. Talk-in on 145.29. For more info, contact Jack Arnold, KD4JC, 1333 Picadilly Dr, Charlotte, NC 28211, tel 704-595-7073 days, 704-366-2382 nights

SOUTHEASTERN DIVISION CONVENTION

March 13-15, Orlando, Florida

The Orlando ARC is sponsoring their Hamcation and Computer Show to be held at the Expo Centre, 500 W Livingston St. Friday, 5 PM-9 PM, features a Swap Shop (in 100% air-conditioned comfort.) Doors open 9 AM-5 PM Saturday, 9 AM-3 PM Sunday. Free parking available, also for self-contained RVs. Activities include: AMSAT Phase 4 Seminar, 4 DARS meeting, alternative activities on Saturday, VE exams on Sunday, and much more. ARRL speakers include: President Larry E. Price, W4RA, and Executive Vice President David Sumner, K1ZZ, and Publications Manager Paul Rinaldo, W4RI. Banquet on Saturday evening at 7 PM is \$12.50 (limited seating). Talk-in on 146.76. For tickets and information, contact Jack Leavitt, KF4WM, PO Box 547811, Orlando, FL 32854-7811, tel 305-647-3319.

☐

DELTA DIVISION CONVENTION

April 4-5, N Little Rock, Arkansas

The Central Arkansas Radio Emergency Net (CAREN) is sponsoring their Arkansas Hamfest/Convention at the Woody's Sherwood Forest on W Maryland Ave. Doors open 8 AM-5 PM Saturday and 9 AM-3 PM Sunday. Admission is free. Activities include: dealer sales, flea market, Packet-Radio Forum, Air Force and Army MARS meetings, DX Forum, ARRL Forum, a banquet, and much more. Talk-in on 146.34/94. For more info and reservations, contact Wayne Mahner, WA5LUY, 8 Canyon, N Little Rock, AR 72116, tel 501-223-1935 days, 501-758-4545 nights.

KENTUCKY STATE CONVENTION

March 28-29, Elizabethtown

The Lincoln Trail ARC is sponsoring their convention at the Pritchard Community Center 8 AM-5 PM Saturday and 8 AM-3 PM Sunday.

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.

California (Visalia)—Apr 3-5: Plan now to attend the 1987 DX International convention sponsored by the Northern California DX Club at the Grosvenor Hotel (formerly the Visalia Holiday Inn). For reservations, call the hotel directly at 209-651-5000.

Connecticut (West Hartford)—Mar 15: The Insurance City Repeater Club will hold its annual

Computer/Amateur Radio Flea Market at the American School for the Deaf 9 AM-2 PM. Tables \$10. Admission \$2. Talk-in on 146.88 and 147.15. For more information, contact Chuck Motes, K1DFS, 22 Woodside La, Plainville, CT 06062.

Florida (Ft Walton Beach)—Mar 21-22: The Playground Amateur Radio club will hold its 17th Annual N Florida Ham/Swapfest at the Shrine Fairgrounds on Lewis Turner Blvd. Doors open 8 AM both days. VE exams Saturday only. ARRL, MARS and QCWA meetings. Banquet Saturday night. RV parking. Talk-in on 19/79 and 52. For more information, write to PARC, PO Box 873, Ft Walton Beach, FL 32549.

Illinois (Grayslake)—Mar 29: The Libertyville and Mundelein ARS will sponsor their Lamarsfest 1987

†ARRL Hamfest

at the Lake County Fairgrounds. Northbound and Southbound I-294, exit to Rte 120 W, right on Rte 45; fairground is 2 blocks on left. Doors open 8 AM-2 PM, setup 6 AM. (Advanced commercial setup by reservation only). Admission \$2 in advance (deadline by mail March 20), \$3 at door. Activities include electronic and radio swapfest, exhibitors, code speed testing, rest area, free parking, cafeteria, and more. Talk-in on 63/03 and 52. For more info, contact LAMARS c/o Marc Abramson, PO Box 751, Libertyville, IL 60048, tel 312-255-0642 (8 PM-10 PM).

†**Kentucky (Cave City)—Mar 7:** The Mammoth Cave ARC will sponsor their annual Glasgow Swapfest at the convention center, very accessible from I-65. Parking available. Hours from 8 AM until closing. Admission \$3 per person; exhibitors no extra charge. Tables available \$3 each. Activities:

DX and ARRL Forums, flea market, VE tests at 10 AM. Walk-ins only; bring license and photocopy. Talk-in on 34/94 and 144.59/145.19. For more info, contact N4HCO, Rte 9, Box 112B, Glasgow, KY 42141.

Louisiana (Alexandria)—Apr 4-5: The Central Louisiana ARC is sponsoring their CLARC Hamfest 9 AM-4 PM. Admission \$1. Activities: forums, swap tables, testing, banquet, RV hookups and special motel rates. Talk-in on 145.15. For more info, contact CLARC, PO Box 7772, Alexandria, LA 71306.

Louisiana (Lafayette)—Mar 14-15: The Acadiana Area is sponsoring their Hamfest '87 at the Holiday Inn Central Holiday, south of I-10 on Hwy 167. Hours 9 AM-5 PM Saturday, 9 AM-1:30 PM Sunday. Admission \$2. Activities: dealers, forums, flea market, exams, women's activities, tours, and more. Talk-in on 22/82 and 81/21. For more info, contact June Bodensteiner, 129 Patricia Anne, Lafayette, LA 70508, tel 318-837-9484 day or evening.

Maryland (Timonium)—Mar 28-29: The Baltimore ARC will present the 1987 Greater Baltimore Hamfest and Computerfest at the Maryland State Fairgrounds Exhibition Complex. Food and parking available. Gates open 8 AM both days. Admission \$4 a day or \$6 for both days; under 12 free. Overnight accommodations available. The fairgrounds are located east of I-83 exit 17, three miles north of I-695, just north of Baltimore. For more info, display place or reservations, contact GBHC, PO Box 95, Timonium, MD 21093-0095, tel 301-HAM-FEST.

Massachusetts (Framingham)—Apr 5: The Framingham ARA will hold its annual Spring Flea Market and exams at the Framingham Civic League Bldg, 214 Concord St (Rte 126). Doors open 10 AM until closing, sellers begin setup at 8:30. Admission \$2; tables \$10 (includes one free admission). Preregistration required for tables and exams. Talk-in on 75/15. To reserve tables, contact Jon Weiner, K1VVC, 52 Overlook Dr, Framingham, MA 01701, tel 617-877-7166. To register for license exams, send completed 610 Form, copy of ham license and check for \$4.35 payable to ARRL/VEC to FARA, PO Box 3005, Framingham, MA 01701. Walk-in exams on a space-available basis.

Michigan (Grosse Pointe)—Apr 5: The South Eastern Michigan ARA is sponsoring their 29th Annual SEMARA Swap and Shop 8 AM-3 PM. Admission \$1 in advance, \$3 at the door. Tables \$8 in advance, \$10 at door. Activities: ARRL, DX, Packet, RTTY forums, and more. Talk-in on 70/10 and 52. Deadline for advance registrations is March 21. For more info, contact Fred Lewis, NK8M, 313-881-0187, or write to SEMARA Hamfest, PO Box 646, St Clair Shores, MI 48080.

Michigan (Marshall)—Mar 21: The Southern Michigan ARS and Marshall High Photo Electronics Club are sponsoring their 1987 26th Annual Michigan Crossroads Hamfest at the Marshall High School 8 AM-3 PM. Setup at 6:30 AM. Tickets \$2 in advance (SASE), \$3 at the door. Tables 50 cents per ft (min 4 ft), reserved until 8 AM; send SASE to SMARS, PO Box 934, Battle Creek, MI 49016 or call Wes Chaney, N8BDM, at 616-979-3433. Amateur Radio license exams (Novice-Extra) at 9:30 AM. Preregistration requested. Include Form 610, SASE and \$4.35. Make check out to ARRL/VEC and send to License Exam, PO Box 2, Pleasant Lake, MI 49272. Walk-ins on availability basis. Talk-in on 146.67, 146.52 or 223.94. Directions: I-69 to I-94, then east to exit 110 (old US 27), then south and east to school; follow signs.

New Hampshire (Hudson)—Mar 14: The Interstate Repeater Society will hold its annual flea market at the Lions Club Hall, Lions Ave. Doors open 8 AM-4 PM. Talk-in on 146.85. Admission \$1. Tables \$8 (some available with power). For table reservations, call 603-623-0628 or 603-883-9441, or write to IRS, PO Box 693, Derry, NH 03038.

New Jersey (Egg Harbor City)—Mar 28: Shore Points ARC is sponsoring their Springfest '87 9 AM-2 PM at the Atlantic County 4-H Center on Rte 50, about 15 miles west of Atlantic City. Sellers \$5 per space (bring own table); buyers \$3. Food and

drinks available. Talk-in on 146.985 and 52. For more info, write to SPARC, PO Box 142, Absecon, NJ 08201.

New Jersey (Madison)—Mar 13: The Splitrock ARA is sponsoring their Second Annual Evening Hamfest at the Drew University Center, Rm 107, Rte 24, Madison, NJ. Setup begins 6 PM; doors open 7 PM. Admission \$2 for buyers. Tables available in several sizes, \$2-\$8 per table. Talk-in on 146.985 outside Madison area, on 146.58 in Madison area. For further information, write to SARA, PO Box 3, Whippany, NJ 07981, or call Steve Halliburton, WA2SOC, at 201-366-9642.

New Jersey (Saddle River)—Mar 28: The Chestnut Ridge Radio Club is sponsoring their 10th Annual Ham Radio Flea Market at the Education Building, Saddle River Reformed Church, East Saddle River Rd and Weiss Rd. Admission \$1. Tables \$10 for the first; \$5 each additional table. Tailgating \$5. Food and drinks available. For more info, contact Jack Meagher, W2EHD, 201-768-8360.

New Jersey (Trenton)—Mar 22: The Delaware Valley Radio Assn will sponsor HAMCOMP '87, 8 AM-2 PM, at the New Jersey National Guard, 112th Field Artillery Armory, Eggers Crossing Rd, Lawrence Township, approx 2 miles north of I-95, Rte 206 interchange. Admission \$3 advance, \$4 at the door. Indoor selling spaces \$6. Sellers must provide their own tables. Doors open 6 AM for vendors. Food and parking available. Talk-in on 07/67. For more information and space reservations, write to HAMCOMP '87, c/o KB2ZY, Box 441B, RD 1, Stockton, NJ 08559 (SASE).

New Jersey (Willingboro)—Apr 5: The Willingboro Repeater Group is sponsoring their annual hamfest, 8 AM-2 PM, at the Holiday Lakes, on Rte 130 and Creek Rd. Admission \$2 in advance, \$3 at the door; under 16 free. Table spaces \$5 per 8 ft. Table setup from 6 AM. Tailgaters must purchase admission ticket; outdoor selling only. Talk-in 146.925 and 146.520. Food and parking. For more info, contact the Willingboro AREA Repeater Group, PO Box 472, Willingboro, NJ 08046, or call Jack, K2KLM, at 609-877-5249 after 6 PM.

New York (White Plains)—Mar 8: The Westchester Emergency Communications Assn is sponsoring their WECAFEST '87 Hamfest 9 AM-3 PM. Directions: Sprain Brook Pkwy to 100C Bronx River Pkwy to Westch Community College exit. Admission \$3. Food, ARRL and Tech Forums, VE testing, ham-station demos, and much more. For more info, write to Sal Lagonia, N2EOM, PO Box 348, Millwood, NY 10546, tel 914-245-7550.

Ohio (Circleville)—Mar 1: The TEAY ARC will hold their 1987 Hamfest at the Pickaway County Fairgrounds 4-H Bldg, Rte 22 East, across from Kroger's. Doors open 8 AM-4 PM, with early setup at 6 AM. Tables are 8 ft and \$5 in advance, \$6 at the door. Talk-in on 18/78 and 52. Contact Tim, NM8Y, or Betty Herron for ticket and table information at 339 Walnut St, Circleville, OH 43113, tel 614-477-2355 (SASE preferred).

Ohio (Maumee)—Mar 22: The Toledo Mobile Radio Assn proudly presents their 32nd Annual Hamfest and Computer Show, held at the Lucas County Recreation Center on Key St, 8 AM-5 PM. Tickets \$2.50 in advance, \$3 at the door. Tables, parking, motels, food, women's activities 11 AM, and much more. For tickets and table information, send SASE to TMRA, Robert Hanna, K8ADK, 2154 Circular, Toledo, OH 43614.

Pennsylvania (Hermitage)—Mar 21: The Mercer County ARC will hold its 2nd annual How-To-Seminar 9 AM-5 PM. Topics are on ham-shack skills and related subjects. License exams (Novice-Extra); free admission for examinees and those under 16; all others \$2. Talk-in on 75/15. Location is Hermitage Middle School, Rte 18, near Sharon, PA. For more information, send SASE to MCARC, Box 996, Sharon, PA 16146, tel 412-962-4640 days or nights.

Pennsylvania (Monaca)—Mar 15: The Beaver Valley ARA is sponsoring the 3rd Annual Tri-State Hamfest, 8 AM-4 PM, at the Community College of Beaver County "Golden Dome." Forums, testing, refreshments. Vendor spaces free. Table rental available. Talk-in on 145.31/71 and 52. For

information on tables or reservations, contact Mike Pasterik, KA3JRR, 115 West Woodland Dr, Aliquippa, PA 15001.

South Carolina (Charleston)—Apr 5: The Charleston ARS is sponsoring the Charleston Hamfest, 7 AM-5 PM, at the Elk's Recreation Site, Cosgrove Ave (Hwy 7), off I-26. Tailgating space no charge. Tables \$5 each; free parking, and food. Admission \$5; under 12 free. The Hospitality Room for hamfest participants will be open 7:30 PM-11 PM on April 4. Talk-in on 19/79. For amateur exam information, contact Vernon Wells, WC4C, 128 Miley Ave, Summerville, SC 29483, tel 803-871-1218. For more info, contact Jenny Myers, at 803-747-2324 or Carol Pennington at 803-766-4939.

Texas (Midland)—Mar 14: The Midland ARC will hold its Annual St Patrick's Swapfest 10 AM-5 PM Saturday and 8 AM-2:30 PM Sunday at Midland County Exhibit Building, east of Midland on the north side of Hwy 80. Preregistration \$5; \$6 at the door. Tables \$6 each; refreshments available; VE tests given (all categories). For further info and reservations, contact Midland ARC, PO Box 4401, Midland, TX 79704.

Washington (Puyallup)—Mar 14: The Mike and Key ARC will hold its Sixth Annual Electronics Flea Market at the New Pavilion Hall of the Western Washington Fairgrounds 9 AM-6 PM. Admission \$2. Tables \$15 before March 1, \$18 after. Table setup 4 PM-9 PM Friday, 6 AM-9 AM Saturday. Commercial space \$50. Free parking; free overnight space for self-contained RVs, and food available. Talk-in on 22/82 and 224.12. For further info or reservations, write to M&K Flea Market, PO Box 2121, Kirkland, WA 98083-2121, or call Ray Leslie at 206-821-4188 or Jim Christiansen at 206-265-3481.

Washington (Walla Walla)—Mar 29: The Walla Walla Valley ARC will hold its annual Swap-Meet at the Milton-Freewater, Oregon Community Bldg. Doors open for all 8 AM-5 PM. Tables \$5; admission free. Talk-in on 88/28. For more info, contact Bernie Frazier, WA7CBX, 610 S 1st Ave, Walla Walla, WA 99362, tel 509-529-9879.

West Virginia (Charleston)—Apr 5: The Charleston ARC is sponsoring their Hamfest & Computer Show at the Charleston Civic Center. Directions: Interstate I-64, I-77, I-79 to Charleston WV; take exit marked Civic Center. Admission \$4. Doors open 8 AM-5 PM. Talk-in on 28/88. Activities include forums, slow-scan TV, packet, flea market, swap tables, computer demos, and more. For more info, contact Ollie Rinehart, KA8TIK, tel 304-768-9534.

Wisconsin (Jefferson)—Mar 22: The Tri-County ARC will hold its annual hamfest 8 AM-3 PM at the Jefferson County Fairgrounds. Tickets \$2.50 in advance, \$3 at the door. Tables \$3 in advance, \$4 at the door. Reserve early! Free parking, amateur exams, and more. Doors open 7 AM for sellers only. Talk-in on 144.89/145.49 or 52. For more information, tickets or tables, send SASE to Bob Barker, K9RIJ, 724 Burdick, Milton, WI 53563.

Wisconsin (Milwaukee)—Mar 7: The Milwaukee School of Engineering ARC will hold its annual hamfest 8 AM-2 PM at 1121 N Milwaukee St. Tickets \$2; tables (4 ft) are \$3. Send early. Talk-in on 19/79 and 52. For information, tickets or tables, send SASE to W9HHXFEST, PO Box 644, Rm C-6, Milwaukee, WI 53201-0644.

Wisconsin (Kaukauna)—Mar 14: The Fox Cities ARC will sponsor a Swapfest at the Kaukauna High School. Admission \$1. Amateur testing available. Exit Hwy 55 S off Hwy 41 to Main St. For tables and testing, contact Don Baker, NB9J, 621 W 7th St, Kaukauna, WI 54130.

FEEDBACK

An error appears in February QST concerning the Indiana Hamfest, March 8, 1987 in Indianapolis. The cost per table (including space) is \$8, not \$5.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contraction for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

Contest Corral

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

Feb 28-Mar 1

REF French Contest, phone, Jan *QST*, p 84.
RSGB 7 MHz Contest, CW, Feb *QST*, p 83.
Rats Nest & Crooked Stick Contest Sprint, Feb *QST*, p 83.

Feb 28-Mar 2

YL-OM Contest, CW, Jan *QST*, p 84.

MARCH

7-8

ARRL International DX Contest, phone, Dec *QST*, page 80.

4

West Coast Qualifying Run, 10-35 WPM, at 0500Z Mar 5 (9 PM PST Mar 4). 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 for grading. Please enclose your full name, call (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

12

W1AW Qualifying Run, 10-35 WPM at 0300Z Mar 13 (10 PM EST Mar 12). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Mar 4 listing for more details.

14-15

Maine QSO Party, sponsored by the Portland AWA, from 0000Z Mar 14 until 2400Z Mar 15. Work stations once per band and mode. Exchange serial number, signal report and QTH (county for ME stations; state/province/country for others). Suggested frequencies: CW—1.810 and 60 kHz up from low end of other bands; phone—1.870 3.930 7.280 14.280 21.380 28.580; Novice—20 kHz up from low end; RTTY—3.610 and 90 kHz up on other bands. Work station on CW, phone and RTTY on each band. Count 1 point for phone, 3 points for CW and 5 points for RTTY contacts. Multiply by number of ME counties worked for final score (ME stations multiply by ME counties and states/provinces/countries worked). Mail entries to PAWA, PO Box 1605, Portland, ME 04104.

Iowa QSO Party, sponsored by the Iowa Section, from 1800Z Mar 14 until 0600Z Mar 15. Work stations once per band and mode. No repeater QSOs. Exchange signal report and county for Iowa stations, section or country for others. Suggested frequencies: CW—1.810 3.550 7.050 14.060 21.050 28.050 MHz; phone—3.875 7.225 14.275 21.325 28.600 50.110 144.200 146.520 MHz; Novice—10 kHz from low ends. Count 1 point for each phone contact, 1.5 points for each CW contact, 3 points for each OSCAR contact. Novices and Techs count 5 points for each QSO. Iowa stations multiply total QSO points by total Sections and total Iowa counties. Others multiply total QSO points by Iowa counties (max 99) worked. Bonus multiplier for each ARRL Iowa Section Official worked (max 8). Awards. Mail logs by Apr 1 to Bob McCaffrey, K0CY, 3913 29th, Des Moines, IA 50310.

Virginia State QSO Party, Feb *QST*, p 84.

Wisconsin QSO Party, Feb *QST*, p 84.

14-20

International Slow Scan/Fast Scan TV DX Contest, sponsored by the International Visual Communications Assn (IVCA), from 0000Z Mar 14 until 2400Z Mar 20. SSTV and FSTV only. Work stations once per contest. Exchange by video name, QTH and a picture (one of yourself preferred). Score 10 points for the first contact with any DXCC country, 5 points per additional DXCC countries, 2 points per contact with own country and 2 point bonus for an SSTV/FSTV relay contact for the final transmitting station (the original material must originate from another station who receives no

bonus points). Trophies. You must use official IVCA contest logs, which are available from W6FVV. Send logs within 30 days to Mr L. E. Tepfer, W6FVV, 12114 E Garvey Ave, El Monte, CA 91732.

15

Zero District QSO Party, sponsored by the Davenport RAC, from 1800Z-2400Z Mar 15. Zero District stations may work anyone; all others work 0-district stations. 80-10 meters only, phone and CW. Work each station once per band and mode. Mobile stations may be worked again as they change counties. Exchange signal report and state. Zero district stations also send county. Suggested frequencies: CW—60 kHz up from lower band edges; phone—3.900 7.270 14.300 146.52; Novice—3.730 7.130. Count 1 point for phone QSOs, 2 points for CW QSOs. Zero District stations multiply QSO points by total of states, 0 district counties, provinces and DXCC countries worked. Others multiply QSO points by number of Zero District counties worked. Mail logs by Apr 20 to W0BXR, 5305 White Post Rd, Bettendorf, IA 52722.

17

W1AW Qualifying Run, 10-35 WPM, at 1400Z (9 AM EST) Mar 17. See Mar 4 and 12 listings for more details.

21-22

YL-SSB QSO Party, phone, Jan *QST*, p 83.

BARTG Spring RTTY Contest, sponsored by the British Amateur Radio Teleprinter Group, from 0200Z Mar 21 until 0200Z Mar 23. Operate 30 hours maximum. Off-times must be no less than three hours each and must be indicated on log. Single operator, multioperator and SWL categories. Work stations once per band, 80-10 meters. Exchange UTC time, signal report and message number starting with 001. Count two points for RTTY QSOs with stations in your country, 10 points for others. Count 200 bonus points for each country worked per band. For final score, add QSO points \times (total different DXCC countries + W/VE/VK call areas per band) plus (band countries \times 200 \times continents). Use a separate log sheet for each band. Mail logs to be received by May 30 to Peter Adams, G6LZB, 464 Whippendell Rd, Watford, Herts WD1 7PT, England.

Tennessee QSO Party, sponsored by the Tennessee Council of ARCs, from 2100Z March 21 until 0500Z Mar 22 and 1400Z-2300Z March 22. Work stations once per band and mode. Work portables and mobiles again as they change county. No repeater or list QSOs, CW QSOs in CW bands only. Stations must remain on a band or mode for 10 minutes after making a QSO. Exchange signal report and QTH (county for TN stations; state/province/country for others). Suggested frequencies: CW—1.815 and 50 kHz up from lower band edges; phone—1.860 3.980 7.280 14.280 21.280 28.580; Novice—3.725 7.125 21.125 28.125 Count 1.5 points per CW QSO and 1 point per SSB QSO. TN stations multiply by total states, VE call areas and TN counties (max 95) worked. Others multiply by total TN counties worked. Portables and mobiles add 500 bonus points to total score of each country operated from excluding home county (min 10 QSOs from each county). Mail logs by May 1 (include a large SASE for results, return of log and/or certificate earned) to Middle TN ARC, William Fulcher, N4WF, PO Box 1702, Hendersonville, TN 37077-1702.

28-29

CQ World Wide Prefix Contest, phone, sponsored by *CQ Magazine*, from 0000Z Mar 28 until 2400Z Mar 29 (CW contest, May 30-31). Single ops are allowed a maximum 30 hours operating time; off-times must be at least 60 minutes in length and must be clearly indicated in the log. Multioperator stations may operate entire 48 hours. Phone only, 160-10 meters (excluding the WARC bands). Categories: single op, all band and single band; QRP (5W output maximum); multiop (multiband only) multi and single transmitter. Multi-singles must

remain on a band for at least 10 minutes after making a QSO; multi-multis are allowed only one signal per band. All transmitters must be located within a 500-meter-diameter circle or limits of property; no remote stations. Work stations once per band for QSO point credit, but prefix credit may be counted only once. Exchange signal report plus serial number starting with 001. Multi-multis use separate numbers on each band. QSO points: Contacts between stations on different continents count three points on 28, 21 and 14 MHz and six points on 7, 3.5 and 1.8 MHz. For North American stations, contacts between stations in different countries on the NA continent count two points on 28, 21 and 14 MHz and four points on 7, 3.5 and 1.8 MHz. For non-NA stations, contacts with stations in other countries but on the same continent count one point on 28, 21 and 14 MHz and two points on 7, 3.5 and 1.8 MHz. QSOs between stations in the same country count zero points, but are permitted for prefix multiplier credit. Multipliers are prefixes, to be counted only once. A prefix is the two or three letter/number combination that forms the first part of an amateur call sign, as in W1, G4, DF3, 8P6, etc. Stations operating outside the call area indicated by their call signs must sign portable. The portable prefix counts as the multiplier; for example, AA1K/3 in Delaware counts as an AA3 multiplier. Final score is total QSO points times sum of prefixes worked. Awards and club competition. Mail logs by May 10 (Jul 10 for CW) to *CQ Magazine*, WPX Contest, 76 North Broadway, Hicksville, NY 11801.

31

West Coast Qualifying Run, 10-35 WPM, at 0500Z Apr 1 (9 PM PST Mar 31). See Mar 4 listing for more details.

APRIL

4-5

North American QSO Party, CW, sponsored by the *National Contest Journal*, from 1800Z Apr 4 until 0600Z Apr 5 (phone—1800Z Apr 11 until 0600Z Apr 12). Contests are separate. Single-operator and multioperator. Multiop may be multitransmitter, but only one signal per band. No spotting nets for single op. Single ops may operate any 10 hours. Rest periods must be at least 30 minutes long and noted in log. Multiops may work the entire contest. Use only one call sign per contest. Exchange name and state/province/country. 160-10 (no WARC bands). Work stations once per band. Suggested CW frequencies are 35 kHz above band edge; phone—1.865 3.850 7.225 14.250 21.300 28.600. Try 10 m at 1900Z and 2000Z, 160 m at 0430Z and 0530Z. A valid QSO is two-way, logged exchange between a North American station (as defined by *CQ WW DX Contest* plus KH6) and another station. Multipliers are states (including KH6 and KL7), VE call areas (VE1-VE8, VO1, VO2, VY1) and other NA countries (do not count USA, VE, KH6 or KL7 as countries). Score 1 point per QSO. Multipliers times QSO points for final score. Awards. Send logs, summary sheet and dupe sheets before 30 days after the contest to Dave Pruett, K8CC, 2727 N Harris Rd, Ypsilanti, MI 48198.

GARTG SSTV Contest, Part 1, sponsored by the German AR Teleprinter Group, 0000Z-0800Z Apr 4, 1600Z-2400Z Apr 4 and 0800Z-1600Z Apr 5 (Part 2 will be held Oct 10-11). 3.5, 7, 14, 21 and 28 MHz only. Work stations once per band. Exchange call signs, signal report and serial number. GARTG members also send membership number. Count 10 points per QSO. Multipliers: countries as defined by the WAE and DXCC lists and W/K, VE/VO, JA, PY, VK call areas. Final score = QSO points \times multipliers worked per band \times continents worked per band. Add 50 bonus points per GARTG member worked. Mail logs to be received within 2 months to Wolfgang Punjer, DL8VX, PO Box 90 11 30, D-2100 Hamburg 90, Fed Rep of Germany.

Connecticut QSO Party, sponsored by the Candlewood ARA, from 2000Z Apr 4 until 0200Z Apr 6,

with a rest period from 0500Z to 1200Z. Phone and CW. Exchange signal report, serial number and ARRL Section (county for CT stations). CT stations work DX for QSO points (only one multiplier). Club station WIQI counts 5 points per band/mode. Novice QSOs count 2 points; OSCAR QSOs 3 points. CT stations multiply QSOs by ARRL Sections worked, others multiply by CT counties worked. Suggested frequencies: phone—3.927 7.250 14.296 21.370 28.540 MHz; CW—40 kHz from low end; Novice—3.725 7.125 21.125 28.125 MHz. Certificate to highest scorer in each state, and CT Certificate for working all CT counties. Mail by Apr 30 to CARA, c/o R. Dillon, N2EFA, RFD 7, Noel Ct, Brewster, NY 10509.

CRRL QST QSO Party, CW, sponsored by the CRRL Apr 4-5, 1500Z-2300Z each day (phone—Apr 11-12, 1500Z-2300Z each day). Work VE/VO QST stations. Suggested frequencies are the lower 50 kHz of all CW bands (phone—1.850 3.850 3.740 7.250 7.060 14.350 14.130 21.300 28.600). Make CW, phone or mixed contacts with 8 different VE/VO QST stations and receive a special CRRL QST Award. Send logs and SASE or SAE/IRC (business-size envelope) to Gary Hammond, VE3XN, 5 McLaren St, Listowel, ON N4W 3K1, Canada.

10 WIAW Qualifying Run, 10-35 WPM at 0200Z, Apr 11 (10 PM EST Apr 10). See Mar 12 listing for more details.

11-12 North American QSO Party, SSB, see Apr 4-5 listing for more details.

CRRL QST QSO Party, phone, see Apr 4-5 listing for more details.

GARTG RTTY Contest, Part 2, sponsored by the German AR Teleprinter Group. VHF, 1200Z-1600Z Apr 11; HF, 0700Z-1100Z Apr 12. VHF and HF are separate contests. Classifications: A—HF over 200-W input, B—HF under 200-W input, C—SWL, D—VHF. Exchange RST, QSO number, name, QTH, QTH locator (for VHF only). After each QSO, the station who called CQ must QSY. HF—3.5 and 7 MHz. Count 1 point per QSO. VHF—144, 432 and 1296 MHz. Count 1 point per 144-MHz QSO, 2 points per 432-MHz QSO, 3 points per 1296-MHz QSO. Final score is total QSO points. Mail logs to be received no later than 20 days after the end of the contest to Wolfgang Punjer, DL8VX, PO Box 90 11 30, D-2100 Hamburg 90, Fed Rep of Germany.

13 ARRL Spring Sprints, 144 MHz.

21 ARRL Spring Sprints, 220 MHz.

25-26 Helvetia Contest

26 WIAW Qualifying Run

29 ARRL Spring Sprints, 432 MHz.

Deadline: 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 Apr 1 to make the June issue. Please include name of 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; 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 as well as all regulations established for Amateur Radio in my country." The declaration should be signed and dated.

Special Events

Conducted By Billy Lunt, KR1R
Contest Manager, ARRL

San Antonio, Texas: The San Antonio RC will operate W5SC from 1200Z Mar 2 until 0200Z Mar 3 from the Alamo in celebration of the Texas Independence. Operation will be in the lower portions of the 10-80 General CW and SSB bands. For QSL, send SASE to W5SC, 3642 E Houston St, San Antonio, TX 78219-3818.

Sweetwater, Texas: The Nolan County ARC will operate a special-event station 1500Z-2400Z Mar 13-15, during the World's Largest Rattlesnake Roundup. Operation will be in the 20 and 40 General phone bands. For certificate, send QSL and large SASE to WR5B, Rte 2, Box 121-A, Sweetwater, TX 79556.

Fairbanks, Alaska: The Arctic ARC and the North Star Borough will operate special-event stations Mar 13-22 celebrating the Fairbanks Ice Festival and the Yukon Quest Sled Dog Race. Operation

will be on all bands 10-160 and most modes. For special QSL, send QSL and SASE to the station worked.

Macon, Georgia: The Macon ARC will operate W4BKM Mar 28, 1500Z-2100Z, to commemorate the Cherry Blossom Festival. Suggested frequencies: phone—14.237; CW—7.137. For a Cherry Blossom Certificate, send large SASE and QSL to Macon ARC, PO Box 4862, Macon, GA 31208-4862.

Deadline: 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 Apr 1 to make the June issue. Please include the name of the sponsoring organization, the location, dates, times (Z), frequencies and call sign of the special-event station. 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- x 12-in 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 both 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 will often print their cards and/or certificates after the operation is over so they will know how many to order.

Strays



ATTENTION: YLs

The Lani Kai Resort, Ft Myers Beach, Florida will be the site of the YL Spring Fling, May 29-31. Registration is \$7 until May 1, \$8 after May 1. Accompanying OMs need not register, but must have meal reservations. Activities include fashion show, shell-making demonstrations, charter fishing, golf and tours. There will be a rooftop luau on Saturday night. Hotel rooms and efficiencies cost \$45; RV accommodations available. For more information, contact Myrtle Farnsworth, N2AKC, 142 Kihade Trail, Medford Lakes, NJ 08055, tel 609-654-9496.

I would like to get in touch with...

US or Canadian hams with spare amateur call-sign license plates. Wilhelm Johannes, YD2DKL, Pandega Duta 3/17, Yogyakarta 55281, Indonesia.

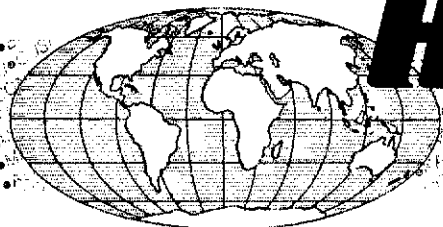
QST congratulates...

- the following radio amateurs on 50 years as ARRL members:
- Grant Storey, W6NIK, of Oakhurst, California
 - Lee McKee, W0BX, of Muscatine, Iowa
 - Paul Schneider, N6XW, of Oxnard, California

Mel Hughes, K6KSY, on being elected mayor of Rancho Palos Verdes, California.

Feedback

The Novice and Technician class labels in the 15-meters bar chart on page 58 of January 1987 QST are not aligned properly with the frequencies they relate to. The "N" and "T" should be under the extreme-right column.



HAM RADIO OUTLET

LARGEST HAM OUTLET IN THE WORLD

OUR COMMITMENT TO YOU IS
QUALITY, ACTION & SERVICE.

7 STORE BUYING POWER

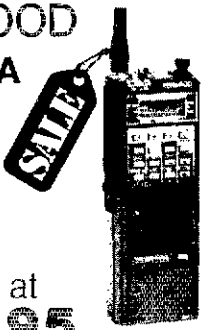
KENWOOD TS-940S



TOP-OF-THE LINE
HF TRANSCEIVER
GREAT PRICE. CALL

KENWOOD TR-2600A

SUPER SALE!



A few left at
\$269.95
plus free spare PB-26

HAM RADIO HOME STUDY NOVICE VOICE COURSE



- Updated novice-voice questions
 - 6 stereo code & theory cassette tapes
 - 2 text books, code oscillator, key & battery
 - Color Ham Bands wall chart & frequency list
 - Sealed novice exam for a Ham friend to give you the code & theory test in your home
 - FCC license application forms & instructions to your examiner. **Ideal for spouse & the kids!**
- \$49.95**



MA-40
40' TUBULAR TOWER
\$745 SALE! \$549

MA-550
55' TUBULAR TOWER
\$1245 SALE! \$899

- Handles 10 sq. ft. at 50 mph
- Pleases neighbors with tubular streamlined look

TX-455
55' FREESTANDING CRANK-UP

- Handles 18 sq. ft. at 50 mph
- No guying required
- Extra-strength Construction
- Can add raising and motor drive accessories



IN STOCK FOR QUICK DELIVERY
OTHER MODELS AT GREAT PRICES

HY-GAIN

CRANKUP SALE!

Single Strength
(handles 9 sq. ft.)
HG37SS - 37' Tower
HG52SS - 52' Tower

Heavy Duty
(handles 16 sq. ft.)
HG54HD - 54' Tower
HG70HD - 70' Tower

- All steel
- Includes base & rotor plate
- No guying required
- Hot dip galvanized
- Accessories available

CALL FOR PRICE!



KENWOOD R-5000

NEW



High Performance Receiver

- Covers 100 kHz - 30 MHz in 30 bands
- Superior dynamic range
- Computer control option

LOW PRICE!

YAESU FT-727R

NEW

5w, Dual Band
2m/440 MHz

Enhanced Version
Now Available!

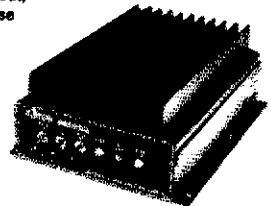
GREAT PRICE!



LUNAR

30w in, 180w out,
with low-noise preamp!

MODEL
2M30-160P
for 2 meters
SALE!
\$219.95



From the Originator of the
QUALITY VHF AMP/PREAMP COMBO!

Full Line Now Includes
UHF Models with
GaAs FET PREAMP!



All Major Brands in Stock Now!

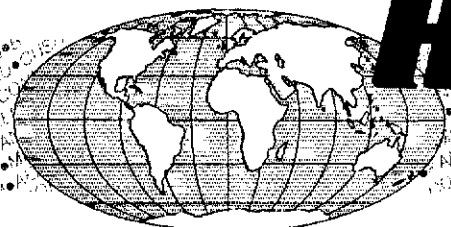
CALL TOLL FREE (800) 854-6046



Toll free including Hawaii. Phone Hrs: 7:00 am to 5:30 p.m. Pacific Time. California, Arizona and Georgia customers call or visit nearest store. California, Arizona and Georgia residents please add sales tax. Prices, specifications, descriptions subject to change without notice.



OUR COMMITMENT TO YOU IS
 QUALITY, ACTION & SERVICE.



HAM RADIO OUTLET

LARGEST HAM OUTLET IN THE WORLD

7 STORE BUYING POWER

KENWOOD
TS-711A TS-811A

Ideal VHF/UHF base stations for 2M/70CM transceiver operation.

GREAT PRICES. CALL

KENWOOD
TS-940S

TOP-OF-THE LINE HF TRANSCEIVER

CALL FOR LOW, LOW PRICE

KENWOOD **NEW**
TH-21BT/31BT/41BT

MINI HAND-HELD
 With dip switch programmable CTCSS encoder built-in.

GREAT PRICE!

KENWOOD
TS-440S

HF TRANSCEIVER

- 160-m to 10-m Amateur Band
- 100-kHz to 30-MHz General
- Available with optional built-in Antenna Tuner.

CALL FOR PRICE!

NOW! RAPID DELIVERIES

COAST TO COAST

FROM STORE NEAREST YOU

KENWOOD
TM-2570/2550/2530
 70w 50w 30w

Compact FM Mobile Transceivers

LOW PRICE!

KENWOOD
TR-751A

COMPACT 2-METER ALL MODE TRANSCEIVER

LOW PRICE!

KENWOOD
TM-3530A

The First Comprehensive 220 MHz FM Transceiver.

ARE YOU READY FOR 220 MHz OPERATION?

KENWOOD **NEW**
TH-205AT

The Ultimate Affordable Portable!

GREAT PRICE!

All Major Brands in Stock Now!

Bob Ferrero W6RJ
 President

Jim Rafferty N6RJ
 VP So. Calif Div.
 Anaheim Mgr.

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

ATLANTA, GA 30340
 6071 Buford Hwy.
 (404) 263-0700
 Neil, Mgr. KC4MJ
 Doraville, 1 mi. north of I-285

BURLINGAME, CA 94010
 999 Howard Ave.
 (415) 342-5757
 George, Mgr. WB6DSV
 5 miles south on 101 from SFO

OAKLAND, CA 94606
 2210 Livingston St.
 (415) 534-5757
 Al, Mgr. WA6SYK
 17N-5th Ave./17S-16th Ave.

PHOENIX, AZ 85015
 1702 W. Camelback Rd.
 (602) 242-3515
 Bob, K7RDH
 East of Hwy. 17

SAN DIEGO, CA 92123
 5375 Kearny Villa Rd.
 (619) 560-4900
 Tom, Mgr. KM6K
 Hwy. 163 & Claremont Mesa Blvd.

VAN NUYS, CA 91401
 6265 Sepulveda Blvd.
 (818) 988-2212
 Al, Mgr. K6YRA
 San Diego Fwy. at Victory Blvd.

STORE HOURS
 10 AM-5:30 PM
CLOSED SUNDAYS

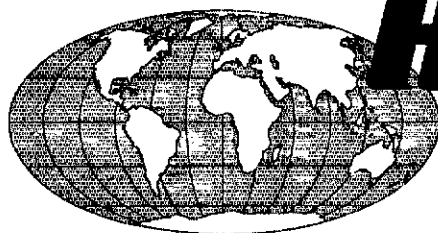
FREE SHIPPING!
 Most items in our store

CALL TOLL FREE (800) 854-6046

Toll free including Hawaii. Phone Hrs: 7:00 am to 5:30 p.m. Pacific Time. California, Arizona and Georgia customers call or visit nearest store. California, Arizona and Georgia residents please add sales tax. Prices, specifications, descriptions subject to change without notice.



WORLDWIDE DISTRIBUTION



HAM RADIO OUTLET

LARGEST HAM OUTLET IN THE WORLD

NEW ATLANTA STORE!
EASY SERVICE FOR
OUR EASTERN CUSTOMERS

7 STORE BUYING POWER

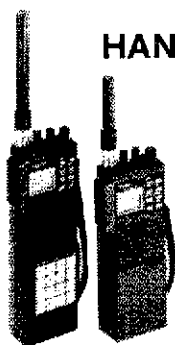


YAESU

MINI HAND-HELD

FT-23R
2 METER

FT-73R
440 MHz



NEW

GREAT PRICE!



YAESU

FT 757GX



Compact HF Mobile Transceiver

CALL FOR PRICE



YAESU

HANDHELD FT 209RH

5 WATT 2M/HT



CALL NOW FOR LOW PRICE

NOW! RAPID DELIVERIES

COAST TO COAST

FROM STORE NEAREST YOU



YAESU

FT-727R

5w, Dual Band
2m/440 MHz

Enhanced Version Now Available!

CALL FOR PRICE



YAESU

FT 726R



Great for OSCAR 10 and VHF DXing

YOUR BEST BUY!

WE SHIP DIRECT TO YOU FROM ANY ONE OF OUR NATIONWIDE OUTLETS.



YAESU

FT 2700RH



Full Duplex FM 2M/70cm

CALL FOR PRICE

FREE SHIPMENT

MOST ITEMS UPS SURFACE

All Major Brands in Stock Now!



Bob Ferrero W6RJ
President

Jim Rafferty N6RJ
VP So. Calif Div.
Anaheim Mgr.

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

ATLANTA, GA 30340
6071 Buford Hwy.
(404) 263-0700
Neil, Mgr. KC4MJ
Doraville, 1 mi. north of I-285

NEW

BURLINGAME, CA 94010
999 Howard Ave.
(415) 342-5757
George, Mgr. WB6DSV
5 miles south on 101 from SFO

OAKLAND, CA 94606
2210 Livingston St.
(415) 534-5757
Al, Mgr. WA6SYK
17N-5th Ave./17S-16th Ave.

PHOENIX, AZ 85015
1702 W. Camelback Rd.
(602) 242-3515
Bob, K7RDH
East of Hwy. 17

SAN DIEGO, CA 92123
5375 Kearny Villa Rd.
(619) 560-4500
Tom, Mgr. KM6K
Hwy. 163 & Claremont Mesa Blvd.

VAN NUYS, CA 91401
6265 Sepulveda Blvd.
(818) 988-2212
Al, Mgr. K6YHA
San Diego Fwy.
at Victory Blvd.

STORE HOURS
10 AM-5:30 PM
CLOSED SUNDAYS



CALL TOLL FREE (800) 854-6046

Toll free including Hawaii. Phone Hrs: 7:00 am to 5:30 p.m. Pacific Time. California, Arizona and Georgia customers call or visit nearest store. California, Arizona and Georgia residents please add sales tax. Prices, specifications, descriptions subject to change without notice.





8975 W. GOSHEN AVE., VISALIA, CA 93291

Fastest Shipments in the Industry.

MA SERIES CRANK-UP TUBULAR TOWERS

Will handle 10 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
MA-40	40"	21'6"	2	242	3"sq.	4 1/2"	\$ 735.00
MA-550	55'	22'1"	3	435	3"sq.	6"	\$1245.00
MA-550MDP*	55'	22'1"	3	620	3"sq.	6"	\$2640.00
MA-770	71'	22'10"	4	645	3"sq.	8"	\$2385.00
MA-770MDP*	71'	22'10"	4	830	3"sq.	8"	\$3780.00
MA-850MDP*	85'	23'6"	5	1128	3"sq.	10"	\$5090.00

*MDP models complete with heavy-duty motor drive with positive pull down.

Shown w optional MAHS 550 motor base and motor drive



FREE STANDING CRANK-UP TOWERS

Will handle 18 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
TX-438	38'	21'6"	2	355	12 1/2"	15"	\$ 925.00
TX-455	55'	22'	3	670	12 1/2"	18"	\$1395.00
TX-472	72'	22'8"	4	1040	12 1/2"	21 1/2"	\$2295.00
TX-472MDP*	72'	22'8"	4	1210	12 1/2"	21 1/2"	\$3695.00
TX-489	89'	23'4"	5	1590	12 1/2"	25 1/2"	\$3995.00
TX-489MDPL*	89'	23'4"	5	1800	12 1/2"	25 1/2"	\$5995.00

*TX-472MDP includes heavy-duty motor drive with positive pull down. TX-489MDPL comes with heavy-duty motor drive with dual level wind and positive pull down. (Both motor drive models include limit switch brackets)

FREE STANDING HEAVY-DUTY CRANK-UP TOWERS.

Will handle 30 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
HDX-538	38'	21'6"	2	600	15"	18"	\$1195.00
HDX-555	55'	22'	3	870	15"	21 1/2"	\$2095.00
HDX-572	72'	22'8"	4	1420	15"	25 1/2"	\$3595.00
HDX-572MDPL*	72'	22'8"	4	1600	15"	25 1/2"	\$5495.00
HDX-589MDPL*	89'	23'6"	5	2440	15"	30 1/2"	\$7195.00

*Includes heavy-duty motor drives with dual level wind and positive pull down. HDX-572MDPL includes limit switch brackets only. HDX-589MDPL includes limit switches and limit switch brackets

FREE STANDING "LOW PROFILE" COMPACT CRANK-UP TOWERS.

Will handle 18 sq. ft. antennas at 50 MPH winds. (TMM-433HD handles 24 sq. ft.)

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
TMM-433SS*	33' w/o mast	11'4"	4	315	10"	18"	\$ 985.00
TMM-433HD*	33' w/o mast	11'4"	4	400	12 1/2"	20 1/2"	\$1195.00
TMM-541SS*	41' w/o mast	12'	5	430	10"	20 1/2"	\$1295.00

*Hy-Gain and some Alliance rotors when installed inside tower will restrict retracted height by approx. 24" Most Kenpro models allow full retraction.

Standard bases included with all towers (except MA-770, 770-MDP and 850-MDP).

- ALSO AVAILABLE: • Motor drives for most towers
• 5' to 24' antenna masts • Coax arms • Service platforms
• Mast raising fixtures • Special bases • Limit Switch Packages

FOR ADDITIONAL INFORMATION Contact:
Amateur Electronic Supply (All Locations) • Texas Towers
Ham Radio Outlet (All Locations) • U.S. Tower (209) 733-2438

Prices are FOB factory, Visalia, CA. Prices and specifications are subject to change without notice.

441, WN3VAV 224, N3AES 177, WA3UNX 157, N3CZW 124, WA3DBW 73, W3NGO 69, W3RUL 52, W3KZM 50, W3KUN 50, N3FM 50, KA3NVZ 44, W3TTN 36, WA3QNT 35, K3SMB 35, ADJ 35, K3LTV 31, KQ3M 29, N3EJK 25, KE3V 22, KC3HR 22, KA3EGE 11, WGSN 3. (Nov.) W3KUN 54, W3TTN 9.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBO—SEC: W9QBB, STM (vacant) OOC: W9IT, BM: K9EUI, SGL: W9KPT, PIO: K9IDQ, ACC: W9SFT, TC: N9RF, ASM: AA9D. Congratulations to N9CT who earned BPL this month with a traffic total of 817. December brought its heavier than usual traffic load, the handling of which was not made any easier by the generally lousy conditions on 80/75 in the evenings. Thanks to PIA N9EWA for the fine summary of his many public information activities throughout the year. If each of us were as conscientious about keeping the media informed of the public service activities of Amateur Radio as Bill has been, ham radio would be a household topic of discussion throughout the state. Keep up the fine work! December saw the completion of the long-awaited Illinois Repeater information package. If by the time you read this, the trustee or other representative of your coordinated repeater has not received the mailing, please contact WD9EBO for a copy. It appears that the novelty of the Illinois Section ARRL hotline, 800-IL-ARRL, (800-451-2775) has worn off a bit, as very few callers now dial the number "just to see if it works." It does get regular use in the coordinating of various activities within the section, and gets quite a few calls from non-amateurs interested in getting licenses, as well as from League members with questions about the field organization. In short, it appears to be well worth the section budget dollars that are spent to support it, and it will be continued as long as our budget, which is based on section membership, allows it. (Traffic total 817, KA9EZF 403, W9HLY 334, W9EHS 303, W9NKG 225, WAFZAD 187, W9VLC 175, W9HCT 127, K9CNP 108, W9LWH 108, W9HBI 99, N9N9 93, K9JL 91, W9KR 76, W9DZU 72, N9CIB 50, KA9BZW 33, KA9CWT 27, WA9Y2R 22, W9LNU 21, N7DYO 20, W9BTU 19, K9WPM 16, N9DX 13, W9UJM 12, K9QEW 11, W9DQW 10, KD9TK 5, W9VEY 5, WA9RUM 5, W9OES 3, N9EDK 2.)

INDIANA: SM, Ron Koczor, K9TUS—ASM: W9UJM, SEC: W9BZQ, STM: W9UJU, ACC: K9TUS, TC: K9PS, SGL: WA9VQ, BM: K9STA, PIO: KA9LQM, OOC: K9JG, SRC: N9WB, Net Managers: ITN KD9DU, QIN K9J, ICN KW9D, VHF W9PMT, IWN KA9ER.

Net	Freq	Time Daily	UTC	QNI	QTC	QTR	See
ITN	3910	1330/2130/2300		3557	547	2869	89
QIN	3656	1430/0000/0300		514	480	1582	62
ICN	3705	2315					
IWN	3910	1310		1589	364	31	
IWN VHF	Bloom/Kokomo			2018	345	62	
Hoosier VHF Nets:				3696	166	3269	114

APPT: KD9NC, EC Johnson County: W9BRLR, EC Hamilton County: W9CRI, EC Cass County: K9RNC, EC Montgomery County: N9BRN, EC Vigo County: N9BS, OBS: N9AAC, OBS, Silent Keys, W9KVE, Evansville: KD9MN, Terre Haute: BPL for December: W9JUU, total traffic, 1240. This month's SSC of the month is Huntington County ARS. This small town club has about 30 members, operates a repeater and regular ARS nets twice a week, and actively supports SKYWARN system. Contact is KC9AX, Club operates Field Day, SE and provides travel and refreshments on the masts on the highways on holiday weekends. HCARS also provides public service communications for three annual local events. Proof again that you need not be big to be active. Keep up the good work Auburn hams got some good PR when they assisted the mayor get information about typhoon damage. It took less than 30 minutes to get a report from Saipan to Auburn. All Indiana 75 meter NCS have a listing of license test sessions for the state. If you want to know when the next session is, check into ITN, ICN or QIN and ask the NCS. I plan to be at the Tloga ARC club meeting March 2. Looking forward to meeting everyone there. Don't forget the Winchester Hamfest on March 1 and the Indiana Hamfest formerly called the Martinsville Hamfest) at Indy on March 8. Also don't forget the 1987 is the 50th anniversary of the ARRL DXCC program. Do something special to commemorate the event. Congratulations to the ARRL staff who have kept this the premier DX award worldwide! Club officers please make sure your 1987 affiliation forms are sent in to maintain your active status. It is such a simple step to stay part of the family. Station reports December: W9JUU 1240, K9J 442, W9JZV 215, KA9FFO 163, KB9H 116, W9UEM 103, K9WUJ 92, W9DWD 92, N9J5 83, WA9CZ 80, W9BQZ 50, KA9QIM 48, W9HJ 42, W9ZQE 36, KD9ER 35, W9PMT 28, N9D7 27, K9KTB 26, K9ZBM 28, W9JHR 22, KA9LQM 20, KA9HNY 19, W9ZGC 18, K9WC 18.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK, STM: K9LUT, ACC: KA9FOZ, BM: W9JUSW, OOC: N9CG, PIO: K9ZD, SGL: AG9V, TC: K9GDF. Thanks to N9EEE for capably handling the VUCC Awards Manager position for the past three years; K9RHS will be taking over the work and can help you apply for the award. Confirm 100 or more grid squares to qualify for the VHF/RHF Century Club award. Congratulations to VUCC recipients K1TMM, W9XT, KD9IV, K9RHS and KA9SPD on 6 meters; K9VGE and W9YCV on 2 meters; and W9UB both 2 and 6 meters. March 7 at 8 AM, Milwaukee School of Engineering RC Swapfest, southwest corner of Milwaukee and Juneau Streets, N9EOZ for information. The 1987 Wisconsin QSO Party starts at noon on March 15th, check QST Contest Corral or ask other amateurs for details. Get on the air to meet other Wisconsin amateurs, give the Wisconsin QSO Party a try. March 14, Fox Cities ARC Swapfest, Kaukauna High School, exit Hwy 55 south off Hwy 41 to Main Street, exams available, N9SJ, March 22, Tri-County ARC Hamfest, 3 AM, Jefferson County Fairgrounds, walk-in exams begin 9 AM at WCTI, 800 Main Street, Pewaukee, with W9JLZ. New officers Manroed RC: Pres. KA9UPM; V. Pres. W9BESM; Sec. N9FVZ; Treas. N9BCX. The Badger State Smoke Signal newsletter which promotes Wisconsin Amateur Radio now has a new print format. BSSS does us all a service by publishing an exam list, club meeting schedule and all the news. Contact K9ZZ, K9EN or W9UQT for information on how you can subscribe. The Ozaukee RC new Newsletter Editor is W9WQ; former editor KA9DDN will be putting more time into other club activities. Sorry to report Silent Key W9IGW. Let me know your news. Traffic: W9YV 125, KA9H 518, W9YCV 377, N9EGE 297, W9CBE 253, WA9WYS 248, K9GDF 239, W9BQZ 170, N9ALU 156, W9UCI 125, N9BDL 105, N9BCX 105, K9UTU 85, W9DND 73, KA9BHL 78, W9SJK, W9AGG 74, K9AKG 70, KA9KLZ 50, W9DFR 42, W9ODV 338, K9JPS 33, W9NPK 31, W9NGP 31, K9GB 26, K9FHI 29, W9DNO 23, N9FTN 18, W9UW 15, WA9BZW 11, W9PVD 2. (Nov.) KC9CJ 783, N9BGE 147, N9BDL 107, N9BCX 102, KA9KLZ 68, K9AKG 68, AG9G 62, KA9BHL 50, KY9P 11, K9LGU 9, KA9RZL 6.

DAKOTA DIVISION
MINNESOTA: SM, George Fredrickson, Jr., KC9T—SEC:

CALL FOR
FREE
CATALOG



1500 WATT PEP TRANSMATCH KIT



BASIC KIT—

- 1 - rotary inductor 28µh
- 2 - 6:1 ball drives
- 1 - 0-100 turns counter
- 2 - variable capacitors 25-245 pf 4500 v rms

OPTIONS—

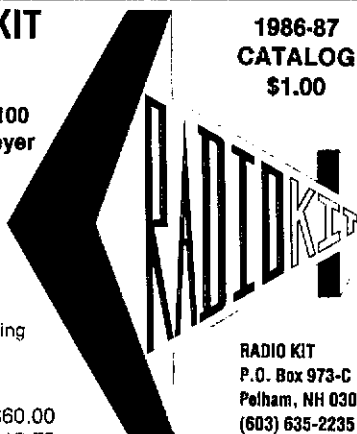
- enclosure (pictured in Sept. 86 CQ) \$60.00
- 4:1 balun kit \$18.75
- dials, terminals, ceramic standoffs, hardware, toroids, amp components, B & W coil stock, etc.

Call Now
Nel-Tech DVK-100
Digital Voice Keyer
in STOCK
\$349 net

Basic Kit

\$154.95
Plus \$4.00
Shipping and handling

1986-87
CATALOG
\$1.00



RADIO KIT
P.O. Box 973-C
Pelham, NH 03076
(603) 635-2235
telex 887697



R&L ELECTRONICS 575 main st.

HAMILTON! OHIO 45013

Large
Stock

YAESU 
The radio.

KENWOOD

 **ICOM**



See you at the **DAYTON HAMVENTION** in the
MAIN ARENA

for all of the 1987 **SUPER DEALS!!!**

WE **STOCK** ALL MAJOR LINES OF AMATEUR RADIO EQUIPMENT, ANTENNAS,
TOWER, AND RADIO ACCESSORIES.



COD'S WELCOME!

1-800-221-7735

STORE HOURS

Monday-Friday
10:00 A.M. to 6:00 P.M.
Saturday 10:00 A.M. to
3:00 P.M.

CALL OR WRITE FOR OUR **FREE CATALOGUE**

WE SERVICE WHAT WE SELL!

513-868-6399

1987 CHARLOTTE HAMFEST AND COMPUTERFAIR

ARRL ROANOKE DIVISION ANNUAL CONVENTION, 1987

SAT. MARCH 21 9:00 AM to 5:00 PM -- SUN. MARCH 22, 9:00 AM to 3:00 PM
CHARLOTTE CONVENTION CENTER, 4th & COLLEGE STREETS, CHARLOTTE, NC

AWARDS
FORUMS

AWARDS
MANUFACTURER AND DEALER BOOTHS

AWARDS

AWARDS
FLEA MARKET TABLES

AWARDS
EXAMS

**SPECIAL - CW CONTEST SUNDAY 11:00 AM - SPECIAL
***** PRIZE TO THE FASTEST LICENSED AMATEUR!**

LICENSE EXAMS BY CHARLOTTE VEC ON SATURDAY
COMPLETED FORM 610 AND \$4.00 FEE REQUIRED BY MARCH 14, 1987 - NO WALK-INS
MAIL TO CHARLOTTE VEC, 227 BENNETT LANE, CHARLOTTE, NC 28213

ADMISSION STILL AT 1983 PRICES!
PREREGISTRATION TICKETS: \$5.00 AT-THE-DOOR: \$6.00 (VALID BOTH DAYS)
Flea Market Tables: Preregistration \$10.00 : At-the-door \$12.00
PREREG. DEADLINE MARCH 14, 1987 - MAIL REQUESTS + S.A.S.E AND CHECK TO:
CHARLOTTE HAMFEST, P. O. BOX 221136, CHARLOTTE, NC 28222-1136
Talk-in frequency - 145.29 MHz.

HAMFEST ACCOMODATION SPECIALS
HEADQUARTERS HOTEL: MARRIOTT CITY CENTER, 100 W. TRADE ST., CHARLOTTE, NC 28202
Phone 704-333-9000 - \$54 sngl or dbl, reservation by Feb. 27, 1987, subject to availability
ADDITIONAL ROOMS AT RADISON PLAZA HOTEL, TWO NCNB PLAZA, CHARLOTTE, NC 28280
Phone 704-377-0400 - Subject to availability

EXHIBIT BOOTH INFO: Dick Klavohn, W4QWD, 7317 Easen Court, Charlotte, NC 28211, 704-366-3661
PREREGISTRATION: Jack Arnold, KD4JC, 1333 Picadilly Dr, Charlotte, NC 28211, 704-366-2382
FLEA MARKET INFO: Jeff Blyth, KA4WYC, 634 Northway Dr, Charlotte, NC 28208, 704-393-7140
CW CONTEST INFO: Jack Mitchell, KA4FHS, 442 Mammoth Oaks Dr, Charlotte, NC 28211, 704-366-2235

OPPORTUNITY CALLING FROM NRI

Start your own telephone/cellular radio service & repair business



NRI telephone course includes: (Phone) Lab and Digital Multimeter, B&K Telephone Line Analyzer, Pushbutton Memory Phone, Cordless Phone, NRI Design Worksheet, look-a-likes and personalized help from the NRI professional staff!

New Bootstrap Industry Lets You Be Your Own Boss

Since the breakup of AT&T, things aren't the same in the telephone business. Now there's a perfect new business opportunity for thousands of independents who have been trained to service, install and repair old phones, plus all the new cordless and cellular mobile car phones, that are becoming more and more popular. NRI's training and start-up equipment offer you the option of starting your own bootstrap business or cashing in on the jobs being created by the new telephone technologies.

NRI shows you how you can make a good living in telephone servicing, with a practical combination of electronic fundamentals and hands-on experience with all types of phones in use today in homes and offices—cord, cordless and cellular.

Learn troubleshooting—with cordless and memory phones you keep!

The heart of NRI telephone training is eight

Action Learning kits. You master the "reason-why" theory, then you move immediately into "hands-on" practices. Using a digital multimeter and a telephone line analyzer, you'll test every function of a telephone line, zeroing in on the problem spots and correcting them.

As an NRI student, you learn at home, at your convenience. Without rigid night-school schedules or classroom pressures, NRI's tested "bite-size" lessons lead you step-by-step toward your goal of independence as a telephone service expert.

Send coupon for FREE catalog

Find out for yourself exactly what this new NRI training can do for you. NRI's free catalog gives you all the facts on training for Telephone Servicing & Repair or other technical fields such as Microcomputers, TV/Audio/Video System Servicing and Communications Electronics. If coupon has been removed, write to NRI Schools, 3939 Wisconsin Ave., Washington, DC 20016.

KABARP, STM KDQCI. Hello to everyone that reads this. As the new editor of this column, please bare with me. Thanks goes out to the guys who helped out at the Lat/Plumian International Sled Dog Races held on December 27/28, 1988 near Wynne Lake. A special TX goes out to the Communications Dept. whose members were: NTBB, KABBF, WDQCGM, WDPGUF, WDHNO, KMMK, and WBWJL. I am sorry to report the following Silent Keys: NBBEH, Richard Sutton, and WBMV, Kline Bower, our deepest sympathy to their family and friends. Our Amateur of the Month for December is NTBB, Lee, from Parkville. We should have a drum roll for this, KAEPY, Jim from Coon Rapids, is Ham of the Year: CONGRATULATIONS! Our recent upgrade include KAOPYE, Dean, to General. In closing, anyone with Antenna projects had beautiful WX in December to get it done, I did. (Just ask my wife.) 73's KAEBFF.

NET	FREQ	TIME	QNI/QTC/SESS	MGR
MSN/RTTY	3620	6:30P	78/4/13	WA8LUT
MSN/1	3685	6:30P	404/106/31	KA8EYF
MSN/2	3685	10:00P	329/47/31	NC8E
MSSN	3710	6:00P	251/39/30	KA8ODQ
MSPN/N	3929	12:00P	577/224/31	WB8WJL
MSPN/E	3929	5:30P	938/194/31	KA8BFF
MNAMWXNT	3929	6:15P	505/101/21	K8OGI
PICONET	3925	9:00A	5055/397/173	WD8BAC

MN EMERGENCY FREQ: 3929 BULLETINS: 3685 & 3929
M/MSSO: 3620, Traffic: KA8EYF 499, WA8TFC 468, KABARP 423, KDQCI 270, K791 199, N8FQD 144, KA8SBJ 91, WD8GUF 89, KA8ODQ 87, W8GRW 84, N8C1 870, KD8JL 84, W8WDM 59, KD8JL 58, K8OGI 58, KA8AJF 48, KA8BF 43, WA8ONE 35, N8JP 33, K8BR 30, KC8T 29, W8KYG 26, NTBB 21, KA8PQW 18, WA8LUT 16, KA8PDM 16, KA8CDC 13, N8CRO 7, N8EWA 7, N8HHB 6.

NORTH DAKOTA: SM, Lois Jorgensen, WA8RWM—This is my last report as I have resigned as SM as time doesn't give me enough time to do Amateur Radio justice. Congratulations to N8AFP who was elected as your new SM. I hope you all give him the help and cooperation you gave me; it is always appreciated. Be sure you send him your Club Newsletter as it helps to know what Clubs are doing and helps to get news items for his column. W8GZD was on local Television at his QTH demonstrating Ham Radio showing DX cards and talking on his rig. Thanks alot Paul for FB.

NET	FREQ	MGR	SESS	QNI	QTC
GOOSE RIVER	1990	W8CDO	4	138	61
ND WX NET	3883	W8GFE	82	619	70
DATA	3883	KA8FSM	21	364	20
NORTH FORTY	04/64	NS8H	4	44	0

Traffic: KA8FSM 105, (Nov.) W8CDO 48, W8CDO 69.

SOUTH DAKOTA: SM, R. L. Cory, W8YMB—STM: N8ABE, Ole Johnson. SEC: KA8KPY, Warner Muns. The Rapid City council has passed an antenna ordinance to regulate antenna construction in Rapid City. Rapid City Club president WB8PWA, Rudy Mooney, did a lot of work with the people on the council and he reports that the ordinance as passed is kind to the radio amateurs and it does not create any problem for ham radio. The Amateur Radio call letter License plate bill is house bill 115 and calls for a state to be no charge. I hope by the time you read this that it will have passed. N8ABE reports 87 stations now on packet in south dakota I am still looking for a volunteer for a bulletin station for South Dakota. Anyone interested in any field appointment, please contact me. Due to delays in the mail, I have not received the traffic report at the time of this writing. Traffic: K8ZBJ 111, K8ERIM 88, WA8VRE 32, WA8VRE 48, WB8DMF 33, W8YMB 11, N8ABE 11, KA8UEH 6.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, W8SIFG—ASM: K5UR, SEC: NS8FU, STM: W8OK, ACC: N8SD, SGL: W5LCI, TC: W8FD, Repeater Coordinator: W8SPD. The 1987 ARRL Delta Division Convention is 8 & 9 in Little Rock. You need information, contact WASLUV, Wayne Mahnker in North Little Rock. DON'T MISS THIS CONVENTION. 1987 club officers: CAREN - Pres W85VUH, VP WASOQY, Sec: KA8DQG, MARC - Pres K85QL, VP KA5WVE, Sec: N8SD, Treas: KC5ZP, Act. Mgr. KF5LK, NW Ark ARC - Pres W8ASNAT, VP W8SEP, Sec: KA5RFC, Treas: KA5BML. The W85B Packet Gateway system is up and running and is receiving NTS traffic into the state. It is also available to export NTS traffic also. Our section traffic handlers are to be commended for the excellent work during the holiday traffic rush. Ark Razorback Net now on 3987.5 KHz at 6:30 pm each night. Arkansas CW Net (OZK) on 3591 KHz. Congratulations to K5UR on appointment to DXAC.

LOUISIANA: SM, John "Wondy" Wondergem, K8KR—SEC: NS8ADP, ACC: K5DPG, SGL: K5SSL, OOC: K5SQK, TC: NSJIM, PACKET: N8SS. Congrats to the new officers of the Baton Rouge ARC: Pres: John K5PWC, VP: Rick N8VA, Sec: Bob W5FLK, Treas: Tom NS8ADP. Most hams at most times have encountered a problem that needs outside assistance to solve. To assist hams with a volunteer contact that has technical knowledge the ARRL appoints Technical Coordinators (TC) and Assistants (ATC). They have indicated their willingness to help novices to old timers with a technical or RFI problem. RFI problems in todays world of electronic computers and control seem to be commonplace. Contact your TC or any of the ATCs and they can make some suggestions and refer you to a wealth of RFI information. Bill-K5VGGQ from West Monroe, Ronnie-K5SKT from Olla, Bob-N8EBH/5 from Fort Polk and Clarence W8SHY from Lake Charles are ready to help if you request assistance. If you are interested in being appointed an ARRL ATC you need to be a full member, be a tech or higher and have a technical understanding of ham radio. If interested contact the Louisiana Section Technical Coordinator (TC) John-NSJIM, 112 Sherwood Forrest Dr, New Orleans, LA 70119. The Lafayette Hamfest is one of the best. Mark your calendar for March 14 & 15 at the Central Holidays, I-10 and LA 167 in Lafayette. See you there.

MISSISSIPPI: SM, Paul Kemp, KW5T—ASM: K5QNE, SEC: K4HKD, SGL: AL7GQ, ACC: KC5VD, PIO: KA5VBE, OOC: W5VMC, VHF Coord: NS8WU, BM: AJ8X, TC: W8SSXK. Kudos to the Jackson ARC for another outstanding ARRL State Convention and Jackson Hamfest; KC5VD and crew did another great job! Hattiesburg and Laurel ARC's enjoyed their annual joint dinner meeting and ARRL forum. Regret to report the deaths of K5OAF, a premier traffic man and CW op; W8TAB, known widely for his WARS work; and W8GGZ, who spent many a hour helping new and potential hams. These gentlemen will be sorely missed. Completely reworked 31/31 repeater up in Natchez and sounding great! More and more folks enjoying packet; have you sampled this exciting new frontier? With Spring arriving, it's a good time to get your station checked out for "storm season"; have your gear ready to go in case you're needed. Is there life above I-20? Your PIO receives regular reports from Vicksburg, Jackson, the Gulf Coast, Hattiesburg and Laurel; but, there's little input from the northern half of the Section. Let us hear from you and share your accomplishments in these pages. MSBN (WJ5P) Sessions 31 QNI 2352 QTC 64. MMIN (WJ5L) Sessions 31 QNI

NRI

SCHOOLS

McGraw-Hill Continuing Education Center
3939 Wisconsin Avenue, Washington, DC 20016

We'll give you tomorrow.

✓ CHECK ONE FREE CATALOG ONLY

- | | | |
|---|--|---|
| <input type="checkbox"/> Telephone Servicing | <input type="checkbox"/> Color TV, Audio, and Video System Servicing | <input type="checkbox"/> Industrial Electronics |
| <input type="checkbox"/> Computer Electronics with Microcomputers | <input type="checkbox"/> Electronics Design Technology | <input type="checkbox"/> Basic Electronics |
| <input type="checkbox"/> Data Communications | <input type="checkbox"/> Digital Electronics | <input type="checkbox"/> Small Engine Servicing |
| <input type="checkbox"/> Robotics & Industrial Controls | <input type="checkbox"/> Communications Electronics | <input type="checkbox"/> Appliance Servicing |

For Career courses approved under GI bill,
 check for details.

Name (Please Print) _____

Age _____

Street _____

City/State/Zip _____

Accredited by the National Home Study Council

Phone _____

19-037

ANNOUNCING

For Orders & Quotes

CALL TOLL FREE

1-800-423-2604

(US and Hawaii)

Mon-Fri 9:00-5:00 Central Time

Sat 9:00-1:00 Central Time

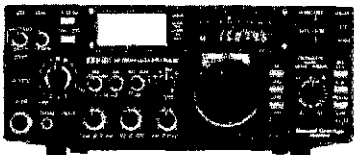
**AUSTIN AMATEUR
RADIO SUPPLY**

Friendly Service

Texas Style!

Texas Residents Call

(512) 454-2994



IC-745

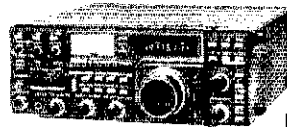


IC-R7000



IC-28A
IC-28H

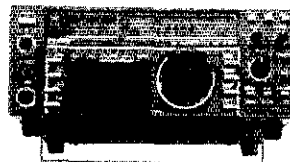
IC-02AT
IC-04AT
IC-2AT
IC-3AT
IC-4AT



IC-751A



IC-3200A



IC-735



IC-R71A

KENWOOD

KENWOOD

KENWOOD



TR-2600A
TR-3600A

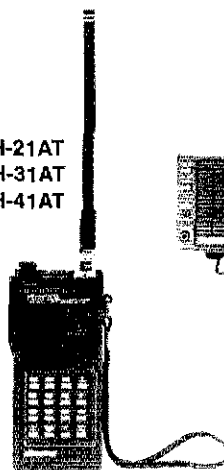


TR-751A

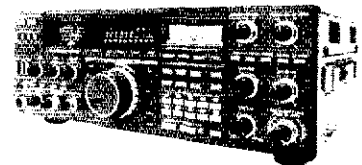
TH-21AT
TH-31AT
TH-41AT



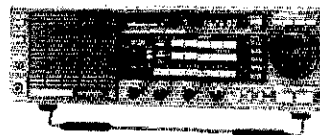
TM-2530A
TM-2550A
TM-3530A



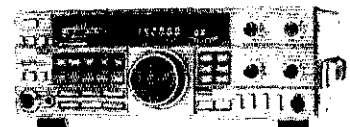
TS-940S



R-2000



TS-440S



Austin Amateur Radio Supply • 5325 N. IH 35 • Austin, Texas 78723 • 512/454-2994



DAYTON **HAMVENTION**

April 24, 25, 26, 1987

Early Reservation Information

• General Chairman, Jim Simpson, WB8QZZ

• Asst. General Chairman, Bill McNabb, WD8SAY

Grand banquet tickets are limited, please place your reservations early.

- **Giant 3 day flea market** • **Exhibits**
- **Awards** • **License exams**
- **CW proficiency test**

Flea Market Tickets

We increased Flea Market area by nearly 400 spaces this year and all were sold out by January 10.

Special Awards

Nominations are requested for "Radio Amateur of the Year", "Special Achievement" and "Technical Achievement" awards. Contact: Awards chairman, Box 44, Dayton, OH 45401.

License Exam

Novice thru extra exams scheduled Saturday & Sunday by appointment only. Send current FCC form 610, copy of present license and check for \$4.35 (payable to ARRL/VEC) to: Exam Registration, 8830 Windbluff Point, Dayton Oh 45459

Slide Show

35 mm slide/tape presentation about the HAMVENTION is available for loan. Contact Dick Miller 2853 La Cresta, Beavercreek, OH 45324

Parking

Free parking is available at Hara Arena. In addition, there will be free shuttle bus service from all major motels and designated parking lots. Parking and road information will be available on DARA's 146.34/.94 repeater.

Free Bus Service

Free Bus Service will be provided between many Motels and Hara Arena. See the schedules at the motel registration desks. Avoid parking problems at the Arena by taking the HAMVENTION buses.

Campers & Trailers

Campers and Trailers may be parked at Montgomery County Joint Vocational School. A HAMVENTION bus will provide transportation between the camper parking area and the Arena. No campers or travel trailers will be permitted to park in the Arena lot or Flea Market area.

Wheelchairs

Wheelchairs will be available. Send S.A.S.E. for details to "Wheelchair" P.O. Box 44, Dayton, OH 45401.

Alternate Activities

HAMVENTION is for everyone. We have planned activities for the YL or your non-ham family members.

Deadlines

Award Nominations: April 4

Lodging: April 4

License Exams: March 28

Advance Registration and banquet: USA - April 11
Canada - April 4

Information

General Information: (513) 433-7720

or DARA Box 44 Dayton, OH 45401

Flea Market Information: (513) 223-0923

Lodging Information: (513) 223-2612

(No Reservations By Phone)

This is the year for you to attend the internationally famous Dayton HAMVENTION. Come with your friends to hear enlightening forums, see the latest equipment, and visit a flea market that has everything! No matter what you are looking for, you can find it in Dayton!

HAMVENTION is sponsored by the Dayton Amateur Radio Association Inc.

The Closer You Look, The Better ICOM Looks

While initial purchasing decisions concerning amateur equipment are often influenced by glamorized magazine advertisements, the overall acceptance and long-term success of any unit depends on its after sale performance and reliability. ICOM realizes that satisfied customers are always the best salespeople, and its new generation of HF and VHF transceivers continue to reflect that philosophy. ICOM is devoted to top of the line quality, smooth operation, and uncompromising service.

One shining example of that situation is demonstrated in the **IC-735** and **IC-751A's** RF power amplifier reliability record. Thanks to the use of elaborate protection circuits and conservatively rated components, an operational failure of those transceivers' 100-watt "finals" has yet to appear at ICOM America's service centers. Furthermore, a large number of ICOM owners continuously report "really putting their transceivers to use" with heavy contesting and RTTY operating. That's reliability supreme!

The previously mentioned protection circuit in ICOM transceivers monitors final amplifier current, forward/output power, and reflected power. A control voltage proportional to those measurements is then directed to an auxiliary input in the transceiver's **ALC** circuit. The usual purpose of an Automatic Level Control section in any SSB transceiver is to limit its IF amplifier's gain during modulation to ensure maximum "talk power."

The sounds and syllables in normal speech continuously vary in amplitude. Some are strong and quite pronounced, others are barely perceptible. By increasing the IC-751A's gain for weak sounds and decreasing its gain for strong sounds, a high average RF output is maintained during transmissions.

The ALC section in ICOM transceivers thus serves a dual purpose: constantly protecting the power amplifier from harmful operating conditions, and ensuring full bodied modulation during SSB transmissions. Its operation might be visualized as an electrical equivalent to the RPM-limiting governor added to some autos to avoid engine damage.

Since ALC section can be monitored on the transceiver's front panel meter, it serves as both an operating and preliminary diagnostic aid. A steady output mode such as RTTY or FM is suggested for diagnostic checks. If the ALC meter reads abnormally low when there's less than 100 watts output, the power amplifier is trying to boost a weak input (low mic gain or weak AFSK tones). An excessively high ALC reading indicates the power amplifier is protecting itself from a high input or excessive reflected power. Clever radio, eh?

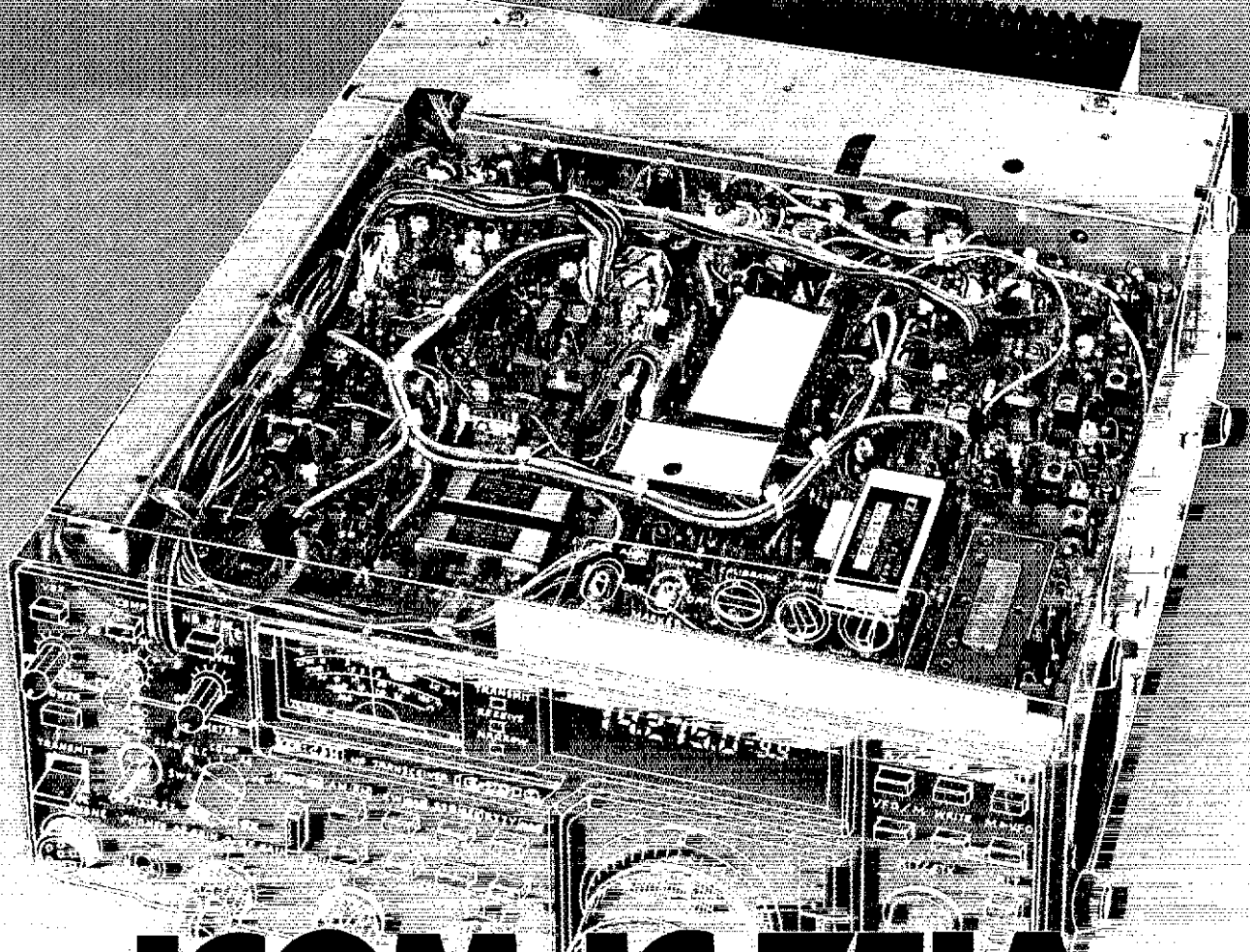
Although an external oscilloscope can be used for determining a proper mic gain setting, the convenient and popularly accepted technique involves ALC metering. The mic gain is adjusted until the meter reads comfortably within its

ALC zone to provide full bodied modulation with normal speech. Too much mic gain will cause an excessive ALC reading (remember, it's measuring "hold back" action on the power amplifier). Low mic gain will not produce ALC action (and since the levels in speech vary, "talk power" is lost).

Several of today's HF linear amplifiers require only 65 to 70 watts of RF drive to produce their maximum output. Since additional drive can create a distorted signal and adjacent frequency interference, amateurs usually consider reducing their transceiver's mic gain (and forfeiting ALC-acquired "talk power") to reduce RF drive. ICOM owners, however, enjoy a more logical and efficient alternative. A front panel **RF POWER** control functions on all modes (including SSB), providing transceiver output adjustments independent of the mic gain settings and ALC action. The results assure maximum "talk power" at any RF level. It's the best of both worlds!

Whether your operating interests involve QRP, QRO, or something in between, ICOM's new generation transceivers have you covered with maximum "talk power" and long-term reliability. It's also reassuring to know the ICOM service department isn't bogged down with repairs so an ailing unit receives prompt attention. It's an inspiration rather than an inconvenience to its outstanding technicians.

Ready to join the winning team?
Join the new ICOM generation!



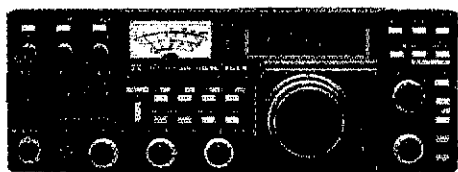
ICOM IC-751A

"IT'S WHAT'S INSIDE THAT COUNTS!"

- All HF Band Transceiver / General Coverage Receiver
- Advanced Circuit Designs
- All Modes Built-in USB, LSB, FM, AM, CW, RTTY
- Superb Frequency Stability
- Continuous Duty Operation
- Crystal Clear Signal Quality

Midsize Masterpiece! The deluxe IC-751A includes more high performance features and professional circuitry per cubic inch than any other HF transceiver. Its smooth-as-silk operation and long-term reliability produce the ideal contesting, DX'ing, mobiling and portable rig. Owning an IC-751A truly means "Going First Class!"

Unsurpassed Quality and Reliability. Quality and Reliability is important to you and it's important to ICOM. ICOM now covers you and your investment with its exclusive



one year warranty. There's more! The IC-751A's receiver boasts 105dB dynamic range for superb listening. The 100% duty cycle transmitter defies abuse and delivers 100 watts of exceptionally stable and clean RF output. Reliability. Quality. One year warranty. That's ICOM.

All Bands, All Modes Included. Operates 160 through 10 meters, it's easily modified for MARS operation, plus it includes general coverage reception from 100kHz to 30MHz. No compromise, no comparison!

32 Tunable Memories. Store both frequency and mode information. Use them to quick-access your favorite spots or as 32 preferred frequency-remembering VFOs.

A Modern Amateur's Delight! Special attractions include an electronic keyer, semi or full break-in rated to 40 WPM, panel selectable 500Hz/FL-32A CW filter, and volume control-tracking sidetone. SSB transmissions are enhanced with an RF speech processor and tone control to produce sparkling clear audio. PLUS there's a new rubberized tuning knob for velvet-smooth tuning and a full line of accessories and filters.

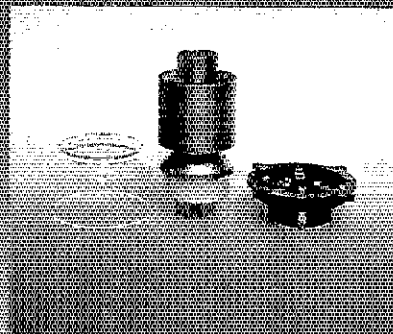
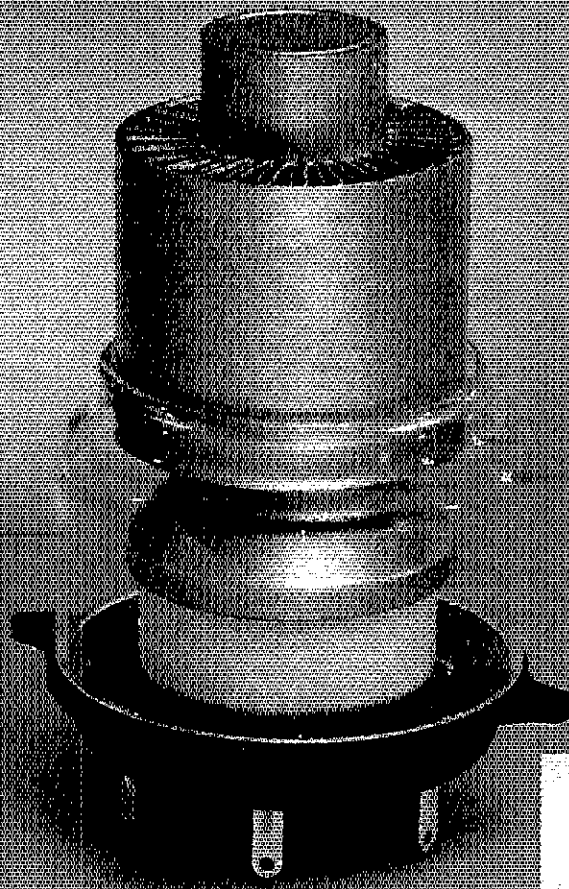
RF Power Control. Varies output independent of mic gain, ALC and speech processor action. Enjoy maximum "talk power" at any drive level!

To see the IC-751A, contact your local ICOM dealer.



ICOM America, Inc., 2380-116th Ave NE, 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 approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 751A187



The 3CX1200A7 continues the EIMAC tradition of serving AMATEUR RADIO.

EIMAC was right there to meet Ham requirements of 1500 watts PEP with its 3CX1200A7 tube. Leading manufacturers count on its proven performance and reliability.

Low-cost power for small spaces

The rugged 3CX1200A7 takes size into consideration and, by design, is recommended as a single, low-cost alternative for a pair of EIMAC 3-500 Z tubes for new amplifier designs.

General Specifications

The EIMAC 3CX1200A7 is a high- μ , compact, forced air cooled triode for zero-bias class AB2 amplifiers.

- 2.9" dia. x 6.0" long
- Plate dissipation: 1200 watts
- Glass chimney SK-436 available
- Standard EIMAC SK-410 socket available

More information is available on the new EIMAC 3CX1200A7 tube from Varian EIMAC, or any Elec-

tron Device Group worldwide sales organization.

Varian EIMAC
1678 S. Pioneer Road
Salt Lake City, Utah 84104
Telephone: 801 • 972-5000



20MHz IC-38A
140MHz IC-48A
Now Available!



ICOM IC-28A/H

THE ONE FOR THE ROAD

- Compact Size
- Simple to Operate
- Large LCD Readout
- 25 Watt IC-28A
- 45 Watt IC-28H
- Packet Compatible
- 21 Memory Channels

The IC-28H has all the features you need for carefree 2-meter mobile operation. The only thing it doesn't have is a big price.

45 Watts. The IC-28H provides a full 45 watts of powerful output. The IC-28A 25-watt version is also available. Both units have a selectable low power.

Large LCD readout. A wide-view LCD readout can be easily read even in bright sunlight. An automatic dimmer circuit reduces the brightness for evening operation.

Wideband Coverage. The IC-28H performs from 138-174MHz (specifications guaranteed from 144.00-148MHz) and includes weather channels. Ideal for MARS and CAP operation.

Compact Size. The IC-28H measures only 2 inches high by 5 1/2 inches wide by 7 1/4 inches deep (IC-28A is 5 1/4

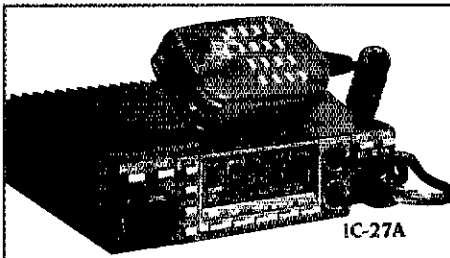
inches deep). Great for mobile installations where space is limited.

21 Memory Channels. Store 21 frequencies into memory, or lock out certain memory channels. All memories are backed up with a lithium battery.

Scanning. Scan the entire band or the memory channels from the provided HM-12 mic.

Easy to Operate. With only 11 front panel controls, the IC-28H is simple to operate.

Available Options. IC-HM14 DTMF mic, PS-45 13.8V 8A power supply, UT-29 tone squelch unit, SP-10 external speaker, IC-HM16 speaker mic and HS-15/HS-15SB flexible boom mic and PTT switchbox.



The IC-27H 45 watt and IC-27A 25 watt ultra compact 2-meter mobiles continue to be available.



ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 Customer Service Hotline (206) 454-7819
3150 Premier Drive, Suite 126, Irving, TX 75063

ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 - Canada

All stated specifications are approximate and subject to change without notice or obligation. All radios significantly exceed FCC regulations limiting spurious emissions. 28H986

*Delaware
Amateur Supply
presents...*

ICOM DAY

SATURDAY

MARCH 7, 1987

9:00am—3:00pm

WIN!

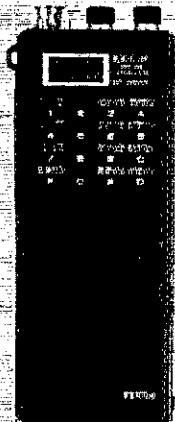
★ Prize drawings each hour.
Come and register to win!

★ Grand Prize
Drawing:

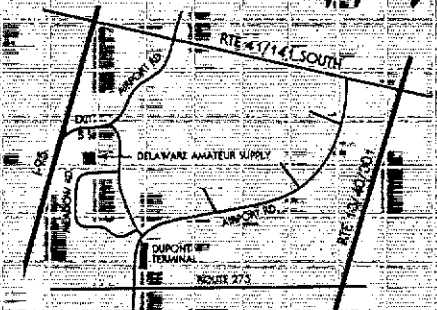
IC-02AT

2-Meter
Digital
Readout
Handheld

★ No purchase
necessary to
register for
drawings.



*Delaware
Amateur Supply*



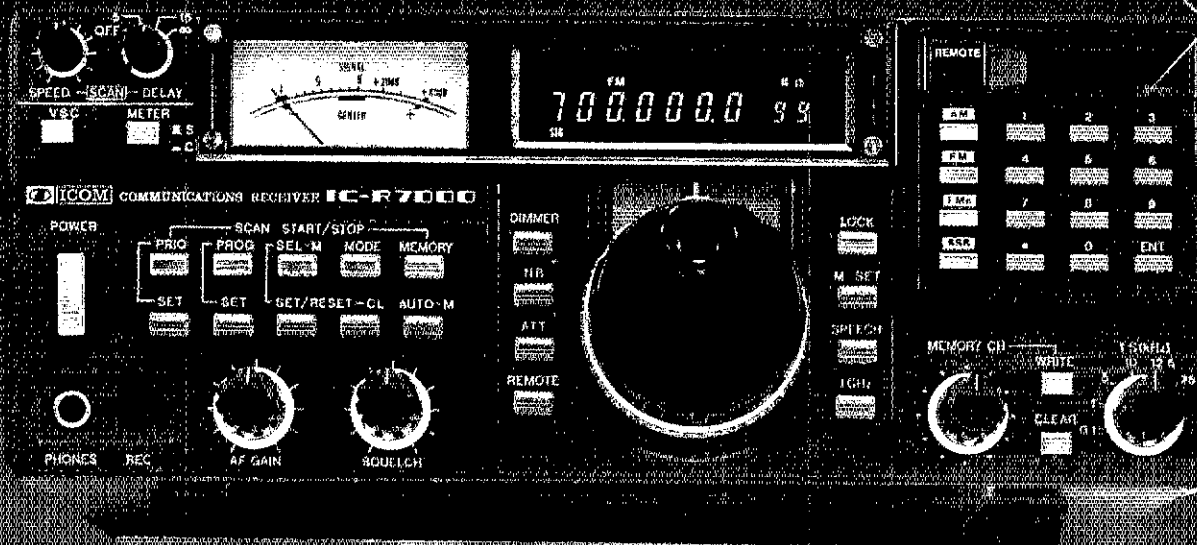
71 Meadow Road
New Castle, DE 19720

(302) 328-7728
(800) 441-7008

- ★ Special pricing!
- ★ ICOM personnel to demonstrate new equipment.
- ★ See the new line of ICOM equipment.
- ★ New equipment available for your inspection and purchase.

ICOM 25-1000MHz Plus!

IC-R7000



ICOM's commercial quality scanning receiver...Top quality at a gem of a price.

ICOM introduces the IC-R7000 advanced technology 25-2000MHz* continuous coverage communications receiver. With 99 owner programmable memories, the IC-R7000 covers low band, aircraft, marine, business, FM broadcast, amateur radio, emergency services, government and television bands.

Keyboard Entry. For simplified operation and quick

tuning, the IC-R7000 features direct keyboard entry. Precise frequencies can be selected by pushing the digit keys in sequence of the frequency or by turning the main tuning knob.

99 Memories. The IC-R7000 has 99 memories available to store your favorite frequencies, including the operating mode. Memory channels may be called up by simply pressing the Memory switch, then rotating the memory channel knob, or by direct keyboard entry.

Scanning. A sophisticated scanning system provides instant access to most used frequencies. By depressing the Auto-M switch, the

IC-R7000 automatically memorizes frequencies in use while the unit is in the scan mode. This allows you to recall frequencies that were in use.

Other Outstanding Features:

- FM wide/FM narrow/AM/upper and lower SSB modes
- Six tuning speeds: 0.1, 1.0, 5, 10, 12.5 or 25KHz
- Dual color fluorescent display with memory channel readout and dimmer switch
- Compact Size: 4-3/8"H x 11 1/4"W x 10 7/8"D
- Dial lock, noise blanker, combined S-meter and center meter

- Optional RC-12 infrared remote controller
- Optional voice synthesizer. When recording, the voice synthesizer automatically announces the scanned signal frequency.

*Specifications guaranteed from 25-1000MHz and 1260-1300MHz. No coverage from 1000-1025MHz. No additional module required for coverage to approximately 2.0GHz.

See the IC-R7000 receiver at your local authorized ICOM dealer. Also available is the IC-R71A 0.1-30MHz general coverage receiver.

ALL THIS AT A PRICE YOU'LL APPRECIATE.



First in Communications

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. IR7000985

hy-gain® Tower of Strength

Rugged, all steel Hy-Gain antenna crank-up towers are galvanized after welding. Precision welding fixtures assure straight and true alignment of tower sections for close tolerance crank-up guide systems. Diamond web bracing, 2.5 times the strength of ordinary "W" bracing, adds strength where tower sections meet. Open-end tubular steel legs are galvanized inside and out and permit unrestricted moisture drainage. It all adds up to long lasting, massive tower strength for antenna loads of up to 16 sq. ft. at 60 mph.

	Height Extended	Height Retracted	Antenna Square Foot Windload Limit
HG-37SS	37 ft.	20.5 ft.	9.5 @ 50 mph
HG-52SS	52 ft.	21 ft.	9.5 @ 50 mph
HG-54HD	54 ft.	21.5 ft.	16 @ 60 mph
HG-70HD	70 ft.	21.5 ft.	16 @ 60 mph

Towers come complete with hinged base, installation steelwork, predrilled rotator plate and a manual winch.

Hy-Gain crank-up towers require no guying and conform to EIA, to the Uniform Building Code, and are approved by Los Angeles (license 1095). UBC documents for building permits are available on request (specify tower model) before you buy the tower.

OPTIONAL TOWER ACCESSORIES

- Mast • Thrust Bearing • Coax Arms • Rotators • Tower Gin Pole

FREE FREIGHT

Order any Hy-Gain tower from your dealer for factory shipment direct to you. Hy-Gain will pay the freight on the tower and any of our antennas, rotators and accessories ordered for shipment at the same time. This offer is limited to within the 48 contiguous United States.

For detailed information call toll free
1-800-328-3771
In Minnesota call 612-887-5528

TELEX®

hy-gain®

TELEX COMMUNICATIONS, INC.

9600 Aldrich Avenue South
Minneapolis, Minnesota 55420

838 QTC 8, HAEN (N5GRW) Sessions 4 QNI 87 QTC 0, CAND (W5KLV) Sessions 31 QTC 1300 (Mississippi) represented 100% by N5AMK, DRNS (W5B500) Sessions 62 ATC 1304 (Mississippi) represented 100% by N5AMK, KT5Z, W5HKW, KB5W and KB5EC. Traffic: N5AMK 633, KT5Z 147.

TENNESSEE: SM, John C. Brown, N04Q—ASM: WA4GLS, ACC: WA4GLS, OOC: W9FZW, SEC: WA4GZQ, SGL: WA4GZZ, STM: NG4J, & TC: W4HHK. Much talk has been running the bands about a "PACKET RADIO MANAGER" for the section. I guess most has been by the SM, but nonetheless as of 1 January, 1987, Bill Gilroy, W4YXA has consented to take on the task. I say task and that is the least that could be said to describe the things required to get the program and management and operation system going for Tennessee. He will need all the help from all sources he can get. He will need managers for the various local and area nets. Please make contact with him and offer your assistance and resources. Many thanks Bill for taking on the JOB. Your section manager is requesting that all hamfest committee chairman send N04Q a note or radiogram as soon as possible. I need to also advise HQs so that hamfest material can be in time for the affair. The date is also needed so that Section Staff personnel can be scheduled at the hamfest. By the time you read this the season will be under way. Thanks for your assistance in this matter. I am reminded about the integrity of our VE teams. There have been some not-so-good reports getting out on some teams. Sure hope none are in the Tennessee Section. Team liaisons keep clean, squeaky clean your team. I am not in the least way saying that we have not been. I thank you for that. The traffic activity for this reporting period is up. I am sure that we did a lot that I am not seeing and can add to this report. A lot of satisfaction can be realized from calling a household name and passing greetings from a distant place. If YOU JUST MIGHT think it. We have some fine YLs calling some of the nets and I can say that they are doing a mighty fine job. Thanks WA4HKU and WB4T and host of others on nets that I don't hear. Traffic for this period is as follows: LF Sessions-74, QNI-4432, QTC-104; VHF Sessions-31, QNI-2201, QTC-532; CW Sessions-40, QNI-97. NET MANAGERS—please get your reports in to NG4J before 6th of the month. CW Net Honor Roll-N4OSZ, N4OSB, WA4CNW, NG4J & W4LVP. Station activity for period: W9FZW 216, W4DDK 176, K4WVW 152, WA4FMR 120, NN4S 100, W4TYV 68, K4WOP 53, K4S4DB 49, WA4HKU 28, W4TYU 26, KE4LS 23, W4PFP 20, W4PSN 19, W4EVR 10, N4OSB 9 & W4MRD. CUL

GREAT LAKES DIVISION

KENTUCKY: SM, Dale Bennett, WA4JTE—Not much going on this month. We all made it through the holidays. Hope all had an enjoyable holiday. KTN is in the news again. Russ, KA4GBZ, would like for someone to take over as manager. He has agreed to remain in office for a while. Anyone interested in the job, please let me know. Russ has done a fine job, and we very much appreciate all your efforts. Hope you change your mind, Russ, and stay on as manager. Packet Radio is still growing in the state. Some new areas of activity are Hazard and Somerset. We need to get some activity in the southwest corner of the state, then we would have the state pretty well covered. P3HR: K4AMT 77, Traffic: K4VIF 206, K4CJA 82, WD4RIU 16, K4S4A 46, K4A4B 40, KA4B50 28, K4AVX 28, WD4OQF 23, K4HOE 23, WA4SWF 22, K4JHP 22, WA4AVV 15, KA4GBZ 8, W4PKX 8, KU4A 4.

MICHIGAN: SM, James R. Sealey, W8BMTD—Silent Keys, with deep regrets: W8BD; KB8IO. For those who might have missed it elsewhere, the MI ARRL State Convention will be held in Saginaw, Aug. 29-30, in conjunction with the GL Division Convention, rather than in Muskegon in March as previously announced. Clubs: officially, MI was 150 years old on January 26, but all of 1987 is our Sesquicentennial year. Are you getting involved in the celebration? It's a golden opportunity for some good PR and for having a lot of fun. So far I've heard from CMARC, LCARC and Bay Area ARC. If I don't get your bulletin and you're doing something related to the celebration, let me know, what, where and when, to help me with a comprehensive report I'll be trying to put together for this memorable time. Photos would be nice, too. Michigan Emergency Patrol (MEP) in the Detroit area welcomes and encourages amateur participation. Those with autopatch or mobile phone capability can report traffic emergencies on MEP's priority line, 875-2555. (From Catalpa ARS Radiator). One local group's view of packet communication (Bay Area ARC): Packet... What happened to the Packet? Seems to be BBS, Digipeaters, and quiet QSO's with one or two people. All three can't exist on the same frequency. So everyone is seeking their own frequency to play on. We still haven't settled on what we can do with it. We tried passing messages but the rest aren't ready for that yet. Most are still learning the many methods of a packer and time we will see if it realizes the potential. Not necessarily a accurate summation of the overall picture, but a good indication of the "growing pains" that we all should be aware of when we hear all the "Packet about Packet." Does anyone remember when SSB was its infancy? Or VHF repeaters in theirs? Dec. net activity (Net QNI, Tlc, Sessions): QMN 984, 396, 90; MACS 643, 285, 31; MITN 412, 190, 29; SEMTN 284, 117, 30; UPN 1698, 112, 35; GLETN 765, 52, 31. SEMTN is now a part of NTS. Traffic: K4BOPS 601 (BPL), W8BKCQ 330, K8RDN 224 (BPL FOR 107 ORIG. + DEL), W8BSIV 182, AFV 172, W8BMBJ 157, W8RNO 121, W8QBH 119, K6HAP 115, N8FHH 91, K8GXV 86, K2BV 81, W8BSY 76, N8AJA 70, W8SCW 66, W8ADIB 63, KJUB 61, W8BSV 57, W8BIA 56, N8JH 50, K8MQ 46, K8OCP 43, N8BX 37, N8TG 34, W8HX 32, W8YIQ 31, N8CNY W8EIB 27, W8ACW 26, K8ZJU 20, W8YZ 19, K8O 17, W8URM 16, N8BSG W8EOI 14, W8VZ 13, W8CUP 9, W8BEZ 8, W8AMVH 5.

OHIO: SM, Jeffrey A. Mazess, K8ND—ASM: N8AJH, SEC: W8BMPV, STM: KF8J, BM: W8ZM, ACC: KJ30, TC: KB8MU. OOC: AD8I, PIO & SGL: N8CVK.

NET	QNI	QTC	Sess.	Time(Local)	FREQ.	MGR
BN(E)				1845	3.577	N8EVC
BN(L)	181	154	31	220	3.577	K8TVG
BNR	308	144	31	1800	3.605	W8BEK
BSSN	467	395	61	0945, 1900	3.873	K8OZ
ONN	137	32	28	1825	3.708	W88KBW
OSN	319	153	31	1810	3.577	N8AEH
OSSBN	2202	1391	93	1030, 1615, 8:1830	3.9725	W8JGW
OSSN	213	225	31	0645 M-F, 0800 G-Sn	3.577	K8RGV
				2100	50.16	K8BJV
06MN	114	17	14	1500 Sun.	3.875	W8BCTX
Ohio Section ARES Net				1500 Sun.	3.875	W8BMPV
Hamfest in March: Circleville March 1; Toledo/Maumee March 15; Lake County March 22. The Dayton Hamvention is coming, April 24-26. Amateur exams: March 14 in Columbus, Lima, and Maumee; March 21 in Youngstown; March 22 in Marietta and Mentor; March 28 in Ravenna and Barberton; April 4 in Portsmouth. Contact me for details. Tornado awareness week begins March 22, with a statewide drill by the National Weather Service on March 25 at 1010 AM. Participate: the public						

KENWOOD

...pacesetter in Amateur radio.

NEW!

Ultimate Affordable HT!

TH-205AT

Affordable 5-watt hand-held transceiver. Ultimate Affordability!

It's here now! The affordable, "Kenwood Quality" hand-held transceiver. Standard features include a large, easy-to-read LCD display, wide-range power requirements (operates on 7.2 VDC—16 VDC), 3-channel memory, built-in battery saver circuit, and, when operated on 12 VDC, a robust five watts of power! The die-cast metal rear panel/heat sink assures cool, reliable operation. Receiver frequency coverage from 141—163 MHz is also standard—you can even listen to the "weather channels" at 162.40 or 162.55 MHz!

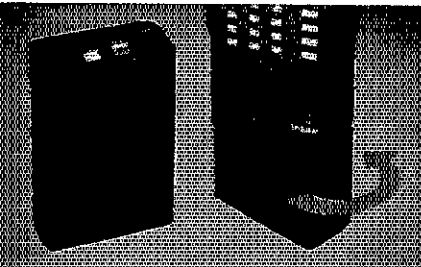
• Monitor switch—to check frequency when PL encode/decode switch is on.

• Extended frequency coverage for certain MARS and CAP operations.

• 3 memory channels store frequency and offset. And so easy to use! Simply press the memory channel number to recall your favorite channels!

• Night light, offset/reverse.

• 16-key DTMF pad for repeater autopatch is standard.



• **NEW! Twist-Lok Positive-Connect** battery case. A wide range of quick-change commercial duty battery packs are available.

• 12 VDC input terminal—allows direct mobile or external power supply operation. When 12 VDC is applied, power output increases to **5 watts!**

• Heavy-duty final amplifier and heat sink. The die-cast rear panel assures reliable operation. With the optional 12-volt PB-1 battery pack, the TH-205AT provides 5 W output. The standard 8.4 volt PB-2 provides 2.5 W output. (300 mW low power).

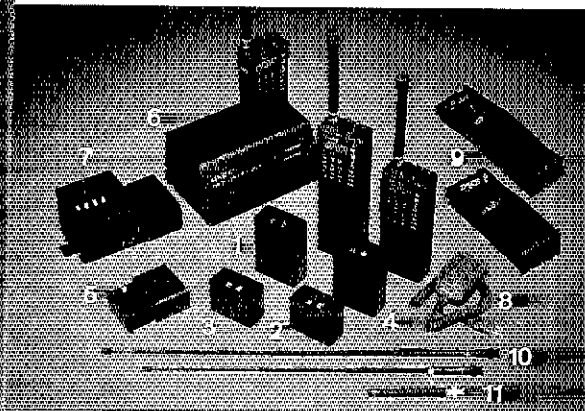
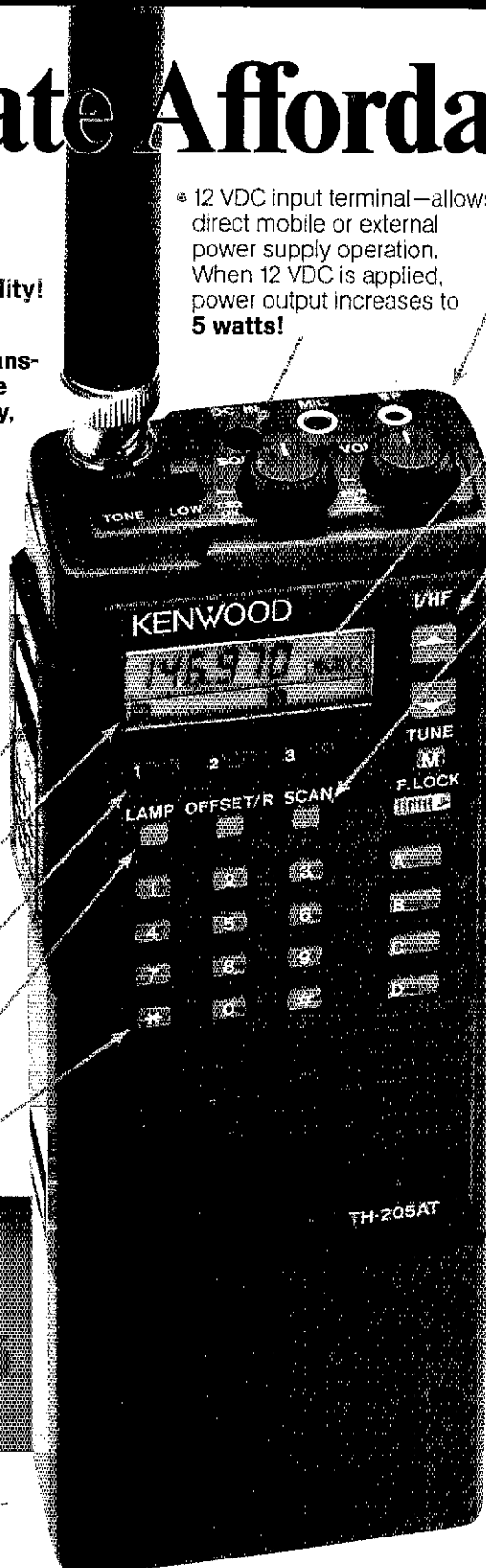
• Large, easy-to-read LCD display. Frequency, offset, memory channel, TX, RX, and battery indicator.

• Frequency UP/DOWN keys. Used to select frequency or scanning direction.

• Scan function key.

• Automatic battery saver circuit extends battery life. No buttons to push!

• Supplied accessories include: Rubber flex antenna, belt hook, 8.4 V, 500 mA NiCd battery pack, wall charger.



Optional Accessories:

- 1) PB-1 12 V 800 mA NiCd batt. pack (5 W output)
- 2) PB-2 8.4 V 500 mA NiCd batt. pack (2.5 W output)
- 3) PB-3 7.2 V 800 mA NiCd batt. pack (1.5 W output)
- 4) PB-4 7.2 V 1600 mA NiCd batt. pack (1.5 W output)
- 5) BT-5 AA manganese/alkaline battery case.
- 6) BC-7 Rapid charger for PB-1, 2, 3, or 4.
- 7) BC-8 Compact battery charger
- 8) SMC-30 Speaker microphone.
- 9) SC-12, SC-13 Suit cases.
- 10) RA-3, RA-5 Telescoping antennas.
- 11) RA-BB StubbyDuk antenna • TSU-3 CTCSS encode/decode unit • VB-2530 2 m, 25 W RF power booster • LH-4, LH-5 Leather cases • MB-4 Mobile bracket • BH-5 Swivel mount • PG-2V DC cable • PG-3C Filtered cigar lighter cord.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

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

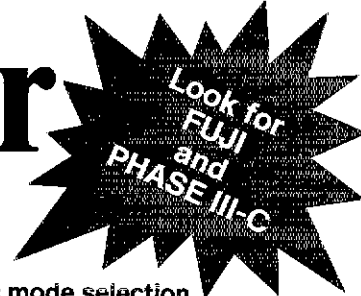
KENWOOD

...pacesetter in Amateur radio

Good
for Satellite
Digital QSOs

Matching Pair

TS-711A/811A VHF/UHF all-mode base stations



The TS-711A 2 meter and the TS-811A 70 centimeter all mode transceivers are the perfect rigs for your VHF and UHF operations. Both rigs feature Kenwood's new Digital Code Squelch (DCS) signaling system. Together, they form the perfect "matching pair" for satellite operation.

• **Highly stable dual digital VFOs.**

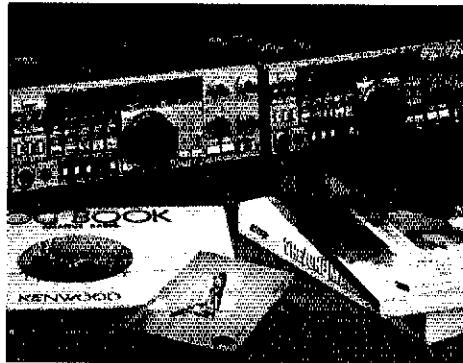
The 10 Hz step, dual digital VFOs offer excellent stability through the use of a TCXO (Temperature Compensated Crystal Oscillator).

• **Large fluorescent multi-function display.**

Shows frequency, RIT shift, VFO A/B, SPLIT, ALERT, repeater offset, digital code, and memory channel.

• **40 multi-function memories.**

Stores frequency, mode, repeater offset, and CTCSS tone. Memories are backed up with a built-in lithium battery.



• **Versatile scanning functions.**

Programmable band and memory scan (with channel lock-out). "Center-stop" tuning on FM. An "alert" function lets you listen for activity on your priority channel while listening on another frequency. **A Kenwood exclusive!**

• **RF power output control.**

Continuously adjustable from 2 to 25 watts.

• **Automatic mode selection.**

You may select the mode manually using the front panel mode keys. Manual mode selection is verified in International Morse Code.

• **All-mode squelch.**

• **High performance noise blanker.**

• **Speech processor.**

For maximum efficiency on SSB and FM.

• **IF shift.**

• **"Quick-Step" tuning.**

Vary the tuning characteristics from "conventional VFO feel" to a stepping action.

• **Built-in AC power supply.**

Operation on 12 volts DC is also possible.

• **Semi break-in CW, with side tone.**

• **VS-1 voice synthesizer (optional)**

More TS-711A/811A information is available from authorized Kenwood dealers.



Optional accessories.

- IF-10A computer interface
- IF-232C level translator
- CD-10 call sign display
- SP-430 external speaker
- VS-1 voice synthesizer
- TU-5 CTCSS tone unit
- MB-430 mobile mount
- MC-60A, MC-80, MC-85 deluxe desk top microphones
- MC-48B 16-key DTMF, MC-43S UP/DOWN mobile hand microphones
- SW-200A/B SWR/power meters: SW-200A 1.8-150 MHz SW-200B 140-450 MHz
- SWT-1 2-m antenna tuner
- SWT-2 70-cm antenna tuner
- PG-2U DC power cable

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
111 West Walnut Street
Compton, California 90220

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

C-COMM

THE HAM RADIO SPECIALISTS



IC-735

New compact general coverage receiver/ham band transceiver.

Call to Place Your Order

FEATURING



KENWOOD

YAESU

AEA

Kantronics

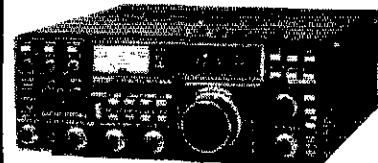
TELEX *hy-gain*



ASTRON CORPORATION

And More

- Competitive Pricing
- Fast Service
- Helpful Salespeople



IC-751A

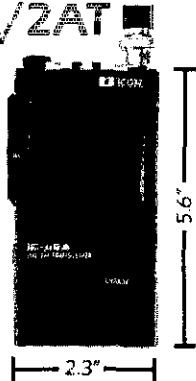
Deluxe HF Transceiver

Call For Your Price



IC-μ2A/ZAT

- Small Size
- 10 Memories
- Scanning
- Wide Frequency Coverage
- Size: 2.3"W x 5.6"H x 1.1"D



IC-28A/IC-38A/IC-48A

VHF-UHF Mobile

- Compact size
- Large LCD Readout
- 21 memory channels

Call For Your Low Price

FREE UPS GROUND SERVICE ON MOST ITEMS.

K7HBN
George
Sales

W7GAB
Dale
Sales

K7DS
Frank
Sales

WB6WPY
Joe
Service



800-426-6528

TOLL FREE — Including Alaska and Hawaii.
During regular store hours.

Washington residents call (206) 784-7337

Professional repair service is available through our complete service facility.

All prices, specifications and availability subject to change without notice. Washington residents add applicable sales tax. Free UPS Ground Service applies to most transceivers with related accessories excluding antennas.

C-COMM / 6115 15th Ave. N.W. / Seattle, WA 98107

STORE HOURS:

Mon.-Fri. 9:00a.m.-5:30p.m.
Saturday 10:00a.m.-4:30p.m.

C-COMM

George, Dale, Frank, Joe and other knowledgeable professionals are willing to help you.

KENWOOD

...pacesetter in Amateur radio

“Dual-Band” Leader!

TW-4000A 2-m/70-cm FM transceiver.

The first is still the best! The original FM “Dual Bander” TW-4000A delivers 25 watts output on both VHF and UHF in a single compact package.

2 m and 70 cm FM in a compact package.

Covers the 2 m band (142,000-148,995 MHz), including certain MARS and CAP frequencies, plus the 70 cm FM band (440,000-449,995 MHz), all in a single compact package. Only 6-3/8 (161)W x 2-3/8 (60)H x 8-9/16 (217)D inches (mm), and 4.4 lbs. (2.0 kg.).

Single-function keys allow easy operation.

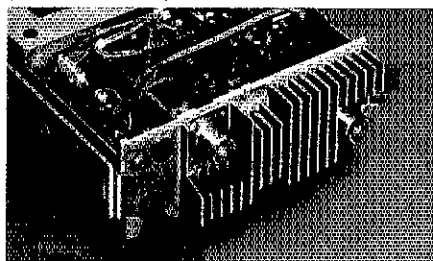
Large, easy-to-read LCD display.
A green, multi-function back-lighted LCD display for better visibility. Indicates frequency, memory channel, repeater offset, “S” or “RF” level, VFO A/B, scan, busy, and “ON AIR.” Dimmer switch.

Front panel illumination.

10 memories with offset recall and lithium battery backup.

Stores frequency, band, and repeater offset. Memory 0 stores receive and

transmit frequencies independently for odd repeater offsets, or cross-band (2 m/70 cm) operation.



• **Rugged die-cast chassis.**

• **Two separate antenna ports.**

Use of separate antennas is recommended. This simplifies antenna matching and minimizes loss. However, mobile installations may require a single antenna. The optional MA-4000 dual band mobile antenna comes with an external duplexer.

• **Programmable memory scan with channel lock-out.**

Programmable to scan all memories, or only 2 m or 70 cm memories. Also may be programmed to skip channels.

• **Band scan in selected 1-MHz segments.**

Scans within the chosen 1-MHz segment (i.e., 144,000-144,995 or 440,000-440,995, etc.). The scanning direction

may be reversed by pressing either the “UP” or “DOWN” buttons on the microphone.

• **Priority watch function.**

Unit switches to memory 1 for 1 second every 10 seconds, to monitor the activity on the priority channel.

• **Common channel scan.**

Memories 8 and 9 are alternately scanned every 5 seconds. Either channel may be recalled instantly.

• **High performance receiver/transmitter.**

GaAs FET RF amplifiers on both 2 m and 70 cm, high performance monolithic crystal filters in the 1st IF section, provide high receive sensitivity and excellent dynamic range. The high reliability RF power modules assure clean and dependable transmissions on either band.

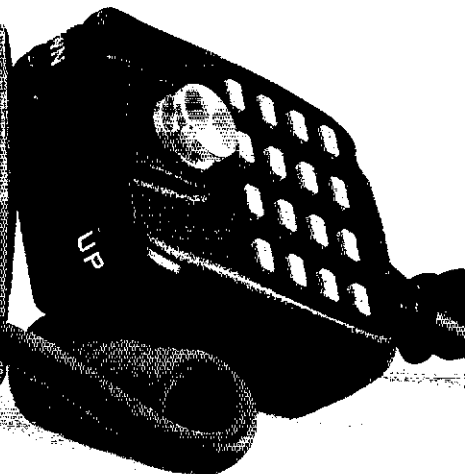
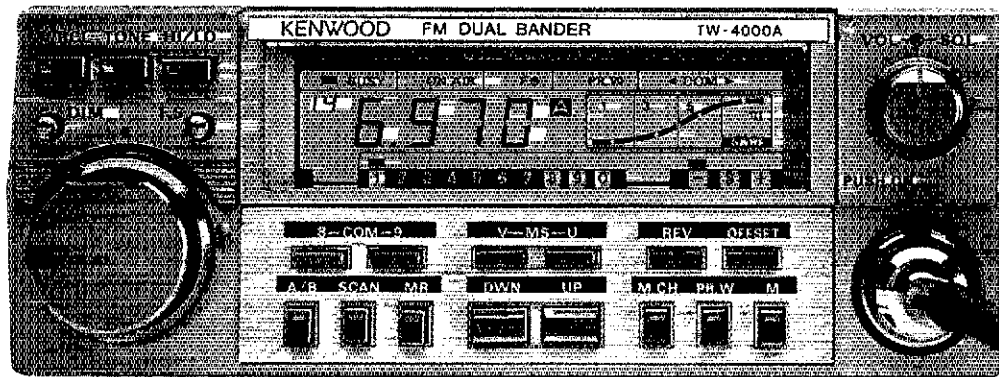
• **Optional “voice synthesizer unit”**

Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.

• **Repeater reverse switch.**



More TW-4000A information is available from authorized Kenwood dealers.



Optional accessories:

- VS-1 voice synthesizer
- TU-4C two-frequency CTCSS tone encoder
- PS-430 DC power supply
- KPS-7A fixed station power supply
- MA-4000 dual band mobile antenna with duplexer
- SP-40 compact mobile speaker
- SP-50 mobile speaker

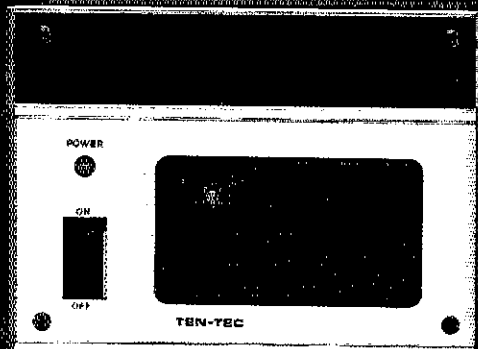
- MC-42 UP/DOWN microphone
- MC-55 8-pin mobile mic. with time-out timer
- SW-100B SWR/power meter
- SW-200B SWR/power meter
- SWT-1/SWT-2 2 m/70 cm antenna tuners
- PG-3A noise filter
- MB-4000 extra mounting bracket

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation. Antenna mag mount is not Kenwood supplied.

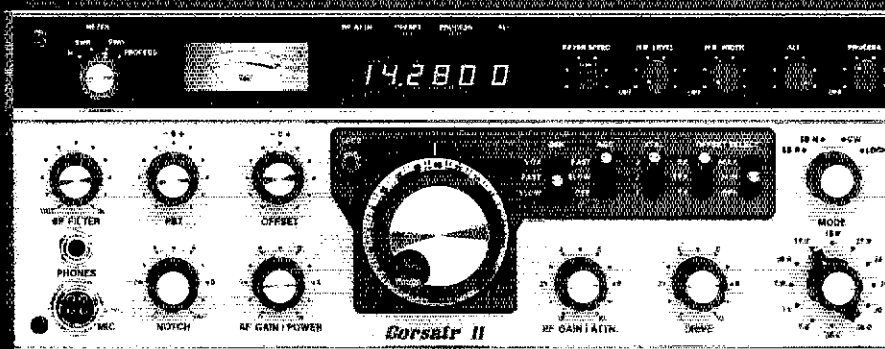
KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

America's Best Kept Secret!



MODEL 260 POWER SUPPLY



MODEL 561 CORSAIR II

CORSAIR II HF TRANSCEIVER, Model 561 . . . \$1345

Receiver performance that only a permeability tuned oscillator can deliver . . . superb signal to noise ratio, outstanding adjacent signal rejection. Three, frequency tuning rates using dual range offset tuning. QSK with a changeover time of 30 ms or less for superior CW or AMTOR operation. Twelve position band switch for operation on all nine HF bands, from 1.8 to 30 Mhz, plus 40 KHz overshoot on band edges.

RECEIVER

Sensitivity: 0.25 μ V for 10 dB S/N ratio.

Selectivity: 16 pole crystal ladder filter, 2.4 kHz bandwidth. 1.6:1 shape factor at 6/60 dB. Three position, mode independent, switch selects standard 2.4 kHz, optional 1.8 kHz, 500 Hz or 200 Hz filters.

Notch filter: Greater than 50 dB notch, adjustable from 200 Hz to 3.5 kHz.

Audio Bandpass filter: 8 pole, active filter centered at 750 Hz variable from filtered to flat response.

Passband tuning (PBT): Tunes 2nd IF frequency 3 kHz.

Noise Blanker: Switchable on/off with adjustable threshold and blanking

Offset tuning: Dual range, tune RX, TX or TRX.

PLUS: Built-in antenna pre-amp, spot button, selectable AGC fast, slow and off and much more.

TRANSMITTER

RF Output: Broadband, solid state, self tuning with 85-100 watts, all bands.

Built-in Iambic keyer. Speed adjustable 8-50 WPM with 40 character programmable memory.

Multi-meter: Reads Ic, Power out, SWR, speech processing level.

Built-in speech processor, with level control, standard.

Variable ALC, adjust power output continuously from 100% to 25% and retain full ALC action.

PLUS: Rear panel connectors for station control, AFSK, QSK, phone patch, auxiliary antenna, PTT, standard CW key, and more.

POWER REQUIRED: 13.8 VDC, Base or mobile at 20 A.

Size: HWD 5.25" x 15.25" x 15".

REMOTE VFO, Model 263 . . . \$219

Uses the same PTO design as the CORSAIR. Adds complete TX/RX



ARGOSY II, SSB/CW HF TRANSCEIVER, MODEL 525D . . . \$695

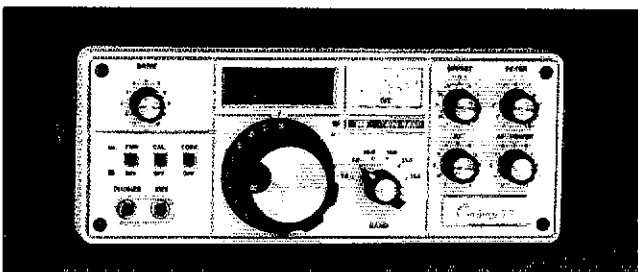
A unique combination of small size, simplicity and low cost. Great for mobile, portable and base station use. Operates 80, 40, 30, 20, 15 and 10 meters, in 500 kHz segments, plus 40 kHz overshoot at band edges. 100 watts input with solid state, no tune, final. 12 to 14 VDC at 500 mA, RX, 9A TX. Optional RX filters, 250 Hz, 500 Hz or 1.8 kHz. RX sensitivity .3uV for 10dB S + N/N typical. Offset tuning range, 6 kHz. Variable notch filter, greater than 50 dB rejection, 200 Hz to 3.5 kHz. Optional noise blanker. Famous Ten-Tec QSK CW, of course.

Clutter-free front panel allows single-hand operation without even looking at the rig, even with fat fingers. Isn't that different! Weighs in at a mere 8 pounds! HWD 4"x9.5"x12".

Model 225 115/230 VAC 9A power supply . . . \$129.00

Model 222 Mobile Mount, w/quick release . . . \$27.50

Model 223A Noise blanker (plug-in) . . . \$37.50



CENTURY/22, CW Transceiver, Model 579 . . . \$389

Put the fun back into hamming. This is a top notch, 50 watt, CW transceiver. Features found in only the best rigs are included. Full break-in QSK, excellent RX selectivity on CW (also tunes LSB/USB) and 100% solid state circuitry, Broadband "no tune" RF amp. Operates 80, 40, 30, 20, 15 and the lower 500 KHz of 10 meters. Power required, 12 to 14 VDC at 6A. Size HWD 4" x 10" x 10.5". Weight 6 lbs. Great for portable, mobile or base station operation.

POWER SUPPLY for Century/22, Model 979 115VAC . . . \$98, 979E 230VAC . . . \$110

THE ULTIMATE HF MOBILE ANTENNA SYSTEM

. . . From \$28.00 - \$40.00 per band.

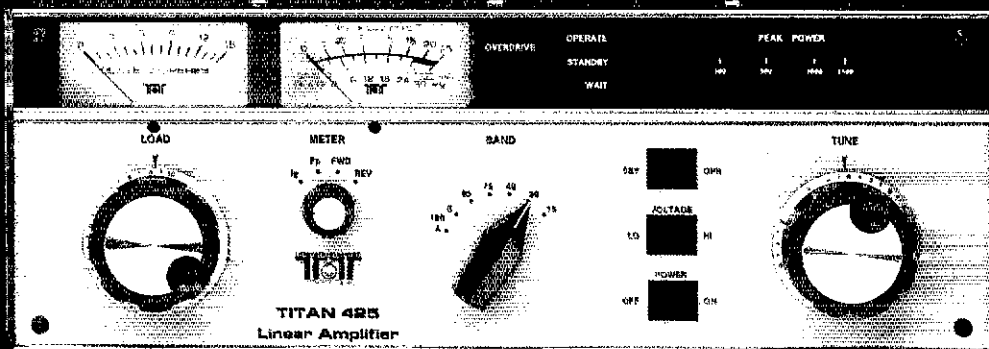
HF mobile is a world of compromise! Give yourself a chance. Choose the finest, environmentally protected, antenna system. Loaded to the best height for radiation efficiency, and to clear most overhead obstacles. Upper SS whip is vertically adjustable for "no tears" tuning. Lowest wind resistance too, less whipping and de-tuning. Standard 3/8" x 24 base fitting screws into all standard mounts. Typical height 78" or less.

WARRANTY

Our outstanding SSB performance equals our CW and DIGITAL reputation!



MODEL 263G REMOTE VFO



MODEL 425 TITAN

frequency control. Front panel switch selects, CORSAIR transceiver, 263 transceiver, CORSAIR TX/263 RX, 263 TX/CORSAIR RX. You can also listen to both frequencies simultaneously. A balance control is provided for priority adjustment. Also makes provision for Xtal control. Connects to CORSAIR with cables provided. Size is HWD 5.25" x 7.5" x 12".

MATCHING SPEAKER/POWER SUPPLY Model 960 . . . \$229

A highly regulated and filtered, 22 amp. supply. Includes protective circuit breaker and primary power fuse. Can use either 115 or 230 VAC, 50/60 Hz. Size is HWD 5.25" x 7.5" x 12".

TITAN HF LINEAR AMPLIFIER . . . \$2685

"BOOM BOX" EXTRAORDINAIRE! Remoted power supply makes possible, this compact, desk top linear amplifier. Puts out a solid 1500 watts SSB and CW, 1000 watts continuous power on RTTY, AMTOR or SSTV. Lightning fast QSK for "break-in" CW and super AMTOR performance.

RF DECK

Drive power: 80 watts typical.
Four LED status indicators, including "overdrive" warning.

Hi/Lo plate voltage switch.

Metering: Full time plate current meter. Multi-meter, selectable for plate voltage, grid current, power out or reflected power.

Vernier drive, tune and load controls.

Peak power indicator: Ultra quick 10 element LED bar-graph display.

Amplifier tubes: Two Eimac[®] 3CX800A7, ceramic, external anode, air cooled triodes in grounded grid circuit. Plate dissipation, 1600 watts.

Frequency coverage: 160, 80, 40, 20 and 15 meter bands plus 18 and 24 MHz standard, 10 meter kit supplied upon proof of authority to transmit.

Size and weight: HWD 5.25" x 15.25" x 15". 17 lbs.

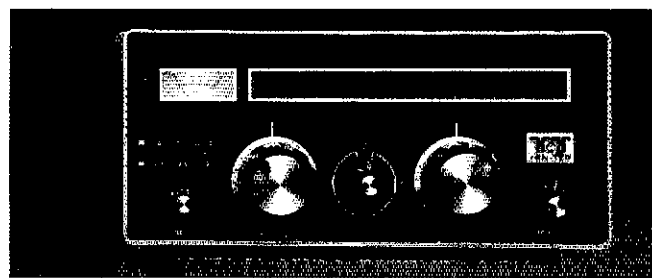
POWER SUPPLY (Supplied with TITAN)

Primary power: 220-250 VAC @ 20 amps, maximum. Conservatively designed for cool operation under full load using a Ten-Tec, tape wound, Hypersil[®] transformer.

Hi/Lo blower speed switch.

Size and weight: HWD 8.25" x 13.4" x 10.25". 45 lbs.

UPS shippable.



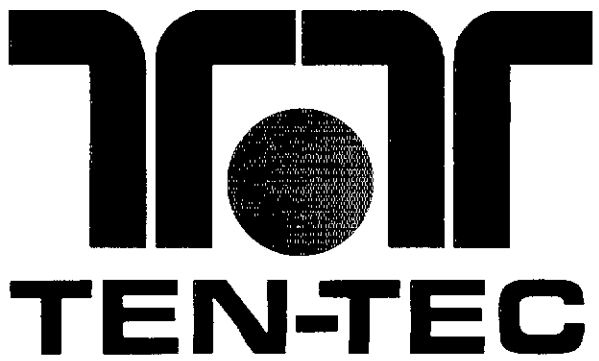
1.5KW ANTENNA TUNER, Model 2298 . . . \$299

Designed to match your 50 ohm, un-balanced coaxial, transmitter output to virtually any un-balanced antenna. General coverage from 1.8 to 30 MHz. Handles all the power the law allows.

- Reversible "L" network circuit for best match and bandwidth, at either hi or lo, antenna impedance.
- Avoids false load indication.
- Ceramic insulators and coil forms throughout. Silver plated switch contacts and roller inductor coil.
- Built-in SWR bridge.
- System by-pass switch.
- 4 Position antenna select switch.
- HWD 5.5"x13"x11", 9 lbs.
- Also available in kit-form. Model 4229 . . . \$219.
- For balanced feedline order accessory balun. Model 3229 . . . \$15

The term of the TEN-TEC WARRANTY IS ONE YEAR...as always!

...America's Best Kept Secret!



Highway 411 East
Sevierville, Tennessee 37862
615/453-7172



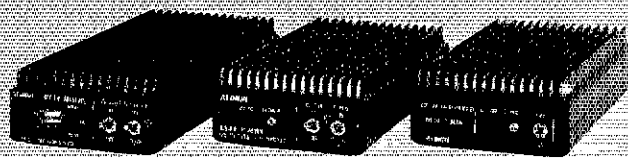
ALINCO ELECTRONICS INC

ALM-203T
List \$345.00



2m FM Handheld Transceiver

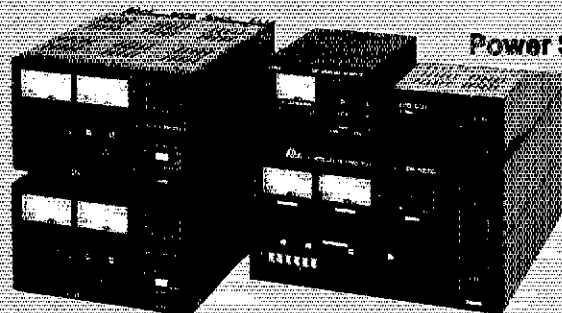
- 2 Band HT
Band A 140-150 MHz
Band B 150-160 MHz (Receive Only)
- 10 Channel Memory
- Built-In Sub Audible Tones
- Battery Save Function
- 3 Watts Output Standard; 5 Watts with 12 V adapter
- Don't decide on a handheld until you have seen Alinco's newest!



Linear Amps

List Prices From \$82.00 to \$177.00

- 2m and 70cm micro linear amplifiers
- 3 watts in provide 30 to 50 watts out to convert your HT to a high power mobile radio
- Each amp includes a heavy duty heat sink, protection circuit and a low pass filter for a clean signal
- Some models available with a 15 db gain GaAsFET receive preamp, others with a 10 db gain FET receive preamp and one with an RF meter.



Power Supplies

Affordable performance is the final output of these workhorses. These high efficiency, high output, regulated supplies each comes with automatic current limit and shut down protection. Choose from 6.5 to 30 amps of output.
List Prices From \$74.00 to \$193.00

ALR-206T List \$358.00

- 140-149.995 MHz Covers MARS and CAP
- Programmable Band Scan
- Programmable Non-Standard Repeater Offset
- Unique Control Knob
- 25 Watt High - 5 Watt Low
- Built in Lithium Back Up Battery
- Up/Down Control On Microphone
- 10 Channel Memory
- Built In Sub Audible Control
- Many Features, See Your Dealer



ALINCO ELECTRONICS INC.

20705 South Western Ave., Suite 104
Torrance, CA 90501 • (213) 618-8616



Yaesu has serious listeners for the serious listener.

Yaesu's serious about giving you better ways to tune in the world around you.

And whether it's for local action or worldwide DX, you'll find our VHF/UHF and HF receivers are the superior match for all your listening needs.

The FRG-9600. A premium VHF/UHF scanning communications receiver. The 9600 is no typical scanner. And it's easy to see why.

You won't miss any local action with continuous coverage from 60 to 905 MHz.

You have more operating modes to listen in on: upper or lower sideband, CW, AM wide or narrow, and FM wide or narrow.

You can even watch television programs by plugging in a video monitor into the optional video output.

Scan in steps of 5, 10, 12½, 25 and 100 KHz. Store any frequency and

related operating mode into any of the 99 memories. Scan the memories. Or in between them. Or simply "dial up" any frequency with the frequency entry pad.

Plus there's more, including a 24-hour clock, multiplexed output, fluorescent readout, signal strength graph, and an AC power adapter.

The FRG-8800 HF communications receiver. A better way to listen to the world. If you want a complete communications package, the FRG-8800 is just right for you.

You get continuous worldwide coverage from 150 KHz to 30 MHz. And local coverage from 118 to 174 MHz with an optional VHF converter.

Listen in on any mode: upper and lower sideband, CW, AM wide or narrow, and FM.

Store frequencies and operating modes into any of the twelve channels for instant recall.

Scan the airwaves with a number of programmable scanning functions.

Plus you get keyboard frequency entry. An LCD display for easy readout. A SINPO signal graph. Computer interface capability for advanced listening functions. Two 24 hour clocks. Recording functions. And much more to make your listening station complete.

Listen in. When you want more from your VHF/UHF or HF receivers, just look to Yaesu. We take your listening seriously.

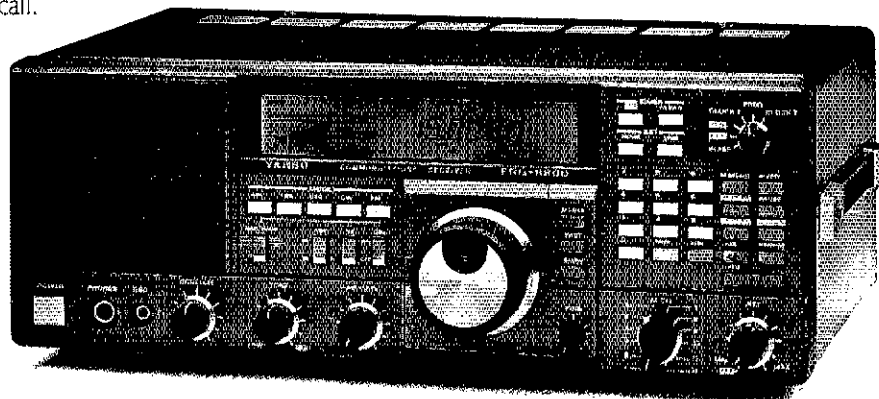
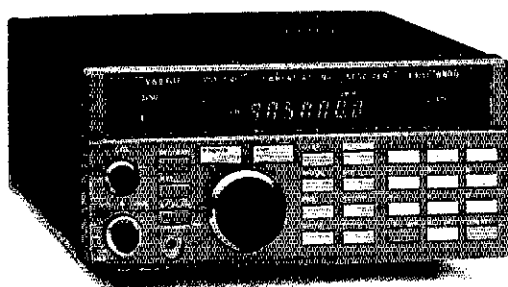
YAESU

Yaesu USA

17210 Edwards Road, Cerritos, CA 90701
(213) 404-2700

Yaesu Cincinnati Service Center

9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100



Dealer inquiries invited.

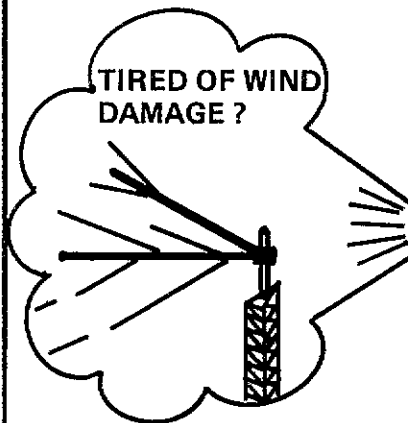
Prices and specifications subject to change without notice.
FRG-9600 SSB coverage: 60 to 460 MHz.

**NOW
FACTORY
DIRECT!!!**

**STEP UP TO
TELREX
ANTENNAS
ANTENNA SYSTEMS**

"INVEST" in a Telrex antenna!

Why gamble with shoddy antenna construction when Telrex makes available a professionally designed quality product.



Antennas that last "Decades"
(not months)



Some of the WORLD'S finest.

TB4EC 10, 15, 20 Mtr.	\$320.00
TB5ES 10, 15, 20 Mtr.	\$475.00
TB5EM 10, 15, 20 Mtr.	\$550.00
TB6EM 10, 15, 20 Mtr.	\$655.00
20M326 3 elem. 20 Mtr.	\$410.00
20M536 5 elem. 20 Mtr.	\$695.00
20M646 6 elem. 20 Mtr.	\$1075.00
15M532 5 elem. 15 Mtr.	\$110.00
15M845 8 elem. 15 Mtr.	\$995.00
10M523 5 elem. 10 Mtr.	\$375.00
10M636 6 elem. 10 Mtr.	\$725.00
2MVS814, 2 Mtr. phased	\$289.00

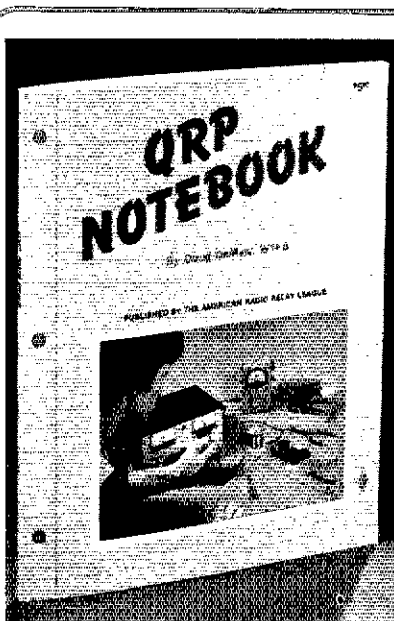
Prices subject to change.



For data on the complete line of Telrex antennas phone (anytime) and leave your call sign, or write.

Phone: 201-775-7252

Write: **Telrex** P.O. Box 879
Asbury Park, N.J. 07712



**Doug DeMaw's
QRP Notebook!**

Doug DeMaw, W1FB, has been writing articles about QRP operating and equipment construction for many years. In this ARRL publication, Doug presents construction projects for the QRP operator, from a simple one-watt crystal-controlled transmitter to more complex transceiver designs. Rather than simply presenting a collection of completed units, Doug guides you through the project "building-block" style. This way, you gain an understanding of how the circuits operate and learn how the building blocks might be put together in other configurations.

Experimentation and low-power operating go hand in hand. Construction of a complete modern transceiver is a major undertaking, but some of the circuits in this book can be put together in an evening or a weekend from a few dollars' worth of parts. Once built, the equipment can be tested and improved as your understanding and skill grow. Many of the simpler circuits can be used later as parts of the more complex projects.

The QRP Notebook contains 112 pages. #0348, copyright 1986, \$5.00, plus \$2.50 postage and handling (\$3.50 for UPS).

Sec., WA2BGE, K2YEW, KA2BYB/N2GUL, WB2CJUV Directors. WB2ALW has proposed a sub-fund of LIMARC's Helen Reed fund in memory of Woody, WB2IAP, please send contributions to either Hank Wener, KB2ALW, 53 Sherrard St, East Hills, NY 11577 or Kenny Gunther, WB2WKC, 219 Normandy Rd, Massapequa NY 11758. New officers for Grunman ARC are: KC2DH Pres., W2MFM VP., WB2QDT Sec., WA2DNP Treas., WB2MPP, NN2C, W2DT, WB2VA, N2GCV, W2ZVJ Directors. Officers for Great South Bay ARC are: KD2SX Pres., N2CRV VP., N2GBT Sec., KA2CJW Treas., W2DUK, N2FIF, KA2RGI, N2GCK Dir. Officers for the Queens chapter of the American Red cross are: N2AUK Pres., W2ZTH VP., W2BCW Sec., W2BZV Treas., KA2YCV, WB2JCV Dir. Congratulations to our new Director WA2DHF and Vice Director WB2VJK; the future is now. Traffic K2YQK 349, W2GKZ 65, K2JFE 14. (Nov.) K2YQK 138, W2GKZ 72. (Sept.) K2JFE 2.

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG—ASM (VE liaison); N2XJ, ASM (FO info); N2BFG, SEC: N2FOZ, STM: KA2HNO, OQ/AAC, KA2BZ3, ACC: KY2S, PIO: WB2NOV, SGL: W2KB, TC: K2BLA, and 8M: N2CXX, N2DZZ, EC Ringwood replaced K2SE as DEC Passaic county effective 1/1/87. DEC W2ZEE reports a score of 197 points for Monmouth County ARES in the 1986 SET, EC N2DXP has been appointed by our Sec to provide section level ARES liaison with NTS. The NTS Eastern Area Staff (EAS) has recommended implementation of VHF/UHF Packet to facilitate the movement of third party traffic. KC2TF is the second region Packet Manager. His responsibilities are to manage NTS Packet Inter-section and Intra-region traffic movement. The EAS recommendation is that only one Packet Node Station (PNS) be allowed in each section. In our NNJ section the WA2SNA-1 PBBS is designated to perform this function. ORSs are needed to provide liaison at least once within a 24-hour period from the PNS and NTS CW/Phone nets. WB2FTX is providing Packet liaison with NNJVNE. To ensure that this essential Packet/NTS net liaison is properly covered and functional a section Packet Liaison Manager is needed. This will be a NM position for NNJ Packet Liaison NNJ/PL. The NNJ PNS (WA2SNA-1) provides auto-forwarding to the designated PNS's in the NLI (A12Q-O) and ENY (WA2RKN-2) sections, and to other areas via East Net. Ramapo Mountain ARC has renewed its status as a Special Service Club. K2MHP has been awarded the Bergen ARA amateur of the year award for his outstanding effort running BARA's VE program. Congratulations to the following who were newly licensed or upgraded during December sessions conducted by: Bavonne EM, Ft. Monmouth ARC, NNJ VE Board, and Bergen ARA. Novice: GBrew, D Caffro, F Kurian, D Mc Guire, J Nutlev, N Tendall, T Forqash, and R Reitz. Technician: KB2ANB, KB2BQK, KA2YCV, KB2BCK, KB2BRI, M Pomerantz, KB2APF, KB2APH, KB2BVI, KB2BYN, KB2BVZ, J Foscolo, D Houston, and KA2ZJH. General: KB2BRP, KB2DXB, KB2APG, KB2BTH, KB2BWO, KA2MMO, and N4MVA. Advanced: N2CUH, N2GOF, KB2BOJ, N2GIX, and N2GPE. Extra: WB3BWP, WA2TKA, N2CXX, KA2BLF, KA2CMB, N2EMI, N2GAM, KD2PS, K2BJA, and KA2YQV. December Data: /P indicates VHF Packet Liaison.

MIDWEST DIVISION

IOWA: SM, Rollin Slevers, WB8AVW—SEC: KD8BG, STM: KC8XL, OOC: W8VX, ACC: W8QAM, BM: K8IIR, TC: K8DAS, SGL: AK8Q, On Dec. 22, Lee W8BX celebrated 60 years as an amateur 50 years as a member of the ARRL. Congratulations, Lee, from all of us. All League appointees are eligible for the ARRL call sign badges of appropriate background colors, contact you SM for more information. Harold (K8JTF) was honored by the Ia. Div. of the American Cancer Society he organized 40 years ago with the help of other doctors. All clubs holding Conventions and hamfests should register their event dates as soon as possible to help avoid conflict with other events. Ia. QSO Party March 14-15, Sioux City hamboare May 29-31.

NET	QNI	QTC	FREQ	TIME	DAY	MGR.
75 Meter noon	1238	175	3970	1830z	Dy	WB8JFF
75 METER EVE.	950	72	3970	2330	Dy	N8AEF
ICN Nov&Dec	40	6	3708	7:PM	MVF	N8BJ
ITEN 4 sess.	104	25	3970	2330	Sun	KD8BG
W. Cen ARES	299	0	147,693	8:30	MTH	K8CNA
Traffic: K8GP 127, W8GS 120, KA8ADF 150, K8IPT 124, KA8GSA 119, K8BPE 63, W8YLS 56, WB8AVW 48, WB8UJF 42, KA8VBA 16, W8BW 14, TLCN QNI 241, QTC 147 in 62 sessions, NM W8YLS, DTEN, 962 messages; 62 sess. at rate of .595. Ia represented 97% by K8IPT 50, W8HTP 47, KC8LX 34, WA8AUX 13. The Davenport RAC installed a new repeater with autopatch on 146.0464 which greatly increase their covered area. Roger (WB8AXT) a Ham operator for 50 years, first licensed as W9ZA on Dec. 22, 1936.						

KANSAS: SM, Robert M. Summers, N8BFX—SEC: N8BLD, STM: W8OYH. Xmas should be long over by the time you read this column, so I'll just say I hope you all got what you deserve as Presents. Knowing you all were the best—you should have received some nice new gear. NK8B is hoping a lot of you received PACKET gear. Harry has agreed to coordinate the PACKET activity for K8. If you are interested in joining the PACKET FUN, contact him, W8PB reports the HAWAIIA ARC celebrated its 20th anniversary with 20 charter members Present. Net activity for the month of Nov. is as follows:

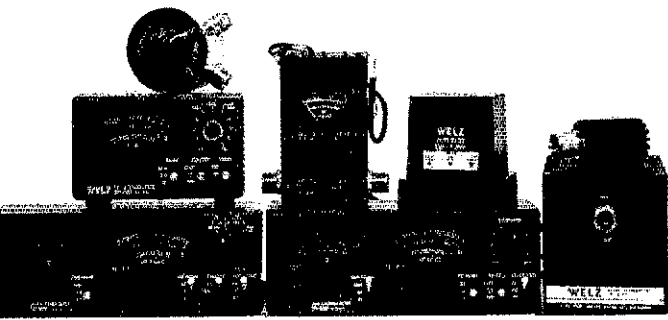
NET	QNI	QTC	MGR	FREQ	TIME	DAYS
K8BN	1131	172	W8FRC	3920khz	0300z	DAILY
KPN	455	35	W8FRC	3920khz	1245z	M-W-F
KWN	907	717	W8BHOZ	3920khz	0001z	DAILY
KMWV	708	649	W8BHOZ	3920khz	1300z	DAILY
CSTN	2322	107	W8ODE	7253khz	1830	M-S
QKS	256	84	W8BZEN	3610khz	0100z	DAILY
QKS-SS	37	11	W8MYM	3735khz	0130z	T,TH,S
K8PITY	74	5	K8CUP	3905khz	1230z	T,TH

Start the new year off right by getting ready to apply for a station appointment! Traffic: W8FRC 48; N8GCC 402; W8FTR 190, K8BJ 137, W8OYH 85, W8FDJ 64, W8H 46, K8BFX 56, W8QMT 50, W8BZEN 49, W8BHOZ 36, N8BZ 35, W8MYM 19, W8PB 10, W8CHJ 8, NK8B 8.

MISSOURI: SM, Ben Smith, K8PCK—Amateurs in the Kansas

WELZ CORP.

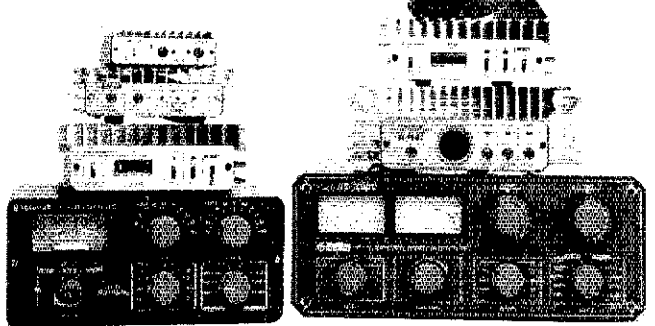
LOADS • WATTMETERS



THE MOST POPULAR HAM RADIO ACCESSORIES are available from WELZ. WELZ brand easy-to-read power and VSWR meters and other high quality station accessories are used world-wide. WELZ, good enough to be the best.

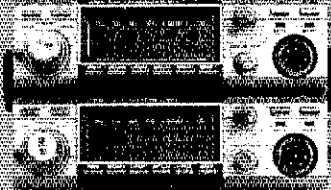
THL CORP.

AMPLIFIERS • COUPLERS



THL THE INDUSTRY LEADER IN DESIGN AND PERFORMANCE add-on accessory VHF/UHF amplifiers, antenna couplers and now HF LINEARS too. When power out is your problem, stop in for the THL brand solution.

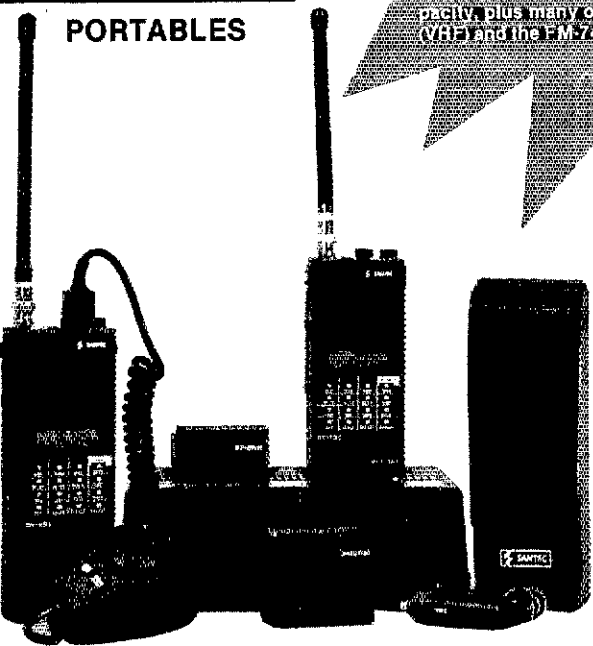
KDK



COMPACT MOBILES MAKE FULL DUPLEX POSSIBLE. KDK mobile radios are so small, TWO of them will fit in the space normally accommodating one full size mobile radio. This allows for full duplex cross band operation with 32 memory capacity, plus many other advantages. Check out the FM-240 (VHF) and the FM-740 (UHF) today.

SANTEC

PORTABLES

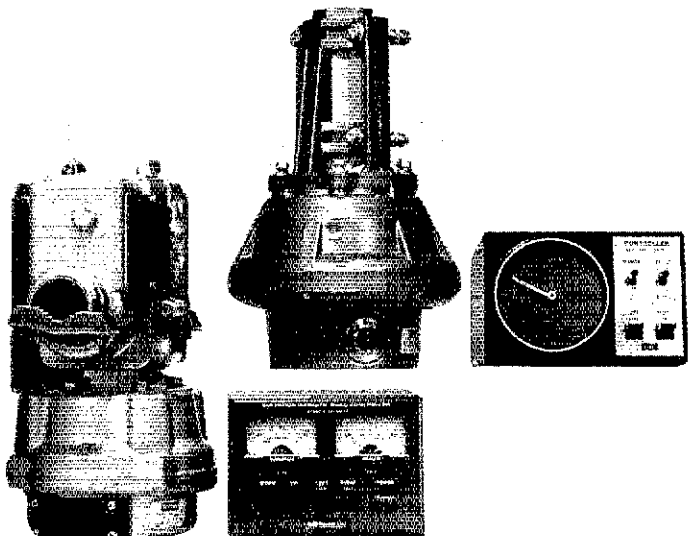


LOOK CLOSELY AND YOU WILL CHOOSE SANTEC. Santec hand-helds are truly the BEST value + quality + performance combination available today. A Full 5 Watts output, Multi-mode Scan, 10 Memories and AUTO-DIALER make the SANTEC a fantastic hand-held radio. Try one yourself at your next trip to your favorite Ham Radio Shop.

KENPRO

ROTORS • ACCESSORIES

WHEN YOU TURN YOUR ANTENNA, DO IT WITH KENPRO antenna aiming devices and accessories. From light to heavy-duty there's a KENPRO for you. NEW Satellite tracking AZ-EL units with external computer controller interface.



PAUCOMM

1506 CAPITAL AVENUE, PLANO, TEXAS 75074 PHONE: 214-423-0024 GIL FAX: 214-423-0081 NATIONAL DISTRIBUTION FOR SANTEC, KDK, KENPRO, THL, WELZ, DIAMOND

Alpha Delta Limited Space High Performance Antennas..

THE SOLUTION TO 160-80-40 METER OPERATION IN SMALL AREAS!

Model DX-DD shown

- No-trap design. Unlike trap antennas, there are no capacitors to break down under high RF voltages, and a tuner may be safely used for multi-band operation if desired
- Direct 50 ohm feed. Tuners usually not required when operating in resonant bands.
- Full power operation.
- Uses "ISO-RES" inductors.
- Stainless steel hardware.
- Fully assembled.

Model DX-A 160-80-40 Meter Quarter Wave Twin Sloper —

- The premier low frequency DX antenna.
- Combines the tremendous DX firepower of the quarter wave sloper with the wide bandwidth of the half wave dipole.
- One leg is 67', the other 55'. Installs like an inverted-V. Ground return through tower or down-lead \$49.95 each

Model DX-DD "Delta Dipole" 80-40 Meter Electrical Half Wave Dipole —

- Also covers 80-10 meters with a wide range tuner.
 - Only 82' overall length \$69.95 each
- Model DX-KT 160 Meter Add-on Kit for Model DX-DD Dipole** —
- Adds a total of 20' to overall length of Model DX-DD \$29.95 each
- Available from your local Alpha Delta Dealer or direct. Add \$4.00 shipping and handling (USA only). Exports quoted.



ALPHA DELTA COMMUNICATIONS, INC. AA

P.O. Box 571 Centerville, OH 45459
(513) 435-4772 Orders

current solutions to current problems

City area provided communications for the Prime Health Marathon and 10K Run. The operation was organized by WA0KUH and KA0SKY was net control. Other hams assisting were KA0WZQ, WA0PFS, K0TLM, KA0YUL, N0K06, KA0WZX, WA0P0C, KA0TAM, WA0CLF, N0BKR, KA0WZY, WA0GQA, K0JAA, N0J0X, KA0SZ, and K0SD. It is election time for many amateur radio clubs in the Missouri section. We are always glad to report club news, so the clubs reporting and their 1987 officers are: Hannibal ARC, Pres. KA9RTV, VP, N1D0C, Sec. K10W and Tres. K0Q0, Ozarka Amateur Radio Society; Pres. KY0B, VP, N0GNH, Sec-Tres. WB8SQY, Board of Directors, WD0ARX and K0BZ, Kansas City DX Club; Pres. K0RFL, VP, KD0FW, Sec. K0VBU and Tres. K00U, Heart of America ARC; Pres. WB0EJJ, VP, N0CLV, Tres. K00UH and Sec. KD0AJ and the St. Charles ARC; Pres. N0GL, VP, W00GS, Sec. N0HDM, Tres. N0HDL and elected to the Board of Directors were; N0ECE, KA0KU and KW0Z. New Field Appointments for the month were; N0MU, ORS, OBS, OES and KA0EJQ an OBS appointment. The Kansas City ARC has a net on 146.82 at 7:30 PM on Thursday except the fourth Thursday of the month. The St. Charles ARC provided communications for the St. Louis Marathon. Club members who helped with the operation were; N0Q0, WB0UQ, N0CTT, WA0C0K, KD0H, WB0RAB, WB0NSM, K0GK, W0DCZE, N0FTF, K0WZ, KA0CWU, KA0YKO, KA0UXV, K0BJ, K0CZ, N0HDL, KA0UR and N0GLY.

NET	Sec	QNI	QTC	Day	Time	Freq	Mgr
MON	62	369	243	Dly	7:00/9:46	3.585	KBSI
MEOW	31	683	234	Dly	5:30	3.963	K0DSQ
MOSSB	31	721	89	Dly	9:00	3.963	K00RB
ZASN	5	75	52	Tue	8:00	147.84/24	N0RE
MTTN	19	69	36	Mon-Sat	5:00	3.370	N0BKE
HBN	23	274	27	Mon-Fri	12:05	3.580	K0DSQ
PHD	5	183	13	Mon	9:00	146.43	WA0KUH
MOFON	5	48	9	Wed	8:15	222.42/4.02	A10C
SLAN	5	305	7	Mon	8:00	146.31/91	K0NEX
CMEN	5	63	7	Wed	9:00	146.18/78	K0PCK
RRABN	30	393	6	Dly	9:00	146.18/79	K0LLN
SWARC	5	74	2	Tue	7:00	146.31/91	K0QUD
ARESN	4	42	2	Thu	9:00	147.855/255	N0FQW
LOZBC	27	432	0	Mon-Sat	8:00AM	146.13/73	W0RTL
LOZFM	4	83	0	Fri	8:00AM	146.13/73	W0RTL
MCARES	4	28	0	Thu	8:30	146.205/605	WB0EJJ
Traffic	WB0MA 310, WA0VJX 251, N0P3 251, K0S1 211, ND0N 178, K00AS 133, K0P0K 121, W0BELL 100, K00RB 78, K00L 23, K0C0U 73, W00LD 70, N0K0E 68, N0SS 58, WA0TN 56, N0MU 48, N10R 47, K0DSQ 46, W00CJB 38, KTSY 28, W00TF 18, WA0KUH 5.						

NEBRASKA: SM, Vern Wilka, WB0GOM—STM; Jerry Kohn, WD0EGK, SEC; Michael Rudrzan, N0FER. The Nebraska Section Emergency Coordinator has moved, so N0FER has a new address and phone number. Please note the new address for our SEC, N0FER, is: 5030 La Salle, Lincoln, NE 68516. The numbers are: 402-488-1446 home and 402-472-5236 work. Lancaster County EC, Bruce Colgrove/W00DMS, has scheduled a severe storm spotter training session for March 14, 1987. Contact W00DMS for further information. The Nebraska State APRIL Convention in Kearney, March 28-29, will feature Lyle Johnson, WA7GED of Tucson AZ. On packet radio, Chuck Conner, K0NE, of Lincoln, NE. On microwave communications (K0NE is the Nebraska Section Technical Coordinator), John Champa, K80CL, of Dearborn, MI speaking about ASAT. The convention banquet speaker will be Roger Walsch of Lincoln, NE. See you in Kearney March 28-29. The Lincoln Amateur Radio Club reports that the club was involved in 29 public service activities during 1986. Nebraska Cornhusker Net Manager, Ken Albright, WB0GMQ, reports the Cornhusker net increased QNI by 17% and QTC by 23% in 1986, as compared to 1985. Traffic: K00DKM 539, W0KK 115, WA0BOK 31, K0GND 26, KA0BCB 17, WB0GQM 13, N00A 12, W00CRD 8, WB0GPM.

NEW ENGLAND DIVISION:

CONNECTICUT: SM, John T. Ronan, K3ZJL—STM; K1E1C, SEC; KA1ECL, ACC; K31M, COOC; N41L, TC; W1HAD, BM; K3ZJL, PIO; KX1B, SGL; W1AH.

NET	SESS	QNI	QTC	MGR
RASON	30	226	95	KA1JAN
CN	56	211	181	K1E1R
WESCON	32	429	307	WB1GXZ
CPN	31	275	86	KA1BHT
NUTMEG	28	158	99	K1CE

The first edition of the Connecticut Section Newsletter has been circulated to Section Appointees and Affiliated Clubs. If successful, the circulation will be expanded. Editor K1NGL is running a contest for a catchy name for the Newsletter and will offer a "thankable" prize to the winner. News items will be gratefully accepted for publication or for items and KB1VM DEC District 3 have signed an emergency communication agreement with the Red Cross. ECARA will receive Disaster Response training. The Agreement is based upon the Red Cross package developed by N1DCS for W1HARA and ARES District 7. ECARA has also worked out an agreement with Day Kimball Hospital in Putnam to provide communication and 4-wheel drive transportation as part of the Hospital's Emergency Response Plan. A packet/BBS network has been established on 143.07 covering most of the state which includes: K1UCL-1, KB7H, W7FUR, WB1DZK-4N1DKF, W40TC-1 and in emergencies KA1ECL and KA2BCD-1. AREA is modernizing its 147.315 repeater to provide packet access, mailbox, BBS, 10 meter and 220 MHz links. N411 is conducting a General Upgrade Class for his hams at the Washington Middle School. AI is also running VE Exams and a Novice Course for the G&T program. I01B attended Emergency Preparedness Training at the National Fire Academy in Emmitsburg, Md. SARA is organizing communications for the Second Annual Stamford Marathon on April 5. Volunteers are sought. W1FDY, W1NU, KA1GGT and N1AMC are installing a remote receive site at the Fairfield Town Hall for the FARA 146.625 repeater. Emergency and Public Service communication coverage will be greatly improved. KZ1Z has received a State Education grant for a new 220 MHz BEARS repeater. New SARC 220 MHz repeater coordinations for Connecticut include N1DCS, K0B1, KZ1Z, KB11 and K1C. NARL enjoyed an informative field trip to Channel 30 in W. Hartford where President N41F works. Traffic: KA1MDM 775, KA1MKJ 214, WB1GXZ 206, N1EED 188, KA1KTH 164, N1DMV 145, W1YOL 139, KA1GWE 131, KB1ZC 112, KA1BHT 55, KY1F 54, W1WP 53, WA1NLD 44, W1BDN 41, K1AQE 26, W1CUH 19, W1QV 7.

EASTERN MASSACHUSETTS: SM, Luck Hurdler, KY1A—ASM; K9HI, SGL; K3HI, OQAA; KA1KF, SEC; KB1PA, PIO; K1HLZ, BM; KB1AF, STM; KW1U, TC; KA1IU, ACC; KA1KCU. EMAS Hot Line-437-0111. Westlink 449-2226.

NET	MGR	FREQ	TIME(LOC)	DY	QTC	QNI
EMRI	N1AJJ	3658	1900/2200	DY	325	264
EMRIPN	N1BGW	3880	1730	DY	184	184
EM2MN	KA1AMR	145.23	2000	DY	259	309
NEEPN	K1BZD	3945	0830	SN	4	40
HHTN	N01A	04/64	2230	DY	272	409
EMRIS	N1CVE	3715	1600/2030	DY	124	132

ASSOCIATED RADIO

8012 CONSER BOX 4327
OVERLAND PARK, KANSAS 66204

VISA-MC
AMEX-DISC.



BUY — SELL — TRADE
ALL BRANDS NEW AND RECONDITIONED



WE'LL BUY YOUR EXTRA RIG OR ENTIRE STATION

Call **913/381-5900**

DISCOUNT PRICES
SEND \$2 FOR CATALOG
AND WHOLESALE LIST

Introducing the next logical step.

Yaesu's Dual Band Handie.

Two affordable radios in one—that's exciting.

Yaesu's dual-band FT-727R packs our best HT know-how into one compact design. At a price that's in step with your ham budget.

Hit hard-to-reach repeaters with a powerful 5 watts on both 2 meters and 440 MHz.

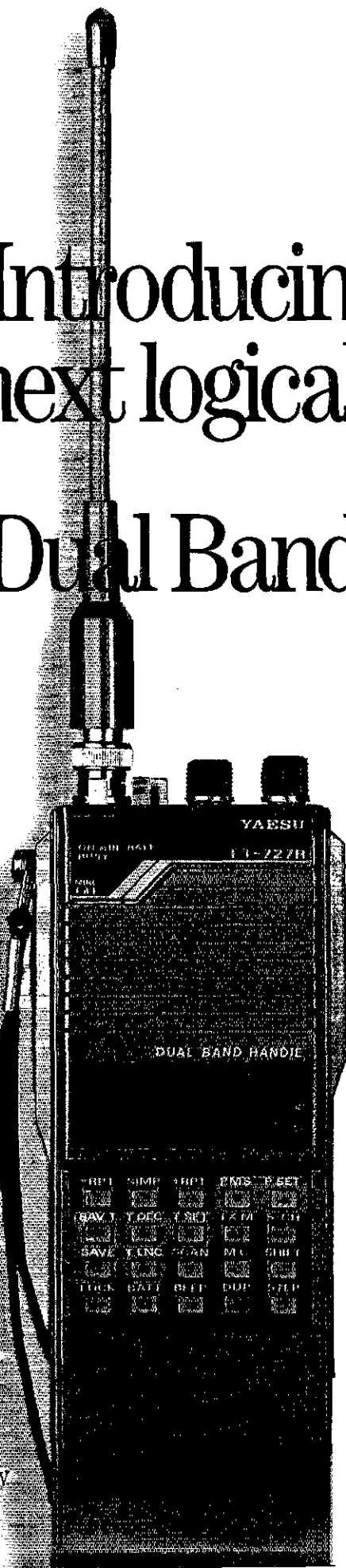
Work the bands quickly and easily with a wealth of microprocessor-controlled commands:

Jump between the separate VHF and UHF VFO registers. Program each of the ten memories for instant recall of repeater input and output frequencies, odd splits, and tone encode/decode.

Scan the memory channels, the entire band, or a band segment. And return to any special frequency with the priority feature.

Use link repeaters by programming TX on one band and RX on another.

Conserve power with the battery saver. It lets you monitor silently



while drawing negligible current. And measure your battery level with the digital battery voltmeter. There's even a "Low Battery" LED.

Finally, your operation is rounded out with features like VOX capability. A one-touch repeater reverse switch. An LCD readout with illumination lamp. A high/low power switch. Remote computer control capability. An optional CTCSS module. And Yaesu's full line of optional accessories.

So step up your operating capability now with the logical choice in HT operation.

Yaesu's dual-band FT-727R.

YAESU

Yaesu USA
17210 Edwards Road, Cerritos, CA 90701
(213) 404-2700
Repair Service: (213) 404-4884
Parts: (213) 404-4847

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100

Prices and specifications subject to change without notice.

the HAM STATION

P.O. Box 4405
220 N. Fulton Ave.
Evansville, IN 47710

Store Hours
MON-FRI 9AM-6PM
SAT 9AM-3PM

WARRANTY SERVICE CENTER FOR:
ICOM, YAESU, TEN-TEC

TERMS:

Prices Do Not Include Shipping.
Price and Availability Subject to
Change Without Notice

AEA	
FR-64/HPH	\$239.95
CP-1 Interface	\$125.00
HAP-2 Interface w/HBA TOR	\$100.00
ALINCO	
730-D 440 3/30	\$120.00
AMP SUPPLY	
LR-500 HT-B Auto Amp	\$1,075.00
NT-1200 1.2 Kw Tuner	\$149.95
DRAKE	
T4XC, R4C, AC4, MS4	\$519.95
T4XB, R4B, AC4, MS4	\$469.95
T4X, R4B, AC4, MS4	\$399.95
T4A/AC P.S.	\$235.00
NV4 VFO	\$ 75.00
R4C Rcvr., MS4 Spkr.	\$249.00
MS4 Noise Blanker	\$ 49.00
ENCOMH	
ST-144 2m H.T.	\$175.00
KDK 2030 2m 25v	\$199.00
HL20u 2/20v UHF Amp	\$100.00
HL-90u 10/100v 430-450	\$289.95
HL-160v 10/160v 2m	\$250.00
ST-442 440mhz H.T.	\$219.95
ST-400ET 440mhz H.T.	\$199.95

ST-200ET 2m H.T.	\$169.95
HC-2000 2kw Tuner	\$269.95
KDK FM 2402mtr.	\$239.95
KDK FM 240 v/pl & voice	\$275.00

HAL	
HPT-3100 (No Monitor)	\$1,700.00
CT 2200, KB 2100	\$399.00
CRI-200 Interface	\$150.00
CRI-100 Interface	\$125.00

HEATHKIT	
SE 700 Amp	\$299.95
SM 104A Xcvr., P.S.	\$369.95

ICOM	
745, PL44	\$775.00
730 Xcvr.	\$459.95
271 R/ P.S. 100W 2m	\$899.00
R71A, PH, PL32, Remote,SSB	\$775.00
27H 45v 2 mtr.	\$315.00
502A 6m SSB	\$129.00
202 2m SSB	\$129.00
402 430mhz SSB	\$129.00
W 20 w/Pan	\$149.95
RP 1210 1.2 ghz Rptr.	\$999.00
Phone Patch (720,30)	\$ 89.95
FL-44 SSB Filter	\$ 99.00
4AT 440 mhz H.T.	\$239.95
O2AT 2m H.T.	\$260.00
2AT 2m H.T.	\$185.00
BP-3 250 ma Batt.	\$ 15.00

KANTRONICS	
UFU Terminal Unit	\$125.00
Challenger Interface	\$ 69.00
Mini Terminal	\$110.00

KENWOOD	
VFO-170	\$ 99.95
TS-520	\$349.95
VFO-520	\$ 89.95
TR-2500 2m H.T.	\$175.00
TR-2400 2m H.T.	\$129.95
DC-1A DC Module 520 or 820	\$ 50.00
ST-2 Base Char.	\$ 65.00
TR-9000 2m All Mode	\$275.00
TH41AT 440 mhz H.T.	\$169.95
TH21AT 2m H.T.	\$159.95
7400A w/ Scan 2 mtr.	\$189.00
R1000 Gen. Cov. Rec.	\$269.95

USED EQUIPMENT

KIRAGE	
E-3015 2m 30/160w	\$175.00
A-1015 6m 2/100w	\$209.95
D-1010H 440 mhz 10/100w	\$239.95
D-1010R 440 mhz Rptr. Amp	\$315.00

TEN-TEC	
580 Corair I	\$679.00
425 Titan Amp	\$1,875.00
444 Hercules Amp	\$950.00
515 Argonaut	\$379.95
585 Xcvr.	\$379.00
405 50v Amp	\$149.00
251 9a Power supply	\$ 49.00
570 Century 21	\$189.95
262C P.S. w/207 Amtr.	\$ 89.95
2510 Sat. Station	\$299.00
260 Pa/ Spkr.	\$129.00
540 Xcvr, NB, CW	\$275.00
262M Power Supply/ Vox	\$ 89.95
242 Remote VFO	\$125.00
242 Remote (Triton)	\$149.00

YAESU	
FT 101Z Xcvr.	\$379.95
FT 901 D w/memory, Keyer	\$499.95
FT 101 2D Xcvr.	\$499.95
FC 757 AT Tuner	\$259.00
FP 757 H.D. Power Supply	\$179.95
FT 101 K w/Pan, 2 cv Filters	\$419.95
FT 101 P Xcvr.	\$349.95
FT 101 EE Xcvr.	\$300.00
FT 209 RH 5v 2m H.T.	\$239.95
FT 2700 RH 2m/440 w/pl	\$425.00
FT 270 RH 2m 45v w/pl	\$295.00
FT 708 R 440 mhz H.T. w/pl	\$169.95
FT 221 2m All mode	\$225.00
FT 208 R 2m H.T.	\$159.95

MISCELLANEOUS	
ASTRON 20a Power Supply	\$ 69.00
ASTRON 12a Power Supply	\$ 55.00
MICROLOG AIR-1-64 Interface	\$100.00
MICROLOG AIR-1 w/Amtor C-64	\$125.00
HYGAIN HDR-300 Rotator	\$399.00
REGENCY H-604 Pocket Scanner	\$ 59.95
WILSON WR-800 7 mtr.	\$169.00
SWAN ASTRO 150 Xcvr.	\$329.95
HENRY 2K-3 Amp	\$899.00
J.W. MILLER AT-2500 Autotuner	\$550.00

CLOSE OUT

AEA	
HF-64 Interface/HBA-Text	\$ 99.00
HAP-64 Interface/HBA-Tor	\$149.00

KANTRONICS	
KPC-1 TRC 2.3	\$119.00
KENWOOD	
TH 411A 25v 440 mhz	\$340.00
TH 4000A 2m/440	\$469.00
CD-10 Display	\$ 69.00
HFJ	
1228 Interface w/software	\$ 49.95
HAP-20 Interface/HBA-Text	\$ 99.00
PK-80 Packet Controller	\$169.00
MP-1 Interface	\$ 75.00
ENCOMH	
KDI-7033 10w 220 mhz	\$319.95
KDI-7033 10w 440 mhz	\$279.95
ICOM	
R-70 Gen. Cov. Rcvr	\$549.95

Indiana call 1-800-0422-0231
Service Dept. 1-800-422-0252

To transform your shack into a DX powerhouse, combine the intelligence of Yaesu's FT-767GX HF/VHF/UHF base station and the muscle of our powerful FL-7000 HF amplifier.

You'll be amazed at how you can cut through pile-ups. Be heard anywhere in the world. And wake up otherwise inactive bands.

The brains of the operation: The FT-767GX. This intelligent HF/VHF/UHF base station includes four micro-processors for unparalleled flexibility and ease of operation.

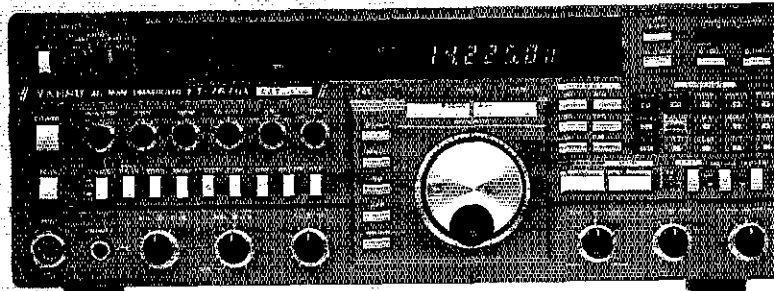
Features include 160 to 10 meter transmit, including WARC bands. Optional plug-in modules for 6-meter, 2-meter and 70-cm operation. Receiver coverage from 100 kHz to 30 MHz. AM, FM, SSB, CW, AFSK modes built in. Ten memories that store frequency, mode, and CTCSS information (optional CTCSS unit for controlled-access repeaters). Memory check feature for checking memory status without affecting operating frequency. Dual VFOs with one-touch split frequency capability. VFO tracking for slaved VFO-A/VFO-B operation at a constant offset. Digital display in

10 Hz steps. Slow/fast main dial tuning. Synthesizer step programming at up to 99.99 kHz per step. Digital SWR meter. Digital RF power meter. Built-in RF preamplifier. Adjustable drive level from 0 to 100 watts. Blue fluorescent display. Built-in AC power supply.

Up to 30 minutes continuous transmit (100% duty cycle). Full CW break-in. Built-in CW electronic keyer. Audio peak filter for CW (Yaesu patent). CW and AM wide/narrow filters. Woodpecker noise blanker.

RF clipping speech processor. IF shift for both receive and transmit (TX side allows you to adjust voice frequency response pattern). IF monitor. IF notch filter. Audio low-pass filter.

Built-in antenna tuner with memory of settings on each band. Separate antenna connectors for each VHF or UHF optional unit. Separate beverage antenna receive input on rear panel. Quick turnaround time from TX to RX for AMTOR, Packet, and QSK CW. AGC slow/medium/fast/off selection. Push-pull MRF422 transistors



GET THE BRAINS

AMERITRON

HF Linear Amplifiers

Designed and built to give reliable long-life performance. All four models cover 160 through 15 meters.

AL-84 with 4 6MJ6 tubes - 600 watts PEP output.

AL-80A with 3-500Z tube - 1000 watts PEP output.

AL-1200 with 3CX-1200A7 tube - full legal output with 100 watts drive.

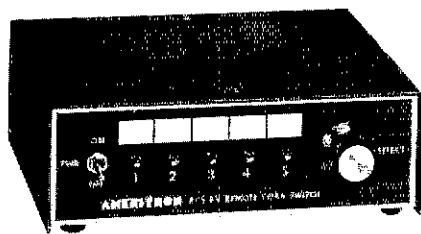
AL-1500 with 8877 tube - full legal output with 65 watts drive.



RCS-4 FOR CONVENIENT INSTALLATION

No control cable required.
Selects one of four antennas.
VSWR: under 1:1 to 1 from 1.8 to 30 MHz.
Impedance: 50 ohms.
Power capability: 1500 watts average, 2500 watts PEP maximum.

Remote COAX Switches



RCS-8V FOR SPECIAL APPLICATIONS

Selects up to five antennas.
Loss at 150 MHz: less than .1 dB.
VSWR: under 1.2 to 1 DC to 250 MHz.
Impedance: 50 ohms.
Power capability: 5 kW below 30 MHz, 1 kW at 150 MHz.

Available at your dealer-Send for a catalog of the complete AMERITRON line.

AMERITRON, Division of Prime Instruments, Inc.

9805 Walford Avenue • Cleveland, Ohio 44102 • (216) 651-1740



AND THE BRAWN.

(rated dissipation 290 watts each) operated at 24 volts for excellent intermodulation rejection in transmitter.

Enhanced C.A.T. system for external control of transceiver from personal computer. (Software for Apple IIe/MAC, Commodore C-64, and IBM-PC is available through your Yaesu dealer.) There's also data communication with the FL-7000 linear amplifier for hands-free amplifier operation.

The muscle to get you out: The FL-7000. This solid-state amplifier covers 160 to 15 meters, and includes

a built-in power supply, automatic tuner and lots of powerful operating features.

There's fast turnaround time for break-in (QSK) CW, HF packet radio, and AMTOR. Only 70 watts excitation for full output, and 1200 watts PEP input power. Fully protected push-pull parallel wideband "no-tune" amplifier circuit powered by 47V, 25A DC power supply. Yaesu's exclusive "DVC" (Direct Vertical Cooling Heatsink System) with bottom-mounted fan. Automatic antenna matching sensor

turns off amplifier and rematches tuner circuitry if SWR rises above 2:1. Hands-free automatic band change when used with FT-767GX, FT-757GX or FT-980. Lithium battery backup remembers antenna selection and tuner settings. Dual 2-speed fans with independent thermal sensors. Connection to up to four antennas, including automatic selection via optional unit. Eight front panel LED status indicators. And more.

Get the DX advantage. Just combine the FT-767GX's brains, the FL-7000's brawn, and your special operating knowledge. What an impact you'll make on the world!

YAESU

Yaesu USA

17210 Edwards Road, Cerritos, CA 90701
(213) 404-2700

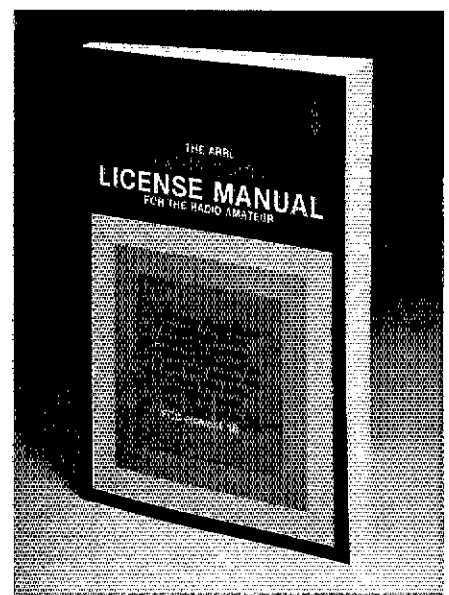
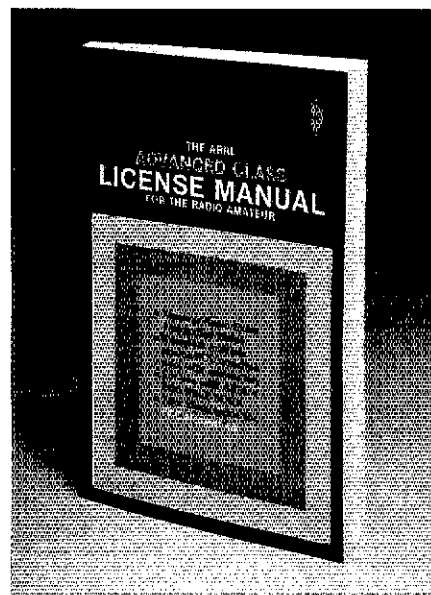
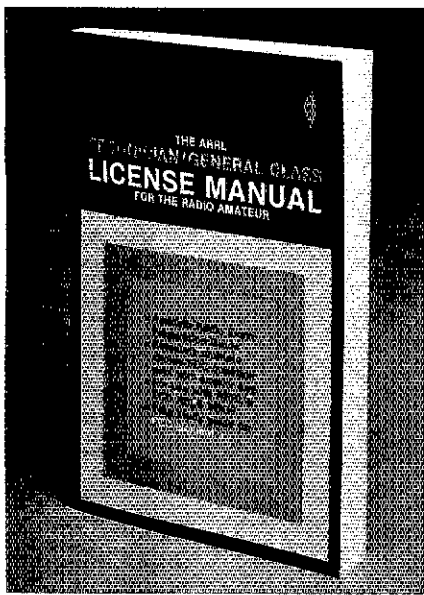
Repair Service: (213) 404-4884

Parts: (213) 404-4847

Yaesu Cincinnati Service Center

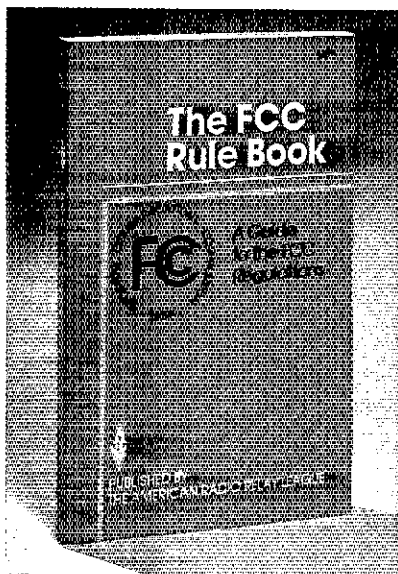
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100

Prices and specifications subject to change without notice.



PASSING POWER!

The ARRL publications pictured on this page are just what you need in order to pass the various amateur exams. Beginning with **Tune in the World with Ham Radio** for the Novice and progressing through the new and 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 the FCC question pools and answer keys. **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 of The FCC Rule Book!*



Tune in the World with Ham Radio
 Kit with book and cassette .. #0380 \$10
 Book only #0399 \$ 8

License Manual Series
 Technician/General Class #0143 \$ 5
 Advanced Class #016X \$ 5
 Extra Class #0178 \$ 5
 FCC Rule Book #0216 \$ 4

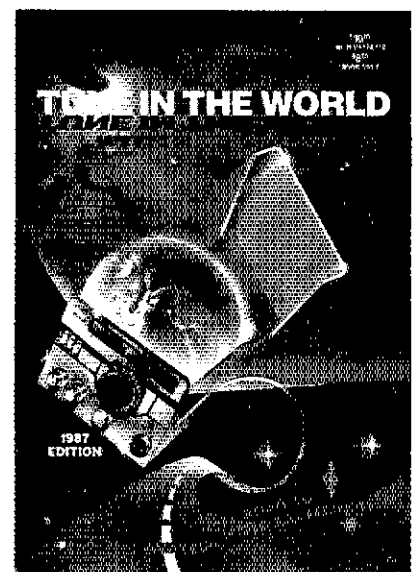
Code Proficiency
 Code Kit #5501 \$ 8
 Morse University TM Tune-in book and
 cartridge for C-64 computer #0259 \$40

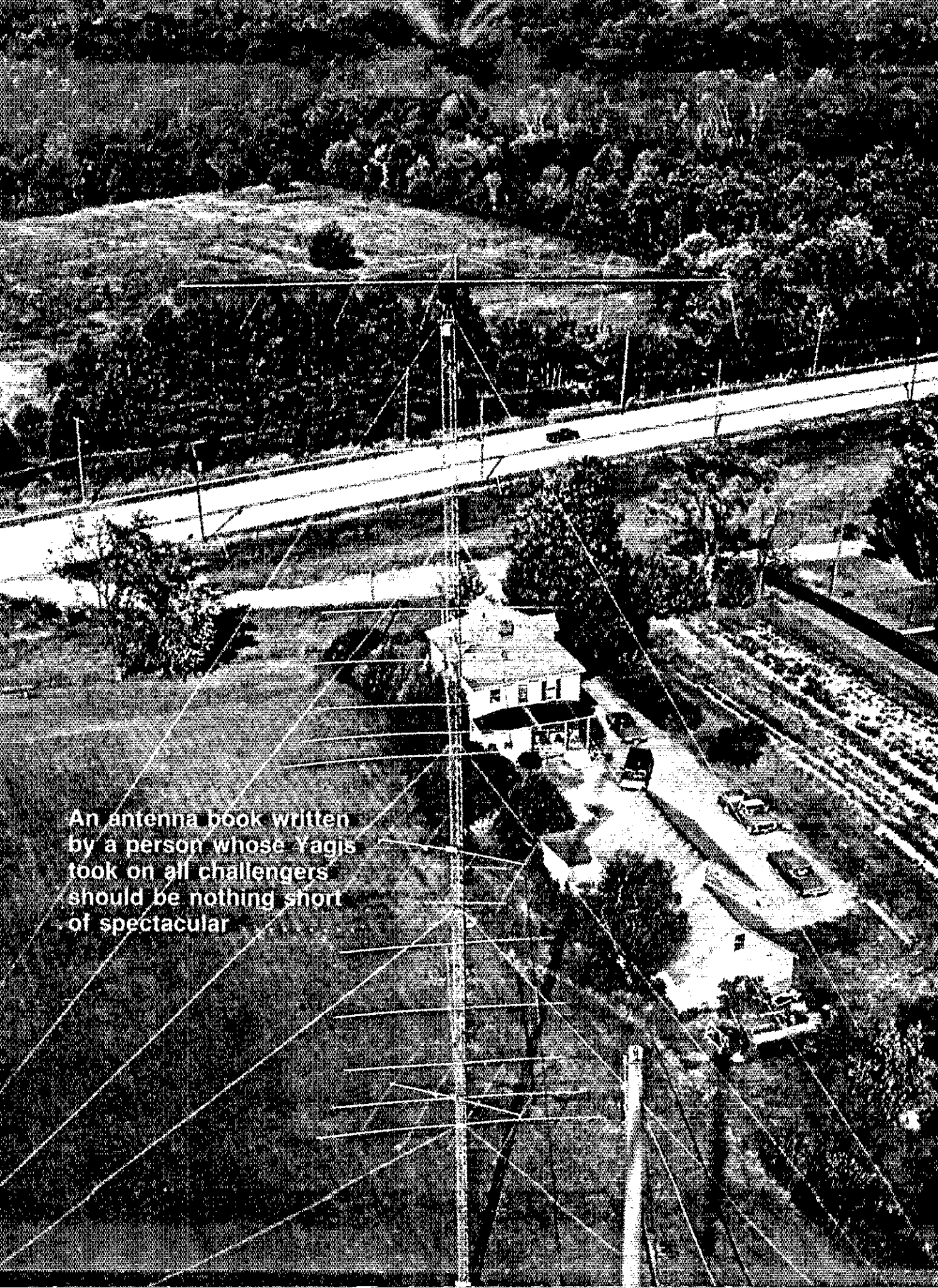
C-60 Code Practice Cassettes
 30 min. each at 5 and 7½ WPM* #1030 \$ 5
 30 min. each at 10 and 13 WPM* #1040 \$ 5
 30 min. each at 15 and 20 WPM .. #2050 \$ 5

*Same tapes included in Code Kit

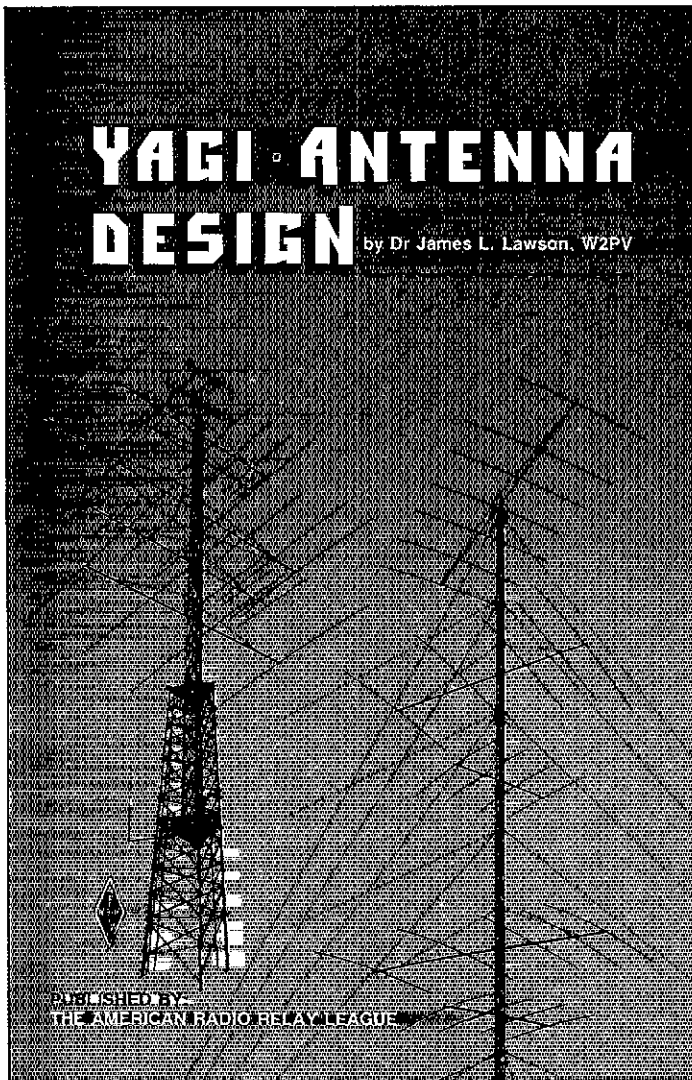
Orders must include \$2.50 shipping for book
 rate or \$3.50 for UPS.

The American Radio Relay League, Inc.
 225 Main Street
 Newington, CT 06111





An antenna book written
by a person whose Yagis
took on all challengers
should be nothing short
of spectacular



Yagi Antenna Design is based on the series in *Ham Radio Magazine* by the late Dr. James L. Lawson, W2PV. Jim was a highly competitive person and this carried through to his Amateur Radio hobby and work with antennas. Although this book is primarily the work of the author, credit should be given to its editors: Bill Myers, K1GQ; Clarke Greene, K1JX; and Mark Wilson, AA2Z. This ARRL publication stands to be a "classic" that should be added to every radio amateur's technical library. The book is available in hard cover, and contains over 210 pages of detailed information on Yagi design. For more detail, refer to the column at right. The photograph on the previous page is the 7 over 5 over 5 20-meter array on a 140 foot tower at W2PV. You can also see a 4 over 4 array for 10 meters. The photograph was taken by K1ZX. You can purchase this book at your ARRL dealer or direct from ARRL. Order #0410. Price is \$15 plus \$2.50 (\$3.50 for UPS) shipping and handling.

The American Radio Relay League, Inc.
225 Main St., Newington, CT 06111

CONTENTS

Chapter 1	
Performance Calculations	
Antenna Properties	1-2
Modeling	1-3
Computational Methodology	1-5
Element Self-Impedance	1-5
Mutual Impedance	1-9
Element Currents	1-9
Input Impedance and Directivity	1-11
Writing Computer Programs	1-12
Validation	1-15
NBS Yagi Experiments	1-15
Yagi Gain and Patterns	1-16
Effect of Director Length	1-22
Gain Variations	1-24
Comparison Summary	1-26
Chapter 2	
Simple Yagi Antennas	
Two-Element Beams	2-1
More Than Two Elements	2-7
Performance Characteristics	2-22
Element Illumination	2-24
Summary	2-31
Chapter 3	
Yagi Antenna Performance Optimization	
Parasite Length Variations	3-3
Parasite Placement Variations	3-11
Front-to-Back Optimization	3-19
Optimum Design	3-24
Design Example	3-24
Number of Reflectors	3-29
Missing Parasites	3-33
Summary	3-35
Chapter 4	
Loop Antennas	
Square Loop Model	4-1
Other Driven Loops	4-9
Multiloop Arrays	4-12
Summary	4-16
Chapter 5	
The Effects of Ground	
Reflections From A Plane ground	5-1
Ground Curvature Effects	5-2
Image Models	5-3
Propagation Elevation Angles	5-4
Antenna Performance Over Ground	5-6
Best Height	5-12
Antenna Upward Tilt	5-14
Summary	5-15
Chapter 6	
Stacking	
Vertical Stacking Arrangements	6-2
Excitation	6-2
Two-Array Stack	6-3
Phase-Derived Fill	6-13
Three and Four-Array Stacks	6-15
Optimization of Stack Arrays	6-16
Orthogonal and Antiparallel Stacked Yagis	6-17
Summary	6-18
Chapter 7	
Practical Design	
Preferred Antenna Designs	7-1
Radius Scaling	7-3
Taper Corrections	7-5
Boom and Element Clamping Correction	7-11
Examples of Three-Element Beams	7-13
Summary	7-17
Chapter 8	
Practical Amateur Yagi Antennas	
Designs for 7.15 MHz	8-3
Designs for 14.2 MHz	8-4
Designs for 21.3 MHz	8-7
Designs for 28.5 MHz	8-8

NEW! FROM ARRL

MORSE CODE: The Essential Language tells of the evolution from the straight key to computers. Using the code is a fun and exciting way to communicate, and author Pete Carron, W3DKV has incorporated his own enthusiasm into this book. The beginner will find practical advice on learning to receive and send. There are chapters on high speed operation, distress calls and what the future has in store for CW operation. An extensive history of the code is presented and the appendix lists abbreviations, the RST system, associations and organizations of CW operators and manufacturers of equipment. If the sight of a radio operator sending a message in code generates a certain intrigue that makes the mind wander to thoughts of mysterious signals in the night, ships in distress and faint transmissions from distant lands; then *MORSE CODE: The Essential Language* is must reading for you! 111 pages, copyright 1986 #0356 \$5 plus postage and handling.*

The Amateur Radio Field Resources Directory for 1986-87 is now available. Its 514 pages are divided into three sections. The WHITE pages list those individuals who can help with almost any Amateur Radio-related question or problem. The BLUE pages include a 10-year **QST** cumulative index, ARRL organization and much more. The YELLOW pages contain advertisers. Copyright 1986 #0321 \$10 plus postage and handling*.

GIL - A Collection of Classic Cartoons from QST Phillip "Gil" Gildersleeve, W1CJD contributed over 1500 cartoons and drawings to ARRL from the late twenties until he became a silent key in 1966. This book presents only a small portion of the "best of Gil." Most hams would love to have a "Jeeves" character to do the tough chores around the ham shack, and what radio club doesn't have characters similar to those portrayed on the famous field day covers? Gil was an avid radio amateur, and a member of *Who's who in American ART*. This book is a tribute to W1CJD, and we are sure that you will have as much fun reading and viewing Gil's work as we did in assembling the material. Approximately 110 pages, copyright 1986 #0364 \$5 plus postage and handling.*

*Shipping and handling charges are \$2.50 per order for book rate or parcel post, \$3.50 for UPS.

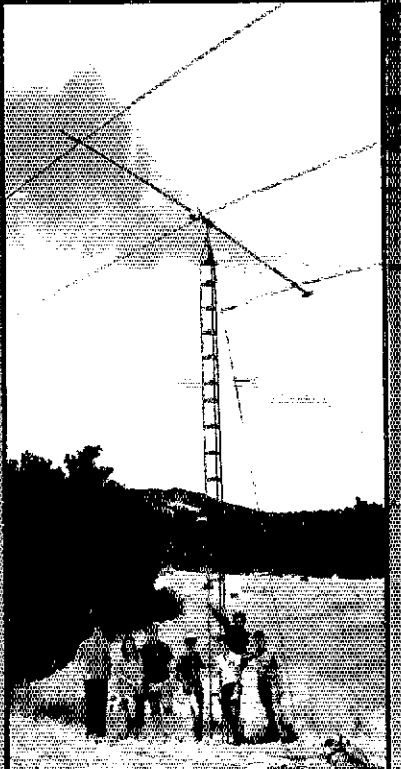
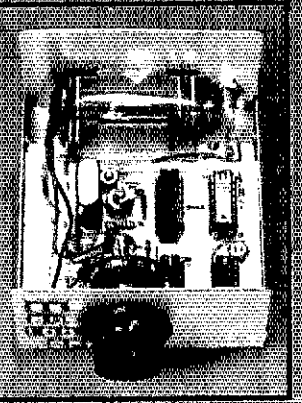
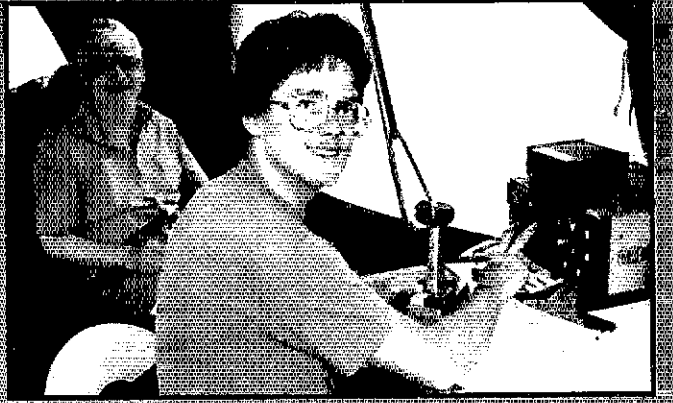


THE AMERICAN RADIO RELAY LEAGUE, INC.

295 MAIN STREET
NEWINGTON, CONNECTICUT 06111

THE 1987 ARRL HANDBOOK

FOR THE RADIO AMATEUR



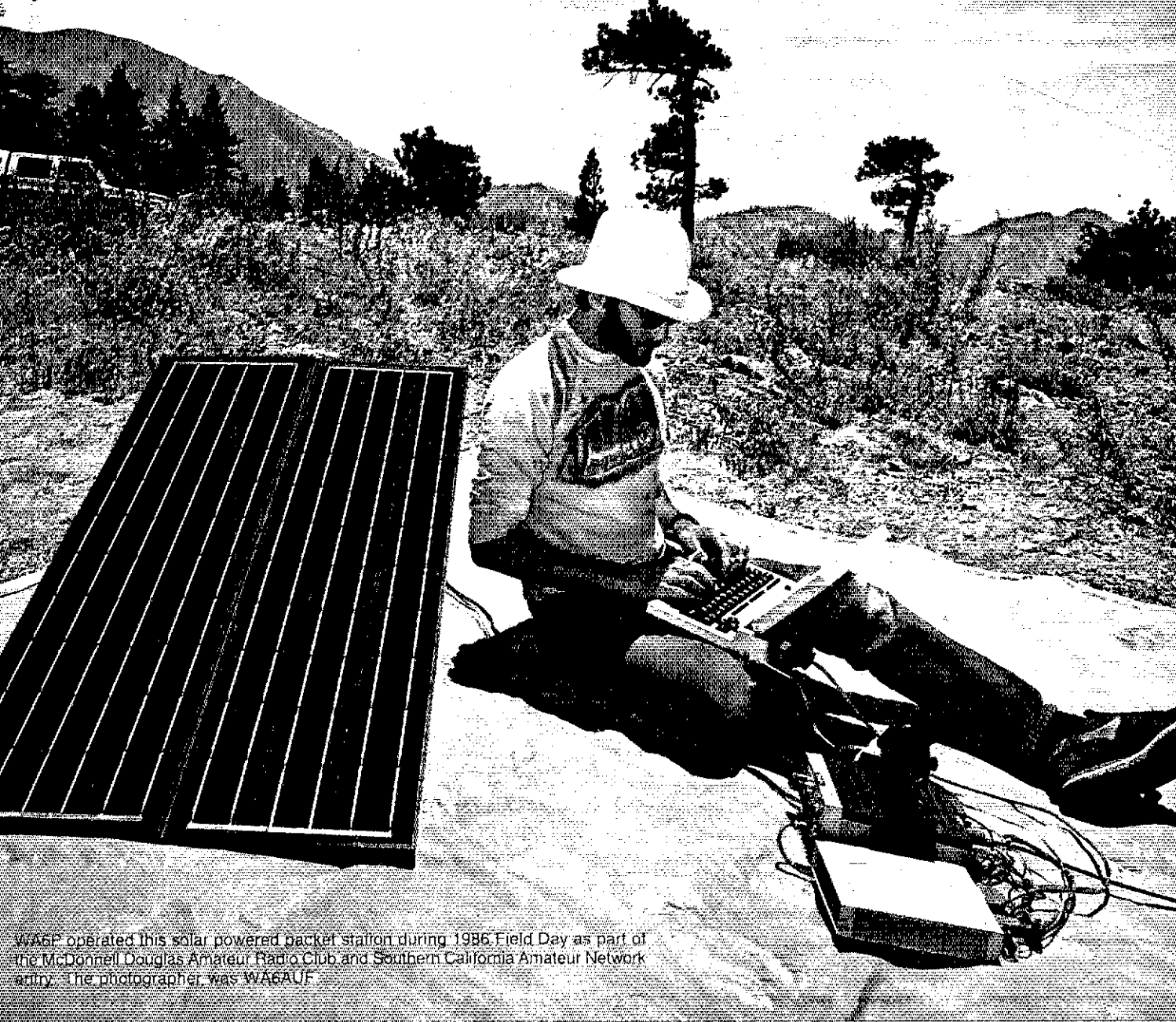
PUBLISHED BY: THE AMERICAN RADIO RELAY LEAGUE

The 1987 Handbook has it all!

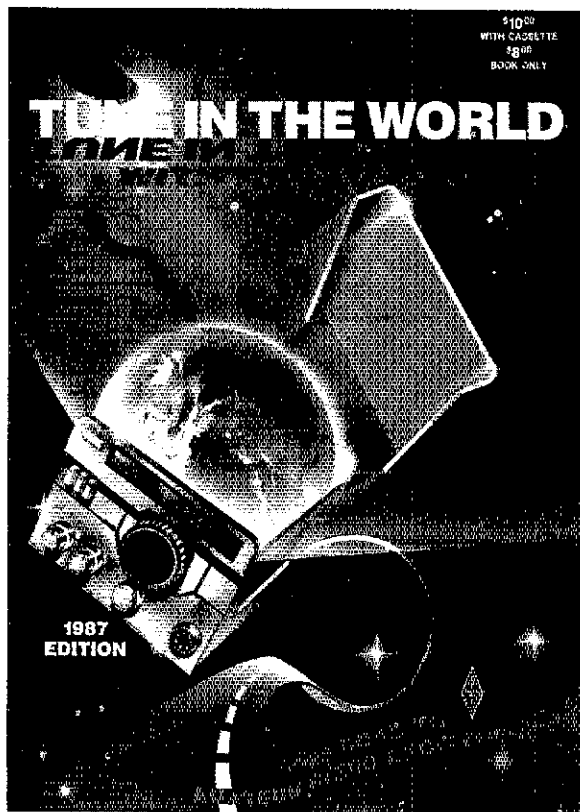
The 1987 ARRL Handbook for the Radio Amateur is your source for the most up-to-date information on:

- Packet Radio and other forms of digital communication
- RF Circuits and design
- Power amplifiers
- Visual communication — ATV, SSTV, and FAX
- Propagation
- Operating
- Antennas and transmission lines
- Voice communication
- Space communication

The 64th edition has 40 chapters and over 1200 pages. It's packed with practical construction projects and there are many with printed-circuit board etching patterns. Every year the *Handbook* is updated to reflect changes in the state-of-the-art. Whether you are a radio amateur, engineer or technician you'll find the latest edition a must addition to your technical library. There is no change in price from last year! Paperbound: \$18 in the US, \$19 elsewhere; cloth: \$27 US, \$29 elsewhere. Payment must be in US funds. Add \$2.50 (\$3.50 for UPS) shipping and handling.



W6GP operated this solar powered packet station during 1986 Field Day as part of the McDonnell Douglas Amateur Radio Club and Southern California Amateur Network entry. The photographer was W6AUF.



JOIN THE FUN BECOME A HAM!

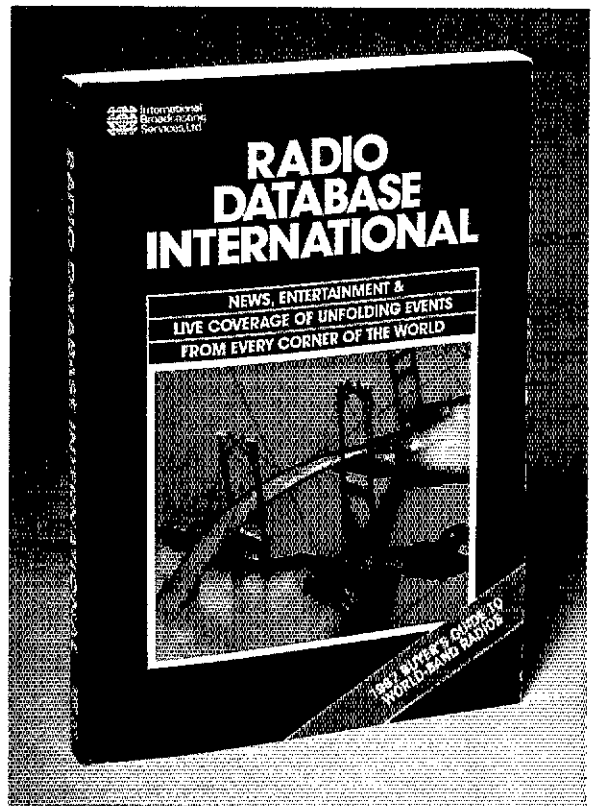
- Communicate with new friends all over the world
- Compete with other Amateur Radio operators for awards in contests that build operating skills.
- Learn the basics of communications electronics.

Tune In The World With Ham Radio has been used by thousands as their road to Amateur Radio adventure. The 6th Edition explains in simple bite-sized chunks what you need to know in order to pass your beginner's (Novice) exam. It also tells you how to select equipment for your first station and guides you step-by-step through your first on-the-air contact! In no time you will be communicating with new-found friends, *and* there's excitement too. During recent earthquakes and forest fires these active communicators were in the thick of the action, passing messages to loved ones and providing communications for rescue workers. Amateur communications satellites, ham-astronauts, and communication between home computers via digital ham networks are all part of the fun. A code learning cassette is included in the package. #0380 \$10.00. Book only, #0399 \$.80

Please include \$2.50 (\$3.50 for UPS) for shipping and handling on all orders.

DISCOVER!

Here's your chance to discover (or rediscover) what is going on between our ham bands in the way of international broadcasting. Many modern Amateur Radio transceivers can receive these frequencies. Now it is easier than ever to hear world events as they happen — *providing* you know where and when to look for a particular station. **Radio Database International** lists shortwave broadcast stations by country and frequency. It also gives the language, power and antenna directivity at specific times. For example, when might you expect to hear an English language broadcast from Malta? The country listing shows such a transmission on 9515 kHz. For more detail you turn to the frequency listings and see that the broadcast takes place at 2030z with a power of 250 kW beaming Europe. The frequency listing makes identifying particular stations a snap! International radio is a great way of increasing your knowledge of the world. Something is happening *right now!* You can be a part of it by listening in on the medium and shortwave broadcast bands. 352 pages, 1987 edition \$13.00 #RDBI.

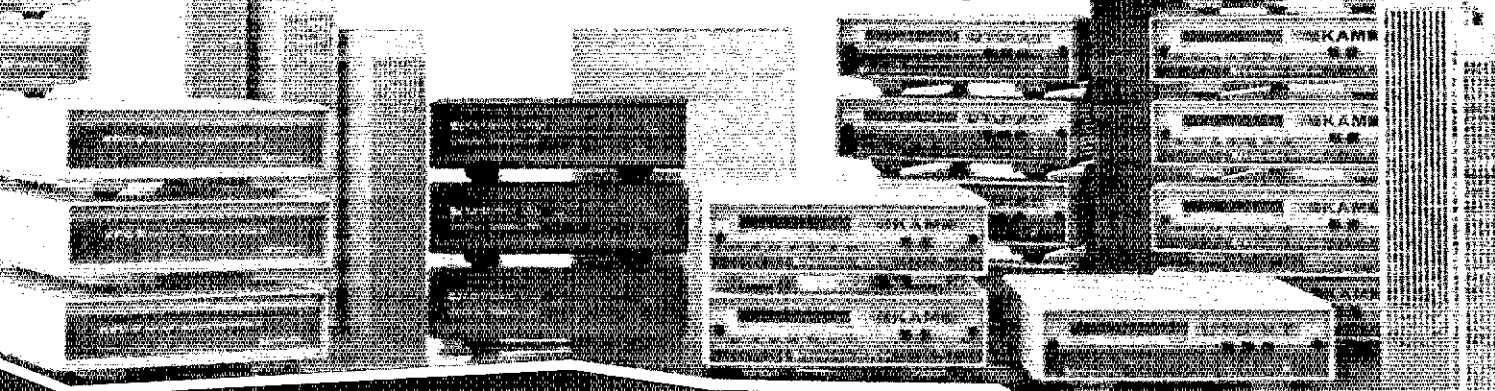


THE AMERICAN RADIO RELAY LEAGUE, INC.

225 MAIN STREET
NEWINGTON, CT 06111



Our Numbers Are Growing



Kantronics TUs & TNCs

UTU™ UTU transmits/receives CW 6-99 WPM; RTTY 60, 67, 75, 100, and 132 WPM; ASCII 110, 150, 200, and 300 baud; and AMTOR modes A, B, and L. UTU features switched capacitance filters, and a ten-segment LED bargraph for extra easy tuning. Suggested Retail \$189.95.

UTU-XT/P™ now operates HF PACKET along with CW 6-99 WPM, RTTY from 45-300 baud, ASCII from 110-300 baud, and AMTOR modes A, B and L. UTU-XT/P features user programmable parameters, such as MARK/SPACE tones, multiple RTTY shifts, and limiter/limiterless operation. UTU-XT/P utilizes a 6303 microcomputer, 8K RAM, NOVRA, and 128K EPROM. Suggested Retail \$289.95.

KAM™ The Kantronics designed All Mode unit operates HF and VHF packet; CW 6-99 WPM; RTTY/ASCII 45-300 baud; and AMTOR modes A, B, and L. KAM features HF and VHF radio ports; simultaneous HF and VHF packet connects and digipeating; HF/VHF gateway; bargraph tuning; and user programmable parameters, such as MARK/SPACE. KAM's separate CW demodulator is also center

frequency and bandwidth programmable. Suggested Retail \$319.00.

KPC-2400™ Fully compatible with all other TNCs, the KPC-2400 includes all the features of KPC-2 plus 2400 bps packet. KPC-2400 operates at 300, 1200, and 2400 bps, software selectable. Suggested Retail \$329.00.

Kantronics has also designed the **2400 TNC Modem™** for TNC-1s and TNC-2s. This add-on modem adds 2400 bps packet, while retaining 1200 bps operation. Suggested Retail \$149.00.

KPC-2™ This Kantronics designed AX 25 version 2 TNC features a built-in HF and VHF modem, full duplex operation, and multiple connects. The enhanced generic command structure fits any computer. KPC-2 includes 128K EPROM, 16K RAM - expandable to 32K, and 4K EEPROM. Suggested Retail \$169.00.

Kantronics Terminal Programs
Pacterm/UTU-Term™ for IBM and compatibles, C-64, 128; TRS III, IV, IV/P. Operates KPC-2, KPC-2400, KAM, UTU-XT/P, and UTU. Disk \$19.95. Cartridge \$24.95, IBM disk \$29.95.

Call or write Kantronics for a free catalog.



All Kantronics products are designed and manufactured in the U.S.A.

And There Are Good Reasons Why

Features and Support — Just a couple of reasons why so many amateurs are choosing Kantronics.

Take our packet units. Only Kantronics TNCs have always included the HF modem as standard equipment. And only Kantronics offers high-speed 2400 bps packet.

Our RS-232/TTL jumper makes all Kantronics "SMART" TUs and TNCs universally compatible. You won't need special interfacing for Commodores when you choose Kantronics.

Kantronics prices are compatible too! Check and see.

And what about support? — Kantronics full-time customer support departments have earned a reputation of excellence. From the time we answer your first call, our goal is to get you, and keep you on the air.

By providing updates and enhancements, Kantronics keeps you current too - like our 2.0 update.

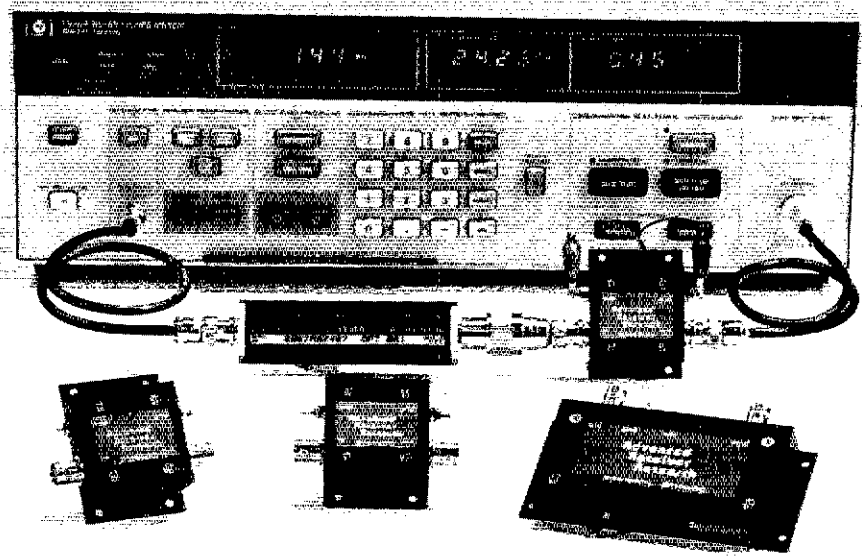
Over 80% of our original Packet Communicator owners stayed current by updating to version 2.0.

We support our customers, and our products. And that's why **Our Numbers Are Growing.**

Kantronics
RF Data Communications Specialists

1202 E. 23rd Street Lawrence, Kansas 66046
(913) 842-7745

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
F432VD	420-450	<1.8	15	-20	Bipolar	\$32.95
F432VDA	420-450	<1.1	17	-20	Bipolar	\$49.95
F432VDG	420-450	<0.5	16	+12	GaAsFET	\$79.95

Inline (rf switched)	Freq. Range (MHz)	N.F. (dB)	Gain (dB)	1 dB Comp. (dBm)	Device Type	Price
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 7-1/2% 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



For reliability...



...and increased resale value, rely on Cover Craft Dust Covers. Try our low-cost protection for ALL your equipment... before it's too late.

- Protects equipment and investment.
- Great looking.
- 100's of designs.
- Extra strength heavy gauge vinyl.
- Machine stitched.
- Satisfaction guaranteed.

See your dealer or contact:
COVER CRAFT
 Div. of Amherst International Corporation
 540 N. Commercial St., Manchester, NH 03101 • (603) 644-3555

FROM \$8.95

CITN KB1AF 745/045 1930 DY 256 271
 Congratulations to Bob Chin WB1FHT who has now been appointed Assistant Emergency Coordinator for communications with the American Red Cross; Bob will act as liaison with the Amateur community and the ARC. Kudos, also, to Emergency Coordinator N1BLH who has been appointed as the assistant communications chairman for the ARC. Cape and islands ARA reports new officers: W1HVO as Pres, W1XV as VP and W1TTY as Sec/Treas. FBI Ass't STM for packet WICE notes that Section packet traffic node K1BC/PBBS showed a whopping traffic count of 1005 during the month-not bad for a "fledgling" traffic node and likely a lot better than any other formal packet traffic node in the country. FCC Aux Coord. KA1KF sez that there is a growing number of Amateurs who are beginning to recognize the capabilities of the Amateur Auxiliary, and who are contacting the Aux FIRST, without pestering the FCC. This is the game plan agreed upon by the FCC and the Auxiliary to avoid straining the FCC's already-overburdened resources. THINK before calling Boston or Belfast. WA1TBY still publishing his excellent "NETWORKS" newsletter for those interested in traffic handling. Contact Jim for details on a free subscription. "It's the satisfaction", sez he, "of knowing that you helped that makes it all seem worth while." Flight/ Public Information Officer K1HLZ is asking that all Elmers call the EMASS ARRL info hotline at 437-0111 and give details of the areas of EMASS that you are able to help people in so that he can refer callers. Congrats to Public Service Honor Rollers N1CVE WA1FCD KB1AF KW1U KATON NG1A WA1TBY KN1K and K1ABO. A "well done!" also to the following who so ably assisted with traffic during the busy holiday season: KW1U 1113 BPL K1BC 1005 BPL WA1TB 741 BPL KN1K 706 BPL KB1AF 537 BPL W1CE 511 BPL WA1FCD 469, N1BHH 436 W1ZHC 378, KY1T 361 BPL N1CVE 337 BPL KATON 244.

MAINE: SM, Cliff Lavery, W1RWG—ASM: KA1FK6. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: K1PV.

NETS	SESS	CHECKINS	TRAFFIC MANAGER
N1AHH-1 BBS	1115	421	N1AHH
SEAGULL	25	850	K1GUP
PINETREE	31	311	ND1A
AROSTOOK	4	101	2
RACES	4	68	26
CMEN	9	162	22
MePubSvc	No Report		

Congrats to 17-year old Jody MacDonald, KA1JTU, a hi sch jr w/copy of Wall St Journal under his homework is bldg a \$35,000 co-generation pwr plant producng 94 kw to sell to Gen Me Pwr. Bulletin Manager, W1JTH, reports 24 transmissions for November of ARRL Maine, 4 propagation bulletins by 5 stations. N1BUG, W1KX, KA1JPR, W1VEH, W1WCI, 56 kindergarten children from midcoast area participated in "talk to Santa Claus" sponsored by Pen Bay Co. They talked to Santa and Santa's xyl at North Pole. We welcome two new OOs: Bill Kaiser, ND1O, of Bath and Bruce Palmer, N1CNM, Saco. That brings the Section coverage to eleven: W1ISO Millinocket, K1NIT Hallowell, K1PV Rumford, KY1C Wilton, KY1E West Farmington, W1KX Pittsfield, K1WWT and N1BCF Augusta, and KA1CNG Farmington. Traffic: WB1CBP 268, KA1JQJ 158, NE1A 153, WA2ERT 134, W1ISO 114, W1JTH 99, KA1JPR 86, AK1W 85, W1KX 70, W1RWG 66, W1OTQ 29, W1VEH 27, WA1YNZ, W1GCB 22, W1BMX 11, N1BME 6, NB2K 3, PSHR: WB1CBP, W1RWG.

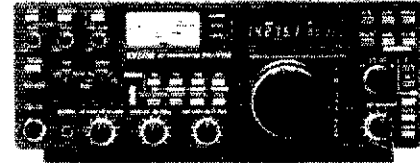
NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—OOC: N1NH, PIO: WA2MBQ. This month's feature is a good demonstration of how some publicity can spark some life into NTSI Luck Hurder, KY1T, EMASS SM used packet to promote the use of tel answering machines to encourage the public to send Xmas messages. The idea was picked up by Dave, WA1FHB, and passed to Butch, WB1GXM, DEC SW, NH. They recruited local ham help to publicize the service. People called local numbers and left messages to be sent to friends and relatives. The messages were formatted for NTS and sent on their way. With an intense promotional effort including articles in local papers, interviews on radio stations, and announcements on area repeaters and packet BBS, approx 200 messages were sent via NTSI Credit for this outstanding effort goes to WB1GXM, K1TQY, WA1FHB, W1FYR and to all the names that helped move the traffic. A special thanks to KY1T for sharing the initial concept with us. Around the Nashua area. Congrats to K1XV, who has been appointed ASM for youth recruitment. Congrats to ND1A, K1MNS, WA1OAG and K1SOG are working on portable stations for 2304. NH CD Director spoke at a recent Interstate Rptr Soc meeting and presented the club with a commendation from Gov Sununu for providing emrg comm support. New NARC officers for 87-KA1LDF, Pres-WA1TGN, VP-KA1GOZ, Sec-KC1AY, Treas-K1CL, Membership-KA1DT, Programs-K1LGG, Activities. Congrats to W1TN on his recent retirement from the FAA, W1RTV recently retired and has moved to S. Carolina. The Sullivan City ARES group did a demo at Claremont K-MART showing packet, 2M and the hndlg. Hams involved were W1GLA, KA1NWP, WB1EAE, NG1O, WB1GXM, and WA1FHB/PBBS. TRY THIS: use the KY1T plan to promote radiograms in your area. Focus on local, area, national holidays and events and publicize, publicize! Contact KY1T or WB1GXM for more info. Finally, the section was 100% on FRN/cycle 2 and WB1GXM and W1FYR made BPL. Traffic: GSPN 125, N1NH 152, WB1DSWP 793, W1FYR 401, W1PEX 307, N1NH 273, WB1GXM 234, N1AKS 192, K1TOY 190, N1CPX 187, K1POV 167, K1PE 162, WA1YZN 142, WA1E 111, K6LXO 107, W1TN 84, NE1J 84, KV1S 84, KA1LMS 57, KA1GOZ 48, KAHPQ 35, KA1LBW 30, N1CAR 15, N1EKC 12, K1ACL 9, N1DQA 8, W1LQQ 6.

RHODE ISLAND: SM, John (Bob) Vota, WB1FDY—Txn to N.P.A.R.C. for their Novices Classes. New Officers of the N.P.A.R.C. Pres, KY1G, V.Pres, N1EEU, Sect, KA1JFT, Treas, KA1JPL. Well done to OSARG for the communications set up for the R.I. first Night Activities. No other info was sent in this month, so short colln. Traffic: KA1KML 200, PSHR 79, KA1JXH 435, PSHR 157, WA1CFY 81, W1EOP 177, KA1JXH Qualified for Brass Pounders Medalion. 73a OUL.

VERMONT: SM, Frank I. Suito, W1CTM—December was indeed filled with those events that continued to alter and illuminate our times. The joy of the Xmas season, with new licenses/equipment/parties, etc., was tempered by the loss of one of the most dedicated and respected members of our hobby, Bob Scott (W1RNA). Bob's passing into the ranks of the Silent Keys forces us not only to recognize Bob's outstanding achievements within our hobby, but also to rededicate ourselves to the goals and ideals of this avocation that he loved and served so well. Bob's service to our section leadership (SM/SEC/DEC etc.) plus his traffic-handling activities for Navy/Marine Corps Mars truly reflected his lifelong dedication to our hobby. It is my hope that each of us can continue to serve our hobby by using the example of W1RNA. The next generation of hams is on the way as evidenced by the high pass rate (83%) of the BARC VE exams held on Dec. 13. Ten new upgrades plus two new Novices have joined our ranks. Upgrades included: KA1MLK, KA1NUL, KA1PDX, KA1PDY, KA1PEA, KA1ORR, KA1LMS. Of special



HF Equipment	Regular SALE
IC-735 HF transceiver/SW rcvr/mic	999.00 849 ⁹⁵
PS-55 External power supply	199.00 179 ⁹⁵
AT-150 Automatic antenna tuner	445.00 349 ⁹⁵
FL-32 500 Hz CW filter	66.50
EX-243 Electronic keyer unit	56.00
UT-30 Tone encoder	17.50
IC-745 9-band xcvr w/1.30 MHz rcvr	1049.00 899 ⁹⁵
PS-35 Internal power supply	199.00 179 ⁹⁵
EX-241 Marker unit	22.50
EX-242 FM unit	44.00
EX-243 Electronic keyer unit	56.00
FL-45 500 Hz CW filter (1st IF)	66.50
FL-54 270 Hz CW filter (1st IF)	53.00
FL-52A 500 Hz CW filter (2nd IF)	108.00 99 ⁹⁵
FL-53A 250 Hz CW filter (2nd IF)	108.00 99 ⁹⁵
FL-44A SSB filter (2nd IF)	178.00 159 ⁹⁵



IC-751A 9-band xcvr/1.30 MHz rcvr	1649.00 1399
PS-35 Internal power supply	199.00 179 ⁹⁵
FL-32 500 Hz CW filter (1st IF)	66.50
FL-63 250 Hz CW filter (1st IF)	54.50
FL-52A 500 Hz CW filter (2nd IF)	108.00 99 ⁹⁵
FL-53A 250 Hz CW filter (2nd IF)	108.00 99 ⁹⁵
FL-33 AM filters	35.25
FL-70 2.8 kHz wide SSB filter	52.00
RC-10 External frequency controller	39.25

Other Accessories:	Regular SALE
IC-2KL 160-15m solid state amp w/ps	1999.00 1699
PS-15 20A external power supply	169.00 154 ⁹⁵
PS-30 Systems p/s w/cord, 6-pin plug	299.00 269 ⁹⁵
OPC Opt. cord, specify 2, 4 or 6-pin	10.00
MB Mobile mount, 735/745/751A	24.50
SP-3 External speaker	61.00
SP-7 Small external speaker	49.00
CR-64 High stab. ref. xtal (745/751)	63.00
PP-1 Speaker/patch	159.25 149 ⁹⁵
SM-6 Desk microphone	44.95
SM-8 Desk mic - two cables, Scan	78.50
SM-10 Compressor/graph EQ, 8 pin mic	136.25 124 ⁹⁵
AT-100 100W 8-band auto. antenna tuner	445.00 389 ⁹⁵
AT-500 500W 9-band auto. antenna tuner	559.00 489 ⁹⁵
AH-2 8-band tuner w/mount & whip	625.00 549 ⁹⁵
AH-2A Antenna tuner system, only	495.00 429 ⁹⁵

Good Until February 28th, 1987!

With the purchase of an IC-735, IC-745 or IC-751A, receive Your Choice of One of the following accessories, FREE, from ICOM.

- CW Filter: FL-45, FL-52A, FL-53A, or FL-54
 - World Clock: GC-5 • Desk Microphone: SM-6
 - Mounting Bracket: MB-5, MB-12, or MB-18
- also, until 3-31-87

\$50 FACTORY REBATE on AT-150

ICOM

Other Accessories - continued:	Regular SALE
GC-5 World clock	91.95 89 ⁹⁵
6-meter VHF Portable	Regular SALE
IC-505 3/10W 6m SSB/CW portable	549.00 489 ⁹⁵
BP-15 AC charger	14.00
EX-248 FM unit	55.50
LC-10 Leather case	39.50
VHF/UHF base multi-modes	Regular SALE
IC-551D 80W 6-meter SSB/CW	799.00 719 ⁹⁵
EX-106 FM option	140.00 126 ⁹⁵
BC-10A Memory back-up	9.50
IC-271A* 25W 2 meters ... CLOSEOUT	859.00 699 ⁹⁵
AG-20* Internal preamplifier	64.00
IC-271H 100W 2m FM/SSB/CW	1099.00 969 ⁹⁵
AG-25 Mast mounted preamplifier	95.00
IC-275A 25W 2m FM/SSB/CW w/ps	1199.00 1049
IC-471A* 25W 430-450... CLOSEOUT	979.00 769 ⁹⁵
AG-1* Mast mounted preamplifier	99.50
IC-471H* 75W 430-450 ... CLOSEOUT	1399.00 999 ⁹⁵
AG-35* Mast mounted preamplifier	95.00

*Preamp \$9⁹⁵ with 271A/471A/471H Purchase

Accessories common to 271A/H and 471A/H	Regular SALE
PS-25 Internal power supply for (A)	115.00 104 ⁹⁵
PS-35 Internal power supply for (H)	199.00 179 ⁹⁵
SM-6 Desk microphone	44.95
EX-310 Voice synthesizer	46.00
TS-32 CommSpec encode/decoder	59.95
UT-15 Encoder/decoder interface	14.00
UT-15S UT-15S w/TS-32 installed	92.00
VHF/UHF mobile multi-modes	Regular SALE
IC-290H 25W 2m SSB/FM, TTP mic	639.00 569 ⁹⁵
IC-490A 10W 430-440 SSB/FM/CW	699.00 599 ⁹⁵
VHF/UHF/1.2 GHz FM	Regular SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00 369 ⁹⁵
IC-27H Compact 45W 2m FM w/TTP mic	459.00 399 ⁹⁵
IC-37A Compact 25W 220 FM, TTP mic	499.00 439 ⁹⁵
IC-47A Compact 25W 440 FM, TTP mic	549.00 479 ⁹⁵
PS-45 Compact 8A power supply	139.00 129 ⁹⁵
UT-16/EX-388 Voice synthesizer	34.99
SP-10 Slim-line external speaker	35.99
IC-28A 25W 2m FM, UP/DN mic	429.00 369 ⁹⁵
IC-28H 45W 2m FM, UP/DN mic	459.00 399 ⁹⁵
IC-38A 25W 220 FM	459.00 399 ⁹⁵
IC-48A 25W 440-450 FM	459.00 399 ⁹⁵
HM-14 TTP microphone	55.50
UT-28 Digital code squelch	37.50
UT-29 Tone squelch decoder	43.00
HM-16 Speaker/microphone	34.00
IC-3200A 25W 2m/440 FM w/TTP	599.00 499 ⁹⁵
UT-23 Voice synthesizer	34.99
AH-32 2m/440 Dual Band antenna	37.00
AHB-32 Trunk-lip mount	34.00
Larsen PO-K Roof mount	20.00
Larsen PO-TLM Trunk-lip mount	20.18
Larsen PO-MM Magnetic mount	19.63
RP-3010 440 MHz, 10W FM, xtal cont.	1229.00 1089
IC-120 1W 1.2 GHz FM Mobile	579.00 499 ⁹⁵
ML-12 1.2 GHz 10W amplifier	379.00 339 ⁹⁵
IC-1271A 10W 1.2 GHz SSB/CW Base	1229.00 1069
AG-1200 Mast mounted preamplifier	105.00
PS-25 Internal power supply	115.00 104 ⁹⁵
EX-310 Voice synthesizer	46.00
TV-1200 ATV interface unit	129.00 119 ⁹⁵
UT-15S CTCSS encoder/decoder	92.00
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1479.00 1289



Hand-helds	Regular SALE
IC-2A 2-meters	279.00 249 ⁹⁵
IC-2AT with TTP	299.00 259 ⁹⁵
IC-3AT 220 MHz, TTP	339.00 299 ⁹⁵
IC-4AT 440 MHz, TTP	339.00 299 ⁹⁵
IC-02AT 2-meters	369.00 299 ⁹⁵
IC-02AT/High Power	399.00 339 ⁹⁵
IC-03AT for 220 MHz	449.00 399 ⁹⁵
IC-04AT for 440 MHz	449.00 389 ⁹⁵
IC-u2A 2-meters	299.00 269 ⁹⁵
IC-u2AT with TTP	329.00 289 ⁹⁵

Accessories for IC-u2A/T (CALL)
 IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP 459.00 399⁹⁵
 A-2 5W PEP synth. aircraft HT 599.00 499⁹⁵

Accessories for IC series	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.50
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
MB-16D Mobile mtg. bkt for all HTs	24.50
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	34.95
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	23.25
HS-10SA Vox unit for HS-10 & Deluxe only	23.25
HS-10SB PIT unit for HS-10	23.25
ML-1 2m 2.3w in/10w out amplifier	SALE 99.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular SALE
R-71A 100 kHz-30 MHz, 117V AC	\$949.00 799 ⁹⁵
RC-11 Infrared remote controller	67.25
FL-32 500 Hz CW filter	66.50
FL-63 250 Hz CW filter (1st IF)	54.50
FL-44A SSB filter (2nd IF)	178.00 159 ⁹⁵
EX-257 FM unit	42.50
EX-310 Voice synthesizer	46.00
CR-64 High stability oscillator xtal	63.00
SP-3 External speaker	61.00
CK-70 (EX-299) 12V DC option	12.25
MB-12 Mobile mount	24.50
R-7000 25 MHz-2 GHz scanning rcvr	1099.00 969 ⁹⁵
RC-12 Infrared remote controller	67.25
EX-310 Voice synthesizer	46.00
TV-R7000 ATV unit	131.95 119 ⁹⁵
AH-7000 Radiating antenna	89.95 (14)

HOURS • Mon. thru Fri. 9-5:30; Sat. 9-3

Milwaukee WATS line: 1-800-558-0411 answered evenings until 8:00 pm Monday thru Thursday.
WATS lines are for Quotes & Ordering only, use Regular line for other Info & Service dept.

All Prices in this list are subject to change without notice.

Order Toll Free: 1-800-558-0411 In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

AMATEUR ELECTRONIC SUPPLY[®] Inc.

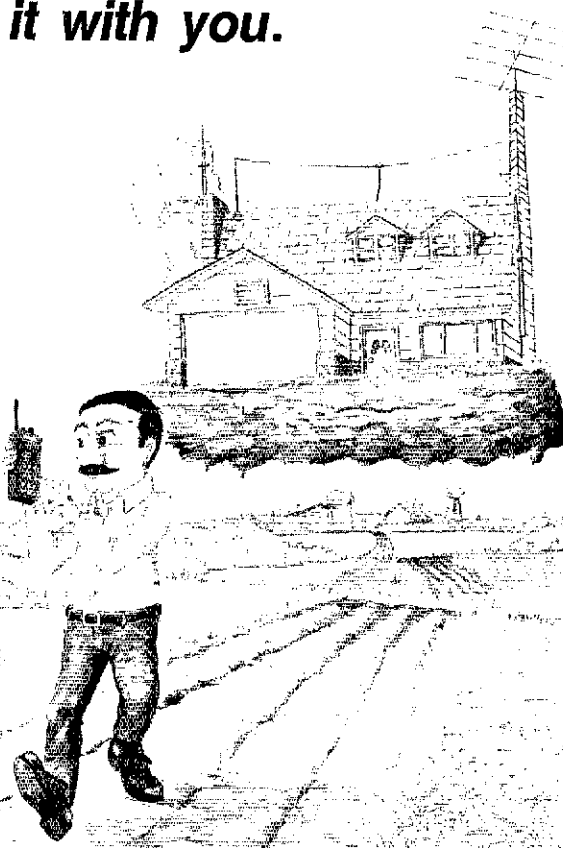
4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 • Phone (414) 442-4200

AES[®] BRANCH STORES

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 (305) 894-3238 Fla. WATS 1-800-432-9424 Outside Florida 1-800-327-1917	CLEARWATER, Fla. 33575 1898 Drew Street Phone (813) 461-4267 No In-State WATS No Nationwide WATS	LAS VEGAS, Nev. 89106 1072 N. Rancho Drive Phone (702) 647-3114 No In-State WATS Outside Nevada 1-800-634-6227	CHICAGO, Illinois 60630 ERICKSON COMMUNICATIONS 5456 N. Milwaukee Avenue Phone (312) 631-5181 Outside Illinois 1-800-621-5802
--	---	---	---	--

Take it with you.



ShackMaster™ puts your home station in the palm of your hand. Whether portable, mobile, around the yard or around town you'll be linked through your handheld to your high performance equipment at home. Even call home from any Touch-Tone phone and operate.

Scan the bands, change modes, select antennas, turn gear on and off - all from your Touch-Tone keypad. Check into nets, work skeds, ragchew and DX without being tied down to the shack.

Exchange electronic mailbox messages with your family - like "I'll be late", or "All is OK". Or talk with your family directly through ShackPatch™, with you in remote control of your home station. Report traffic accidents or disabled motorists through your home phone while mobile or portable with PersonalPatch™.

Because of the remote control capabilities of ShackMaster™, the ARRL would like us to remind you that "Use of this device with a transceiver operating in the two meter band, or on any other frequency below 220.5 MHz is not permitted unless a separate control link is provided". To find out more about ShackMaster™, just write, send us your QSL, or call and talk with us at 408-727-3330.

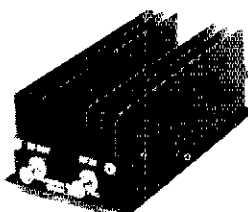


advanced
computer
controls, inc.

2356 Walsh Avenue • Santa Clara, CA 95051 408-727-3330

CALL LONG DISTANCE ON YOUR HANDHELD

The Model 335A will deliver 35 watts of power using the latest state-of-the-art circuitry. The amplifier will operate SSB or FM and is compatible with most handheld transceivers, including the TR2400, TR2500, IC-2AT, Yaesu, Santec, and Ten-Tec. Only 300 mw input will deliver 5 watts out; 3 watts in will deliver 35 watts out. Maximum input drive level is 5 watts.



Our products are backed by prompt factory service and technical assistance. To become familiar with our other fine products in the amateur radio market, call or write for our free product and small parts catalog.

Model 335 A
Kit \$69.95
Wired & Tested \$89.95



CCI Communication
Concepts Inc.

121 Brown Street • Dayton, Ohio 45402 • (513) 220-9677



note is that both KA1ORR (Kathy) and KA1LMG (Shel) are 11 years old. Instructors Mitch/Chris/Greg—U done good. Did U know that the word "ham" as applied to Amateur Radio dates back to 1908/9 when three Harvard Wireless Club members used the first letter of their last names (Hyman/Almy/Murry) as the club call? A new training program agreement with DOD will allow Amateur Radio courses to be held on military bases. BARRC having planning in full swing for 1988, aside the weekend of Aug. 9-9 for some fun at Essex Jct. Fairgrounds—contact is N1DLE. ARRL has provided ham radio material to the entire 6th grade of the Concord, VT, school system. A new ARES net has been started by N1CQE on 28.350 MHz on Sat. at 10:30 AM (L). SEC (W1KRV) now can be heard on 2 meters sporting a new TS-211A. He also indicates a continued growth in ARES throughout the section. W1BD's autopatch crew, headed by WA1ODL, is hard at work and should be off the air soon. Look for Novice Enhancement soon. Will review N.E. Division meeting held 1-10-87 in next issue. Chip (W1AIM) has had QSOs with AF1T on 12 bands (direct—no repeaters) over a distance of 100 miles. Can anybody top that record? Dec net report: GMN 27427736, CAT 27770837, VPHN 47935, CYPIN 518143, BSEN 14283, HJ 141840, TSEN 555/9, VTN 31247240, Dec Traffic: WA2SP1 828, KT1Q 914, N1DHT 210, W1KRV 188, AE1T 163, K2KBT 127, WA1JVV 94, W1OAK 56, NB1A 7.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T—STM: W1UD, TC: KA1JUM, PIO/ACC: K1BE, SEC/SGL: WB1HIH. Total ARES membership in WM exceeded 300 for the first time in December. Thanks to the continuing good work of the DEC/ECs and to SEC WB1HIH. Join up now by contacting the DEC/EC for your county and then be prepared to assist in emergency activities. The DEC/ECs are: W1JTL DEC Worcester City, WB1GLX Hampden City, K1JHC No Worcester City, WB1FSV Franklin City, K1ISW So Worcester City, W1SJV Berkshire City, WA1WEJ Hampshire City. KA1EXJ is starting the West Mass Slow Net on 3735 kHz each night at 8:30 local. This net meets in the Novice band and is ideal as starter activity for a new Novice, for anyone who wants to get their code speed up, or who wants to get into traffic handling. Join the group on 3735 and new Novices to get involved. Good to see KA1IFC very active in December traffic load. PSHR: WB1HIH. Traffic: KA1T 58, W1UD 278, KA1IFC 157, W1KK 105, KA1EXJ 55, WB1HIH 33, WA1OPN 32, KA1EKQ 32, N1DMU 31, KA1OFC 28, W1ZPB 7.

NORTHWESTERN DIVISION

ALASKA: SM, Jim Moody, Jr. N17C—SEC: KL7JIM. STM: KL7T, TC: AL7L, NM: KL7GID, KL7AF, K1JKW, DEC: AL7AC, KL7WM, KL7JFT. February was a busy month and a warm-up (?) for the month to come. The Anchorage ARC provided communications for the annual "Rondy" dog-sled races—a super job. The Arctic ARC is busy putting together communications for the Yukon Quest International Dog Sled race. AL7FS has been working hard planning for the annual Iditarod dog-sled race from Anchorage to Nome. Amateurs from all over the state and "outside" will participate in providing HF and VHF (including PACKET) communications over the 1049 miles of the race. It will be an interesting month for all amateurs in this section. Don't forget the "Alaska Novice Week" contest this month!

IDAHO: SM, Don Clower, KA7T—SEC: N7BI. STM: W7GHT. QOC: WB7CYO. On Dec. 3 Ada County conducted a simulated disaster. The drill involved all of law enforcement and the local hospitals. W7WU and WA7VPW headed up the amateur group that was involved. Thanks to W7MAI, W7GCI, KC7DN, K7CXG, KC7UN, WA7ESJ, WB7PFO, K7PKT, W7JMH, KB7ZO for their efforts in the drill. Don't forget the ARES net at 0000Z Mon. each week on 3.990 MHz.

MONTANA: SM, Les Belyea, N7A1K—New officers for the Capitol City ARC are: Pres: N7CC, VP: K7EGM, Sec'y: WA7GQO, Newsletter: N7RB. Yellowstone ARC, Pres: WB7CWB, VP: KA7MMY, Sec'y K7AEZ. Billings selected as HAM of the year—N7AT, congrats. The Missoula VE team consisting of KC7HP, K7YI, KE7LL and K7V7 received a "Praise Paper" from National VEC W5V1 for their work in conducting test sessions. Sorry to report the W7OD from Helena is a SAC. It was reported in a 1988 issue of QST that a 2-meter contact was made between Great Falls and Helena, WOWI N7DXJ, (Red Lodge) connected to a Calif. station via 2m packet, KE7LL (Missoula) worked 2K1CT (Cook Island) using 2 watts. WA7DEO reports the following up-grades; to Extra -KA7WYU, to Gen-WA7PDD, to Tech-KA7YV1. PSHR-KF7R.

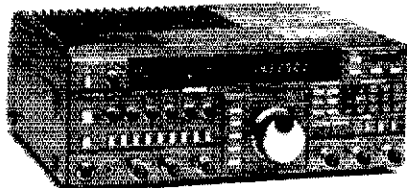
NET	SESS	QNI	QTC	MGR		
ID CD	3.990	0810	M-F	23	777	74
NWNT	148/38/98	0730	PA	31	935	60
IMN	3.635	CW	9P DA	23	347	85

Traffic: NW7K 38, W7JMH 44, W7GHT 313, N7BHL 325.

OREGON: SM, William R. Shrader, W7QMU—ASM: KZ7T, STM: W7VSE, SEC: N7CPA, PIO: K7YIN, SGL: KA7KSK, STC: N7ENI, ACC: KB7CC, OO: N7SC, RFI: AK7T, Upgrades: KA7CKX (Extra), W7HDF (Adv) KA7WZS, KA7FY, KA7ZWA, KA7WIN, N7HZB, KA7SAG (Gen), KA7YDB, KA7ZEL, WA7BIX, KA7YXE, KA7WQI, KA7ZDE, KA7ZFY, KA7ZEF, KA7YKX, KA7ZCQ, KA7ZHP, KA7ZIS. New officers for the Klamath Falls Club: N7HFB, Pres: KA7NEP, 1st VP: K7J1J, 2nd VP: ND7V, Sec: W7E0, Treas: WB7SIC has been selected as the Chairman for the 1988 National ARRL Convention to be held in Portland. Congrats to all the above! This report covers December 86, so it will be my last report as Section Manager. My successor will be Randy Stumson, KZ7T. Randy's home base is in Portland and he has been Assistant SM for the last five or so months. His info will appear on the Section Manager list in the front of QST. Please give him the same support and help that you gave me over the last years as your SM and I'm sure he will do a fine job. My sincere thanks to each and every one for your support. I will continue to represent you in my new position as Vice Director NW Division. Send me your ideas. Thanks & 73's! Traffic(P=PACKET): W7VSE 955, N7BGW 357, W7ZB 214, WB7SN 154, KA7BYG 122, N7FJ 119, W7HLF 45, KA7AEE 41, KM7R 40(P), N7DRP 28, KA7AID 15, WB7SZM 14(P), W7LNE 3; (Nov.) KZ7B 81, KM7R 23(P), W7LNE 9.

WASHINGTON: SM, Brad Wells, KR7L—SEC: KA7INX, ACC/ASM: KC7PH, STC: KD7ME, TC: W7BUN, SGL: KD7AC, BM: N7CAK, OMC: N7DVR, ASM: KD7G. Congrats to the new officers of the Olympia Amateur Radio Society: WA7RDJ-Pres; N7HOE-VP; N7VJ-SEC; NX7Y-Treas. OARS meetings 4th Wednesday of each month in a new location: The Olympia Center, 222 Columbia Street, Olympia. Congrats to the new officers of the Western Washington DX Club: N7FSW-Pres, W7QN-VP, WA7BPI-Treas, W7YF-Sec, and the Radio Club of Tacoma: K7CYZ-Pres, W7BUN-VP, N7FXM-Treas, WB7QAH-Sec. The ARES group in Island county has been active the past month with several call-outs due to ex-

Call TOLL FREE for DISCOUNT Prices or TRADE-IN quote on your clean, late model equipment



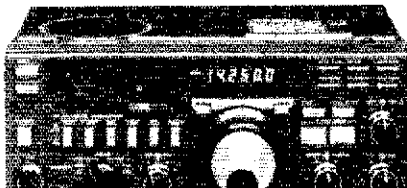
HF Equipment LIST
 FT-767GX 160-10m xcvr/1-29.99 MHz Rcvr \$1895.00
 6M/767 6m module 179.95
 2M/767 2m module 179.95

SPECIAL! • 2M/767 \$1 with FT-767GX Purchase

430/767 430-440 module 219.95
 440/767 440-450 module 219.95
 FT-ONE Xcvr/Rcvr/4 filters/RAM/FM 2859.00
 KY-ONE Keyer unit 50.00
 DC-ONE DC cable 15.00



FT-980 9-band CAT Xcvr/SW Rcvr \$1795.00
 SP-980 Speaker with audio filter 99.95
 SP-980P Speaker/patch 99.95
 FC-757AT Automatic ant. tuner w/memory 359.00
 FAS-1-4R Remote antenna selector 79.95
 E-980 Interface cable; FT-980/757AT 46.50
 XF-8.9HC 600 Hz CW filter (1st IF) 50.00
 XF455.8MC 300 Hz CW filter (2nd IF) ... 59.95
 KY-ONE Keyer unit 50.00
 FIF-65 Computer interface; Apple IIe 69.95
 FIF-80 Interface; NEC PC-8001 119.95
 FIF-232C for VIC-20/TI/most RS-232 79.95
 FRB-1 External relay box 20.00
 GC-980 General coverage kit 14.95

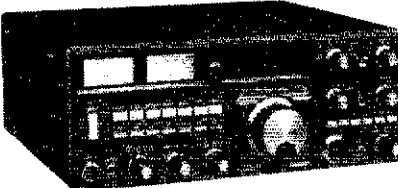


FT-757GX 9-band Xcvr/SW Rcvr/mic \$995.00
 FP-757HD Heavy duty supply with fan 249.00
 FP-757GX Compact power supply 235.00
 FP-700 Power supply 209.95
 FRB-757 External relay box 10.00
 FC-757AT Automatic ant. tuner w/memory 359.00
 FAS-1-4R Remote antenna selector 79.95
 MMB-20 Mobile mount 25.95
 FIF-65A Interface; Apple IIe 59.95
 FIF-232C for VIC-20/TI/most RS-232 79.95
 GX Turbo/F01 Software; Apple II 59.95
 GX Turbo/C01 Software; C64/128 89.95
 GX Turbo/V01 Software; VIC-20 89.95

FT-757GX accessories - cont. LIST
 FTV-700 Transverter w/no module 175.00
 2M/FTV 2m module only 189.00
 6M/FTV 6m module only 139.00
 70 cm/FTV 430 module only 255.00
Misc. accessories LIST
 SP-102 Speaker with audio filter \$ 99.95
 SP-102P Speaker/patch 99.95
 MD-1B8 Desk microphone 89.95
 MH-1B8 Mobile microphone 24.95
 YS-60 1.8-60 MHz 2kw PEP wattmeter \$ 84.95
 YS-500 140-520 MHz 200w wattmeter 69.95
 YH-55 Lo-Z headphones 21.95
 YH-77 Lightweight headphones 21.95
 FF-501DX Low pass filter 34.95

Call TOLL FREE for DISCOUNT PRICES

All items are shown with the Manufacturer's Suggested LIST Prices. On Major items and some accessories, we can offer a Substantial Savings.

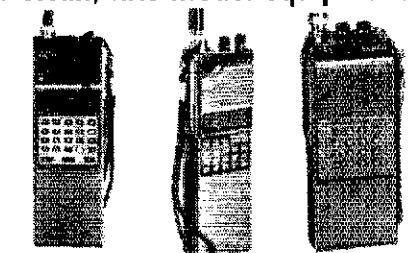


VHF/UHF equipment LIST
 FT-726R VHF/UHF Xcvr w/2m, TTP mic ... \$1095.00
 HF/726 10-12-15m unit 289.95
 6M/726 6m unit 269.95
 430/726 430-440 MHz unit (OSCAR) 329.95
 440/726 440-450 MHz unit (FM band) 329.95
 SU-726 Satellite duplex module 129.95
 XF-455MC 600 Hz CW filter 69.95
 DC-726 DC cable for FT-726R 10.05
 FTE-36 Tone board for FT-726R 58.00
 AD-2 50w 2m/440 duplexer 34.95
 FT-290R MKII 25w 2m FM/SSB xcvr 579.95
 FT-690R MKII 10w 6m FM/SSB xcvr 569.95
 FBA-8 Holder for C-cell Nicads 26.95
 NC-26B Wall Charger for FBA-8 16.95
 CSC-19 Soft case 10.00
 MH-10F Speaker/Microphone 27.95
 MH-10E Hand Microphone 21.95
 FTS-7 Encoder/decoder 49.95
 FT-270RH 45w 2m FM Xcvr w/TTP mic 439.95
 FT-2700RH 25w 2m/440 FM w/TTP mic 599.95
 FTS-8 Encoder/decoder 49.95
 FVS-1 Voice synthesizer 31.95
 AD-2 50w 2m/440 duplexer 34.95
 FT-770RH 25w 440 FM xcvr w/TTP mic 479.95

FTS-8 Encoder/decoder • FREE with the purchase of a FT-270RH or FT-770RH

HOURS • Mon. thru Fri. 9-5:30; Sat. 9-3

Milwaukee WATS line: 1-800-558-0411 answered evenings until 8:00 pm Monday thru Thursday.
WATS lines are for Quotes & Ordering only, use Regular line for info & service department.



Handhelds LIST
 FT-209RH 5w 2m FM HT/TTP/batt/cgr \$359.95
 FT-109R 220 FM HT/TTP/batt/cgr 379.95
 FT-709R 4w 440 FM HT/TTP/batt/cgr 359.95
 FT-727R 5w 2m/440 HT/TTP New CPU! 499.95
 FT-23R 2.5w 2m compact HT 269.95
 FT-23R/TTP 2.5w 2m compact HT w/TTP 299.95
 FT-73R 2w 440 compact HT 279.95
 FT-73R/TTP 2w 440 compact HT w/TTP 314.95

2.5W FM Handheld Closeouts

FT-203R/TTP 2m w/batt/cgr/TTP ... \$199⁹⁵
 FT-103R/TTP 220 w/batt/cgr/TTP ... 199⁹⁵
 FT-703R/TTP 440 w/batt/cgr/TTP ... 169⁹⁵

Acc. for 09-series/03-series FT-727R LIST
 FBA-5 Alkaline battery holder 14.95
 FNB-3 425ma 10.8v batt (comes w/03 series) 49.95
 FNB-4 500ma 12v batt (comes w/09-series) 59.95
 FTS-6 Encoder/decoder; 09-series 49.95
 FTS-7 Encoder/decoder; 03-series *29.95
 *When purchased with FT-703R or 203R, otherwise \$49⁹⁵
 LCC-6 Leather case w/top cover; 09-series 39.95
 MH-12A2B Speaker/microphone 39.95
 NC-9B Wall charger for FNB-3 9.95
 NC-15 Desk quick charger/AC ps 89.95
 NC-18B Wall charger for FNB-4 9.95
 MMB-21 Mobile bracket 14.95
 PA-3 Mobile adapter and charger 39.95
 TA-2 2m 19" telescoping whip ant 11.95
 YH-2 VOX headset 26.95



Receivers LIST
 FRG-9600 \$599.95
 FRG-8800 150 KHz-29.999 MHz Shortwave \$599.95
 FRA-7700 Indoor active receive antenna 59.95
 FRT-7700 Antenna tuner 64.95
 FRV-8800 118-174 MHz VHF converter 129.95
 FIF-232C Interface; VIC-20/TI/RS-232 79.95
 FF-5 500 KHz low-pass filter for VLF 20.00
 DC-8800 DC kit 3.50
 FM-W/8800 FM-wide kit 20.00
 FRG-9600 60 to 905 MHz receiver 679.95
 VU-9600 NTSC video unit 25.00
 Catpack software (specify computer) 79.95



Order Toll Free: 1-800-558-0411 In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

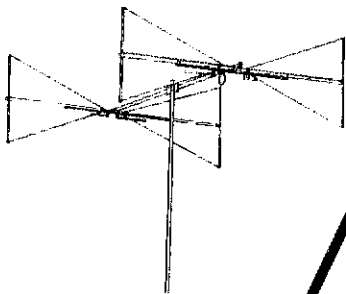
AMATEUR ELECTRONIC SUPPLY® Inc.

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 - Phone (414) 442-4200

AES BRANCH STORES

- | | | | | |
|--|---|---|---|--|
| WICKLIFFE, Ohio 44092
28940 Euclid Avenue
Phone (216) 585-7388
Ohio WATS 1-800-362-0290
Outside Ohio 1-800-321-3594 | ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (305) 894-3238
Fla. WATS 1-800-432-9424
Outside Florida 1-800-327-1917 | CLEARWATER, Fla. 33575
1898 Drew Street
Phone (813) 461-4267
No In-State WATS
No Nationwide WATS | LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
Outside Nevada 1-800-634-6227 | Associate Store
CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
15 min. from O'Hare! |
|--|---|---|---|--|

The HF4B "Butterfly"™
A Compact Beam
for 20-15-12-10 Meters



- Unique design reduces size but **not** performance.
- No lossy traps; full element radiates on all bands.
- Retrofit kit for 17 meters coming soon.
- Turns with TV rotor
- Only 17 lbs.

HF ANTENNAS FROM BUTTERNUT

Butternut Verticals

Butternut's HF verticals use highest-Q tuning circuits (not lossy traps!) to outperform all multiband designs of comparable size!

Model HF6V

- 80, 40, 30, 20, 15 and 10 meters automatic bandswitching
- Add-on kit for 17 and 12 meters available now
- 25 ft tall

Model HF2V

- Designed for the low-band DXer
- Automatic bandswitching on 80 and 40 meters
- Add-on units for 160 and 30 or 20 meters
- 32 feet tall - may be top loaded for additional bandwidth

For more information see your dealer or write for a free brochure



BUTTERNUT ELECTRONICS CO.

405 East Market Lockhart, Texas 78644

remely high tides, some accompanied by gale force winds. The Spokane APES participated in a 5 hour exercise conducted by the local DES involving a derailed trainload of toxic chemicals. W7IEU qualified for USACA by working all 3078 counties. Congrats to KF6NW on becoming DEC of the Northwest region, W6UVP on becoming EC of Clallam county, WA7SD on being the EC for Shelan county and N7DXS becoming the EC for Kits county. The Washington Emergency Net now meets 3987 kHz Monday 3:00 PM and Saturday 9:00 AM. N7DVR is looking for one Official Observer in each of our 39 counties. If interested in this important program, contact Dan at his callbook address. Don't forget the ARRL DX contest (phone) the first weekend of this month. It's not too early to be thinking about Field Day. Plan to attend the Mike & Key Club annual Swapfest on March 14 at the Puyallup Fairgrounds. Clubs: Boeing Employees ARS meets 1st Saturday monthly 10 am, Bldg 5.02, Renton Airport, contact K7ZBF; West Seattle ARC meets 1st Monday monthly, 11220 16th Ave SW, Seattle, contact NA7OC; Island County ARC meets 1st Saturday monthly 8:00 AM, Island County Courthouse, Coupeville, contact W7GHI. Please contact me if you would like your club listed in this column. In spite of the generally poor band conditions, our section and local nets did an outstanding job of handling traffic in 1986. Following is a recap of last year's activity:

NET	QNI	QTC	FREQ	TIME
WARTS	34531	2298	3970 KHz	6:00 PM
WSN	5420	1789	3590 KHz	6:45/9:45 PM
NTN	14760	1229	3970 KHz	12:00 noon
PSTS	1597	857	148.92 MHz	5:30/10:30 PM
EWTN	762	662	148.64 MHz	5:30/9:30 PM
NWSSB	7787	543	3945 KHz	6:30 PM

Traffic: WB7WOW 1299, KD7YV 244, W7IGL 244, KR7F 211, W7GB 203, N7GJ 188, WA7CBN 178, K7GXZ 168, N6EQZ 116, K7SUX 114, W7LTK 56, WA7EN 45, KA7PMD 38, W7LG 35, KD7TJ 35, W7APB 27, K7AJT 24, N7GDW 22, KR7L 14, KE7PI 11, W7IEU 7, N7FXM 5, KA7VEE 2.

PACIFIC DIVISION
EAST BAY: SM, Bob Vallio, W6RGG—ASM: W6ZF, N6DHN. EC: W6LKE. STM: K6APW. OOC: NY6Z. TC: N6AMG. K6APW will be putting more time on the air now that he has found the trouble in a 40 KV transformer... at work, not in the shack! He did find time to participate as a VE at the Alameda Adult School. Ex-W6B6RO got the last two-by-one in the state: W6ZC. HARC is celebrating their 35th year (I was a member in 1952). W6B6RO is getting things moving in Reno area on Packet. KA7AJQ new EC in Carson City. WB5BPU appointed DEC. KD7YZ made 535 mi. tropo QSO with W5LTR on Dec. 13. New officers for LVRAC: Pres. KE7JX; VP: K6PIY; Sec: W6HXT; Treas: WA7NOH; Board: KD7QY, KB7CG, N5CJV. New officers for SSC/FARS: Pres: NW7O, VP: N7CXD, SEC: WB5PTO, TREAS: W7IZU, WA6CBA has formed a new ham equipment manufacturing co., RF Concepts, in Reno. SNARS got their new building up on the hill. SNARS new officers: Chairman: N7GXJ, Vice Chairman: K7HRW, SEC: K7WYC, TREAS: K7AZ. Members of board: K7KLT, WA7MOF, KA7VWV. New appointment for ATC: N7DNL. If you are interested in field appl., please contact SM, W8IXD.

NEVADA: SM, Joe Lambert, W8IXD—SM, W8IXD with help from N7FPF and N7FZG lighted their tower to make a X-mas tree & won 2nd place in B.C. contest! FARS is sponsoring the first NEVADA QSO PARTY May 9. Contact NW7O or WB5PTO for info. WB5PTO is getting things moving in Reno area on Packet. KA7AJQ new EC in Carson City. WB5BPU appointed DEC. KD7YZ made 535 mi. tropo QSO with W5LTR on Dec. 13. New officers for LVRAC: Pres. KE7JX; VP: K6PIY; Sec: W6HXT; Treas: WA7NOH; Board: KD7QY, KB7CG, N5CJV. New officers for SSC/FARS: Pres: NW7O, VP: N7CXD, SEC: WB5PTO, TREAS: W7IZU, WA6CBA has formed a new ham equipment manufacturing co., RF Concepts, in Reno. SNARS got their new building up on the hill. SNARS new officers: Chairman: N7GXJ, Vice Chairman: K7HRW, SEC: K7WYC, TREAS: K7AZ. Members of board: K7KLT, WA7MOF, KA7VWV. New appointment for ATC: N7DNL. If you are interested in field appl., please contact SM, W8IXD.

PACIFIC: SM, Army Curtis, AH6P—Aloha and hafa adal to all of the Pacific. If you are a repeater operator and haven't returned data form yet to KH6NF, please do so. ASAP. Several new repeaters in the works, both VHF and UHF. Tune the bands some time, there's lot of new stuff on. The EARC evening net on Cily Hall is doing great! December saw QTC 29, QNI 327. Trx to N4ESX for the stats. KH6H-1 on air from Pukatani on 145.05. December upgrades included NH6HD from Tech to Gen, KH6JWB from Gen to Adv, and WH6BLF from Novice to Tech. Congrats to all. Very sad to report KH6TR now Silent key. We will miss Ed. Traffic: KH6S 44, KH6H 27, N4ESX 14, WX4J 7, AH6P 3.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—STM: WA6WJZ. SGL: N6IG, ACC & TC: W6RFF. SEC: KJ8R. DEC North: KF6KJ. DEC Sierra: KA6GHI. SECTION NET: First Sunday each month, 8 PM, on 146.085, input up, Yuba/Sutter repeater WD6AXM/R. Net Control—W6IEW or W6RFF. Continued from last month, I am sure all of you are anxious to hear whether the 6th District ran out of 2 x 1 calls before Gobby (formerly KH6KJ) got hers. Would you believe WZ6Y? The next to go last one! I was lucky. My neighbor, W6JG, the new Pres. of the River City ARCS. They have new officers, a new meeting place and a new meeting night. Fortunately, they still have the same fine team that has done such a good job with license classes and exams. Make note of a new Yolo County Emergency Coordinator, Chris Wong, N6JGC. Many thanks to the Golden Empire ARS for hosting the mid-winter Section meeting in Chico. Thanks also to STM Al Biegler, WA6WJZ, for arranging it. The Directors will be informed that the primary concern of those at the meeting was proposed Museum and Archives at headquarters and that there was total opposition. A travelling display was much preferred. The reports of my resignation as SM are greatly exaggerated—I have no such plans. Traffic: N6CVF 65, WA6WJZ 295, K6RPF 270, N6LUN 270, WA6WJZ 212, N6LUN 49, K6GUV 32, WB5SRO 14. From STM WA6WJZ: After talking to our Air Force MARS stations, I am suggesting that all traffic handlers put a filing time as well as the date on their messages. Much of our Hawaii traffic goes through the MARS stations, and they don't like to handle it when there is no filing time. Let's help them comply with their directives. Your cooperation will be appreciated. 73, WA6WJZ.

SAN FRANCISCO: SM, Bob Smith, NA8T—CARL, KK1A, could top the PSHR list in Dec with a total of 371, a traffic total of 1208 total and 6 BPL cards for 1986. If you are interested in traffic handling contact him via Packet or CW for information about this interesting facet of Amateur Radio. WB9LOZ is writing an interesting column in the SFRC newsletter about PACKET. The intermod problem on Mt. Pratt seems to be located, remedies in the works, trnx to WB6MVF as W6VEJ, the always detective for FWRA. George, K5WV, is the Ham of the Year in SCRA. Was there a bump in Dec? No, WW6B, throat when he presented the FD Packet for SCRA for out-contesting the "REXDA Contest Machine"? The American Red Cross commended Amateur Radio Packet operation in the latest issue of QUAKE by saying it was the ONLY MODE

• DISNEY WORLD • KENNEDY SPACE CENTER • SEA WORLD • DISNEY WORLD • KENNEDY SPACE CENTER • EPCOT

• SILVER SPRINGS • CYPRESS GARDENS • DAYTONA BEACH • BUSCH GARDENS • CHURCH STREET STATION •

EPCOT • SILVER SPRINGS • CYPRESS GARDENS • DAYTONA BEACH • BUSCH GARDENS • CHURCH STREET STATION •

Come to Florida
for
THE WINTER HAMFEST

Orlando Amateur Radio Club

HAMCATION

AND COMPUTER SHOW

at Expo Centre
MARCH 13, 14, 15, 1987

1987 ARRL
Southeastern Region Convention

AIR CONDITIONED SWAP AREA TABLES \$20
REGISTRATION:
\$5 Advance \$7 At The Door Banquet \$12.50

For tickets & swap table reservations SEND check and SASE to:
Orlando Hamcation & Computer Show
Dept. QST, P.O. Box 547811, Orlando, FL 32854-7811

TIMBERLINE ELECTRONICS

Expert Repair on all types of ham equipment, from tubes to the most modern. FCC licensed.

ALL MAIL TO: ALL UPS TO:
P.O. Box 2064 25440 Wrightwood Dr.
Idyllwild, CA 92349 • 714-659-4018

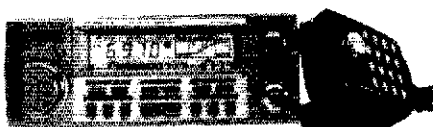
RDC

THIS MONTH'S GOODIE FROM THE CANDY STORE
MFJ-1274 UNDER \$129.90

ALLIANCE HD-73 \$109.90 ALL L.T.O. OVER 7500 HAM RELATED ITEMS IN STOCK. ALL PRICES FOB PRESTON.

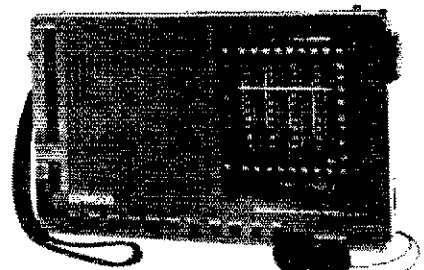
Send SASE for NEW HT PRICE LIST. More specials in classifieds.
ROSS DISTRIBUTING COMPANY
78 South State St, Preston, Idaho 83263
Telephone (208) 852-0830. We close at 2:00 on MON. & SAT

SAVE on these AES/KENWOOD Specials!



TW-4000A 25W, 2m/440 FM dual band xcvr
Call for Sale Price

TU-4C Programmable Encoder
\$1⁰⁰ with TW-4000A Purchase.



R-11 Receiver
 Portable, 11 bands: AM, FM broadcast + 13, 16, 19, 22, 25, 31, 41, and 49M SW bands. No BFO. Bandspread tuning, meter, 3" speaker, record/phone jacks, whip and ferrite antennas. 7 1/2" w x 4 1/2" h x 1 1/2" d, requires 4 'AA' cells. Soft case and earphone; shown with optional HS-7 micro-headphones (\$21⁹⁵) . . **Closeout \$69⁹⁵**

TH-Series FM Handheld CLOSEOUTS



TH-21AT • 2-meters
 ★ TH-31AT • 220 MHz
 ★ TH-41AT • 440 MHz

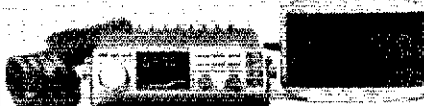
Your Choice!
\$199⁹⁵* each

*includes **FREE** Extra PB-21 Battery Pack

★ **SAVE \$25** on TU-6 Tone Board! Now only **\$4⁹⁵** when purchased with TH-31AT or TH-41AT

Due to changing prices and limited quantities, all listings on this page are subject to change without notice. Please check with salesperson when ordering.

TM-411A UHF Mobile CLOSEOUT



Compact 70-cm FM Mobile. Covers 438-450 MHz, 25/5 Watts output. Digital code squelch (DCS), dual digital VFO's built-in, five memories with battery back-up, priority watch, memory scan and programmable band scan. LCD frequency display and S/Rf meter, tiltable front panel. Separate external speaker and 16-key Autopatch UP/DOWN Microphone. 1 1/2" h x 5 1/2" w x 7 3/4" d. 2.8 lbs. **SAVE \$150 Closeout \$299⁹⁵**

TR-3600A 440 MHz FM HT
Call for Sale Price*

*Extra PB-26 Battery **FREE** with Purchase.

HELP WANTED • Full or part-time experienced Service Technician for our Las Vegas Branch Store. Some sales work. Good benefits. Will consider helping with moving expenses. Prefer non-smoker.

Please send your resume and picture to:
AES® Box 16729, Milwaukee, WI 53216

Order Toll Free: 1-800-558-0411

In Wisconsin (outside Milwaukee Metro Area)
1-800-242-5195

AMATEUR ELECTRONIC SUPPLY® Inc.

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 - Phone (414) 442-4200

AES BRANCH STORES

WICKLIFFE, Ohio 44092
 28940 Euclid Avenue
 Phone (216) 585-7388
 Ohio WATS 1-800-362-0290
 Outside Ohio 1-800-321-3594

ORLANDO, Fla. 32803
 621 Commonwealth Ave.
 Phone (305) 894-3238
 Fla. WATS 1-800-432-9424
 Outside Florida 1-800-327-1917

CLEARWATER, Fla. 33575
 1898 Drew Street
 Phone (813) 461-4267
 No In-State WATS
 No Nationwide WATS

LAS VEGAS, Nev. 89106
 1072 N. Rancho Drive
 Phone (702) 647-3114
 No In-State WATS
 Outside Nevada 1-800-634-6227

Associate Store

CHICAGO, Illinois 60630
 ERICKSON COMMUNICATIONS
 5456 N. Milwaukee Avenue
 Phone (312) 631-5181

15 min. from O'Hare!

Please use WATS line for Ordering and Price Checks. For other Info and Service Dept., please use our Regular lines.

Contact AES® for all of your KENWOOD needs!

★ Low Prices ★ Large Stocks ★ Fast Service
 ★ Top Trades ★ Toll Free Ordering line
 ★ **AES®** Ships Coast to Coast

HOURS: Mon. thru Fri. 9-5:30; Sat 9-3



USE YOUR CREDIT CARD



Note: Our TOLL FREE Ordering line 1-800-558-0411 is answered until 8 pm CST Monday thru Thursday.

Clip out this handy Coupon and Mail Today!

TO: AMATEUR ELECTRONIC SUPPLY®
4828 W. Fond du Lac Avenue
Milwaukee, WI 53216

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.

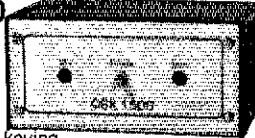
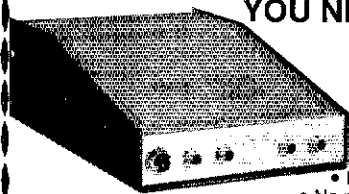
Name _____

Address _____

City/State _____ Zip _____

NOW FULL BREAK-IN WITH ANY AMPLIFIER

IF YOU OWN ONE OF THE NEW FULL BREAK-IN QSK TRANSCEIVERS YOU NEED A QSK 1500



FEATURES:

- Capable of 100 WPM keying.
- Ultra high speed PIN diode switching.
- Rated 1500 watts output CW @ 40 WPM into 50 OHM load.
- No modifications needed to either your transceiver or amplifier.
- Totally silent . . . No clicking relays.
- Compatible with linear amplifier . . . Even Homebrew.
- Installs in minutes with only 2 additional coax cables (RG8) and 2 additional shielded leads with phono plugs. (Not supplied).
- Fully automatic bandswitching from 1.8 to 30 MHZ.
- Designed and manufactured in U.S.A.
- Permits high power AMTOR with your amplifier.
- Includes a custom built continuous duty power supply.
- 1 Year warranty.

AVAILABLE FROM EITHER DEO OR UAR



CONTACT: DR. J.R. SHELLER
GROVEPORT, OHIO
(614) 836-3929



\$299

PLUS \$7.00 SHIPPING
IN U.S.

UNIVERSAL AMATEUR RADIO, INC.



CONTACT: RALPH RICKETT
1280 Aida Drive
Reynoldsburg, Ohio 43068
PHONE: (614) 866-4267

MULTI-BAND SLOPERS

ALSO: DIPOLES & LIMITED-SPACE ANTENNAS
Outstanding performance of W9INN antennas is well known. Now enjoy multiband BIG-SIGNAL reports! Automatic bandswitching • Very low SWR • Coax feed • 2kw power • Compact • FULLY ASSEMBLED to your specified center frequency each band • Easy to install • Very low profile • Complete instructions • Your personal check accepted

4 BAND SLOPER - 160, 80, 40, 20M	50 ft. long	\$ 48 ppd
2 - 160, 80, 40M	70 ft. "	55 "
2 - 80, 40M	40 ft. "	35 "
2 - NO-TRAP DIPOLE - 160, 80, 40M	131 ft. long	\$ 71 "
2 - 80, 40M	85 ft. "	\$ 55 "
9-BAND SPACE-SAVER DIPOLE - 160 thru 10M	48 ft. long	\$ 85 ppd

Requires wide-range tuner (80, 40, 20, 15M without tuner)

SEND SASE for complete details of these and other unique antennas

W9INN ANTENNAS 312-594-3414
BOX 393 Mt. Prospect, IL 60056

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, 6-8, 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: 5-6, 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 \$5.00 per tape. Call anytime.

Instant Service
PH: 517-484-9794 WRIGHTAPES
235 E. Jackson St • Lansing, MI 48906

of communications that EVERY CHAPTER should rely on during emergencies, here is your chance PACKETEERS! Sonoma and Lake Counties were active in the CDF-VIP programs with airborne ATV in 1986, and are working on an expanded version for fire control in 1987. K6HY published an interesting view on NOVICE ENHANCEMENT, a little common sense and a lot of peer pressure. Best of New Years Greetings for 1987.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WC6U, STM: N6AWH, TC: WA6EXV, ACC: W6DDP, Asst.SM's: W6TRP and K6YK. 1987 officers of the Stockton-Delta ARC are Pres KA6JLJ, VP WB6SJP, S/T WA6WRP. The club meets in Stockton. 1987 officers of the Kings ARC are Pres N6DTX, VP WB6VFZ, Sec N6NZK, Treas KB6FJA. The club meets the 3rd Thursday at the Kings Dist. Meetings. 1987 officers of the Sierra ARC are Pres WA6QYR, 1st VP KG6LR, 2nd VP WG6VK, Sec WA6KZY, Treas N6BVP. The club meets the 2nd Monday in Ridgecrest. New appointments: ORS: N6MCO, ATC: WA6QYR, W6DVL is a SILENT KEY, K16MN is Extra, N6ECH is Advanced, KB6NT0 is Tech, KA6GNK is N6LSW, N6DZA and ABFCY are on packet, K6AYA has a TS 940, W6FAH has 5BXDX. N6EHA has an IC R7000. The Fresno Hamfest is May 1-3, 1987 at the Airport Holiday Inn in Fresno. For information write to Fresno Hamfest, P.O. Box 763, Fresno, CA 93712-0763.

SANTA CLARA VALLEY: SM, Glenn Thomas, W6BW, SEC: WA6OCV, TC: WA6PWW, STM: N6JLJ, PIO: WB6NLA, ASM: N6JQJ & NS6S, ACC: W6MKM, BM:(vacant) OOC:(vacant) On March 28 and 29, 1987, we will be hosting the Emergency Response Institute, which will be open to all persons, amateur or not, who are interested in the ARES/RACES activity. The topics to be covered include ARES, RACES, SKYWARN, CDF VIP, NTS, packet, and ATV among other things. The cost is \$5, which covers lunch and the room, and should be sent to Dave Larson N6JQJ. Note that reservations are required and will NOT be taken at the door. A note to appointees, please send a report to your DEC, STM, OOC, etc at least every few months. Why? So we can know what you are doing with your appointment and be able to supply whatever help we can. When we don't hear from you, we can't even tell if you are active or not! Please? . . . On December 17th, Gilroy ARES and the Gavilan Amateur Radio Club combined to supply ATV to the Brownell Fundamental School in Gilroy. Kevin Levonius, NJ6L, who was one of only a couple of stations to make contact with Tony England, W6ORE during the Challenger Ham in Space project, was asked to find a way to supply a picture of Brownell School's Christmas program to the kids and their parents at the Landon Convalescent Hospital in Gilroy. Students at Brownell have started an "Adopt a Grandparent" program and the Christmas program was entitled "Christmas Around the World". Kevin recruited members of the Gilroy ARES/RACES team as well as individuals of the Gavilan Amateur Radio Club to put ATV to the task. Thanks for a job well done. Don't forget the Section Managers Net on Tuesdays at 9PM local on K6FB (145.45), WB6ADZ (146.115 +), and N6ITW (440.010). This is a good place to publicize your club activities and also to learn about what is going on elsewhere in the section. PSHR: W6NJR, KA8PEC, OO Reports: K6AYB, Traffic: (Dir) W6BYV 505, KA8SXW 80, W6KZJ 252, NR7E 69, W6PHI 42, N6JLJ 40, KB6IWW 28, K6YKG 2. (Nov) WA6HAD 11.

ROANOKE DIVISION:

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W, STM: K4NLK, BM: K4IWW, ACC: WC4T, PIO: WA4OBR, TC: K4TL, SGL: KE4ML. Headline news this month is the Division Convention/Hamfest at Charlotte Mar. 21/22. NTS/ARES meeting, Dir/V-Dir. meeting, exams, and much more. See you there. This is December news and Section is to be congratulated for an outstanding job—WELL DONE—in public service of handling holiday traffic. New record set. K4IWW, AB4W, K4NLK, KA4TL, WB4TOP made BPL. New officers: JO: K4RP, PIA: A4TW. Congrats to NEW FCC CB Chief, Mike Fitch and his deputy, Ralph Haller, N4RH. Hope they will keep eye open for Amateur Radio. WB4HRH, NM advises PETN now on 145.43 Rptr. at 2000 ES1. Will be a public service oriented net. New officers of RARS: Pres: WA9NEW, VP: KB4MDZ, Sect: WB4USX, Treas: N4IOA, at Mecklenburg ARS Pres: KF4MZ, VP: WB4PCS, Sect: WO4G, Treas: KA4FHS, at Shelby ARC Pres: KB4EOO, VP: N4G0Q, 2nd VP: KB4LTZ, Sect: WC4T, Treas: N4MRZ. Brightleaf ARC presented their officers with a plaque and ARRL pin. This year recognize the hard working amateurs in your club. Congrats to VOYAGER Crew: KB6LQS, KB6LQR, ARRL Information net meets Thurs. 8 PM on linked repeaters Green Mtn, Asheboro, Raleigh, Greensboro. If you have something to offer would be of interest to every ham in the section and would like to share, please contact SM for a schedule. Field Day is just 3 months away so make your plans NOW to participate. League Planning Meeting—LPM—May 16/17 at Roanoke, VA. Make plans now to attend. Section would like to RECOGNIZE and SALUTE the OFFICIAL OBSERVERS this month. K4BE, W0DDQL, KF5DS, WU4S, AA4SL, NQ4T, AA4TW, K4RP. Do you have some packet racket or BBS? Advise SM of activities in your area. Traffic: KA4TLC 625, ABOY 601, K4NLK 589, K4IWW 508, AK1E 343, WB4HRH 330, AA4MP 327, NJ4L 315, N4JRE 272, WB4N 186, KA4EYF 178, WD4HTE 154, WB4TIC 144, KB4V 134, K4AY 96, N4NO 85, WB4W 11, W4AMNR 75, W4FMN 75, KA4TE 72, K6SWN 60, K4JHF 52, KB4OQJ 50, K4GI 48, WB4CYN 42, K4DDY 41, KU4W 41, N4MMM 36, NE4J 35, WD4MRD 29, WA9NEW 25, N4LUO 24, N4NOY 23, WD4RMQ 21, WD4EQK 18, N4UE 14, N4LST 13, NT4K 12, KB4NWV 10, K4QXA 7, NV4F 6, KF5DS 3, W2IDB 3, N4CJ 1. (Nov.) KU4W 14, Total SAR's 45, PSHR's 13. Total Traffic: 5,798. NJ4L advises that he had a Bahama Christmas vacation. That's the life. Bet he worked some CW DX!!

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ—A very high priority objective for 1987 in South Carolina is to ensure that Amateur Radio is always seen as being in the public interest. Read the editorial in January QST. Good grass roots public information and public relations do a great deal to help us by providing visibility for Amateur Radio. Message booths at malls, solicitation of traffic from local service clubs, regular and frequent dissemination of info about amateur activities through the local media as well as community activities, school programs, presentation to service clubs and community organizations, exhibits and demonstrations are essentials. Your club, net or group should have a PIA hard at work involving your members in this effort. Our Section PIO, KJ4DT, is able to assist your PIA to have a first rate public awareness program. Contact Charles for help. Traffic: WA4NK 329, W0LKT 320, K4ZN 243, W4FMZ 167, KA4LRM 90, KB4EZA 82, KA4YEA 74, WB4UDK 26.

VIRGINIA: SM, Claude Feigley, W3ATO—STM: KB4WT, SEC: N4EXQ, ACC: NT4S, OOC: W4HU, BM: AB4U, TC: WB4MAE. A listing of section NTS nets can be found in Dec. 1986 QST. The Mall stations WA4TGF and KA4UFI report great success with a lot of interest shown by visitors. W4TGF used HF phone and CW plus VHF Packet to send over 600 msgs. Over 50 members of the Virginia Beach Club assisted in the operation, and they report many prospective members for their Novice Class starting in January was obtained by the exhibit.

Are you radioACTIVE?



Dean LeMon, KR0V sure is! Dean got active in Amateur Radio when he was 16 years old and earned his Extra Class license in less than four years! "It's a fascinating hobby and a great way to meet all kinds of new people from all over the world."

Dean has cerebral palsy and got started in Amateur Radio with help from the Courage HANDI-HAM System. The HANDI-HAM System is an international organization of able-bodied and disabled hams who help people with physical disabilities ex-

pand their world through Amateur Radio. The System matches students with one-to-one helpers, provides instruction material and support, and loans radio equipment.

Isn't it time you got radioACTIVE with the Courage HANDI-HAM System?



Call or write the Courage HANDI-HAM System W0ZSW at Courage Center, 3915 Golden Valley Road, Golden Valley, Minnesota 55422, phone (612) 588-0811.



ICOM

KENWOOD YAESU



IC-735

HF Equipment	List	Juns
IC-735 Gen. Cvg Xcvr	\$999.00	Call \$
IC-745 Gen. Cvg Xcvr	1049.00	Call \$
IC-751A Gen. Cvg. Xcvr	1649.00	Call \$
Receivers		
IC-R7000 25-1300 + MHz Rcvr	1099.00	Call \$
IC-R71A 100 kHz-30 MHz Rcvr	949.00	Call \$
VHF		
IC-271A All Mode Base 25w	859.00	Call \$
IC-271H All Mode Base 100w	1099.00	Call \$
IC-27A FM Mobile 25w	429.00	Call \$
IC-27H FM Mobile 45w	459.00	Call \$
IC-28A FM Mobile 25w	429.00	Call \$
IC-28H FM Mobile 45w	459.00	Call \$
IC-38A FM Mobile 25W	459.00	Call \$
IC-2AT FM HT	299.00	Call \$
IC-02AT FM HT	399.00	Call \$
IC-μ2AT Micro HT	329.00	Call \$
UHF		
IC-471A All Mode Base 25w	979.00	Call \$
IC-471H All Mode Base 75w	1339.00	Call \$
IC-47A FM Mobile 25w	549.00	Call \$
IC-48A FM Mobile 25W	459.00	Call \$
IC-4AT FM HT	339.00	Call \$
IC-04AT FM HT	449.00	Call \$
IC-3200A FM 2m/70cm 25w	599.00	Call \$
220 MHz		
IC-37A FM Mobile 25w	499.00	Call \$
IC-3AT FM HT	339.00	Call \$
Repeaters		
IC-RP3010 440 MHz	1229.00	Call \$
IC-RP1210 1.2 GHz	1479.00	Call \$



TS-440S/AT

HF Equipment	List	Juns
TS-940SAT Gen. Cvg Xcvr	\$2249.95	Call \$
TS-940S Gen. Cvg Xcvr	2049.95	Call \$
TS-930S/AT Gen. Cvg Xcvr	1849.95	Call \$
TS-830S Xcvr	1099.95	Call \$
TS-530SP Xcvr	899.95	Call \$
TS-430S Gen. Cvg Xcvr	819.95	Call \$
TS-440S/AT Gen. Cvg Xcvr	1199.95	Call \$
TS-440S Gen. Cvg Xcvr	1049.95	Call \$
Receivers		
R-5000 NEW!	899.95	Call \$
R-2000 150kHz-30 MHz	649.95	Call \$
TS-670 All Mode Quad 6 M	799.95	Call \$
VHF		
TS-711A All Mode Base 25w	899.95	Call \$
TR-751A All Mode Mobile 25w	599.95	Call \$
TM-201B FM Mobile 45w	369.95	Call \$
TM-211A FM Mobile 25w	399.95	Call \$
TM-2530A FM Mobile 25w	429.95	Call \$
TM-2550A FM Mobile 45w	469.95	Call \$
TM-2570A FM Mobile 70w	559.95	Call \$
TH21-BT FM, HT	259.95	Call \$
TH-205 AT, NEW 2m HT	259.95	Call \$
TH-215A, 2m HT, HAS IT ALL	349.95	Call \$
TR-2600A FM, HT	359.95	Call \$
UHF		
TS-811A All Mode Base 25w	1049.95	Call \$
TM-401B FM Mobile 25w	399.95	Call \$
TM-411A FM Mobile 25w	449.95	Call \$
TH-41BT FM, HT	269.95	Call \$
TR-3600 FM HT	369.95	Call \$
220 MHz		
TM-3530A FM 220 MHz 25w	449.95	Call \$
TH-31BT FM, 220 MHz HT	269.95	Call \$
TL-922A HF Amp	1499.95	Call \$



FT 757GX

HF Equipment	List	Juns
FT-ONE Gen. Cvg Xcvr	\$2859.00	Call \$
FT-757 GX Gen. Cvg Xcvr	995.00	Call \$
FT-767 4 Band New	1895.00	Call \$
Receivers		
FRG-8800 150kHz-30 MHz	599.95	Call \$
FRG-9600 60-905 MHz	679.95	Call \$
VHF		
FT-270RH FM Mobile 45w	439.95	Call \$
FT-290R All Mode Portable	579.95	Call \$
FT-23 R/TT Mini HT	299.95	Call \$
FT-209RH FM Handheld 5w	359.95	Call \$
UHF		
FT-770RH FM Mobile 25w	479.95	Call \$
FT-73 R/TT Mini HT	314.95	Call \$
FT-709RH FM HT 4w	359.95	Call \$
VHF/UHF Full Duplex		
FT-726R All Mode Xcvr	1095.95	Call \$
HF/726 Module for 10, 12, 15M	269.95	Call \$
430/726 430-440 MHz	329.95	Call \$
440/726 440-450 MHz	329.95	Call \$
HF-726 10-15-20M	289.95	Call \$
SU-726 Sate Duplex	129.95	Call \$
FT-690R 6m, All Mode, Portable	569.95	Call \$
Dual Bander		
FT-2700RH FM 2m/70 cm 25w	599.95	Call \$
FT-727R 2m/70 cm HT	479.95	Call \$
220 MHz		
FT-109 RH New HT	TBA	Call \$
Repeaters		
FTR-2410 2m Repeaters	1249.95	Call \$
FTR-5410 70cm Repeaters	1289.95	Call \$

CLOSING OUT SALE
KENWOOD TR-2600A w/PB-26 \$259.95
 — SPECIAL SALE —
FT-757GX CALL US!!



ENCOMMOTE • MIRROR • AMERITRON • BIRD • AMP. SUPPLY • KANTRONICS • AEA • ASTRON •

• AMATEUR • TWO WAY • MARINE • CELLULAR MOBILE PHONE • SCANNER
 ★ Free U.P.S. Cash Order ★ SE HABLA ESPANOL
 (Most Items, Most Places)

(213)390-8003 3919 Sepulveda Blvd. Culver City, CA 90230

AMATEUR TELEVISION



Maryann WB6YSS

P.C. ELECTRONICS

2522 PAXSON ARCADIA, CA 91006

Tom W6ORG



HAMS SHOULD BE SEEN AS WELL AS HEARD!

TVC-4G

Now Only \$99 *delivered.



70 CM ATV DOWNCONVERTER

FEATURES: Contains sensitive GaAsfet preamp & mixer - Tunes 420-450 MHz down to ch. 2, 3, or 4. 120 Vac or 12vdc. Cabinet 4x2.5x7". TVC-2G tested board \$59.

WHAT IS REQUIRED: It's EASY! Just connect your TV set, 70 CM antenna and coax to the TVC-4G and get ready to watch live action color video and sound.

ATV APPLICATIONS: See the shack, home video tapes, computer video, Space Shuttle, weather radar and other public service events. Many areas have ATV Repeaters; see ARRL Repeater Directory & 1986 Handbook chapters 20 and 7.

CALL (818) 447-4565 or write for our catalog. Give your amateur call if also interested in our transmitting equipment. We have all your ATV needs: antennas, coax, downconverters, transmitters, etc., 70, 33, & 23 CM.

*Includes UPS surface shipping in cont. USA

WE SHIP WORLDWIDE
Barry Electronics Corp.
 WORLD WIDE AMATEUR RADIO SINCE 1950
 Your one source for all Radio Equipment!

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



"March into BIG SPRING SAVINGS at BARRY'S"
 See you at W.E.C.E., Westchester, NY—March 6th

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

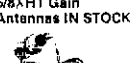
KENWOOD



154400/5M, R-5000, R-2000, TS-940 SAT, TM-201B, TR-400V, TM-2770/450/300A, TR-751A, Kenwood Service Centers, TR-210/41/51, TM-211A, 421A, 15-1128/13A, TM-530A, TR-2041, TR-1741

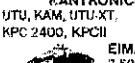
800-TECH-DIV: 100 Digital Voice Keyer
 COMP-FIRE EXTINGUISHERS

VoCom/Mirage/Dalwa
 Amplifiers &
 5/8 HT Gain
 Antennas IN STOCK



Soldering Station,
 4S Watts, \$88
 MICROLOG-ART 1, Air Disk, SWL, Morse Coach

KANTRONICS
 UTU, KAM, UTU-XI,
 KPC 2400, KPCII



EIMAC
 3-800Z
 572B, 6J56C
 12BY7A &
 4-400A

BIRD Wattmeters &
 Elements
 IN STOCK

AEA 144 MHz
 AEA 220 MHz
 AEA 440 MHz
 ANTENNAS

Antennas



FT-787GX, FT-480, FT-757GX, FRG-8800
 FT-728, FRG-9800, FT-2707/770R, FT-2700R

YAESU ICOM Land Mobile HT Midland Standard Wilson Maxon Yaesu PTC 1223, PTC 1143 (COC-10-48) (MOTOR) W/100 Tones 4-11



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



Computer interfaces stocked:
 MFJ-1224, AEA CP-1, DR-DX, PK-87, PK-64A, PK-64, DR-C50, PK-232, PM-1



Complete Butternut Antenna Inventory In Stock!

DIGITAL FREQUENCY COUNTERS
 Tronxy, Model TR-1000, 0-600 MHz

AMP SUPPLY STOCKED
 Long range Wireless Telephone for export in stock

BENCHER PADDLES, GALUNS, IN STOCK

MIRAGE AMPLIFIERS
 ASTRON POWER SUPPLIES
 Saxton Wire & Cable

Commercial Equipment Stocked: ICOM, MAXON, Midland, Standard, Wilson, Yaesu. We serve municipalities, businesses, Civil Defense, etc. Portables, mobiles, bases, repeaters.

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
 HAM DEALERS INQUIRED. PHONE IN YOUR ORDER & BE REIMBURSED
 COMMERCIAL RADIOS STOCKED & serviced on premises.
 Amateur Radio Courses Given On Our Premises, Call ALL SALES FINAL
 Export Orders Shipped Immediately, TELEX 12-7670

ONV Safety belts-in stock



IC-R71A, 751A, 745, 268RN, 38A, 48A, Micro2, R-7030, 1271A, 275AH, 3200A, 475AH, 735,



SMART PATCH \$450.00
 Use of this device on frequencies below 223.5MHz is illegal unless a separate control link is provided.

PRIMA PATCH III, Duplex 8000 in stock

Budwick ANT. Products
 FLUKE 77 Multimeter



Nye MBV-A 3 Kilowatt Tuner



Ten-Tec Tuner 229A MFJ Models 422, 913, 985B, & 941D

SANGEAN Portable Shortwave Radios



HEIL EQUIPMENT IN STOCK
 Hi-Gain Towers & Antennas, and others will be shipped direct to you FREE of shipping cost.

New TEN-TEC
 Consult II, PARAGON, Century 22, 2510 RX-325

The Woodbridge Wireless application for appointment as a Special Service Club has been approved by League Headquarters, so they now join the elite group of VA section clubs. With deep regret, I report to all ARRL and Club members an active member of the Roanoke Club and an ardent amateur, N4EXQ, SEC, says section ARES activity continues to increase with DEC's active in all 15 districts of the section and 877 stns enrolled as ARES members. W4UGJ has been named as the Virginia Beach Amateur Radio Club's Ham of the Year. N4GHI has been appointed an OES. Congrats to "Robbie" as the recipient of the Roanoke Division Service Award. WB4SHK has been awarded a Public Service Commendation for his outstanding effort in Emergency Service communications. Sorry to report W4KX will be leaving the section and moving to Southern Plains, NC. John was first licensed in 1929 as 3KU and served as Va. SCM between 1954-1960. Glad to hear John enjoy the Hamfest. Exchange schedules: Mar-7-Cheapeake, contact A44MB; Mar-7-Roanoke, contact K04DY; Mar-14-Sterling Park ARC, contact Mike Weber; Mar-21-Richmond, contact W4UG; Apr-4-Williamsburg, contact W4J4X. The Richmond VE group gave 6 sessions in 186 with 120 taking tests and 84 (70% passed). December was a "BANG-UP" traffic month with one of the highest traffic totals ever. We had 44 stns reporting with a total traffic count of 12,689. N4GHI, N4EXQ, W4TGF, KB4WT, K4DOR, K4MTX, WB4PNY, A4AAT and W3ATQ made BPL. It was good to see so many newcomers participating in section, region and area traffic nets. By this time many of you have had your second baptism of fire by handling the Virginia VA members to all ARRL and Club members. The Challenge 80 program is still in progress so you can get rebate on new ARRL memberships passed thru your club. Traffic: N4GHI 1732, N4EXQ 1321, W4ATGF 1240, KB4VT 1080, K4DOR 878, K4MTX 718, WB4PNY 691, A4AAT 600, W3ATQ 628, WA4CCK 348, AA4GL 342, K4JUFJ 350, KB4NGO 245, WD4FT 220, K4JST 217, WD4OCV 194, K4BR 184, N4KSO 172, WB4EDB 171, WD4MIS 165, K4BZ 164, WB4ZNB 148, WB4KSG 103, NW4O 99, K4JM 89, K4VWK 79, W4JLS 75, WB4ZTR 57, NT4S 54, NN4I 53, W4TDC 52, K4AXF 48, N6ANQ 39, WB4KIT 39, WA4TAS 18, K4GR 12, K4MLC 11, WANFA 9, KB4PW 9, K3HRZ 9, N4FTN 8, W4YE 7, N3RC 6, WB3ANC 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW, STM: K8BG, SGL: K8CC, ACC: WA8CTO. New officers for KARC: WB3HN pres, WA8WZ V pres, K8BZQ sec, K8STK tres. New ORS are: WB3ZV, K8PT, K8UQ, K8QW, K8WV, K8TK, N8GJO, W8VP, W8LDY and K8UQY made PSHR for 12 straight months. W8LDY and K8WNO made BPL for Dec. Tnx to K8STK for taking over WVNN while W8LDY is away.

NET	FREQ	TIME	ON	QTC	SESS	NM
WVFN	3865	6:00	985	192	31	WBYP
WVMD	7235	11:45	888	107	31	WBZFP
WVNN	3567	7:00	270	163	31	KZBQ
WVMM	3730	5:15	170	61	31	K8TKT
Hillbilly	14290	Noon	su	137	11	4 WBYP

Traffic: K8WNO 653, W8LDY 585, K8E8T 280, WB3ZV 222, K8TFF 214, W8JWZ 209, W8YX 137, K8GOGF 108, K8BG 84, K8UQY 68, K8QEW 61, W8DHCC 43, K8KT 24, W8YCA 23, N8SU 13, N8CG 12.

ROCKY MOUNTAIN DIVISION—ASM:

COLORADO: SM, Bill Sheffield, K0RJ—ASM: K8MQA, SEC: W8FQB, STM: N8DZA, ACC: W8BUJ, POC: N8FCE, SGL: W8GOL, TC: N8CF, BM: K8CZV, OIC: K0AUD, My tnx to W8ACH who has retired as the OOC and from 31 yrs as a NCS on the Colorado Weather Net. The new OOC is K8RUD; he is looking for a few good men & women as the Army says to become OOs for the Colorado Section. Let him know if you are interested. We also would like to express our appreciation to W8LAE who has retired as NM for the HNN, after more than 15 years. The new NM is N8ENY. A reminder that begins the first of the year, there was an increase in VE test fees to \$4.35. A sure sign of the year's first swap fest of the year will be held on March 29th, the annual ARA Swapfest at the National Guard Armory in Aurora, Colorado. This is always a good swap so plan to attend. Further info: ARA P.O. Box 31043, Aurora, CO 80041. This month's name droppers our NMs for our regional & NTS nets. Call: W8RFL, OWN: K8BZ, CWXN: W8WJZ, HNN: N8ENY, NCTN: N8GBE, SCTN: N8HMX, 73, K8BJ, NETS: Col; QNI 919 QTC 32-inf 98, QNF 934, 31 sess. CWXN; no totals. QWNI: QNI 2947, QTC 2311, QNF 2790, 31 sess. HNN; QNI 2015, QTC 1117-427, inf, QNF 1378, 31 sess. NCTN; QNI 287, QTC 208, QNF 585, 31 sess. SCTN; QNI 257, QTC 215, QNF 486, 31 sess. TRAFFIC: N8GQF 247, W8AZT 117, W8TX 96, K8JAN 583, W8BS7 514, K8RYK 388, N8HMX 258, W8DFV 150, K8NLI 129, N8HMR 82, N8DZA 74.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS, SEC: W5DHC, STM: W5DCE, NMs: W5STNO, K8LL W5GNR, TC: W8EY, ACC: K5BEM, Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 199 msgs with 223 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 71 msgs with 1219 stations in. New Mexico Breakfast Club meets daily on 3939 and handled 148 msgs with 1047 checkins. Yuucca 2-mtr Net 7/8/18 handled 11 msgs with 490 checkins. Caravan Club 2-mtr Net 6/6/06 handled 0 msgs with 622 checkins. Info Net 13/73 with 102 checkins. K8ALJ, Tom H. McCullah from Belen, NM is the FIRST HAM that we know of that has a HEART TRANSPLANT for a NEW YEARS gift and he is making a wonderful recovery. Also, SANTA CLAUS was accidentally shot and wounded while preparing to visit the NM State Penitentiary on Christmas Eve. In this regard, SANTA CLAUS was N5HKD, Jim Stevenson from Santa Fe. He is making a good recovery! Traffic: ND5T 1406, W5DAD 156, HNY.

UTAH: SM: Jim Brown, N47G—SEC: Rich Fisher, N5TK, STM: John Sampson, W7OCX. Congrats go to the areas that conducted SET's this year. Counties I heard from include Kane, Utah, and Davis. Thanks to the EC's in these counties for their work. Davis Co ARC has been conducting Novice and Tech/General classes, in addition to ARRL VEC tests. Contact Bill, N7IE for VE test dates. 73 de N47G. Traffic: W47KH 249, W47MEL 138, N57K 76, K7MG 52, N7ASY 44, N7IE 34, N47G 31, W7OCX 22.

WYOMING: SM, Dick Wunder, W47WFC—Asst. SM: Steve Cochran, K47AWS, SEC: Jim Anderson, W7TVK, Congratulations to Jim Raister, N7GVV, on his election to the office of Section Manager for the Wyoming Section. I will be turning the reins over to Jim on April 1, 1987. Sheridan hosted amateur exams on Dec. 20 with 15 candidates and 55% of them successful. The 1987 Wyoming Hamfest is in the planning stages by the Sheridan Amateur Radio League & Milley Radio has indicated he will return this year. QCVWA Net now meets every Sat. morning at 0800 UTC on 3923 KHz with 1077 calls. IOTA reports the Wyo. Cowboy Net held 23 sessions with 730QI & 210TC. Monthly traffic: N77H 451, K07AR 24, K7HBB 18, K7SLM 15.

SOUTHEASTERN DIVISION

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM & BM:

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

"Aquí Se Habla Español!"
 BARRY INTERNATIONAL TELEX 12-7670
 MERCHANDISE TAKEN ON CONSIGNMENT FOR TOP PRICES
 Monday-Friday 9 A.M. to 6:30 P.M. Thursday to 8 P.M.
 Saturday & Sunday 10 A.M. to 5 P.M. (Free Parking)
 AUTHORIZED DIST. MCKAY DYMEK FOR SHORTWAVE ANTENNAS & RECEIVERS.
 TRITELEX—Spring St. Station
 Subways: BMT—Prince St. Station
 IND—"E" Train-Bwy. Station
 Bus: Broadway #6 to Spring St.
 Path—9th St./6th Ave. Station

We Stock: AEA, ARRL, Alpha, Ameco, Antenna Specialists, Astatic, Astron, B & K, B & W, Bencher, Bird, Butternut, COE, CES, Collins, Communications, Spec. Contractors, Covercraft, Cushcraft, Daiwa, Dentron, Digimax, Drake, ETO (Alpha), Eimac, Encomm, HeilSound, Henry, Hustler (Newtronics), Hy-Gain, Icom, KLM, Kambrosics, Larsen, MCM (Daiwa), MFJ, J.W. Miller, Mini-Products, Mirlog, Newtronics, Nye Viking, Palomar, RF Products, Radio Amateur Callbook, Rockwell Collins, Saxton, Shure, Tefex, Tempo, Ten-Tec, Tokyo Hi Power, Tronxy TUBES, W2AU, Weber, Wilson, Yaesu Ham and Commercial Radios, Vocom, Vidiolex, Curtis, Tr-E, Wacom Duplexers, Repeaters, Phelps Dodge, Faxon Intercoms, Scannars, Crystals, Radio Publications.

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
 HAM DEALERS INQUIRED. PHONE IN YOUR ORDER & BE REIMBURSED
 COMMERCIAL RADIOS STOCKED & serviced on premises.
 Amateur Radio Courses Given On Our Premises, Call ALL SALES FINAL
 Export Orders Shipped Immediately, TELEX 12-7670

The DX EDGE: The Hottest DX Aid Since Sunspots

Improve Your DX Achievements on All Bands

See times of sunrise & sunset propagation peaks instantly for any QTH in the world
 Know when to look for the DX you need: Long path and Gray Line possibilities seen at a glance.
 Slide to show Great Circle Bearings, \$3 with order. Specify your latitude.
 Plastic slide rule format—Easy to use—Large size

Price: \$19.95 in U.S., Canada, Mexico.
 \$23.95 elsewhere, by air.
 Please make check or M.O. in U.S. funds payable to the DX Edge and mail to:

The DX EDGE
 P.O. Box 834, Madison Square Stn.
 New York, N.Y. 10159

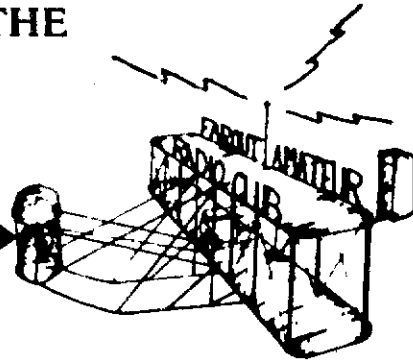
A product of Xantek, Inc. ©Xantek, Inc. 1986
 Commodore 64 and Commodore 128 are trademarks of Commodore Electronics Ltd.

Computerized version for Commodore 64 and 128. \$34.95.

An information flyer is available free of charge.

WATCH FOR OUR BIPLANE OUT AT THE "DAYTON HAMVENTION"

FAROUT A.R.C. WELCOMES YOU
147.135



**DON'T FORGET TO MARK YOUR CALENDARS FOR
FAROUT A.R.C.'S 1987 BLITZ
THE PARTY THAT WILL DEFINITELY BEAT ALL OTHERS**

**FRIDAY APRIL 24th 8:00 P.M. TILL 12 MIDNIGHT
"KNIGHTS OF COLUMBUS PARTY DOWN ROOM" 267 BAINBRIDGE STREET
DAYTON, OHIO**

(SAME LOCATION AS LAST YEAR)

**IF YOU HAPPEN TO BE PASSING THROUGH DAYTON THIS WINTER
PLEASE FEEL FREE TO GIVE US A HOLLER ON DAYTON'S HOTTEST**

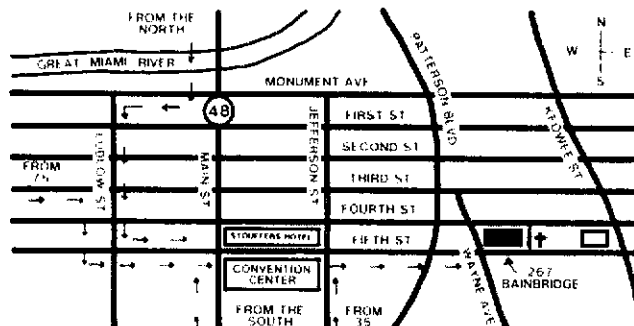
F.M. 147.135 (plus offset) WB8SMC

**IF YOU CAN'T REACH US ON TWO METERS, WHY NOT GIVE US
A CALL ON 10 METERS (29.60 MHZ)**

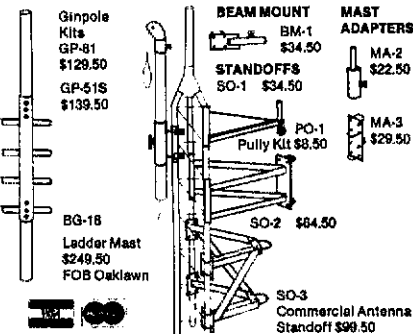
REMEMBER

THERE ARE ONLY 55 SHOPPING DAYS LEFT TILL BLITZ FRIDAY!

GO EAST ON FIFTH STREET UNTIL YOU GET TO
"BAINBRIDGE", TURN LEFT ON BAINBRIDGE
FROM FIFTH. THE "KNIGHTS OF COLUMBUS"
HALL WILL BE ABOUT A HALF BLOCK NORTH
ON YOUR LEFT.
PLENTY OF FREE PARKING JUST SOUTH OF
THE BUILDING. HOLY TRINITY CHURCH
IS THE LANDMARK YOU SHOULD LOOK FOR.
IT'S LOCATED ON THE N.E. CORNER
OF FIFTH AND BAINBRIDGE.

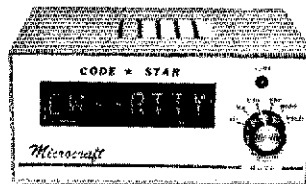


ANTENNA And TOWER ACCESSORIES



CODE ★ STAR--PRICED FROM \$129.00

- ★ Ideal for Novices, SWL's and seasoned amateurs
- ★ Built-in code practice oscillator & speaker
- ★ 12 VDC Operation or 120 VAC with adapter provided
- ★ Optional serial/parallel ASCII output port



- ★ Copies Morse Baudot & ASCII codes
- ★ Two optimized Morse ranges
- ★ Digital & Analog filtering with 18 db AGC
- ★ Automatic speed tracking 3 - 70 WPM

More Features Per Dollar Than Anything Else! Copies code from your receiver! Improves your code speed too! Large LEDs. Easy to connect and operate. Compact, 2lbs. Connect computer (like VIC-20)/printer with optional ASCII output port.

CODE ★ STAR™ Kit . . . CS-K \$129.00
ASCII Port Kit . . . CS-IK \$49.95
Add \$5.00 shipping and handling for continental U.S. Send check or money order. Use VISA or MasterCard.

CODE ★ STAR Wired . . . CSF \$169.00
ASCII Port Wired . . . CSIF \$69.95

Call or write for FREE brochure. Factory Direct - WE'RE AS NEAR AS YOUR PHONE!

Microcraft

Corporation Telephone: (414) 241-8144
P. O. Box 5130, Thiensville, Wisconsin 53092

RF TRANSISTORS

2-30 MHz 12V (* - 28V)				
P/N	Rating	Each	Match Pr.	
MRF412,IA	80W	18.00	45.00	
MRF421	Q 100W	22.50	51.00	
MRF422*	150W	38.00	82.00	
MRF426,IA*	25W	18.00	42.00	
MRF433	12.5W	12.00	30.00	
MRF449,IA	Q 30W	12.50	30.00	
MRF450,IA	Q 50W	14.00	31.00	
MRF453,IA	Q 80W	15.00	35.00	
MRF454,IA	Q 80W	15.00	34.00	
MRF455,IA	Q 60W	12.00	28.00	
MRF458	80W	20.00	46.00	
MRF475	12W	3.00	9.00	
MRF476	3W	2.75	8.00	
MRF477	40W	11.00	25.00	
MRF479	15W	10.00	23.00	
MRF485*	15W	6.00	16.00	
MRF482	Q 90W	16.75	37.50	
SRF2072	Q 65W	13.00	30.00	
SRF3662	Q 110W	25.00	54.00	
SRF3775	Q 75W	14.00	32.00	
SRF3795	Q 90W	16.50	37.00	
CD2545	Q 50W	23.00	52.00	
3800	Q 100W	18.75	41.00	
2SC2290	Q 80W	19.75	45.50	
2SC2879	Q 100W	25.00	56.00	

Q = Selected High Gain Matched Quads Available

VHF/UHF TRANSISTORS

Rating	MHz	Net Ea.	Match Pr.
MRF222	25W 136-174	14.00	—
MRF224	40W 136-174	13.50	32.00
MRF237	4W 136-174	3.00	—
MRF238	30W 136-174	13.00	30.00
MRF239	30W 136-174	15.00	35.00
MRF240	40W 136-174	18.00	41.00
MRF245	80W 136-174	28.00	65.00
MRF247	75W 136-174	27.00	63.00
MRF607	1.75W 136-174	3.00	—
MRF641	15W 407-512	22.00	49.00
MRF644	25W 407-512	24.00	54.00
MRF646	40W 407-512	26.50	59.00
MRF648	60W 407-512	33.00	69.00
SD1441	150W 136-174	74.50	170.00
SD1447	100W 136-174	32.50	76.00
2N5591	25W 136-174	13.50	34.00
2N6080	4W 136-174	7.75	—
2N6081	15W 136-174	9.00	—
2N6082	25W 136-174	10.50	—
2N6083	30W 136-174	11.50	24.00
2N6084	40W 136-174	13.00	31.00

MISC. TRANSISTORS & MODULES

MRF134	\$16.00	MRF406	14.50
MRF136	21.00	MRF428	55.00
MRF136Y	70.00	MRF497	14.25
MRF137	24.00	MRF559	3.00
MRF138	35.00	2N1522	10.50
MRF140	89.50	2N3866	1.25
MRF150	89.50	2N4048	10.50
MRF172	62.00	2N4427	1.25
MRF174	80.00	2N5590	10.00
MRF208	11.50	2N5642	13.75
MRF209	22.50	2N5643	15.00
MRF212	16.00	2N5646	18.00
MRF221	10.00	2N5945	10.00
MRF260	7.00	2N5946	13.00
MRF261	9.00	2SC1969	3.00
MRF262	9.00	510-12	13.50
MRF264	13.00	SAV6	34.50
NE41137	3.50	SAV7	34.50

Selected, matched finals for Icom, Atlas, Yaesu, KLM, Kenwood, Cubic, TWC, etc. Technical assistance and cross-reference on CD, PT, SD, SRF and ZSC P/Ns.

Quality parts users—call for quote

WE SHIP SAME DAY • C.O.D./VISA/MC

Minimum Order—Twenty Dollars

(619) 744-0728



RF PARTS

1320-16 Grand Avenue
San Marcos, CA 92069

Need Quick Turnaround on CRYSTALS?

Try Our E.O.D.
(Emergency Order Dept.)

and get

JAN QUALITY
and **STABILITY**
PLUS Low Prices!

You benefit from 21 years of manufacturing quality crystals for industry, military services, radio amateurs, citizen band and experimenters.

To Get Free Catalog

Call or Write

JAN CRYSTALS

P.O. Box 06017

Ft. Myers, FL 33906

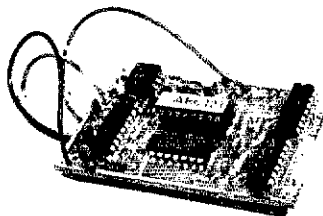
(813) 936-2397



CALL 1-800-237-3063
FREE (Except Florida)

PROUD OF YOUR CALL? WORRIED ABOUT THEFT? BUILDING A REPEATER?

Identify your FM transceiver with automatic code on each transmission.



SMALL: 1 3/4" X 2 1/4" X 5/16"
Perfect means of RTTY code ID

PRICE \$49.95 Ppd.
+\$3.00 for Calif. address.

Full feature repeater IDeR with timer
\$79.50 Ppd. +\$4.77 for Calif. address.

WARRANTY

Returnable for full refund within ten day trial period. One year for repair or replacement.

Your call sign programmed at factory, please be sure to state call sign when ordering.

Inquire about commercial models.

AUTOCODE

P.O. Box 7773 Dept. Q
Westlake Village, CA 91359
(805) 497-4620

K4VHC, SEC: N7AE, STM: WB4BQL, ACC: WA4ABY, OOC: NA4I, PIO: WB4DEB, SGL: W4BTZ, TC: WD4PAH, Southeastern DX Club 1987 officers are Pres: K4TEA, VP: K4PI, Sec & News editor: K4JAG, Treas: W4UYC & Act: K4JRB. Gud luk & God speed to W4AK & W4AGX who moved to Va Beach both will be missed. Tnx to Colquitt County HRS for the hospitality shown me on my recent club visit. I installed K4JAY as Pres, W4JRE as VP, W4JRE as Sec, W4JRE as Gen. Sec, GA ARC new leadership: Pres: WB4UHL, VP: W4HON, Sec/Treas: KC4WU, Prog Dir: WZ4M. 29 Atlanta area hams provided communications for the annual Macy's Christmas Parade. Gud exposure. Remember the annual Columbus Hamfest on March 28 & 29. Municipal Auditorium at 4th St & 4th Ave. Contact W4FIZ for info. March usually brings in bad WX to the section, let's hope not, but let's BE PREPARED. The "Old Goat" articles in the ATLANTA HAM surr brings back some old memories abt the hobby. W4BHW is the Satellite authority in the section. Need help call Byron. Interested in 10 Meter FM, contact K4JIS or locate copies of the Atlanta Ham. The technical articles in the W4PAC NEWSLETTER VERY OUTSTANDING. Remember PSHR rpts come to me. TFC rpts to STM, WB4WQL by the 5th of each month. Dec PSHR reporters are: KF4FG, W4HON, W4PIM, WA4ZHC, WA4LE, KB4JPN & WD4COL. Tnx to all who invited me to Christmas parties, just impossible to make during Dec due to work. Local VHF nets keep propping up in Section, PSE send info to WB4WQL who will register them & be put in the annual APRL Net Directory. As u well know the GA Section will host the 1987 APRL National Convention on July 10, 11 & 12. Bill, KF4CQ, of the Atlanta Radio Club is the Chairman. If u have any ideas on making it better in some area please contact him. Traffic: W4PIM 32, WB4DYZ 22, WA4LE 130, W4VYA 137, WB4WQL 37, KF4FG 33, W4JRE 156, WA4ZHC 58, K4AHE 43, W4HON 35, K4BAI 32, K4AATM 28, NAUJ 26, K4NM 13, WD4NGI 12, AA4JV 12, KI4IG 11.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—ACC: WD4RIQ, BM: KB4LB, OCFRI: K4JJE, PIO: WA4PUC, SEC: WA4PUP, SGL: KC4N, STM: WB4GJU, TC: N4KF. More clubs have been sending me their newsletters so I can report and congratulate more new club officers for 1987. SRRG has K4OSM for Pres., VP is K4ANJ and K4ELK is Sec/Treas. HCARA Pres is N4GEL, VP N8HLV and Sec, KB4JWF, Spring Hill ARC reports they are now two years old and going well. They have K4JBP for Pres., W4SPR as VP, W1ZYR as Sec., and K4JLG is Treas. Good luck to all of you. Running a club is no easy task since you must be able to meet the needs and desires of many people, all of whom have ideas which they feel is what the club needs to do. Compromise becomes the word needed to pull all these ideas together and the club that can do this is the club which will be able to prosper in the future. It is no secret that many clubs and their members are unable to neutralize the situation, then the club cannot function for the good of all its members. Should your club be in this situation, please communicate with your SM and/or ACC who will be glad to talk with the officers and board members to try to arrive at a plan for the club to follow to resolve the difficult situation that has caused the problem. This is not a unique situation with your club, there are many groups that are seeking answers and those that can are the ones that survive. We're glad to try to help. Traffic: KB9LT 1110, WA4QXT 1007, WD4JIO 966, N4PL 926, WX4FH 784, AA4HT 672, WD4D 604, AA4FG 502, KC4VK 285, K4PB 212, KB4FY 200, N4GMM 193, W4WF 189, KB4J 156, WB4JL 156, W4ZP 154, W4EYU 152, N4AJ 133, W4KX 125, W4GG 123, W4YA 120, K4AJV 109, N4ADI 100, WD4EOB 85, KI4CQ 74, NF4O 67, W4GUJ 65, N2AOX 47, N5AC 46, N4DY 45, N4JHI 40, K4KAH 31, W4DTV 30, WD4FJY 27, WD4RIQ 26, WA4SXW 21, WBIM 18, K4JHS 18, WA4PUP 17, N4AF 16, NQ4P 14, WD4HBP 14, KF4GY 7, WD4HUZ 7, WB4AWG 4.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS, STM: K4ZK, TC: K4IT, BM: WD4KBW, PIO: W4WYR, SGL: KC4N, OOC: W4TAH, ACC: WA4NBE. Congrats to the Platinum Coast ARS which has been officially renewed as a Special Service Club. The Fort Myers ARC announces the election of W4PRL as president, KB4LPL vice president, KA4YHF and KA4YHE as secretary and treasurer respectively, W4MPV and WB2JCE were elected as Director and Vice Director to the board of directors. The GOWA Gator Chapter elected W4STX as president, K4AKT vice president, W4CVB and K4JJC as members. K4I reports Operation Fox-trot, a simulated Pan American airliner crash, a success. For the first time, an amateur was allowed to be stationed in the County Fire Alarm/911 Center. The station was named by W4IYT. Permission has been obtained to erect a permanent amateur antenna for the post. WD4KBW was out of town early in January - OBS reports received for him indicate a total of 203 bulletins received and sent by WD4KBW 28, WD4LD 52, KA4GUS 34, WA4EIC 64, AA4BN 21, and W4TF 4. WBSYDD, manager of RN5D, reports KF4JA represented the combined Florida sections 87% - many thanks, Elsie. Cycle 2 sure could use some help with more RN5D reps-check with N4ADI, FMTN and KC4VK. TPTN, it is with regret I inform you that Larry, KD4K, may be leaving TPTN to become a Silver Key. Larry was in the Northern Florida section but well known to many throughout Florida. I still occasionally hear region reps checking in and telling the NCS to give the net credit for one received and already delivered. The region net should get credit for the message handled and the station who received the message and delivered it gets credit for both-BUT, the message was not handled on the net to which the rep was returning and should not be counted as traffic handled on the net. Along this same line, often when traffic is heavy a rep will QNI and tell the NCS he is holding some number of messages. If these are not handled on the net they should not be counted by the NCS. The rep should be informing the NCS of how many QTC he already holds so the NCS will know not to overload him. It is also important to remember that a region rep does NOT represent a net-it is the section which is represented, in the case of Florida the 4RN and RN5 reps represent the combined Northern and Southern Florida Sections. For Cycle 2 during the daytime, the combined section level nets for Florida are FMTN (12 noon, 7247) for the "up" cycle and TPTN (5PM, 2940) the "down" cycle. QFN (7PM and 10PM, 3651) is the combined section level net for Cycle 4 during the evening. It is only these three nets which have official responsibility for designating region reps. The region net NCS may call for additional stations to act as alternates when traffic is heavy. Also, if you are not encouraged on a routine basis, a station may QNI a region net as a Fla alt if he holds traffic for the region net that was not passed on the appropriate section level net. There are of course, several other section level, as well as local nets which are extremely important in the dissemination of traffic. Florida is one of the areas with an extremely large flow of traffic. Every-one handling even just one piece of traffic should file a Station Activity Report (SAR) with their respective Section Manager (SM). These should be sent so they are received no later than the fifth of the month and are counted as follows: A. Originated (for others, not yourself) and sent 2 points, B. Received and sent 2 points, C. Received and delivered 2 points, D. Received 1 point, E. Sent 1 point. 73 de WA4PFK.

MADISON SPRING FLING

New rigs and old favorites, plus the best essential accessories for the amateur.

3621 FANNIN ST
HOUSTON, TX 77004-3913

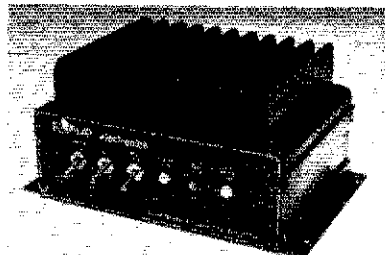
CALL FOR ORDERS
1-713-520-7300 OR
1-713-520-0550

ALL ITEMS ARE GUARANTEED OR SALES PRICE
REFUNDED



EQUIPMENT

Kenwood TH205AT	Trade in your old HT
Kenwood TS 440	Call for trade
Icom R7000 25-2000 MHz	949.00
Icom IC735	849.00
Ten-Tec 2510 (Easy OSCAR)	439.00
KDK FM 240 NT	279.00
Mirage Amps	15% OFF
Tokyo Hy-Power HL1K AMP No. 4CX250B	699.00



Lunar 2M4-40P 109.00

ACCESSORIES

B&W VIEWSTAR ANTENNA TUNER	89.95
Heil HC3/HC4/HC5	Stock
Heil BM10 Boom Mike headset	CALL
Tri-H 5000A Remote Phone	\$189.00
Triplet 3360 VOM (same as FLUKE 77)	69.00
Daiwa NS660A 30/300/3000 watts	135.00
Alenco ELH 230D- Excellent buy	88.00
Nye MB5-A (for the big boys!)	529.00
Shure 444D	54.95
Ameco PT-2	84.95
New Tokyo HC 200A	115.00
Nel-Tech Labs Digital Voice Keyer DVK 100	335.00
Astatic SilverEagle & Base	66.00

BELDEN

9913 low loss, solid center, foil/braid shield	51c/ft.
8214 RG8 Foam	45c/ft.
8237 RG8	39c/ft.
8267 RG213	55c/ft.
8000 14 Ga stranded copper ant. wire	13c/ft.
8448 8 conductor rotor cable	33c/ft.
9405 Heavy duty 2-16 Ga 6-18 Ga.	56c/ft.
9258 RG8x	20c/ft.
9269 RG-62A/U	16c/ft.
8403 Mic Cable, 3 condctr & shield	45c/ft.
100 feet 8214 w/ends installed	54.00
8669 7/16" linned copper braid	1.00/ft.

AMPHENOL

831SP-PL259 Silverplate	1.25
UG176 reducer RG8X	.30
831J Double Female UHF	2.00
82-61 N Male	3.00
82-97 N Female Bulkhead	3.00
82-63 Inline Female N	4.00
82-98 N elbow	9.00
31-212 BNC-RG59	1.50
31-216 UG201 A/U N Male-BNC Female	2.00
31-2 BNC-RG58	1.50
34025 N Male, RG58	3.00
34125 N Female UHF male	9.00
3128 BNC Female-PL259	3.00
4400 N Male-50 239	7.00

PACKET POWER

AEA PK-232	299.00
Kantronics KPC 2400	299.00
Kantronics 2400	139.00
Kantronics Packet II	149.00
MFJ 1270	125.00
AEA PM-1	149.00
New AEA UDC-232 Firmware, No modem,	
List 279.00	249.00
New Kantronics KAM	299.00



IC28A List 429. Your Cost 369.00

ANTENNAS

Isopole 144 MHz	44.95
AOP-1. Complete Oscar Antenna	149.95
Butternut HF6V, 80-10 vertical	125.00
HF2V, 80 & 40 vertical	119.00
HF4B	189.00
Hustler G7-144	119.95
Hustler 6BTV	139.00
KLM HF World Class Series Antennas	Call Don
Alpha Delta Twin Sloper	49.00
Covax Seal	2.00/roll
B&W Dipoles	Less 10%
KLM KT-34A	399.00
W2AU, W2DU	Now Available
NEW KLM 1.2-44LBX	129.00
1296 Power Divider	Soon
Union CID-78 + BS 80 75/80 rotatable dipole	299.00

OTHER ANTENNAS

Diamond D-130 Discone 25-1300 MHz	79.00
Larsen Kulduck	17.00
Larsen 2M 1/2 wave telescope ant.	25.00
Avanti AP151.3G on Glass Antenna	36.00
Anteco 2M, 5/8, Mag. Mount, Comp	25.00
Oron 2M 1/2 wave Handy Antenna	19.00
Van Gordon SLA-1 160-80-40 Sloper	44.00
Valor AB-5 Mobile	79.95
Stoner DA100 D Active Rx Antenna	180.00
DC Tenna Hitch 3/8-24 Thread	
Fits 3/4" trailer hitches	29.95

KEYS

Benchner & Vibroplex	Less 10%
Benchner is now improved. Screws & springs, all stainless steel and extra hand polishing.	
Nye ESK-001 Keyer	58.00

TUBES

Collins & Drake Replacement tubes	Stock
GE 6146B	12.95
3-500Z	109.95
GE Industrial Tubes	Call
GE 12BY7A	7.00
GE 6JS6C	12.95
GE 8950	16.00
12JB6 Sylvania	6.00
Hard to find Tubes 50-90% off list	
6JB6A	9.95
6JE6C/6LO6	9.95

BOOKS

We stock SAMS, TAB, ARRL, RSGB, Ameco Radio	
Pubs	Call
New 1987 Radio Database Book - International SW	
plus reviews	12.95

PARTS

1.5 Amp/400V full wave bridge rectifier	1.95
2.5A/1000PIV Epoxy diode	29 each or 19.00/100
0015/10KV or .001/20KV	1.95 each
3N201	.95
4 inch ferrite rod	1.95
365pF cap	1.95
Sanyo AAA, AA Nicads w/tabs	3.00
2, 4, 5, 6, 8 pin mic plugs	2.00
1/8, 1/4, watt carbon resistors	.05 each
Meters 0-3000 VDC 2 1/2" Square 0-1 Amp DC	9.95
Drake-Collins mike plug	2.00
Thousands of panel meters	3.95 up CALL
MICA Cap .0004/3KV	5.00 others CALL
Close out on rigs & accessories. All the time	Call
We may have what you're looking for.	
Diodes 3A/1000 PIV	.29
Duracell 9 Volt Battery 2 Pak MN1604	3.49
DC Fan 3 1/2" Sq. x 1"	9.95

SERVICES

Alignment, any late model rig	50.00
Flat fee Collins rebuild	Call

USED EQUIPMENT

All equipment, used, clean, with 90 day warranty and 30 day trial. Six months full trade against new equipment. Sale price refunded if not satisfied.

KWM 380/2CW
ETO/ALPHA 77, Clean
ICOM IC 745
TenTec 505 Argonaut
YAESU FT 101E
YAESU FT 901 DM/CW
Kenwood TS-830S/CW
TS-430S/acc
TS-520S
Drake TR4cw, clean

Call for latest used gear list
(800) 231-3057

TOWER ACCESSORIES

1/4" E.H.S Guy cable, Rohn US 1000 ft.	250.00
3/16" E.H.S cable, Rohn US, 1000 ft.	210.00
1/4" Guy Cable, 6100 #7 x 7 strand, import	15c/ft.
3/16" Guy Cable, 3700 #7 x 7 strand, import	12c/ft.
3/8" x 6 E&J Turnbuckle	7.95
3/16" Wire Rope Clips	.40
1/4" wire clips	.50
1/4 Thimbles	.45
Porcelain 500D Guy Insulator (3/16)	1.99
Porcelain 502 Guy Insulators (1/4)	3.39

POLICIES

Minimum order \$10.00. Mastercard, VISA, or C.O.D. All prices FOB Houston, except as noted. Prices subject to change without notice. Items subject to prior sale. Call anytime to check the status of your order. Texas residents add sales tax. All items full factory warranty plus Madison warranty.

DON'S CORNER

*Beginners Guide to Antennas & The Butternut HF-6V is the most popular Amateur Antenna being sold today. Thousands in use around the world today.

BIRD

STOCK ITEMS CALL

Power Range	Frequency Bands (MHz)					
	2-10	25-60	50-121	100-250	200-500	400-1000
5 watts	5A	5B	5C	5D	5E	5F
10 watts	10A	10B	10C	10D	10E	10F
25 watts	25A	25B	25C	25D	25E	25F
50 watts	50A	50B	50C	50D	50E	50F
100 watts	100A	100B	100C	100D	100E	100F
250 watts	250A	250B	250C	250D	250E	250F
500 watts	500A	500B	500C	500D	500E	500F
1000 watts	1000A	1000B	1000C	1000D	1000E	1000F
2500 watts	2500A	2500B	2500C	2500D	2500E	2500F
5000 watts	5000A					

MADISON

Electronics Supply

3621 FANNIN
HOUSTON, TEXAS 77004

1-713-520-7300 OR 1-713-520-0550

New ICOM Call on the IC 2A1 IC-48A IC-03A1

March 1987 145

NEMAL ELECTRONICS

HARDLINE — 50 OHM

Nemal No.	Description	Per Ft.
FXA12	1/2" Aluminum Black Jacket	.89
FLC12	1/2" Corr. Copper	1.59
FLC78	7/8" Corr. Copper	3.92
NM12AL	N Conn., 1/2" Alum. (Male or Female)	22.00
NM12OC	N Conn., 1/2" Copper (Male or Female)	22.00
NM78CC	N Conn., 7/8" Copper (Male or Female)	54.00

COAXIAL CABLES

Nemal No.	Description	100 Ft.	Per Ft.
1100	RG 8 95% Shielded Mil. Spec.	28.00	.32
1102	RG 8 95% Shielded Foam	30.00	.32
1110	RG 8 95% Shield (min 8)	15.00	.17
1130	RG 213/U Mil. Spec. 96% Shield	34.00	.36
1140	RG 214/U Mil. Spec. - Dbl. Silver	155.00	1.65
1180	Belden 9913 Low Loss	46.00	.50
1705	RG 142B/U Teflon/Silver	140.00	1.50
1310	RG 217/U 5/8" 50 ohm Dbl. Shield	80.00	.85
1470	RG 223/U Mil. Spec. Dbl. Silver	80.00	.85
1450	RG 174 95% Shielded Mil. Spec.	12.00	.14

ROTOR CABLE — 8 COND.

Nemal No.	Description	100 Ft.	Per Ft.
8C1822	2-18 Ga., 6-22 Ga	19.00	.21
8C1620	2-16 Ga., 6-20 Ga. Heavy Duty	34.00	.36

* Shipping \$3.00 — 100 Ft. / Conn. \$3.00 / C.O.D. \$2.00

CONNECTORS — MADE IN U.S.A.

Nemal No.	Description	Each
NE720	Type N for Belden 9913	4.25
NE723	N Female Belden 9913	4.75
PL258AM	Amphenol Barrel	1.45
PL259	Standard Plug for RG 8, 213	10/5.90 or 65
PL259AM	Amphenol PL259	10/7.90 or 89
PL259TS	PL259 Yellow/Silver	1.59
UG21D	Type N for RG 8, 213, 214	3.00
UG83B	N Female to PL259	6.50
UG88C	BNC RG58	1.25
UG146	SQ239 to Male N	6.50
UG175/6	Adapter for RG58/59 (specify)	10/2.00 or .22
UG255	SQ239 to BNC Amphenol	3.75
KA51-18	INC RG58	4.35
AM9501-1	SMA RG142B	8.95
SO239AM	Amphenol SQ239	89

GROUND STRAP — BRAID

Nemal No.	Description	Per Ft.
GS38	3/8" Tinned Copper	.30
GS12	1/2" Tinned Copper	.40
GS316	3/16" Tinned Copper	.15
GS316S	3/16" Silver Plated	.35

GROUND WIRE — STRANDED

Nemal No.	Description	Per Ft.
HW06	6 Ga. insulated stranded	.35

Call or write for complete price list. Nemal's 32-page Cable & Connector Selection Guide is available at no charge with orders of \$50.00 or more, or at a cost of \$4.00 individually.

NEMAL ELECTRONICS, INC.

12240 N.E. 14 Ave., No. Miami, FL 33181

(305) 893-3924 • Telex 6975377

24-Hr. FAX (305) 895-8178

THE TOLEDO MOBILE RADIO ASSOC., INC.



PROUDLY PRESENTS OUR

32nd ANNUAL

HAMFEST AND COMPUTER SHOW

MARCH 22, 1987

AT THE

LUCAS COUNTY REC. CENTER — MAUMEE, OHIO

FOR INFORMATION PLEASE SEND A S.A.S.E. TO:

T.M.R.A., INC. c/o Robert Hanna, K8ADK

2154 Circular, Toledo, OH 43614



Spider™ Antenna

U.S. Patents 4349223, 4460896

ENJOY H.F. OPERATION TO ITS FULLEST
WITH A SPIDER™ 4-BAND ANTENNA

Be prepared for expected increases in sunspot activity by using the Spider™ 4-Band Mobile Antenna. Our patented design will enable you to monitor up to four H.F. Bands without having to stop, change resonators or retune. Just band switch your rig for enjoyable mobile operation on 10-15-20-40-or 75 meters. We also have a Spider™ 4-Band Maritime Antenna. Write or call for our free, detailed brochure and price list.

Ask The Ham Who Has Tuned One!™

MULTI-BAND ANTENNAS

7131 OWENSMOUTH AVE., SUITE 363C

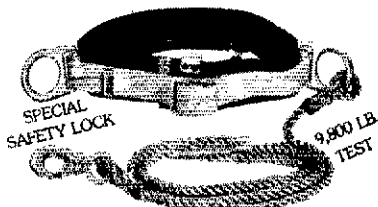
CANOGA PARK, CA 91363

(818) 341-5460

FRED K6AOI

ONV SAFETY BELT

SPECIAL BACK PROTECTION



ADJUSTABLE TO 46" WAIST

Extra \$10.00 Large to 56"

ONV Tool Pouch 15.95

Add 3.00 for handling

VISA / M/C CHECK

\$74.95

UPI Comm. Systems Inc.

Box 886 • Saddle Brook, N.J. 07662

201-368-3655 • Telex: 844-106 (UPICOM)

Traffic: W3CUL 3901, W3VUR 1878, K4EUK 1631, K4AACM 1536, K4KZK 733, WA4PPK 683, WRNFK 543, KF4JA 539, AA4BN 524, K4SCL 472, K4IA 470, K4AGUS 278, WA4E1C 262, KA4NXP 243, WA4RUE 229, KA4FZ1 224, WB4WYG 222, W4DL 203, N4KB 183, WB4AD 155, K4ZV 155, W1N1M 136, WD4KRW 115, K44MON 111, W4KCH 109, W4KSH 109, W4KSG 81, W4YCE 81, W4SME 81, W4WVND 75, K4JAWJ 65, K4KXV 64, WD9AEP 55, K4FOL 54, W3JLR 45, W3TLV 43, WB4GCK 42, WA4NBE 42, WD4NXX 42, WT4F 40, KY8Y 37, K5IHH 36, KF4RL 35, N1EEN 33, N4ET 33, K9AKY 31, K84LPL 27, WA4HDH 24, K4CVG 17, N4MML 15, N4ORZ 15, AA4CH 14, W4MPP 14, W4AGSV 14, N4ORN 13, N4OGR 12, W4MFD 7, N4ILN 7, W4K4F 6, K44GDU 6, K44YHF 4, K42KNZ 4, N4NZ1 3, K4KAW 2, W4NSY 2, K84TIU 2, W4DWN 1, N4LLZ 2, K42KNZ 2. (Oct.) KY8Y 5.

WEST INDIES: SM, Alberto Valdejuil, WP4CSG— I have been informed by the Board of Directors of the PFRAC that repeater frequency coordination will no longer be delegated to any particular individual, at least not for the time being, and that the Board of Directors itself will take care of frequency coordination efforts themselves hereinafter. The Board of Directors of the PFRAC has deemed it proper not to delegate these functions in the future. So if you need to coordinate a repeater frequency within the Section, or any other related communication, please address the same to PFRAC, CPO Box 693, San Juan, P.R. 00926 directly. Again, remind you that we are in need of volunteers for ARES. If you want to join in on the action, and contribute with your abilities in time of need, should an emergency situation arise in our Section, please contact one of the following: KP4IG, KV4JC, or VP2VI. Now is the time to do so. Time flies, and before we know it, hurricane season will be here again. Also, take advantage of our communication nets, which form part of the National Traffic System. You can send your own traffic, or do a friend or relative a favor by handling messages for them; or practice your CW (if rusty). Our CW net, W1NS, meets daily at 2300z at 3710 Khz, at moderate speed. NETS: WINS (KP4JL-NM) Sessions 31, QNT 270, QTC 79, QNI 125; WINS (KP4JW-NM) Sessions 31, CTC 74, QNI 664; WINE (VP2VI-NM) No report. Traffic: KP4DJ 168.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP, NMs: K6LL, KA7HEV, WB7CAG. The Superstition ARC Swapfest in Apache Junction was a financial success in spite of two days of continuous rain. Attendance was down, but over seven hundred attended. Hope next time better WX condx will prevail. It was well planned and organized. Ft. Tullih hamfest in Flagstaff is now scheduled for July 24, 25, 26, so make plans now for this big one. And the biggest of all will be the SW Divn Convention in Scottsdale on October 9, 10 & 11. Your SM and Div. Dir. Heyn attended a planning meeting at OTH of W7KB with the Phoenix area repeater nets. The planning committee consisting of ND7B, KD7FW (C'm), NU7V, KE7MC and WB7PXL are hard at work, and promise a bang-up show. OPRC reports new officers are: Pres: NN7C, V.P.: WB2HEM, Treas: KD7KW, and Sec: N7HOR. Good luck fellows. The ARCA sponsored WINTER SWAPMEET will be held at South Mtn. Park in Phoenix this year on March 15. TRA reports moving monthly meeting back to second week of the month. They are considering linking their 146.82 and 146.88 repeaters together during certain periods of public service and net usage. New Official Bulletin Station appointment is J-B, WA7AHF who will be holding forth with bulletins Thurs. nights 7:30-8:30 PM. Net time goes to the Field Organization, J-B, KA7MUL, made BPL again in Dec., with the highest total yet. Also made PSRR. Mike is a blind operator and does a super job. He regularly checks in to eight daily traffic nets! Congratulations. K7RDH reports that HRC keeps him plenty busy these days. He reports that W7KOY is in Phoenix hospital. Get well soon, Gerf. We miss you on 146.94 while mobilizing thru the area. W7YS reports No. Az. DX'ers are busy at work on new DXCC Golden Jubilee award. Good luck. Green Valley RC reports new officers for 1987 are: Pres: W8EVL, VP: KC7MF, Sec: WB9PYG, and Treas: K8XT. Our heartfelt condolences go to Bill, KC7O whose XYL passed away in Dec. The B.A.R.T. RC Tucson reports new officers for 1987 are: K7COP Pres, VP: KE7PHE, and Treas: WB7UCV. K7CC still running code practice in Tucson area on 147.42 from 6-9 PM daily. New ARCA delegates are NV7X, from TRA and KB8RT from AZ YL Cactus Keys, with W6NLM as alternate. Welcome. That's all. 73 and see you next month, same street corner. JIM.

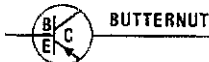
LOS ANGELES: SM, Bob Poole, AJ6F—ASM: K6IYK, SEC: AK6Y, STM: W6INH, P10: NJ6K, SGL: K6KSY, OOC: K6SMG, TC: WB0CO. Herd hoping that Santa was good to all the APRIL folks in the Section. Plenty of public service activities accompanied the holidays this year as usual. URAC helped out in the San Pedro Christmas parade, MWRA did their usual by bringing Santa to children in hospitals and TORRA was on their usual cues at the famous Rose Parade in Pasadena; I regret not being able to print the call signs of all the fine participants, but the column would have to be MUCH too long! The Downey club and EC WA4HTM announce their ARES net will be conducted at 19:00 local beginning Jan 15; this immediately precedes the regular club net. A source for Westlink and APRIL bulletins is the W6LS Tuesday (19:30 PST) net on 147.415. Club program coordinators take note of the speakers listed by the Westlink and APRIL clubs as composed by K6BAR; this is a comprehensive list of speakers in the area, whose topics will be of interest to many clubs, ARES and others are planning to support the huge L. A. Marathon as they did last year; there will be literally hundreds of amateurs operating on several nets and modes, including packet radio. The W6SD club station (SFVARC) is open Wednesdays from 19:00 to 22:00 local; contact N6LGO for details. Vice-Director N6NB was surprised at the Westside club meeting in November when his projector failed prior to his antenna presentation; undaunted, Wayne was able to quickly sidestep the dilemma and managed to present his important lecture on antenna ordinances. The So. Cal. Six Meter Club reminds us that the Net is not to be missed on 19:00 local on the Piedale 52.76/16 repeater. Contact the SDCXC for information on how to attend the always successful convention in Visalia; I'll see you there! RALAC members were treated to a packet radio demonstration by Orange Tech Coordinator K6BXG; Director Heyn was also in attendance when John connected to the AJ6F-1 PBBS and had a chat with (yours truly) the SYSOP. Beginning in 1987, KB6LTL will assume the chore of logging the public service activities on the W6FNO repeater group; many thanks to KA8ZDL for having done such a fine job of this in the past. Let me take this opportunity to thank you for your support in 1986 and to wish you all the best in 1987. My heartiest thanks to the LA section trafficors with poor conditions. We still made a good showing and another thanks to N7CZF for helping out in

ANTENNAS

hy-gain

cushcraft

MIRAGE/KLM



HUSTLER

Mosley

Larsen Antennas

ALPHA DELTA



ALLIANCE

ASTRON



TEN-TEC
CORSAIR II



AMERITRON
 HF LINEAR AMPLIFIERS



MFJ

TUNERS & ACCESSORIES



ROTORS

The Telex/Hy-gain CD 45 II, Ham IV, T2X, and HDR-300 are our top sellers. Excellent parts availability and manufacturer support. We also offer Kenro rotors. Our choice for OSCAR az-el rotor systems. Call for pricing!

WIRE & CABLE

BELDEN COAX

RG-213/U (8267) / Belden 9913.....0.40 / 0.42 ft.
 RG-8/U (8237) / RG-8/U (8214).....0.32 / 0.35
 RG-8X (9258) / RG-11A/U (8261).....0.19 / 0.37
 RG-58A/U (8259) / RG-59/U (8241).....0.13 / 0.14
 450 ohm ladder line.....0.10

COPPERWELD ANTENNA WIRE

Solid: 12 ga. / 14 ga.....0.12 / 0.10 ft.
 Stranded: 14 ga.....0.10

ROTOR CABLE

Std. (6-22, 2-18) / Hvy Dty (6-18, 2-18).....0.19 / 0.35
 Others in stock!

ROHN

TOWERS

FREE STANDING:

HBX40 / HDBX40.....\$198.00 / 249.00
 HBX48 / HDBX48.....265.00 / 325.00
 HBX56 / BX64.....335.00 / 370.00

Today's best tower buy! Freight additional.

GUYED TOWERS

25G / 45G.....\$48.00 / 109.00
 TB-3 Bearing.....49.95

Full line of Rohn accessories. Freight additional.

FOLD-OVER TOWERS

FK2548 / FK2558.....\$869.00 / 929.00
 FK2568 / FK4544.....979.00 / 1179.00
 FK4554 / FK4564.....1279.00 / 1369.00

Fold-overs shipped FREIGHT PREPAID.
 Prices 10% higher in western states.

HY-GAIN

For crank-up, self-supporting towers we recommend Hy-gain's series. The HG-375S, HG-525S, HG-54HD, & HG-70HD represent "top drawer" quality.

REBATES UNTIL 9/30/86! Shipped freight prepaid!

PHILLYSTRAN

Electrically transparent guy systems in stock!

PRE-ASSEMBLED DIPOLES, REMOTE AND MANUAL COAXIAL SWITCHES, CONNECTORS, COAX-SEAL, BALUNS, INSULATORS, ANDREW HELIAX, NYLON SUPPORT ROPE, ETC. — CALL!



rfe enterprises
 HCR Box 41
 Merrifield, MN 56468

NEW
 RETAIL OUTLET



**THE Short Wave Listener FOR
 RECEPTION OF MORSE CODE &
 RADIO TELETYPE SIGNALS.**

Plug the SWL cartridge into your Commodore 64/128 Expansion Port, connect a shortwave radio and you'll be watching text readout from weather stations, news services, ships and HAM radio operators all over the world. A whole new use for your home computer. The SWL contains both program in ROM and radio interface circuit to copy Morse code and all speeds/shifts of radio teletype. Plus the on screen tuning indicators mean you never have to take your eyes off the video for perfect tuning. Housed in a small 3" x 2-1/2" x 7/8" enclosure, with speaker in/out and practice hand key jacks, it needs no other computer connection or power supply. Unshift on space, word wrap around, real time clock, and keyword or manual printer control for permanent paper copy, so that you won't miss a single bit of the action. For about the price of another "Pac-Zapper" game, you can tie into the exciting world of digital communication with the Microlog SWL.

\$64

MICROLOG

INNOVATORS IN
 DIGITAL COMMUNICATION

20270 GOLDENROD LANE
 GERMANTOWN, MD 20874 • (301) 428-3227

**LEARN
 MORSE CODE
 THE RIGHT WAY
 WITH THE**

Morse Coach.

\$4995



A complete Morse code tutor in a convenient plug-in cartridge for your Commodore 64/128. The Morse Coach means business. It's not a toy program or a simple random code generator. Originally developed jointly by Microlog and several government agencies experienced in Morse instruction. Four years of extensive service prove it's the quickest way to Morse proficiency. The method works! You start from absolutely no knowledge of Morse, progress through the alphanumeric symbols, and on to any speed desired. The "alphabet" part of the program introduces new characters and plots the progress on a bar-chart. The speed/test section correlates the input, analyzes mistakes and provides a printout of the analysis/test results on your Commodore screen or printer. As a bonus, it also boosts typing skill. You've never seen any tape or program do that! In fact, there's never been a system so thorough, so efficient and so effective as the Microlog Morse Coach.

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



Only \$14.95

HI-Q ANTENNA CENTER INSULATOR



- Small, rugged, lightweight, weatherproof
- Replaces center insulator
- Handles full legal power and more
- With SO 239 connector

\$6.95

THE ALL-BANDER DIPOLE



- 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 180 through 10 mts
- May be trimmed to fit small city lots

Only \$29.95

DIPOLES

MODEL	BANDS	LENGTH	PRICE
Dipoles			
D-80	80/75	130'	\$31.95
D-40	40/15	66'	29.95
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-80/10	20, 40, 20, 10/15	130'	43.95
PD-40/10	40, 20, 10/15	66'	37.95
PD-80/40	80, 40/15	130'	39.95
PD-40/20	40, 20/15	66'	33.95
Dipole shorteners	— only, same as included in SD models		
S-80	80/75		\$13.95/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 SWLs.

Antenna accessories — available with antenna orders

Nylon guy rope, 450 lb. test, 100 feet \$4.49

Molded Dogbone Type Antenna Insulators 1.00/pr.

SO-239 coax connectors .55

No. 14 7/22 Stranded hard drawn copper antenna wire .08/ft.

ALL PRICES ARE UPS PAID CONTINENTAL USA

Van Gorden Engineering

P.O. Box 21305 • South Euclid, Ohio 44121
Dealer Inquiries Invited

START COPYING WORDS THE EASY WAY!

- **Start copying words instead of letters!**
- **Master the standard exchange in just a few evenings!**
- **Gain on-the-air confidence quickly!**

THE QSO-TRAINER™ Code Course - For the ham who already knows the code. If you have been a ham for a while, tried the "traditional" random-letter approach to code practice, and still don't have the on-the-air confidence you'd like—this course may be exactly what you need.

Easy-to-learn lessons on two 60-minute audio cassettes.

Send \$14.95 + \$2.00 shipping and handling (IN residents add \$0.85) to:

AVC INNOVATIONS, INC.
Dept. Q, P.O. Box 20491
Indianapolis, IN 46220-0491

BUSINESS SIZE SASE GETS DETAILS

Antelope valley area. Ted KUYK, the big one this time. Ted must have worked 24 hours a day. Happy New Year to all. Anyone who needs an ORS certificate, please address me. Traffic: K8UYK #182, W6LHE 404, W6INH 310, K8YBV #118, W6BVPY #5, K8CL 8.

ORANGE: SM, Joe H. Brown, W6UJQ—ASM, RIV OO: BOB, W6LKN, ASM, OR CO: RALPH, W6B6J, ASM, SB CO: TON (W6B), ACC: RALPH, K8BGNZ, TC: The process of establishing Section-wide association of amateur clubs, better understanding of different club goals and joint club activities should result. OOC: RALPH, W6RE reports two problem areas are being looked into. Much time and effort required in this program. SEC: KEN W6AZET requests a copy of the EC annual report so that the Section activity and ARES/RACES files can be completed. In order to promote Amateur Radio public service activities, Public Safety Officials need numbers, so ECs do not forget those monthly reports. TC: JOHN KD7XG, response to requests for tech assistance are forwarded to local ATCs. The Fried (W6AWZD) and John show will take to the road again in January. Club program people take note. This pair put on a very interesting program. STX: FAME, W6GCA, reports DAN, W6RO, has qualified for Brass Founder League with 1182 msgs handled, approx 200 of his msgs via packet mail boxes. PSRR W6F0, W6OACA, W6QBZ, K6BHUJT. Need NTS info? Call ERNIE 714-673-7378.

NET	FREQ	SE	QNI	TFC	NM	TIME
SCN/1	3598	31	282	36B	W6F0	1830
SCN/2	3598	27	167	59	W6F0	2015
SCN/V	146.845	31	415	663	W6AQCA	2100

SM comment: Packet, Digital Radio Communications, NTS? Now "SKIPNET" Amateur Radio Ionospheric Packet Auto-forwarding Net, an exciting concept. Stand by for further information. Being chaired by COIRKY, N6HCl DEC Orange Co, and sponsored by Orange Co. EMD, Carl Page of Rptr Coor fame, Garry Gray Or Co Comm, Don Rote State OES and many other amateurs were there. It was agreed that the Local ECs should report at the next meeting, the local freqs used by groups in their area of responsibility and establish working agreements with repeater owners or trustees for weekly NTS and emergency use. This should help tie together the RACES, ARES and independent amateur groups in Orange Co. Soon, we should know who is on first and what on second. ANZA VALLEY CLUB Officers, Pres: John, W6BIMM, VP: Walt, K6VI, SEC: Karen, W6B6J, Susan, Park ARC, Officers: Pres, Bob, W6B5V, VP: Randy, W6BESQ, SEC: Louis, N6NAS, Treas: Chet, K6B6HX, The Coachella Valley ARC, under the Boss (Hazel N6R6P) has been busy installing antennas at fire stations and other locations. Words of wisdom from the Riverside County ARA. A war is taking shape in the world of Packet radio. It will never be as big as the famous SSB vs AM wars of the middle ages, nor as violent as the repeater wars of our fathers' time. Nevertheless, it promises to be an interesting battle. On one side we have the (ABBA) Anti Bulletin Board Army. On the opposing side, we have the BBS operators. I recommend getting front row seats. (H6GCL), Traffic: W6F0 1182, K6BHUJT 325, W6QBZ 260, N6GOT 252, AD6A 151, W6AQCA 124, K6VCE 106, W6C6P 47, K6ATND 39, W6NTN 14.

SAN DIEGO: SM, Arthur R. Smith, W6INI—The ham radio swap meet is now back to the SanDiego Drive-in first Sat each month. N6BUL demonstrated use of packet radio to the Calif Dept of Forestry's San Diego Ranger Unit officials. We can expect to use this mode in the up-coming fire season. Club officers for 1987-poway ARES: N6GKM PRES: N6INV VP: KB7VE Sec: K9VXL Treas: North Shores ARC: N6JZE Pres: W6N6N VP: K6BUDL Treas: ARC of El Cajon: W6V6K Pres, K6GVP, N6VE, SEC: Palomar ARC: W6FQJ, Pres: K6BQC, VP: W6FL, Sec: W6B, Treas: ARRL affiliated clubs are reminded to send in the Annual Report promptly. K6B5F donated an antenna for the Poway H2O Fire Station. Upgrades to Extra W2BK, to Advanced N6NZO. Thanks to N6B4 and N6B1 for spearheading the K-mast toy drive. North Shores ARC maintains a vacuum tube pool. Contact W6BLO, K6QJP or N6QD for info. The club net operates each Monday at 1900 on 28.800 MHz. Adopt-A-School program: Palomar ARC has adopted Potter Jr HI in Fallbrook and North Shores ARC Standley Jr HI in University City. Attn ORS: If reports must be submitted to N6GW no later than 4th of month to meet deadlines. Traffic: (Dec.) N4KRA 145, (Nov.) N4KRA 143, N6GW 46, K6UD 16, W6BILK 2.

SANTA BARBARA: SM: Byron Looney, K6FL—1987 should be a banner year for growth in SB section. Three VE tests were scheduled the weekend of our Section Meeting! Follow up is essential. Many clubs scheduling radio classes. Let's see that our Novices are General by the end of the year. Strive for quality as well as quantity. Hospital support is of growing concern to ARES. Contact your DEC if you are interested in learning more about it. Remember—radios don't communicate, people do! To be a competent communicator, you must speak the language. SCNR can give you experience in network procedures at your liaison with county OES a light foot? 1986 was a light year for ARES demand, but we need to keep our relationships warm with the services that depend upon us. Traffic: W6NOR 155, K6YD 38, K6BCKW 22, N6FOU 19, K6BHG 15.

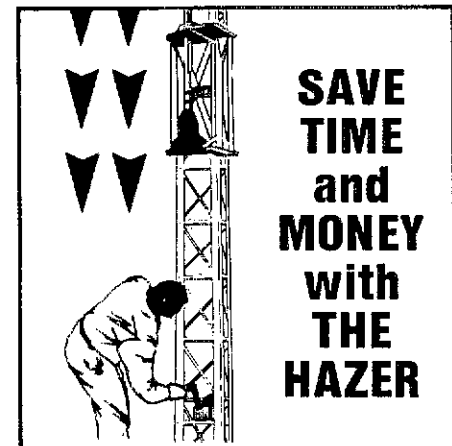
WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst. SM: K5MXQ, SEC: W5GPO, STM: A5E1, BW: W5QXK, PIO: K5HGL, OOC: W5B5BP, TC: W5LNL, ACC: N5V, W5UXP, our State Gov't. Liaison, has resigned his position. Many thanks to Eddie for your years of expertise since the inception of the office. We need someone to volunteer to fill this vacancy on our Section staff, who can keep an eye on the state of things going on down at the state legislature that will be affecting amateur radio either positively or negatively. We have found in the past that good bills need our support early at the committee level, and bad bills can more easily be killed early on at the committee level. This is a most important position, and nominations are open! The new West Texas Section is still in a sort of limbo at this writing; I hope by the time you read this that logistics have been solved, and that organization is under way. Until such time, I will be servicing the members that were previously in the N.TX. Section so that a smooth transition can be made without loss of services and support. Congrats to Lloyd, W5TNT for making BPL in Dec. PSRR for Dec. K5UYK, K5G5V, K5G5S, W5BDD, K5BADE, K5MXQ, W5VMP, N5JHI, K5UPN, K5A5PT, Traffic: W5TNT 524, K5DRK 398, K5A5PT 373, W5A4ML 332, K5BUL 287, W5G5 243, K5MYP 186, W5VMP 166, K5A5AZ 186, K5UPN 181, W5BDD 177, N5JUI 172, A5E1 168, K5BADE 166, W5OYL 116, K5EVI 84, N5JHI 78, K5L7CB 29, W5ERT 27, K5QYV 17, K5GNG 7.

OKLAHOMA: SM, Bill Goswick, K5WG—ASM/ACC: N5BN, BM: W5AS, OOC: K5WG, PIO: W5BSYT, SEC: W5ZTN, SGL: W5NZS, STM: K5VX, TC: W5MJJ, Hamfest season will soon be upon us. All sponsors of hamfests or other amateur radio events please forward details to me. If you would like to have ARRL participation at your event let me know. Clubs should contact N5BN for help with affiliation, Special Service Club status, activities, and programs. All appointees are reminded to report their activity to the appropriate leadership official (listed above) periodically. Failure to report will jeopardize your

active status. Like to increase your code speed and perform a public service at the same time? The QZ net meets daily at 0100 UTC on 3682.5 kHz. Newcomers are welcomed. The Section still needs knowledgeable, technically oriented amateurs to serve as OOs in the Amateur Auxiliary. If you would be interested in participating in this most important program please contact me. Congrats to W5JJ who is beginning his 55th year as a licensed amateur. Traffic: W5S5RX 381, N5XE 376, N5X1 357, K5VX 342, N5R1 209, N5W5 197, W5BPL 131, W5DIFB 107, W5AOUW 85, N5IKN 82, K5GBN 63, W5SUG 42, W5AZCO 29, W5GOCG 25, K5WG 25, W5VOR 24, W5BTSU 20, W5VHP 24, K5CAY 8, W5JJ 2, N5WJ 1.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR—ASM: N5TC, SEC: K5DG, STM: K5QEW, PIO: W5U2J, ACC: W5BYDD, BM: W5OVH, OOC: W5AZJL, TC: N2ZU. San Antonio ARC reports K5SSB has been re-elected president; K5AQQ and K5B5ATR upgraded to Technician; 1 applicant went from unlicensed to General, 2 went from unlicensed to Novice plus 19 went from credit and 1 to 5 wpm credit. PIA N5FJX reports K5F50 is NARS president for 1987; 440 MHz and 2 meter repeaters planned; N5FEX is looking for address of Nigerian ARS for sister club project so help if you can. PIA K5PFE reports he has been elected Lakes Area ARC (Jasper) president; several club members on Jasper County Emergency Corps, a volunteer Search & Rescue organization. Bryan ARC had ARRL publicservice announcement aired on KBTX-TV; received good response, some from as far away as Houston. EC W5ARNV reports conducting regular training for emergency communications. OOC W5AZJL runs regular code practice Wednesday and Friday evenings on the 148 1070 repeater; response is excellent; he reports W5C5 and K5B5V are new OOs; San Antonio ARC has applied for ARRL affiliation. DRN5 Mgr W5BYDD reports 1304 messages in 62 sessions; STX represented 100% by W5CTZ, N5XV, K5B5Q, N5DFO, A5JK, W5KLV, N5VJ, K5E5Z, W5B5EA, W5B5FU, W5AZJY, N5B5H, K5Q5W, W5B5YD, N5J5J, Seguin, using packet; local packet digipeater DEG receiving increased use; club holds exam sessions at 6-week intervals; ex W5EXC and ex W5ABJR passed to Technician, await licenses. El Paso ARC reports great success with 8th BUN parade. OBS W5KLV reports 12 ARRL bulletins, 29 satellite bulletins, 5 propagation forecasts, 4 DX bulletins, 4 CPRL bulletins given 155 readings on 9 nets. Brady ARC Hot Hog News reports W5B5NM upgraded to Extra. N5HCl upgraded to Advanced. PIO W5U2J and Art W5C5D visited Bay Area ARC; report BAARC provides emergency back-up communication for local police, maintain liaison with Red Cross and run 3 emergency repeaters; expect more ARRL Field participation from BAARC. CAND Mgr W5KLV reports 1300 messages in 31 sessions; DRN5 represented 100%; STX stations W5B5EA, W5B5FU, W5KLV, K5B5Q, N2ZU, N5XV, K5WOB, K5E5Z, W5CTZ, W5AZJY, W5B5YD, N5CRU, N5DFO, A5JK helped. 7290 Traffic Net secretary W5D5CVX reports 50 sessions in December with 3041 check-ins, 1315 messages; 1986 had 572 sessions, 32,710 check-ins and 7178 messages. CONGRATULATIONS TO: NUL UPGRADERS!! TC N2ZU reports Sam Houston ARK (SHARKS) sent about 1600 Christmas messages from Texas State Prison, Huntsville; eight members should earn BPL certificates; K5K5W has been allowed to set up a station at M.D. Anderson Hospital, Houston where he can handle all sorts of traffic and phone patches to bed-ridden patients. Traffic: N2ZU 1590, W5BYDD 629, A5JK 562, W5KLV 411, N5IKW 346, W5TFB 311, K5A5TD 302, W5CTZ 285, K5BAFD 256, K5BNX 208, K5FLA 206, W5D5GKH 187, W5B5EA 136, W5B5FU 116, W5AZJL 104, W5BGE 103, W5B5 87, W5SKR 80, A5C5Z 78, K5DG 63, W5AGZ 39, N2ZU 23, N5HOC 46. (Nov.) N5HOC 18.



SAVE TIME and MONEY with THE HAZER

Bring things down for safety and convenience.

Never climb your tower again with this elevator system. Antennas and rotator mount on HAZER, complete system trams tower in verticle upright position. Safety lock system operates while raising or lowering. Never can fall.

Complete kit includes winch, 100 ft. of cable, hardware and instructions. For Rohn 20 and 25 G Towers.

Hazer 2 - Heavy duty alum. 12 sq. ft. load \$297.00 ppd.
Hazer 3 - Standard alum. 8 sq. ft. load \$213.00 ppd.
Hazer 4 - Heavy galv. steel 16 sq. ft. load \$278.00 ppd.
Ball Thrust bearing TB-25 for any of above \$42.50 ppd.

KENPRO Antenna Rotors

KR-400 11 sq. ft. Azimuth Rotor \$214.95 ppd.
KR-600 19 sq. ft. Azimuth Rotor \$298.95 ppd.
KR-2000 27 sq. ft. Azimuth Rotor \$549.95 ppd.
KR-5400 A-Z-EL. Satellite Rotor \$399.95 ppd.
KR-001 C-84 Computer Interface \$159.95 ppd.

Send for free details of aluminum towers specifically engineered for use with the Hazer.

Satisfaction guaranteed. Call today and charge to Visa, MasterCard or mail check or money order.

GLEN MARTIN ENGINEERING INC.
P.O. Box Q 253
Boonville, MO 65233
816-882-2734

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. This includes firms or individuals offering products or services for sale. A special rate of 25 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" x 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 August 14 through September 13 will appear in November 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 their advertising before their 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 characters 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

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 the 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.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't, police etc. invited to join Society of Wireless Pioneers—W7GAQ/6 Box 530, Santa Rosa, CA 95402.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites you to inquire and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: F.A. Dunlap (S.P.A.M.), 14113 Stoneshire, Houston, TX 77060 (S.A.S.E. please).

FCC EXAMS. Novice-Extra. Sunnyvale VEC ARC. 408-255-9000, 24/hr. Gordon, WGNL6, Pres. Flea Market, Los Altos, CA March-September.

FIND OUT what else you can hear on your General Coverage Transceiver or Receiver. Join a shortwave radio listening club. Complete information on major North American clubs and sample newsletter \$1. Association of North American Radio Clubs, P.O. Box 462, Northfield, MN 55057.

THANK YOU for attending Warren, Ohio Hamfest. See you August 16, 1987. W.A.R.A.

HAMFEST TICKETS. Printed Quickly, Cheaply! Samples SASE. Howelab, Box 73, Folly Beach, SC 29439.

QSL CARDS/RUBBER STAMPS/ENGRAVING

CANADIANS QSL samples \$1 (refundable) M.Smith, VE7FI, Box 1376, Delta, BC V4M 3T3.

POST CARD QSL Kit - Converts Post Cards, Photos, to QSLs! Stamp brings circular. Labelcraft, P.O. Box 31, East Schodack, NY 12063.

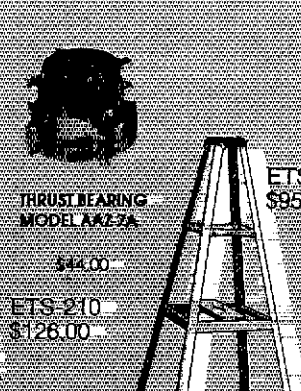
DON'T buy QSL cards until you see my free samples-or draw your own design. I specialize in custom cards. Send black and white sketch; will give quote. Little Print Shop, Box 1160, Pluegerville, TN 78660.

FREE samples—stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & RUBBER STAMPS. Top quality. QSL samples and stamp information 50 cents. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

ELECTRONIC EQUIPMENT BANK

516 Mill Street NE
Vienna, VA 22180 USA



THRUST BEARING
MODEL AAZ-7A
\$44.00
ETS-210
\$126.00

ETS-180
\$95.00

CALL FOR PRICES!

UPS SHIPPABLE

ALINCO "Quad Pod" the perfect match for today's antenna installations. The OSCAR systems light HT beams, VHF-UHF beams, 4 beam, 8 beam, rotor plate accepts optional ground bearing, lightweight, durable aluminum construction—easy installation.

ROHM	ETS-180	ETS-210
2835	10' sect	12' sect
2806	10' sect	12' sect
2836	10' sect	12' sect
2808	2 1/2' 2nd sect	2 1/2' 2nd sect
2838	10' sect	12' sect
2809	2 1/2' top sect	2 1/2' top sect
2839	Access shell	Access shell
2840	Access shell	Access shell
2841	Access shell	Access shell
2842	Access shell	Access shell
2843	Access shell	Access shell
2844	Access shell	Access shell
2845	Access shell	Access shell
2846	Access shell	Access shell
2847	Access shell	Access shell
2848	Access shell	Access shell
2849	Access shell	Access shell
2850	Access shell	Access shell
2851	Access shell	Access shell
2852	Access shell	Access shell
2853	Access shell	Access shell
2854	Access shell	Access shell
2855	Access shell	Access shell
2856	Access shell	Access shell
2857	Access shell	Access shell
2858	Access shell	Access shell
2859	Access shell	Access shell
2860	Access shell	Access shell
2861	Access shell	Access shell
2862	Access shell	Access shell
2863	Access shell	Access shell
2864	Access shell	Access shell
2865	Access shell	Access shell
2866	Access shell	Access shell
2867	Access shell	Access shell
2868	Access shell	Access shell
2869	Access shell	Access shell
2870	Access shell	Access shell
2871	Access shell	Access shell
2872	Access shell	Access shell
2873	Access shell	Access shell
2874	Access shell	Access shell
2875	Access shell	Access shell
2876	Access shell	Access shell
2877	Access shell	Access shell
2878	Access shell	Access shell
2879	Access shell	Access shell
2880	Access shell	Access shell
2881	Access shell	Access shell
2882	Access shell	Access shell
2883	Access shell	Access shell
2884	Access shell	Access shell
2885	Access shell	Access shell
2886	Access shell	Access shell
2887	Access shell	Access shell
2888	Access shell	Access shell
2889	Access shell	Access shell
2890	Access shell	Access shell
2891	Access shell	Access shell
2892	Access shell	Access shell
2893	Access shell	Access shell
2894	Access shell	Access shell
2895	Access shell	Access shell
2896	Access shell	Access shell
2897	Access shell	Access shell
2898	Access shell	Access shell
2899	Access shell	Access shell
2900	Access shell	Access shell

MODEL	ETS-180	ETS-210
Base For Hoisting (top)	2"	2"
Max. Clearing Width (top)	27"	210"
Actual Height	5'3"	6'6"
Angle	60°	80°
Legs	Adjust. cable 3/8"	Adjust. cable 3/8"
Weight	22 lbs	28 lbs

4 band trap vert	128.95	150.00
5 band trap vert	106.95	130.00
4 band trap vert	84.95	100.00
5 band trap vert	118.95	140.00
10m-15m resonator	11.95	15.95
super resonator	15.95	21.95
300m. std. resonator	16.95	22.95
std. and super	17.95	23.95
75 or 80 std	18.95	24.95
75 or 80 super	19.95	25.95
stainless ball mt	20.95	26.95
stainless ball & spring	21.95	27.95
quick disconnect	22.95	28.95
2mt. 5/8 mag. mt	23.95	29.95
truck mt. w/wheel	24.95	30.95
ball	25.95	31.95
AND MORE!		

RTTY-AMTOR Packet

RTTY-AMTOR-PACKET
EEB is one of the few Amateur dealers that actually demonstrates the latest high tech equipment. We test every new item and only sell what we feel confident with. If you are considering Packet, call us and we'll sell you the best. (Ask for Scott, WR4S or Ted, AA4GM at 703-838-3350). If you are in the DC area, stop in and marvel at our dedicated RTTY room.

PAKRATT PK-64 - World's Best Price/Performance Ratio
The Pakratt 64 is the world's first five mode in one Amateur Radio smart data controller \$219.95.

NEW! PK-80 Packet Controller
Thru RS-232C board factory wired for all RS-232C compatible computers. Now at \$219.95.

CP-1 AEA Computer Patch™ Interface
Convert your personal computer and transceiver into a full featured RTTY station w/ the CP-1 Computer Patch interface and software by AEA. Now available for the Commodore 64. Complete with cables for the AEA CP-1.

* Keyboard overlays and manual \$ CALL
* RS-232 option available

KANTRONICS LTD
Now Available at EEB
* Can be used on CW, ASCII, AMTOR and RTTY.
* Easy for beginners.

BIRD

EEB is Bird's No. 1 East Coast Dealer. Large inventory. Package Deal \$ CALL. Bird 43—elements—loads

CABLE & CONNECTORS	per ft.
Belden 9913	Low Loss
Columbia RG 213	50 Ohm
RG8U	75 Ohm
RG 58	50 Ohm
RG59U	72 Ohm
PL 250 Silver	1.10/1.20
9M Male for BU	4.00
9M Female UHF/F	4.90
AND MORE!	

Alpha Delta Twin Sloop 100-10M	49.95
Larsen K04-150-HQ	150.00
Larsen Dual Banders	38.45
Ant. Spac. AP151 3G	34.50
Panda Five	14.95
Stainless Ball DX80	69.95
Hustler UGM	19.95
Urbana Dual Band	51.00
Butternut HF4B	204.00

ANTENNA

CR2A	2M Mag MT	41.00
CR3A	220 MHz Mag MT	37.00
CR4A	440 MHz Mag MT	34.00
CR2B	Radome Cover	12.00
CABLE IS NOT INCLUDED		

CR2A	2M Mag MT	41.00
CR3A	220 MHz Mag MT	37.00
CR4A	440 MHz Mag MT	34.00
CR2B	Radome Cover	12.00

ELECTRONIC EQUIPMENT BANK

516 Mill Street NE
Vienna, VA 22180 USA

Prices & specs subject to change. Shipping charges not included. 2 weeks for delivery. Returns subject to 20% restock charge. ORDER TOLL FREE 800-368-3270. Tech Info—VA orders 703-838-3350. NO C.O.D.s

AA	4' el. triband	300.00
AA	3' el. triband	224.00
BB	10-15-20 remote tuned vert	275.95
BB	4 band trap vert	105.00
BB	18 el. 2mt boom	87.95
BB	18 el. wide band 2mt boom	87.95
BB	24 el. 70cm boom	83.95
BB	18 el. OSCAR 435 MHz	83.95
BB	10 el. OSCAR 145 MHz	80.00
BB	OSCAR pack 2mt & 70cm	83.00
BB	2mt vert. rmpo	150.00
BB	2mt vert. rmpo rmpo	24.50
BB	2mt vert. rmpo rmpo	31.00
BB	2mt vert. rmpo rmpo	37.00
BB	80-10 vertical	125.00
BB	80-40 vertical	174.00
BB	2MT vertical	32.95
BB	rot mtg. kit	41.95
BB	180m. and mt	45.00
BB	mtg. post sleeve	5.00
BB	AND MORE!	

RM10S/RM15S	300.00
RM20/RM20S	224.00
RM30	275.95
RM40/RM40S	105.00
RM75/RM80	87.95
RM75S/RM80S	87.95
BM-1	83.95
SBM-2	83.95
89M-1	80.00
OD-1	83.00
SGM-2	83.00
HOT	150.00
AND MORE!	
VAN GORDEN	
PO8010	80-10 dipole kit
PO8040	80-40 dipole kit
PO4010	40-10 dipole kit
SO80	80 shortened dipole
SO40	40 shortened dipole
160-10kit	160-10kit
AND MORE!	
LARSEN	
LM150MM	2M mag. mt.
NLA150MM	2M mag. mt.
NM0150MM	2M mag. mt.
AND MORE!	
THIS IS ALL THAT'S LEFT	
YET	
FB43SP	41.15 10. 3 el.
MV34H	7.21 28 vert.
MV34HR	7.21 28 vert.
MV34HR	14.22 28 vert.
NLA-4	loop 3.5/7/14/28
QD-10	28 MHz Swiss Quad
KLN	
KT34A	triband 4 el.
RT340X	triband 5 el.
2M-14C	2mt. satellite
2M-22C	2mt. satellite
435-18C	70cm satellite
435-40CX	70cm satellite
432-30LBX	70cm satellite
2M-13LBA	2 meter
2M-16LBA	2 meter
DIAMOND DISCOUNT	
RECEIVING ANTENNA	
ideal for ICOM R-7000 w/ YAESU	
FRG-9500D	
Continuous coverage from	
28 MHz-1300 MHz	
80 ft coax included	
CALL FOR PRICE	



Get Wind of These

You'll find us in Timonium, Maryland, March 28 & 29

EGE VIRGINIA
13646 Jefferson Davis Highway
Woodbridge, Virginia 22191
Information: (703) 643-1063
Service Department: (703) 494-8750

Store Hours:
M-Th: 10 a.m. - 6 p.m.
F: 10 a.m. - 8 p.m.
Sat: 10 a.m. - 4 p.m.

Order Hours: M-F 9 a.m. - 7 p.m.
Sat 10 a.m. - 4 p.m.

EGE NEW ENGLAND
8 Stiles Road
Salem, New Hampshire 03079
New Hampshire Orders:
Information & Service: 1603) 898-3750

Store Hours:
MTWTF: 10 a.m. - 4 p.m.
Th-F: 12 noon - 8 p.m.
Sun: Closed

*Order and we'll credit you \$1 for the call.

**New Improved
Buyer's Guide/
Catalog - Send \$1**



Our associate store
Davis & Jackson Road, P.O. Box 293
Lacombe, Louisiana 70445
Information & Service: (504) 882-5355



Terms: No personal checks accepted.
Prices do not include shipping. UPS
cost fee \$2.35 per package. Prices are
subject to change without notice or
obligation. Products are not sold for
evaluation. Authorized returns are
subject to a 15% restocking and
handling fee and credit will be issued
for use on your next purchase. EGE
supports the manufacturers' warranties.
To get a copy of a warranty prior
to purchase, call customer service at
203-643-1063 and it will be furnished
at no cost.

Dealer Inquiries Invited

**Hard to get
through on our
800 number?**

Call before 10 a.m. or after 5 p.m.,
or call one of our regular numbers if
you pay for the call and order,
we'll credit your order with \$1



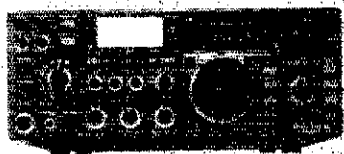
IC 751A
HF Transceiver with
General Coverage Receiver

Micro 2AT
Mini 2m Handheld
Now in Stock



**NEW
IC 12AT**
for 1-2 GHz

IC 3200
2m/440 MHz Mobile



IC 745
HF Transceiver with
General Coverage Receiver



IC 02AT/04AT
Handheld for 2m/440 MHz



R 7000
General Coverage Receiver



R 5000
General Coverage Receiver

NEW TH-205AT
2m 5-Watt Handheld



TS 940S
HF Transceiver with
General Coverage Receiver



TH-215AT
2m FM Handheld



TS 430S
HF Transceiver with
General Coverage Receiver
NEW LOW PRICE - CALL

**EXTENDED
SERVICE
AGREEMENTS
AVAILABLE**



New TS 440
HF Transceiver
with Antenna Tuner



**1st
Anniversary
Sale**

March 7 & 8 at the
New Hampshire Store
Factory Reps: Cushcraft,
Yaesu, Kenwood, Yaesu

BEARCAT

100XL 16-channel handheld	199.95
800XL 40-ch, 800 MHz	319.00
145XL 16-ch, 10-band	99.95
175XL 16-ch with aircraft	154.95
20XL 10-ch, handheld	120.00
210XLW	199.95

UNIDEN

Radar Detectors	Call
CB Radios	Call

SONY

2002 SWL Receiver	210.95
2010 SWL Receiver	310.95
4810 SWL Receiver	89.95

PANASONIC SWL CALL

COBRA CBs/RADAR DETECTORS CALL

MIDLAND CBs CALL

WHISTLER RADAR DETECTORS

HARDWARE

MEJ 1224 with MEJ C-64/V-20 Soft	85.95
MFJ New 1229	159.95
Kantronics Interface II	210.95
Kantronics UIU Interface	189.95
Kantronics UIU-XT	279.95
New Microlog ART-1	Call

SOFTWARE

Kantronics Hamtext Vic-20, C-64, Apple, Atari	Call
Kantronics Hamssoft Vic-20, Apple, Atari, TI-99	Call
Kantronics Hamssoft/Amtor Vic-20, C-64, Atari	49.95
Kantronics Amtorsoft vic-20, C-64	79.95
Apple	119.95
Microlog Air Disk vic-20 and C-64 Disk	39.95
Cartridge	56.95

PACKET

MFJ 1270 Packet	129.95
Kantronics Packet PK12	154.95
New Kantronics KAM	299.95
Kantronics KPC2400	Call
Kantronics 2400 TNC Modem	Call

Call for Models and Price Quotes

Amateur Software for the VIC-20 and Commodore 64
Specify tape or disk

VIC-20	C-64
Contest Log	24.95 / 24.95
Antenna Design	9.95 / 9.95
Computer Morse	9.95 / 9.95
Propagation Chart	16.95 / 16.95
Sayer Log	19.95 / 19.95
Net Controller	16.95 / 16.95
DX Tool Kit	24.95 / 24.95
Master Log (Disk)	28.95 / 28.95

March 7 & 8 at the
New Hampshire Store
Factory Reps: Cushcraft,
Yaesu, Kenwood, Yaesu

**TE SYSTEMS
RF AMPLIFIERS**

With receive
GaAs FET Preamplifier
for superior weak signal
reception with improved
strong signal
intermod rejection.



ege, inc.
Your Factory
**Authorized Service
Center for Icom,
Yaesu, & Kenwood**

EGE offers extended service
contracts on Yaesu, Kenwood,
and Icom products. Prices from
\$10-25. Ask for details.

1410G 2m Amp 10W in-160 out	309.00
1412G 2m Amp 30W in-160 out	269.00
4410G 440 Amp 10W in-100 out	309.00
4412G 440 Amp 30W in-100 out	309.00

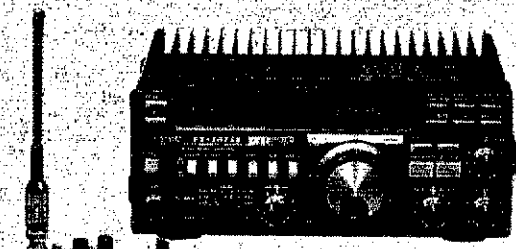


For Orders and Quotes Call Toll Free: 800-336-4799
In New England Call 800-237-0047
In Virginia call 800-572-4201

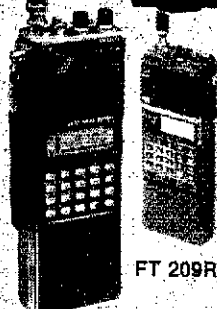
High-Flying Savings

You'll find us in Charlotte, North Carolina, March 21 & 22

YAESU



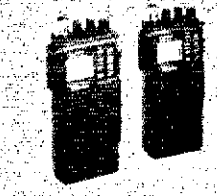
FT 757GX
HF Transceiver with
General Coverage Receiver.



FT 209RH

NEW FT 727R
2m/440 MHz Dual Band HT

NEW FT23/73 Palmate
2m/440 MHz Mini Handhelds



FRG 9600
Scanning Receiver
for 60-905 MHz FM/AM/SSB



NEW FT 767GX
All Mode Transceiver
with CAT System.



FRG 8800
General Coverage Receiver
All mode 150KHZ-30MHz

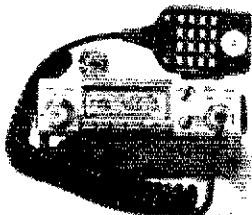
ASK FOR QUOTES ON RADIO/ ACCESSORY PACKAGES

SANTEC

ST-20T
2m HT

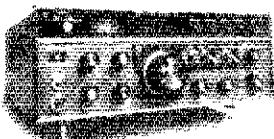


KDK



FM240 2m, 25-watt

TEN-TEC



CORSAIR II Model 561



RX-325 Short Wave Receiver

Mobile HF Antennas
Call for Ten-Tec Prices

ANTENNAS & TOWERS

Unarco-Rohn

Limited Quantities

CUSHCRAFT

A3 3-element 10-15-20m	217.95
A4 4-element 10-15-20m	292.95
R3 10-15-20m Vertical	268.95
215WB SSB/FM 2m Boomer	82.95
ARX-2B 2m Ringo Ranger	36.50
4218XL 2m Boomer	103.95
10-4CD 4-element 10m	111.95
15-4GD 4-element 15m	125.95
40-2CD 2-element 40m	286.95
Other Cushcraft models available	CALL

KLM

KT34A 4-element 10-15-20m	Call
KT34XA 6-element 10-15-20m	Call
2m-11X 11-element 2m	Call
2m-16LBX 16-element 2m	Call
432-30LBX 30-ele 440 MHz	Call
Fiberglass mast 5'	Call
Fiberglass mast 7'	Call

MOSLEY

CL-13 3-element Triband Beam	265.95
TA-33 3-element 10-15-20m	239.95
Pro 37 7-element 10-15-20m	465.95
Pro 57 10-12-15-17-20m	465.95
Pro 67 10-12-15-17-20-40m	579.95

HUSTLER

6-BTV 10-80m Vertical with 30m	128.95
6-BTV 10-80m Vertical	108.95
4-BTV 10-40m Vertical	87.95
G6-440 440 MHz Base Vertical	99.95
G7-144 2-meter Base Vertical	115.95
G6-144B 2m Base Vertical	87.95
MO-1/MO-2 Masts	21.50
RM-1 Bumper Mount	14.95
MURBIL RESONATORS Standard	Super
10 and 15 meter	11.95 17.95
20 meters	15.50 21.85
30 and 40 meters	17.95 25.95
75 meters	19.95 36.95

HY-GAIN ANTENNAS

3915 TH7DX 7-ele 10-15-20m	CALL
3935 TH5DX 5-ele 10-15-20m	CALL
3955 Explorer 14 10-15-20m	CALL
2035 3-element 2-meter Beam	CALL
2085 8-element 2-meter Beam	CALL
2145 14-element 2-meter Beam	CALL
BN86 Beam Bait	CALL
V25 2-meter Vertical	CALL
V45 440 MHz Vertical	CALL

MORE ANTENNAS

AVANTI HM 151 3G 2m On-glass	32.50
LARSEN LM-150 5/8 Mag Mount	39.95
BUTTERNUT HF6V 10-80m Vert	119.95
BUTTERNUT HF4B 2-ele Beam	189.95
BUTTERNUT 2MVC5 2m	42.75
VOCOM 5/8-wave 2m Handheld	15.95

ANTENNAS FOR OSCAR

Cushcraft 416TB 1 twist	59.95
Cushcraft A14410T 10-ele	53.30
Cushcraft A14420T 20-ele	76.95
Cushcraft ADP1 Package	149.95
KLM 2m-14C 2m 14-ele Circular	86.95
KLM 435-18C 18-ele Circ Polar	111.19
KLM 2m-22C 22-ele Circ 2m	109.00

Self-supporting towers:

HDX40 40-foot with Base	209.95
HDX48 48-foot with Base	279.95
HDX56 56-foot with Base	349.95
HDX40 Higher load with Base	259.95
HDX48 Higher load with Base	339.95

Other BX, HBX, HDBX in stock

Guyed foldover towers:

FK2558 58-foot, 25G	940.00
FK4554 54-foot, 45G	1296.00

Other sizes at similar savings. Foldovers shipped freight paid, 10% higher west of the Rockies.

Straight Sections:

20G Straight Section	39.95
25G Straight Section	49.95
45G Straight Section	110.95

Complete Tower Packages:

25G	45G
40'	Call
50'	Call
60'	Call

Each package includes top section, mid section, base, rotor shelf, guy brackets, guy wire, turnbuckles, equalizer plates, guy anchors, cable clamps, thimbles. Ask about substitutions and custom designs. Tower packages are shipped freight collect FOB our warehouse.

HY-GAIN TOWERS

HG37SS 37-foot tall	CALL
HG52SS 52-foot tall	CALL
HG54HD 54-foot/higher load	CALL
HG70HD 70-foot/higher load	CALL

Order Hy-Gain tower, Hy-Gain antenna, and Hy-Gain rotor and receive free shipping on all

Tri-Ex

W3b 36-foot tall	549.00
WT51 51-foot tall	929.00
LM354 54-foot/higher load	1575.00

Shipping not included. Shipped direct from factory to save you money

PHILLYSTRAN CALL

CABLE BY SAXTON

RB213 Mil Spec	29¢/ft
H88/U Foam 95% Shield	25¢/ft
8-wire Rotator 2 #18 6 #22	17¢/ft
Mini 8 95% Shield	13¢/ft

Cablewave Hardline CALL

ROTATORS

Diawa Rotators available	CALL
Alliance HD73	109.95
Calirot HF-Gain Ham IV	CALL
Hy-Gain Talltwister T4	CALL
Hy-Gain Heavy-duty 300	CALL
Kenpro KR500 Elevation Rotator	189.95
Kenpro KR500 azimuth/elevation	329.95

MIRAGE

B23A 2m Amplifier 2-30	120.95
B1016 2m Amplifier 10-160	249.95
B3016 2m Amplifier 30-180	219.95
O1010 10-100 Amp for 430-50	299.95
O1010N UHF Amp/N connectors	299.95
B215 2m Amp 2 in, 150 out	249.95
A1015 6m Amp: 10 in, 150 out	289.95

AMERITRON HF AMPS

ATR15 Ant Tuner 1500 watt	Call
A1H10 Ant Tuner 1 kW	Call
RCS8 Remote Coax Switch	Call
NEW AL1200 1.5 kW Amp	Call
NEW AL80A 1200 watt Amp	Call
AL84 HF Amp 180-15	Call

AMP SUPPLY

LA 1000A 160-15m Amp	Call
LK 500BNT HF Amp no tune	Call
AT 1200A 1200 PEP Tuner	Call
LK 500ZC 2.5 kW hipersit	Call

This is a partial list— IF YOU DON'T SEE WHAT YOU WANT...CALL

DAIWA

LA-2065R 2m Amp, 2 in, 60 out	125.95
LA-2035R 2m Amp with preAmp	74.95

VOCOM AMPLIFIERS

2 watts in, 30 watts out 2m Amp	69.95
2 watts in, 60 watts out 2m Amp	107.95
2 watts in, 120 watts out 2m Amp	169.95
200mW in, 30 watts out 2m Amp	84.95

KENWOOD TL922 2kW CALL

ASTRON POWER SUPPLIES

RS7A	49.95	RS20M	104.95
RS12A	69.95	RS35M	149.95
RS20A	89.95	VS20M	124.95
RS35A	133.95	YS35M	169.95
RS50A	189.95	RS50M	209.95

BENCHER PADDLES

Black/Chrome	51.95/61.95
--------------	-------------

B & W

375 6-position Coax Switch	24.50
376 5-position Coax Switch	24.50
425 1 kW Low Pass Filter	28.50
593 3-position Coax Switch	25.25
595 6-position Coax Switch	29.95
4F-10.5-band Apartment Antenna	39.95
370-15 All-band Dipole Antenna	129.95

—Other antennas in stock—

DAIWA

CN-520/CN-540 Meters	59.95/69.95
NS-660A SWR/Watt Meter	134.95
CN-630 Meter	126.00
CN-720B 2kW HF Watt Meter	120.00
CN-419 Antenna Tuner 500 W	174.95
CN-518 Antenna Tuner 2.5 kW	279.95
CN410M SWR/wt mtr 3.5-150 MHz	64.95
CS201 2-position Switch	21.95
CS401 4-position Switch	64.95

TELEX HEADPHONES

Procum 350 ultra light set	58.95
Procum 250 soft phone/mike	72.90
Procum 400 padded phones	35.50
Procum 400 desk mike	49.95
Procum 460 padded phones	37.20
SWL-610 light headphone	8.75
G-610 light headphone	7.95

Others in stock Please Call

BIG DISCOUNTS

MFJ PRODUCTS

989 3 kW Antenna Tuner	295.95
962 1.5 kW Tuner switch/meter	189.95
949C 300-watt Deluxe Tuner	129.95
941D 300-watt Tuner swch/meter	89.95
1020A Active Antenna	69.95
202B Noise Bridge	48.95
752B Dual Tunable SSB/CW Filter	79.95
Keys-407, 422, 484	CALL
Other MFJ products in stock	CALL

AMPHENOL CONNECTORS

8318P PL 259 silver	1.25
8315P 1050 Nickel PL259	0.95
8261 Type N RG8	2.50
2900 50239-BNC	2.99
3112 BNC RG59	1.35
312 BNC RG58	1.25
8318S Reducer RG58	0.25
8316B Reducer RG59/mmi 8	0.25
831R UHF panel	0.79

Special discounts on 100-piece purchases

BK PRECISION

TEST EQUIPMENT

Oscilloscopes
Digital Multi Meters
Telephone Test Equipment
Function Generators

Now in stock CALL

For Orders and Quotes Call Toll Free: 800-336-4799
In New England Call 800-237-0047 In Virginia Call 800-572-4201

here is the next generation Repeater

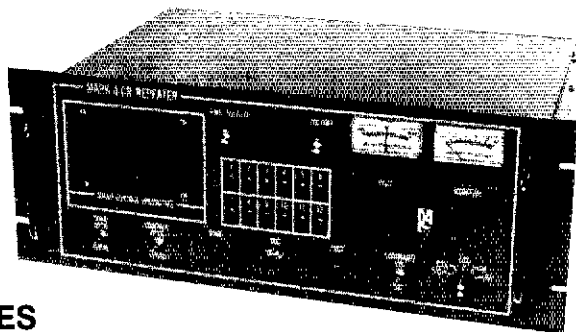
MARK 4CR

No other repeaters or controllers match Mark 4 in capability and features. That's why Mark 4 is the performance leader at amateur and commercial repeater sites around the world. Only Mark 4 gives you Message Master™ real speech • voice readout of received signal strength, deviation, and frequency error • 4-channel receiver voting • clock time announcements and function control • 7-helical filter receiver • extensive phone patch functions. Unlike others, Mark 4 even includes power supply and a handsome cabinet.

Call or write for specifications on the repeater, controller, and receiver winners.

The **only** repeaters and controllers with REAL SPEECH!

Create messages just by talking. Speak any phrases or words in any languages or dialect and *your own voice* is stored instantly in solid-state memory. Perfect for emergency warnings, club news bulletins, and DX alerts. Create unique ID and tail messages, and the ultimate in a real speech user mailbox — only with a Mark 4.

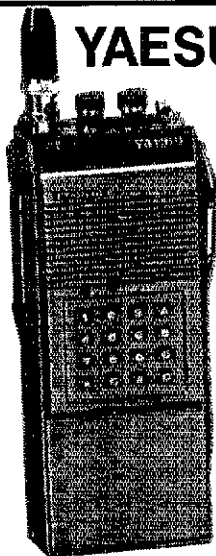


MICRO CONTROL SPECIALTIES

Division of Kendecom Inc.

23 Elm Park, Groveland, MA 01834 (617) 372-3442

YAESU FT-703R/TTP UHF Handheld CLOSEOUT



- 440-450 MHz FM
- 2½ Watts Output
- Compact/lightweight

Frequency selection by three-digit thumbwheel, and +5 upshift button on top, and simplex or standard repeater shift switch on rear panel. Optional FTS-7 37-tone programmable CTCSS unit. Built-in VOX system provides voice actuated transmit/receive switching when using the Optional YH-2 Headset. S/PO meter, 2¼" w x 1¼" d x 4" h, 1.1 lbs. Supplied with 425ma. 10.8V battery, wall charger, flexible antenna and strap.

SAVE \$130

List \$299⁹⁵

Closeout \$169⁹⁵

Accessories:

FTS-7 CTCSS Encoder/decoder .. ***SPECIAL! \$299⁹⁵**

*Only when purchased with FT-703R or 203R, otherwise .. \$49⁹⁵

FNB-3 Extra 425ma. 10.8V battery **499⁹⁵**

NC-15 Desk quick charger/AC supply... **SALE 849⁹⁵**

NC-9B Extra wall charger for FNB-3 **99⁹⁵**

FBA-5 'AA' alkaline battery holder **149⁹⁵**

MH-12A2B Speaker/microphone **399⁹⁵**

YH-2 VOX headset (required for VOX operation) .. **269⁹⁵**

PA-3 Mobile adaptor and charger..... **399⁹⁵**

MMB-21 Mobile mounting bracket..... **149⁹⁵**

WB-2 Waterproof HT baggie **299⁹⁵**

FT-203R/TTP 2m version - Closeout \$199⁹⁵

★ Quantity Limited - Order Today! ★ MASTERCARD/VISA

Order Toll Free: 1-800-558-0411

In Wisconsin (outside Milwaukee Metro Area)

1-800-242-5195

AMATEUR ELECTRONIC SUPPLY[®] Inc.

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 - Phone (414) 442-4200

AES BRANCH STORES

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 (305) 894-3238

Fla. WATS 1-800-432-9424

Outside Florida 1-800-327-1917

CLEARWATER, Fla. 33575

1898 Drew Street

Phone (813) 461-4267

No In-State WATS

No Nationwide WATS

LAS VEGAS, Nev. 89106

1072 N. Rancho Drive

Phone (702) 647-3114

No In-State WATS

Outside Nevada 1-800-634-6227

CHICAGO, Illinois 60630

ERICKSON COMMUNICATIONS

5456 N. Milwaukee Avenue

Phone (312) 631-5181

15 min. from O'Hare!

EMBROIDERED EMBLEMS, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

QSLs-1) FAMOUS KBAAB custom collection. 2) Railroad employees and railfan's specials. 3) Front report styles. 4) Multiple call signs. 5) Ham business cards. State your sample wants. 39 cents self addressed business size envelope required. Mary Mahre, W4MGI, 2095 Prosperity Ave., St. Paul, MN 55109-3621.

QSLs SAMPLES 40 cents (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

BE SURPRISED-get a variety of cards - 100 for \$8 or 200 for \$13. Samples \$1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

FREE, 100 QSLs with first order. Samples 50c. Gazebo Press, Rt. 4 Box 4148, LaPlata, MD 20646.

ENGRAVING: CALLSIGN/name badges by W0LQV. SASE for price sheet. Box 4133, Overland Park, KS 66204.

CADILLAC of QSLs—Completely different! Samples \$1. (refundable). Mac's Shack, P.O. Box 43175, Seven Points, TX 75143.

PICTURE QSL CARDS of your shack, etc. from you photo or black ink artwork. 500 \$24; 1000 \$36.50. Also non-picture cards. Customized cards, send specifications for estimate. Send two stamps for illustrated literature. Generous sample kit \$2; half pound of samples \$3. Raum's, RD 2, Orchard Road, Coopersburg, PA 18036. Phone: 1-215-679-7238.

QSLs QUALITY and Fast Service for 28 years. Include Call for Decal. Samples 50c. Ray K7HLR, Box 331, Clearfield, UT 84015

BROWNIE QSLs since 1939. Catalog & Samples \$1 (refundable) with order) 3035 Lehigh Street, Allentown, PA 18103.

QSL CARDS - Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSL's, Dept. B, 310 Commercial, Emporia, KS 66801.

QUALITY QSLs, Samples 50c. Olde Press, WB9MPP, Box 1252, Kankakee IL 60901.

QSL CARDS, Free Samples. Shell Printing, KD9KW, P.O. Box 50, Rockton, IL 61072

QSL SAMPLES send \$1 (refundable with order) Box 1262 Point Roberts, WA 98281.

MAGNETIC CALLSIGN... 2' x 8'... Instant transfer car to car! Your call in lettering Black, Blue, Green or Red (white background). Each sign only \$8.50 ppd. Sign-On, Dept. T, 1923 Edward Lane, Merrick, NY 11566

PANEL LETTERS: Sample/Circular 25c. Lettering/Titles for Auto, Train, Plane, Coin Hobbyist. My TYPE Shop, P.O. Box 65 Poestenkill, NY 12140

QSLs, QSLs, Rusprint QSLs Quantities of 100, 200, 300 more Full color Old Glory and Liberty also Parchment, Golden Eagle and others. SASE appreciated, Rt. 1, Box 363-QST, Spring Hill, KS 66083.

NEW IARU - recommended Date Format (Year-Month-Day) available on request. Not responsible for resulting confusion!! Write for free samples. QSLs By W4MPY, 705 Audubon Circle, Belvedere, SC 29841.

FREE QSL card samples-quality cards at low prices, wide selection, design your own. 100 FREE miniature cards with each order. KE7GY, Insta-Copy, Rt. 1, Box 1488, Roosevelt, UT 84086.

ANTIQUE-VINTAGE-CLASSIC

WANTED: old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Ave., Milwaukee WI 53204

MANUALS FOR MOST Hamgear made 1937/1972 plus Kenwood. No quotes. Our current catalog "F" at \$1 required to order. Over 2,000 models listed. HI-MANUALS, P.O. Box G802, Council Bluffs, IA 51502-0802

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Andco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60642.

WANTED: Radio, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201, 818-242-8961.

MICROPHONES AND related memorabilia used in radio/TV broadcasting prior to 1980 wanted. Cash paid: trade terms available. Write: James Steele, 160 West 77th Street, New York, NY 10024-6942.

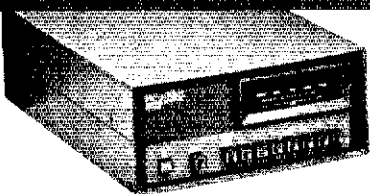
WANTED: QST VOLUME 1. W6ISQ, 82 Belbrook Way, Atherton, CA 94025.

SCHEMATICS: Radio receivers 1920's/60's. Send Brand-name, Model No., SASE Scaramella, Box 1, Woonsocket, R.I. 02895-0001.

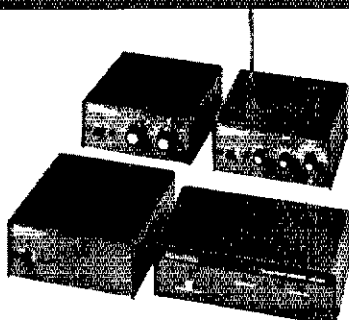
EARLY ELECTRONIC and Mechanical Television Sets, parts, literature wanted for substantial cash. Finder's fee paid for successful leads. Arnold Chase, 9 Rushleigh Road, West Hartford, CT 06117 203-521-5208.

TELEGRAPH BUGS, Keys, and old instruments wanted. Collector seeks most models and variations including military, spark and wireless. Donations of parts, literature, damaged keys appreciated. Write: John Hensley, WJ5J, 5054 Holloway Avenue, Baton Rouge, LA 70808.

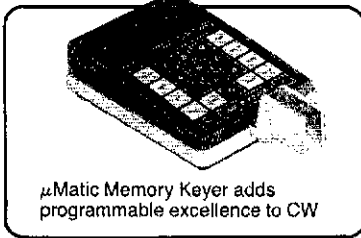
WANTED: McIntosh Tube-type Audio Equipment, Accessories, and literature for personal collection. All inquiries answered; information and appraisals gladly given. Marcus Frisch, WA9IKP, Box 365, Elm Grove, WI 53122-0385. 414-545-6237



"Universal" Terminal Interface for computer or non-computer operation



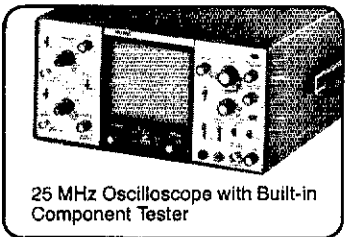
Antenna Noise Bridge/300 kHz to 30 MHz SWL Antenna/VLF Converter/Touch Tone Decoder for Remote Control Reception



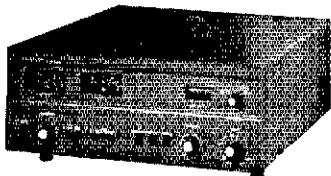
µMatic Memory Keyer adds programmable excellence to CW



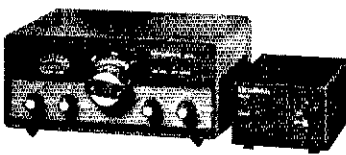
FCC Certified Terminal Node Controller



25 MHz Oscilloscope with Built-in Component Tester



Automatic Antenna Tuner



Deluxe QRP CW Transceiver and Power Supply

Free hi-tech catalog



A very special electronics and computer guide that brings you the exciting world of amateur radio kitbuilding and much more

The Heathkit® Catalog is filled with high-quality HAM radio products that you'll enjoy. Plus you'll get the unique challenge and satisfaction of kitbuilding. So send NOW for your FREE Heathkit Catalog.

Yes! I want to see what kitbuilding can do for me.

Send to: Heath Company, Dept. 009-512 Benton Harbor, Michigan 49022

Name _____
 Address _____
 City _____ State _____
 A subsidiary of Zenith Electronics Corporation AM-448R1 Zip _____



MFJ TUNERS

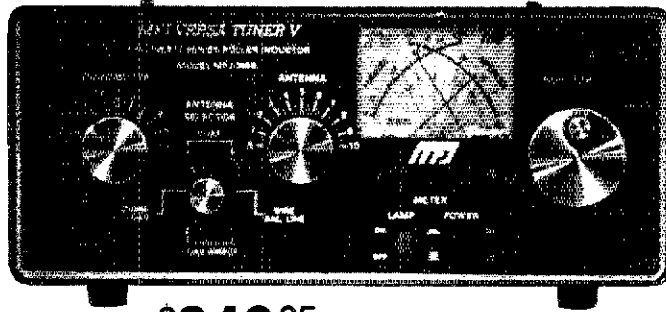
This may be the world's most popular 3 KW roller inductor tuner because it's small, compact, reliable, matches virtually everything and gives you SWR/Wattmeter, antenna switch, dummy load and balun — all at a great price!

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs—only 10 3/4" W x 4 1/2" H x 14 7/8" D.

Matches coax, balanced lines, random wires—1.8 to 30 MHz. 3 KW PEP—the power rating you won't outgrow (250pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.



MFJ989B

\$349.95

Lighted Cross-needle Meter reads SWR, forward and reflected power all in one glance. Has 300 and 3,000 watt ranges. Meter light requires 12 VDC.

6 position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

MFJ's Fastest Selling TUNER

MFJ-941D **\$99.95**



MFJ's fastest selling tuner packs in plenty of new features. New styling! Brushed aluminum front. All metal cabinet. New SWR/Wattmeter! More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

New antenna switch! Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.

New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 RF power output.

Matches everything from 1.8 to 30 MHz! dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ's 1.5 KW VERSA TUNER III

MFJ-962B **\$229.95**

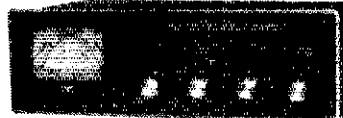


Run up to 1.5 kw PEP and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire.

Lighted Cross-needle Meter reads SWR, forward and reflected power in one glance. Has 300 and 3,000 watt ranges. 6 position antenna switch handles 2 coax lines, wire and balanced lines. 4:1 balun. 250 pf, 6 kv variable capacitors. 12 position ceramic inductor switch. New smaller size matches new rigs: 10 3/4" x 4 1/2" x 14 3/4" inches. Flip stand for easy viewing. Requires 12V for light.

MFJ's Best VERSA TUNER

MFJ-949C **\$149.95**



MFJ's best 300 watt tuner is now even better! The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 100 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

2 KW COAX SWITCHES

MFJ-1702 **\$19.95**



MFJ-1702. \$19.95. 2 positions. 60 dB Isolation at 450 MHz.

Less than .2 dB loss. SWR below 1:1.2.

\$29.95 MFJ-1701

MFJ-1701. \$29.95.

6 positions. White markable surface for antenna positions.



MFJ's Smallest VERSA TUNER

MFJ-901B **\$59.95**



MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines continuously from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier for proper matching. Efficient airwound inductor gives more watts out. 4:1 balun for balanced lines. 5 x 2 x 6 inches. Rugged black all aluminum cabinet.

MFJ's Random Wire TUNER

MFJ-1601D **\$39.95**



MFJ's ultra compact 200 watt random wire tuner lets you operate all bands anywhere with any transceiver using a random wire. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. 2 x 3 x 4 inches.

MFJ's Mobile TUNER

MFJ-945C **\$79.95**



Designed for mobile operation! Small, compact. Takes just a tiny bit of room in your car. SWR/dual range wattmeter makes tuning fast and easy. Careful placement of controls and meter makes antenna tuning safer while in motion.

Extends your antenna bandwidth so you can operate anywhere in a band with low SWR. No need to go outside and readjust your mobile whip. Low SWR also gives you maximum power out of your solid state rig—runs cooler for longer life.

Handles up to 300 watts PEP RF output. Has efficient airwound inductor, 1000 volt capacitor spacing and rugged aluminum cabinet. 8x2x6 inches. Mobile mounting bracket available for \$5.00.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT SATISFIED, RETURN WITHIN 30 DAYS FOR PROMPT REFUND (less shipping).

- One year unconditional guarantee • Made in USA
- Add \$5.00 each shipping/handling • Call or write for free catalog, over 100 products.

MFJ

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

TO ORDER OR FOR YOUR NEAREST DEALER, CALL TOLL-FREE

800-647-1800

Call 601-323-5869 in Miss. and outside continental USA Telex 53-4590 MFJ STKV

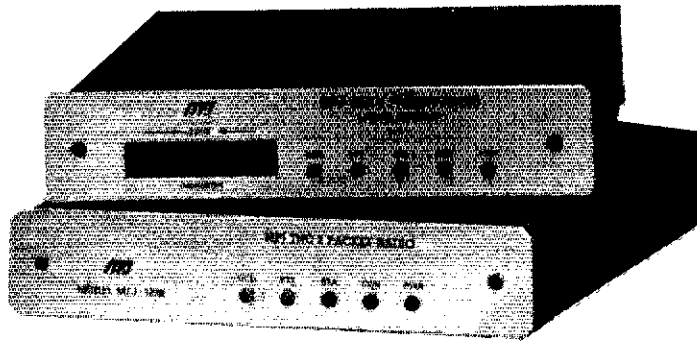


New MFJ-1274 lets you work VHF and HF packet with built-in tuning indicator for \$169.95 . . .

. . . you get MFJ's latest clone of TAPR's TNC-2, TAPR's VHF/HF modem and built-in tuning indicator that features 20 LEDs for easy precise tuning

MFJ-1274
\$169⁹⁵

MFJ-1270
\$139⁹⁵



Now you can join the exciting world of packet radio on both VHF and HF bands with a precision tuning indicator . . . for an incredible \$169.95!

You get MFJ's top quality clone of the highly acclaimed industry standard TAPR TNC-2. We've made TAPR's modem selectable for both VHF and HF operation, added their precision 20 segment LED tuning indicator, a TTL serial port, an easily replaceable lithium battery for memory back-up and put it all in a new cabinet.

If you don't need the tuning indicator or the convenience of a switchable VHF/HF modem, choose the affordable MFJ-1270 for \$139.95.

All you need to operate packet radio is a MFJ-1274 or MFJ-1270, your rig, and any home computer with a RS-232 serial port and terminal program.

If you have a Commodore 64, 128, or VIC 20 you can use MFJ's optional Starter Pack to get on the air immediately. The Starter Pack includes interfacing cable, terminal software on disk or tape and complete instructions . . . everything you need to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape), \$19.95.

Unlike machine specific TNCs you never have to worry about your MFJ-1274 or MFJ-1270 becoming obsolete because you change computers or because packet radio standards change. You can use any computer with an RS-232 serial port with an appropriate terminal program. If packet radio standards change, software updates will be made available as TAPR releases them.

Also speeds in excess of 56K bauds are possible with a suitable external modem! Try that with a

machine specific TNC or one without hardware HDLC as higher speeds come into widespread use.

You can also use the MFJ-1274 or MFJ-1270 as an excellent but inexpensive digipeater to link other packet stations.

Both feature AX.25 Level 2 Version 2 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, multiple connects, 256K EPROM, 16K RAM (expandable to 32K with optional EPROM), simple operation, socketed ICs plus much more.

You get an easy-to-read manual, a cable to connect your transceiver (you have to add a connector for your particular radio), a connector for the TTL serial port and a power supply for 110 VAC operation (you can use 12 VDC for portable, remote or mobile operation).

Help make history! Join the packet radio revolution now and help spread this exciting network throughout the world. Order the top quality and affordable MFJ-1274 or MFJ-1270 today.



MFJ-1273, \$49.95

Now you can tune in HF, OSCAR and other non-FM packet stations fast!

This MFJ clone of the TAPR tuning indicator makes tuning natural and easy - it shows you which direction to tune. All you have to do is to center a single LED and you're precisely tuned in to within 10 Hz. 20 LEDs give high resolution and wide frequency coverage.

The MFJ-1273 tuning indicator plugs into the MFJ-1270 and all TNC-1s, TNC-2s and clones that have the TAPR tuning indicator connector.

Order any product from MFJ and try it -- no obligation. If not satisfied return within 30 days for prompt refund (less shipping).

• One year unconditional guarantee • Add \$5.00 each shipping/handling • Call or write for free catalog, over 100 products.

MFJ

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762

To Order or for Your Nearest Dealer

800-647-1800

Call 601-323-5869 in Miss. and outside continental USA.
Telex 53-4590 MFJ STKV



National Tower Company

P.O. Box 12286 Shawnee Mission, KS. 66212

Hours 8:30-5:00 M-F 913-888-8864

ROHN FREE BASE STUBS WITH EACH BX TOWER

25G	10' section	\$49.00
25AG2 & 3	model 2 or 3 top section	\$80.00
25AG4	model 4 top section	\$65.00
45G	10' section	\$169.00
45AG3 & 4	model 3 or 4 top section	\$123.90
56G	10' section	\$133.50
YB3	thrust bearing	\$56.25
M200	10' mast, 2" o.d.	\$22.00
BX-40	40' self supporting (8 sq. ft.)	\$170.00
BX-48	48' self supporting (8 sq. ft.)	\$216.00
BX-56	56' self supporting (8 sq. ft.)	\$290.00
BX-64	64' self supporting (8 sq. ft.)	\$375.00
HXB-40	40' self supporting (10 sq. ft.)	\$187.00
HXB-48	48' self supporting (10 sq. ft.)	\$255.00
HXB-56	56' self supporting (10 sq. ft.)	\$339.00
HXB-K-40	40' self supporting (18 sq. ft.)	\$249.00
HXB-K-48	48' self supporting (18 sq. ft.)	\$319.00

WE STOCK A COMPLETE LINE OF ROHN ACCESSORIES ALL OF OUR ACCESSORIES ARE MANUFACTURED BY ROHN

★ ★ CALL FOR PRICES ★ ★

HYGAIN/TELEX ANTENNAS

HF ANTENNAS		Tribands	
TH3JRS	3 element 'Junior Thunderbird'		\$210.00
TH5MKZS	5 element 'Thunderbird'		\$438.00
TH2MKS	2 element 'Thunderbird'		\$192.00
TH7DXS	7 element 'Thunderbird'		\$510.00
TH6DXX	conversion kit to TH7DXS		\$171.00
EXP 14	Explorer 14 triband tower		\$347.00
OK710	30/40 M conv. Exp. 14		\$86.00

Monoband		
105BAS	'Long John' 5 element 10 mtr.	\$149.00
155BAS	'long John' 5 element 15 mtr.	\$228.00
205BAS	'Long John' 5 element 20 mtr.	\$388.00
240BAS	4 element 20 element	\$285.00
7-1S	'Discoverer' rotary dipole 30/40mtr.	\$160.00
7-2S	'Discoverer' 2 elem. 40 meter beam.	\$360.00
7-3S	converts 7-2S to 3 elem. beam.	\$226.00

Multiband Verticals		
18HTS	'Hy-Tower' 10 thru 80 meters	\$477.00
14RMQ	roof mt kit for 12 AVQ, 14AVQ and 18ATV/WB	\$40.00
18VS	base loaded, 10 thru 80 meters	\$33.00
12AVQ	trap vertical 10 thru 20 meters	\$53.00
14AVQ/WBS	trap vertical 10 thru 40 meters	\$72.00
18AVT/WBS	trap vertical 10 thru 80 meters	\$117.00

Multiband Doublets		
18TD	portable tape dipole 10-80 meters	\$132.00
2BDOS	trap doublet 40 and 80 meters	\$69.00
5BDOS	trap doublet 10 thru 80 meters	\$141.00

VHF ANTENNAS		Beams & Verticals	
23BS	2 meter 3 element beam		\$24.00
25BS	2 meter 5 element beam		\$28.00
28BS	2 meter 8 element beam		\$40.00
214BS	2 meter 14 element beam		\$48.00
64BS	4 element 6 meter beam		\$72.00
V-2B	collinear gain vertical 138-174 MHz		\$48.00
V-3S	collinear gain vertical 220 MHz		\$48.00
V-4S	collinear gain vertical 430-470 MHz		\$58.00
6P62A	base, 2 mtr. ground plane		\$27.00

VHF & UHF Mobiles		
HR144GRI	tigerglass 2 mtr 3/8-24 mt	\$68.00
HB144GRI	HyBander 2mtr 3/8-24 mt	\$62.00
HB144MAG	HyBander 2 meter	\$21.50
BN86	territe balun for 10-80 meters	\$22.00

OSCAR LINK ANTENNA

21BS	Complete Oscar link system	\$219.00
------	----------------------------	----------

CUSHCRAFT ANTENNAS

A3	3 element triband beam	\$216.00
A743	7 & 10 MHz add on kit for A3	\$74.50
A744	7 & 10 MHz add on kit for A4	\$74.50
4218XL	18 element 2 mtr, 28' boom	\$101.50
A4	4 element triband beam	\$290.50
AV4	40-10 mtr. vertical	\$94.50
AV5	80-10 mtr. vertical	\$101.00
ARX2B	2 mtr. 'Ringo Ranger'	\$35.00
ARX45B	450 MHz 'Ringo Ranger'	\$35.00
A144-11	144 MHz, 11 ele VHF	\$47.50
A147-11	11 element 146-148 MHz beam	\$47.50
A147-22	22 element 'Power Packer'	\$128.50
A144-10T	10 element 2 mtr. 'Oscar'	\$50.50
A144-20T	20 element 2 mtr. 'Oscar'	\$74.50
215WB	15 element 2 mtr. 'Boomer'	\$81.00
220B	17 element FM 'Boomer'	\$94.00
32-19	19 element 2 mtr. 'Boomer'	\$94.00
424B	24 element 'Boomer'	\$81.00
H3	20-15-10 mtr vertical	\$267.00
10-4CD	4 element 10 mtr. 'Skywalker'	\$108.00
15-4CD	4 element 15 mtr. 'Skywalker'	\$121.50
20-4CD	4 element 14 MHz 'Skywalker'	\$270.00

HUSTLER ANTENNAS

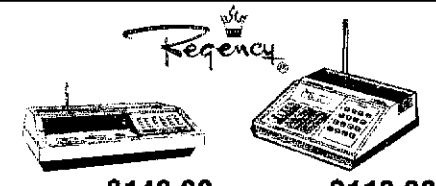
4BT	40-10 mtr. vertical	\$79.00
5BT	80-10 mtr. vertical	\$105.00
6BT	6 band trap vertical	\$124.00

ROTORS

Alliance	HD73 (10.7 sq. ft.)	\$104.00
Alliance	U110	\$47.00
CDE	AR40 TV 3 sq ft.	\$129.00
CDE	CR45-II (8.5 sq. ft.)	\$179.00
CDE	HAM IV (15 sq. ft.)	\$259.00
CDE	12X (20 sq. ft.)	\$309.00

ROTOR CABLE

RG8U	12-18 & 6-21 4080 - per foot	\$0.18
RG8U	12-18 & 6-20 4090 - per foot	\$0.35
RG8U	Mini low loss foam per foot	\$0.17
RG8U	500' roll	\$79.00
RG8U	Columbia superflex #29/100' or 500' for	\$125.00



Z45	45 ch, 7 band, programmable, police, aircraft, search/scan, clock, priority, dual level display, lockout, AC/DC (both cords)	\$149.90
R1080	30 ch, 6 band, instant weather, search, channel lockout, programmable, dual scan, scan delay, manual slip control	\$119.90
C403	4 chan, 3 band, crystal, AC only	\$49.90
R806	8 chan, 6 band, mobile, crystal, AC/DC	\$69.90
Z60	60 chan, 8 band, aircraft, AC/DC	\$159.90
R1075	15 chan, 6 band, programmable	\$89.90
R1090	45 chan, 6 band, programmable	\$149.90
HX1500	55 ch, 10 band hand held, aircraft	\$219.00
MX3000	30 ch, 6 band, programmable, AC/DC	\$199.90

uniden Bearcat

BC100XL	16 ch 9 band, aircraft, search & squelch, scan delay, ch lockout, LCD, W/adaptor-charger, carry case, earphone, nicad batteries, 2 antennas	\$179.00
BC210XL	18 channel 6 band, dual scan search, auto squelch, direct chan. access, limit, search, programmable, auto lockout, AC/DC	\$149.00
BC50 XL	10 Ch, 10 band, hand held	\$119.90
BP55C	Battery pack/charger for BC50XL	\$29.50
BC70XL	NEW 20 chan, 10 band, HAND HELD	\$159.90
BC140XL	10 chan, 10 band, AC/DC	\$85.90
BC145XL	16 chan, 10 band, weather, AC/DC	\$99.90
BC175XL	16 ch, 11 band aircraft	\$159.00
BC210XW	20 chan, 8 band(2 ham), programmable	\$169.00
BC300XLT	40 chan, 12 band, aircraft & 800 MHz	\$279.90

RADAR DETECTORS

SELL		
844	Superhet, sequential LED's, dash/visor	\$139.90
847	Remote, audible & visual alarm, LED's	\$154.95
874	Superhet, dash/visor	\$114.90
876	Dash/visor superhet, audible & visual	\$129.90
880	QUANTUM, superhet, digital dash/visor	\$204.90

FOX		
SUPER XK	X & K band superhet, dash/visor	\$54.90
IMPULSE	Compact, city/hwy switch, dash/visor	\$69.90
VIXEN III	Superhet, LED's, auto mute	\$129.50
MICROFOX	Pocket size superhet, LED's, dash/visor	\$159.90

UNIDEN		
RD35	Superhet, audible & visual alert	\$57.90
RD55	LED superhet, city/hwy, dash/visor	\$83.90
RD9	Dual conversion superhet, LED's	\$154.90

ASTATIC

D104 SILVER EAGLE	Chrome plated base station amateur microphone. Factory wired to be easily converted to electronic or relay operation. Adjustable gain for optimum modulation.	\$59.90
-------------------	---	---------

MAXON....\$26.95

model 498A	49 MHz, FM 2-WAY RADIO	
hands free operation, voice activated transmit up to 1/2 mile. Batteries optional		
model 49B	same features as 498A except uses "AA" nicad batteries and comes with battery charger	\$34.95

TENNA PHASE III POWER SUPPLIES

PSS	Output: 13.8V DC - 3 amp constant 5 amp surge, electronic overload protection w/instant auto reset, fuse protected	\$13.90
PS7	Fully regulated, 7 amp constant, 10 amp surge capacity	\$19.95
PS12	Fully regulated, 10 amp constant 13 amp surge, electronic overload protection w/instant auto reset	\$29.95
PS20	Fully regulated, 25 amp surge capacity, 13.8 VDC, 20 amp constant, with meter	\$59.95
PS25	Regulated 4.5-15VDC-25 Amp constant 27 amp surge, instant auto reset, dual meter for current & voltage	\$69.90



WE MAY HAVE the tubes you need. (Thousands in stock). Send S.A.S.E for our list. Fala Electronics, PO Box 1376-1, Milwaukee, WI 53201.

WANTED: CRYSTAL SET parts: Variometers, Varlocouplers, Condensers, Detectors, Cathwhiskers, Dial Knobs, Tap Switches, Tap Points, Binding Posts, Headphones, MIDCO, 660 N Dixie Highway, Hollywood FL 33020

ANTIQUE RADIO CLASSIFIED. Monthly magazine for buyers and sellers of old radios and related items. sample copy free. 6-month subscription plus sample \$9. ARC, P.O. Box 2-81, Carlisle, MA 01741

QST 1959 to date, complete. Ham Radio all to 1985, complete. Best offer. Robert Meyer, 2710 Main, Lafayette, IN 47904, 317-448-6618.

WANTED, BOOKS: Pre-1900 Electricity and Telegraphy, Pre-1925 Radio, Pre-1940 Television. Books, Magazines of any other related literature. Jim Kreuzer, N2GHD, 6270 Clinton St., Elma, NY 14059 716-681-3188

SELL HALLCRAFTER SX-117 cvr/spkr \$100. Heath SB-303, SB-401, HDP-21 Mic all three \$200. All recently aligned, with manuals excellent condition. K2BWK 716-924-3380.

WANT: OLD Allied, Lafayette, Newark, World Radio Labs, Etc. Catalogs. Also, old Hi-Fi literature. Price and condition first letter please! Marcus Frisch, WA9IXP (Life ARRL) Box 385, Elm Grove WI 53122-0385.

FOR SALE--KWS-1. Also Bound volumes several decades each of QST, IRE and IEEE. Write for details. W6BE.

HEATHKIT CRYSTAL RADIO. CR-1 wanted. Sell Western Electric Key and soulder from old PRR depot. Good condition, \$75. Walker, R.D. 2, Box 143-D, Belleville, PA 17004.

MAGAZINE-QST'S, CQ'S, 73'S, Ham Radio Horizons starting with 1934. SASE for list. W9RHE, 1361 Buttonwood, Glenview, IL 60025.

WANTED: TELEGRAPH Collector looking for pre-1900 keys, sounders, relays, pocket sets, camelbacks, etc. Also looking for pre-1940 books. Vibroplex, Mecograph, DeLaney, Albright, etc. need Midget and Vertical. K5RWV, 1128 Midway, Richardson, TX 75081, tel 214-234-1653.

WANTED: GONSET CB Transceiver. Write Larry, W3LSV, 5052 NE 15 Ave., Ft. Lauderdale, FL 33334, 305-771-7956.

WANTED: HAMMARLUND HC-180A in mint condition - prefer late - production unit, unmodified, with manual, Jeff, K2OD, 7 Timberwick Drive, Flemington, NJ 08822, 201-788-9149.

COLLINS 754A receiver, Johnson Ranger II 160-BM transmitter. WA8BMG, 313-329-9180.

WANTED: NATIONAL 7" TV; National HFS w/PS and Coils; Hallcrafters 6-35 Panoramic Receiver. Sam Thompson, W6HDU, 1031 San Antonio Avenue, Alameda, CA 94501, 415-521-1429.

FOR SALE Globe Champ 300, Viking II-VFO. Hallcrafter FPM-300, 882 595 822R Eimac A54, Radiola 16, 1924. RCA VIII. Wanted: Howard, Bretting, National SW3 Greb CR-18, K4JUZ, 608 West Thompson Lane, Murfreesboro, TN 37130, 615-893-5344.

WANTED: QST in permanently-bound (sewn-in) volumes. Six issues per book, Maroon with gold lettering. Need 1961-1963 and most before 1948. Neil Friedman, N3DF, 503 Kalmia, Boulder, CO 80302, 303-449-7753.

WANTED: AMATEUR Call Book U.S. listings 1938 or 1939 Heath SB-650 Digital. W3ON.

GENERAL

WANTED: CW and 3.1 Filter for Collins "S" line receiver. Write, GW3MHW, Ty-Top, Castle Caerinion, Powys, Wales.

SG6 ELECTRONIC Transverter Systems, Preamps, Power Amplifiers for 902, 1296, 2304 and 10384 MHz. Hans Peters (VE3CRU) 416-759-5582 evenings.

TELETYPEWRITER parts, supplies, gears. Torolds, S.A.S.E. list. Typetronics, Box 8873, Ft. Lauderdale, FL 33310. Buy unused parts, cash or trade.

HAM TRADER YELLOW SHEETS. In our 25th year. Buy, Swap, Sell ham radio gear. Published twice a month. Ads quickly circulate--no long wait for results. Send #10 SASE for sample copy. \$12 for one year (24 issues). P.O.B. 2057, Glen Elyan, IL 60138-2057.

TEFLON, s.a.s.o. W9TFY, Alpha IL 61413.

COLLINS Repair and Alignment, former Collins engineer. Research and Consulting, Glenn A. Baxter, P.E., Registered Professional Engineer. K1MAN 207-495-2215.

HOSS-TRADER ED says "Shop around for the best price then telephone the Hoss list for the best deal." New Amp Supply 2500 Watt Linear/Tubes/Hypersil Transformer Regular \$1149.00 Cash; \$986.00; New Display Azden PCS 5000; \$299. New Icom 27-A Regular \$429 cash, \$319; New Popular Icom 02AT Handy Talkie Regular \$399 Cash \$289; New Display Icom 735 Transceiver Cash \$829; New WmNye 3 K.W. MB5-A Tuner Regular \$825 cash \$499; New Display Kenwood 440-S with Tuner Cash \$1019. New Display Icom 28-H Cash \$379; VISA/Master Card Accepted!!!!!! Moory Electronics Co., P.O. Box 506, DeWitt, Ark. 72042. Tel: 501-946-2820.

WE BUY Electron tubes, diodes, transistors, integrated circuits, semiconductors, Astral Electronics, P.O. Box 707, Linden, NJ 07036. Call toll-free 800-526-4052.

FAST, ACCURATE, readable, nonsensational--The ARRL Letter! Every two weeks, we fill you in on what's happening in Amateur Radio. But, you have to be an ARRL member to get it. For a one year subscription, send \$19.50 (U.S. funds) and we'll send you the Letter first class mail anywhere in the U.S. and Canada. The ARRL Letter, 225 Main St., Newington, CT 08111.

KEYER KITS, \$15. SASE for information MSC, 1304 Toney Drive, Huntsville, AL 35802.

Boost Your Contest Power!

THE NEW LK-500ZC

This self-contained, full QSK high frequency linear power amplifier is capable of amateur continuous operation at output power levels of 1500 watts. It is manually tunable from 1.8-2.4 and 3.5-22 MHz continuous. The HF tank coil and Centralab bandswitch are silver-plated.

INTERNAL POWER SUPPLY

All 500 Series amplifiers have a Peter Dahl Hipersil plate transformer and a separate filament transformer. The fullwave bridge rectifier system—unlike other systems that utilize weak voltage doublers—uses computer grade electrolytic capacitors.

COMPATIBILITY GUARANTEED

Customer feedback in 1986 insisted on system compatibility. Responding to this challenge, a special Plug and Play Harness to hook your favorite radio to the LK500 is offered as an accessory. Of course, all Amp Supply amplifiers have our famous ATI-6 tuned input systems, assuring a perfect 50 ohm load to your transceiver.

AUTOMATIC LOCK OUT "NEW"

All the new LK-500ZC Series amplifiers are equipped with the ALO which stops amplifier operation when it senses an unacceptable SWR, improper tuning, or overcurrent on the tubes.

2-SPEED FANS

Most manufacturers have had to compromise on fan speed, one of the noisiest and objectionable aspects of amateur radio operation. But, our 500 Series amplifiers are different; they are the result of our perfected system of customer communication and engineer response.

THE LK-500ZC WITHOUT QSK

A version of the 500ZC is available without the Jennings vacuum antenna changeover relay and a companion sealed relay QSK system. A super buy at \$1199.00!

THE LK-500NTC NO-TUNE

Our no-tune amplifier is the same dependable amplifier as the LK-500ZC with the new ALO system and full QSK, and completes our popular 500 Series. This desirable version allows you to merely switch to your favorite amateur band and transmit at full power. We have preset internal capacitors and coils for each of the traditional six amateur bands. The LK-500NTC is also available for special MARS and commercial channelized frequencies.



SPECIFICATIONS LK-500ZC

Frequency Range: 160 Meters 1.8-2.2 MHz, 80 meters 3.5-4.5 MHz, 40 meters 7.0-7.5 MHz, 30 meters 10.1 to 10.15 MHz, 20 meters 14.0-14.9 MHz, 17 meters 18.0-19.2 MHz, 15 meters 21.0-21.5 MHz.

Export models: 12 meters 24.8-24.9 MHz, 10 meters 28.0-29.7 MHz.

Drive Power: 100W Nominal for 1500 Watt SSB PEP output, 125W Nominal for 1500 Watt CW output.

RF Output SSB 1.5 KW PEP continuous, CW 1.2 KW Average continuous, RTTY, SSTV 1 KW Average 1.5 KW PEP.

Plate Voltage: RTTY/AM/SSTV/CW/SSB 3.2 KV DC

Harmonic Suppression: -50 dB minimum.

Intermodulation Distortion Products: -33 dB down minimum.

Circuit Type: Class AB₂ grounded grid. Type of Emission: SSB, CW, RTTY, AM, SSTV

Duty Cycle: Amateur continuous duty in all modes at specified output.

Output Circuit: Pi-network (silver plated tubing HF coil).

Power Requirements: 115/230 VAC, 30/15 amps (230 VAC factory wired and recommended).

Dimensions: 8" H x 14" W x 16" D (including knobs).

UPS Shippable: 59 lbs.

Warranty: Two years on amplifier.

LK-500ZC Full QSK	\$1395.00
LK-500ZC Without QSK	\$1199.00
LK-500NTC No-Tune Version	\$1695.00
Plug & Play Harness (Specify your radio)	\$ 9.95
AT3000 Matching 3K Tuner	\$ 499.00

Add an automatic SWR lock-out brain to your present amplifier (any brand). Self contained plug and play.

ALO-1 Accessory

\$ 94.50

Trade in amps accepted. Reconditioned and guaranteed trade-in amps available. We now have a full line of wire antenna and accessories.

Order Today.

For fastest delivery, send cashiers check, money order, or order by credit card. Personal checks, allow 18 days to clear. North Carolina residents, add 4% sales tax. Hours: Monday-Friday 9:00 a.m. - 5:00 p.m. E.S.T.



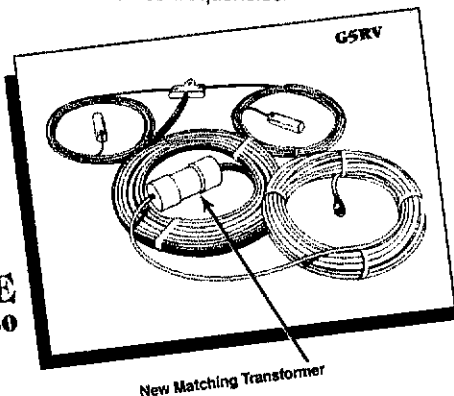
Shipping and handling \$4 on any Amp product.

Call 919-821-5518

208 Snow Ave., P.O. Box 147
Raleigh, North Carolina 27602
919-821-5518
Telex: 980131WDMR

Amp
Supply Co.

New Product: LK 550 using three 3-500Zs.
Call today. LK 450 using one 3-500Z.



SALE
\$49.50

THE G5RV ANTENNA

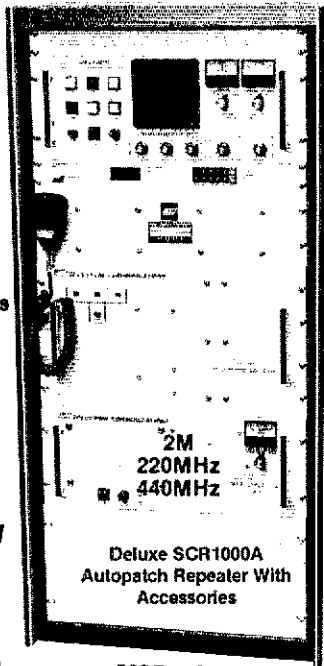
Reg. \$60.00 SALE \$49.50

The G5RV Signal Injector™ antenna is an excellent all band (3.5-30 MHz) 102 ft. dipole. On 1.8 MHz the center and shield of the coax at the transmitter end may be joined together and the antenna may be used as a Marconi with a tuner and a good earth ground. The proper combination of a 102 ft. flat-top and 31 ft. of 300 ohm transmission line achieves resonance on all the amateur bands from 80 to 10 meters with only one antenna. There is no loss in traps and coils. The impedance present at the end of the 300 ohm line is about 50-60 ohms, a good match to the new RG8X mini foam coax.

- 2 KW PEP
- Completely assembled
- Use as horizontal or "V" configuration
- Consists of: 102 ft. copper antenna wire, 31 ft. 300 ohm transmission line, 70 ft. RG-8X coax, 2 end insulators, 1 center insulator, 1 PL-259 and sleeve, connector and the new transformer coupler.

Spectrum Repeater Systems Offer -

- HIGHEST PERFORMANCE**
 - 0.25µV Receivers, UHF Helical Resonators, Excellent Intermod Rejection, Super-Sharp 8 Pole Front-End & 12 Pole IF Filters!
 - Heavy Duty Transmitters to 150 VHF or 100W UHF. 15, 30, 75W VHF and 10 & 40W UHF Models Available.
- WIDEST LINE OF REPEATERS & VHF/UHF LINK EQUIPMENT**
 - "Fully Loaded" Deluxe Repeaters, or "Basic Units"
 - Rack Mount Receivers, Xmtrs, High Power Amps & Power Supplies
 - Complete Line of "built in" features - Full Panel Metering & Controls, Hi/Low Pwr., IDer, "PL", Autopatch, Courtesy Tone, Various Remote (Touch Tone) Control Functions, Btry. Backup, etc.
- HIGHEST QUALITY & FIELD-PROVEN RELIABILITY**
 - 12+ Years experience in the business
 - Thousands of units in service throughout the entire world!
 - Only the Finest Quality Designs, Components & Construction. 6 Mo. Warranty.



Deluxe SCR1000A
Autopatch Repeater With
Accessories

FCC Type Accepted
For Commercial Services

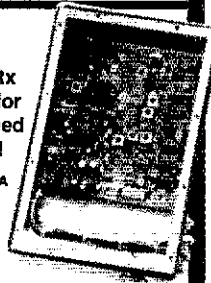
VHF/UHF REPEATER, LINK or PACKET BOARDS & ASSEMBLIES

- Receivers, Transmitters, Amps, Helical Resonator Preselectors, Power Supplies
- Autopatch, ID, COR, DTMF Control
- Boards, In Shielded Housing, or complete Rack Mt. Units

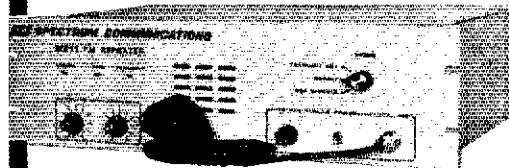


30KHz Rx
IF Filter for
High Speed
Packet!

SCR200A
VHF
RCVR.
ASSY.



Call or write today for data sheets
& prices Sold Factory Direct or
through Export/Foreign Sales
Reps. Get your order in today!



BASIC SCR77 REPEATER

Duplexers, Antennas, Cabinets, Cable,
Commercial Paging Transmitters, etc., also available.



SPECTRUM COMMUNICATIONS

DEPT. Q 3 • 1055 W. GERMANTOWN PIKE • NORRISTOWN, PA. 19403 • (215) 631-1710 • TLX 846-211

WANTED

FOR IMMEDIATE PURCHASE
CALL COLLECT: (201) 440-8787

- | | |
|-----------------|--------------------|
| RT-1159/A | IP-480/WLR |
| RT-712/ARC-105 | TTU205C/E |
| RT-859A/APX-72 | QA3952/AQA-5 |
| RT-1022/ARN-84 | AN/AVM-21.30 or 62 |
| RT-1057/ARN-103 | AN/ARC-114,115,116 |
| RT-823/ARC-131 | AN/ARN-89 |
| RT-868A/APX-76 | AN/TPX-46 |
| RT-988/APX-76 | AN/APQ-120 |
| RT-547/ASQ-19 | MK-994/AR |
| RT-857/ARC-134 | MK-1004/ARC |
| RT-1004/APQ-122 | DT-37/ASQ-8 |
| RT-524/VRC | DT-239/ASQ-10 |
| RT-865D/PRC-66 | RO-32/ASQ |

WE BUY MILITARY PARTS
AND NEW TUBES

SPACE ELECTRONICS

35 Ruta Ct. So., Hackensack, N.J. 07606 (201) 440-8787

"OUR 24th YEAR"

CB-TO-10 METERS

We specialize in CB radio modification
plans and hardware. Frequency and FM
conversions, books, kits, repairs, high-
performance accessories. Our 11th year!
16-page catalog, \$2.

CBC INTERNATIONAL, P.O. BOX 31500AA
PHOENIX, AZ 85046

1986-87 CALL DIRECTORY

(On microfiche)

- Call Directory \$8
Name Index 8
Geographic Index 8

All three — \$20

Shipping per order \$3

BUCKMASTER PUBLISHING

Mineral, Virginia 23117

703: 894-5777

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.

CHASSIS & CABINET KITS. 5120 Harmony Grove Rd., Dover, PA 17315 84SE K31WK.

HAM RADIO REPAIR, tube through solid state. Robert Hall Electronics, P.O. Box 8363, San Francisco, CA 94128; 408-729-8200.

FREE RECORDINGS of Mexico City, Columbia and San Salvador emergency nets. Send three C-90 cassettes and return postage to: International Amateur Radio Network, Belgrade Lakes, ME 04918. IAR emergency frequencies: 14.275-SSB, 14.090-RTTY, 14.313 monitored daily as emergency calling frequency and for routine one and two way traffic. Plan to attend World Emergency Conference in beautiful Belgrade Lakes during second weekend of July. Glenn Baxter, K1MAN, Network Manager, Tel. 207-495-2215.

TOWER CLIMBING Safety Belts and Accessories. Free info. Avatar Mag (W9JVF) 1147 N. Emerson Indianapolis, IN 46219-2929

COMPREHENSIVE APPLE SOFTWARE Transmit/receive CW/RTTY with/without TU. Variable speed code practice. Calculate/display/bear headings on world map. More. \$49.95 and call sign brings disk and good manual for IIII + /e. Send now for free brochure. W1EO 39 Longridge Road, Carlisle, MA 01741.

NICAD BATTERY PACKS - Exact replacement PNB-2 NiCad packs for Yaesu FT-207/FT-208 with case, \$24 + \$2 shipping. Kenwood, ICOM and other inserts and cells also available, send SASE for list. Pariphex, 149 Palmer Road, Southbury, CT 06488, 203-264-3985.

TENNA TEST * * * ANTENNA Noise Bridge. Out-performs others. Accurate. Costs less. Compare 1-40 MHz. \$44 1-150 MHz. \$68. Satisfaction Guaranteed. Send stamp for details. W6URR, 1025 Wildwood Road, Quincy, MI 49082.

"COMKEY" PROGRAM for Commodore 64/128 turns computer into memory keyer. \$15. Free details. Fritz Reuning K4OAO, 120 Elk Rd., Bristol, TN 37620

8877 VHF AMP KITS. HV power supplies, CX600N relays, MuTek LTD front end boards for IC251/IC271, EME newsletter and QRO parts. SASE for new catalog. KB7C, "C" Products, 417 Staudafer Street, Bozeman, MT 59715.

"HAMLOG" COMPUTER programs. 17 modules auto-logs, sorts 7-band WAS/DXCC. Full features. Apple \$14.95, IBM or CP/M \$24.95. Much more. KA1AWH, PB 2015, Peabody MA 01960.

SAVE \$1.50 SHIPPING on any ARRL book. Send book price plus \$1 to Marshall Hill Enterprises, Bradford NH 03221.

'N-TENNA QUAD KITS, \$64.50. Box 5332, Hickory, NC 28603.

TRANSFORMERS WOUND. Peter Robson Co., 18 Washington Trail, Hopatcong, NJ 07843.

HOT / NEW PACKET Programs for your IBM PC. Several telecommunications programs to choose from, especially written to interface your packet controller with your PC or compatible/clone. Features like Full Screen, Line Screen editing, Split-Screens, ASCII, Binary, X-Modem or user defined file transfers. DOS shell, Macro Keys, Command Files, many types of time/date/operator. ID. Multi-page brochures explain them all. Software Support. Write for new information and pricing. Katt and Associates, 2440 E. Tudor Rd. Suite #138, Anchorage, AK 99507, 907-248-0133. Charge Cards accepted.

1987 CALLBOOKS ("Flying Horse"). Either \$23. Both \$44. Any four or more, \$20 each. Any ten or more, \$18 each. RADIO Handbook, Sams, 23rd edition, 1986, \$30. All postpaid U.S. Elsewhere, add \$3/book. Special: 1986 International and 1987 North American Callbooks, both \$33 postpaid worldwide. Century Print, 6059 Essex, Riverside, CA 92504-1522, 714-687-5910

PACKET RADIO MAGAZINE is published monthly by the Florida Amateur Digital Communications Association (FADCA). Enjoy the latest technical and operating news, equipment reviews, construction articles, software reviews, program listings and digital protocol discussions. Write for subscription information, Group Rates for Amateur clubs. Enclose \$1 for a sample issue. FADCA, Inc., 812 Childers Loop, Brandon, FL 33511. 813-899-3355.

MICROLOG AIR-1 with AMTOR, Close-Out Sale. List price \$279. VIC-20 AIR-1's \$125. Add \$5 for shipping in US, \$10 elsewhere. Md. res add 5% sales tax. G and G Electronics, 8524 Dakota Drive, Gaithersburg, MD 20877. 301-258-7373.

U.S. MADE Gould "AA" 500mAh NiCads, ten for \$9.99 Hundred \$90 plus shipping. Raymond Richard 1000 Dorothy, Suite 706, Coraopolis, PA 15108

FAST PROFESSIONAL Ham Repair. NYC Area. All major brands. Commercial FCC lic. #PQ2-16857. Amateur Extra. In business over 10 years. On the air since 1965. Rich Tashner, N2EO, 718-352-1397.

MADISON-MANUALS: Kenwood, ICOM, Yaesu, Heathkit Collins, Hallicrafters. Drake copies - \$10-\$20. Schematics only, \$5. Madison Electronics, 3621 Fannin, Houston TX 77004. 1-713-520-7300. Mastercard/VISA.

PROTECT YOUR GEAR - Register it with the Electronic Equipment Registry. SASE for details Box 304, Wallingford, CT 06492

HAVE PARTS for Linears, power supplies and matching networks Used, but in good condition. SASE please. K4UC 1703 Elder Way Burlington, NC 27215

W6AM ESTATE SALE: Short Wave Manual (1936) by Don C. Wallace, W6AM. New, \$10 ea. Rhombic Insulators with lead inserts 3/4" x 1 1/2" x 6". \$3 ea. N6AW, Jan D. Perkins, 26503 Highridge Rd., Rancho Palos Verdes, CA 90274.

WANTED: DRAKE R7A, W3CRH, Box 20, Macomb, IL 61455.

TRYLON FREE - STANDING Towers, up to 96 feet, for info write BJX Supply, Box 388, Cortu, NY 14036

KENWOOD



TS-940S LIST \$2249
NEW Top-of-the-Line
HF Transceiver
• 100% Duty Cycle
• 40 Memory Channels
CALL FOR SPECIAL PRICES!!



TS-440S NEW! LIST \$1199
CALL FOR SPECIAL SALE PRICE



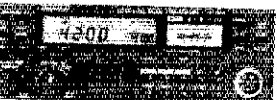
TS-430S LIST PRICE \$819
CALL FOR SPECIAL SALE PRICE!



TS-711A LIST \$899
TS-811A LIST \$1049
CALL FOR SPECIAL PRICE



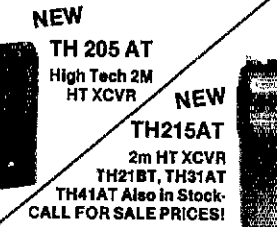
TW-4000A LIST \$599
CALL FOR SPECIAL PRICE



TR-751A LIST \$599
All Mode 2m Mobile



COMPACT 2M FM MOBILE
TM 2570A (70W) LIST \$559
TM 2550A (45W) LIST \$469
TM 2530A (25W) LIST \$429
TM 3530A (25W) LIST \$449
CALL FOR SPECIAL PRICE



NEW TH 205 AT
High Tech 2M
HT XCVR
NEW TH215AT
2m HT XCVR
TH21BT, TH31AT
TH41AT Also in Stock-
CALL FOR SALE PRICES!

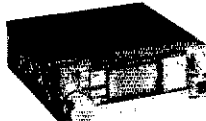
YAESU



FT 767 GX HF/VHF/UHF
LIST \$1895 CALL FOR SALE PRICE



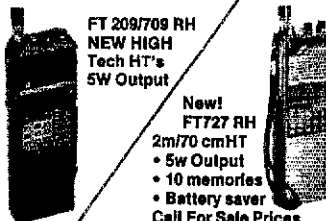
FT-757GX LIST PRICE \$995
CALL FOR SPECIAL SALE PRICE!



FT2700RH NEW 2M/70cm
Dual Band Transceiver
Full Duplex-Cross Band
Operation LIST \$599
CALL FOR PRICE-SAVE \$\$!



NEW FT290R 2m Portable LIST \$579.95
NEW FT690R 6m Portable LIST \$569.95
CALL FOR SALE PRICES!



FT 209/709 RH
NEW HIGH
Tech HT's
5W Output
New! FT727 RH
2m/70 cm HT
• 5w Output
• 10 memories
• Battery saver
Call For Sale Prices



FT 23R 2m HT LIST \$299.95
FT 73R 70 cm HT LIST \$314.95
• compact size
• 10 memories
• up to 5W output W/FNB-11
CALL FOR SALE PRICES!

ASTRON POWER SUPPLIES

Heavy Duty - High Quality - Rugged - Reliable
• Input Voltage: 105-125 VAC Output: 13.8 VDC ± .05V
• Fully Electrically Regulated
5mV Maximum Ripple
• Current Limiting & Crowbar
Protection Circuits
• M-Series with Meter
A-Series Without Meter

Model	Cont. Amps	ICS Amps	Price
RS4A	3	4	\$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS36A	25	35	135
RS36M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

ICOM



IC735 NEW General Coverage
HF Transceiver Full Featured
Ultra Compact - Economical
LIST PRICE \$399
CALL FOR SPECIAL PRICE!



IC-R7000 25-1300 + MHz Rcvr. LIST \$1099
IC-R71A 10 kHz-30 MHz Rcvr. LIST \$949
CALL FOR SPECIAL PRICES!



IC-27A LIST \$429 **IC-27H LIST \$459**
IC-28A LIST \$429 **IC-28H LIST \$459**
IC-37A LIST \$499 **IC-47A LIST \$549**
IC-38A LIST \$459

CALL TODAY FOR SPECIAL ICOM PRICES!



IC02AT - 2mtr
IC03AT - 220 MHz
IC04AT - 70cm
High Tech
HT XCVRS

NEW IC-p2AT
2m HT

• micro design covers
140-163 MHz
• 10 mem. w/scan
• LCD Readout
CALL FOR SALE PRICE!

TEN-TEC

PARAGON
General Coverage HF Transceiver
Microprocessor Controlled Multi-Scan,
62 Memories

561 Corsair II SALE \$1,149.95
260 Power Supply \$169.95
229 2KW Tuner \$259.95
4229 Tuner Kit \$189.95
425 Titan Amplifier \$2,299.95

concept

r/c 2-317 2M
30W In = 170W out
SALE \$209.95

Model	Band	In-Out	Sale Price
2-23	2M	2-30W	\$ 89.95
2-217	2M	2-170W	\$239.95
2-117	2M	1Q-170W	\$239.95

MIRAGE

AMPLIFIER SALE!

B3016 ONLY \$229!

Model	Band	Pre-amp	Input	Output	Sale Price
A1015	6M	Yes	10W	150W	\$289
B23S	2M	No	2W	30W	\$ 99
B23A	2M	Yes	2W	30W	\$129
B215	2M	Yes	2W	150W	\$259
B108	2M	Yes	10W	30W	\$159
B1016	2M	Yes	10W	150W	\$259
B3016	2M	Yes	30W	160W	\$229
D1010N	440	No	10W	100W	\$319

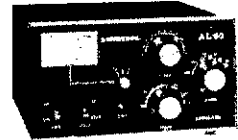
AMP SUPPLY



Model	List	Model	List
LA 1000	\$ 499	LA 1000 NT	\$ 579
LK 500 ZB	\$1295	LK 500 NT	\$1595
LK 800 A	\$2695	LK 800 NT	\$2995
AT 1200	\$ 229	AT 3000	\$ 499

SALE PRICES TOO LOW TO PRINT
CALL AND SAVE \$\$\$\$\$

AMERITRON



AL80A NEW 1000 W 3-500Z Amplifier \$699.
AL84 600 W PEP Output (4-6MJ6 Tubes) \$399.
RCS-4 4 Pos Remote Antenna Switch \$119.95
RCS-8v 5 Pos Remote Antenna Switch \$119.95
ATR 15 1500 W Tuner \$299.95



ELH-730D 149.95
ELH-730G 119.95
ALM-203T 249.95
ACCESSORIES
IN STOCK—CALL!

ASA



PK-232 Packet Controller \$299.95
PK-64 Packet Controller \$219.95
HF Modem for PK64 \$99.95
PK-64A \$269.95
PK-64A w/HF Modem \$359.95
CP-1/84 Computer Interface \$219.95
144 MHz Isopole \$49.95
440 MHz Isopole \$59.95

Other AEA products also in stock call!!!

Kantronics

NEW All Mode KAM
\$289.95



KPC II Packet Controller \$159.95
KPC 2400 2400 Baud Controller \$299.95
UTU-XT/P Terminal \$299.95
UTU IBM Software \$19.95
The Interface \$129.95
Interface II \$239.95

Other Kantronics products in stock.
Call for sale prices!!!

MJF

1270A/1270 B TNC \$119.95
1224/1229 Interface \$89.95/\$159.95
202/204 Antenna Bridges \$59.95/\$79.95
250 Oil Load \$39.95
260/262 Dry Loads \$29.95/\$59.95
407/422 Elect. Keys \$69.95/\$119.95
901/941D Tuners \$59.95/\$99.95
949C/989 Tuners \$139.95/\$299.95

Call today for more MJF sale prices!!!

FREE SHIPPING-UPS SURFACE ORDER 1-800-272-3467

(continental USA) (most items, except towers/antennas)

Texas, Alaska & for information call 1-(214)-422-7306



TEXAS TOWERS

Div. of Texas RF Distributors Inc. 1108 Summit Ave., Suite 4 • Plano, Texas 75074

Mon-Fri: 9am - 5 pm
Sat: 9am - 1 pm

(Prices & Availability Subject To Change Without Notice)

DX THAT STANDS OUT FROM THE CROWD

A3

10, 15, 20,* 40 meters

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.

*40 METERS WITH THE A743 ADD ON KIT, STAINLESS STEEL HARDWARE KIT AVAILABLE

OUTSTANDING A3 FEATURES

- Typical SWR 1.2:1
- Average Band width 500 KHz
- Power Rating 2,000 Watt PEP
- Boom Length 14ft, Weight 27 lbs
- Longest Element 27ft
- Wind Surface Area 4.36ft
- Turning Radius 15.5ft

With the Cushcraft A3 you too will stand out from the crowd.

W2GD STANDS OUT FROM THE CONTEST CROWD

Using the Cushcraft A3, John set a record for a DX station in the 1985 ARRL DX CW contest while operating from VP2MGD. The A3 mounted at 35 feet produced 2,732 contacts on 10, 15, 20 with the maximum possible multiplier on 15 and 20 meters.

Using a Cushcraft 40-2CD 40 meter beam, he made 1083 contacts with 68 countries during the 1986 CQ WW CW contest while operating all band single operator P40GD on Aruba.

John, W2GD says "... I am extremely pleased with the performance and ease of construction. I consider the antennas a good choice. Keep up the fine product line."



Cushcraft
CORPORATION

P.O. Box 4680, 48 Perimeter Road
Manchester, NH 03108 USA/603-627-7877
Telex 4949472 CUSHSIG MAN

AVAILABLE THROUGH DISTRIBUTORS WORLDWIDE.

CRYPTOGRAPHY EQUIPMENT wanted, e.g., Converter M-209. WB2EZK, 17 Alfred Rd., Merrick, NY 11566 516-378-0263.

23 CM 'READY-TO-GO' 100 + watt linears and 2C39 amplifier cavities. Hi-Spec, Box 387, Jupiter, FL 33408

MORSE CODE Practice program for IBM-PC and Compatibles. Send \$19.95 check to SP MicroComputing Co., 1008 Swallow Drive, Cherry Hill, NJ 08003. Developed by NU2H.

FREE ADVERTISING for our subscribers! \$7/year (24 issues). Blue Bargain Swap Sheets, Box 69, Willmar, MN 56201.

ALUMINUM TUBING, telescoping diameters, 0.058 wall, perfect for Yagi antennas, 12 foot lengths, can ship. Also hardware, mast plates, element plates etc. SASE for list R. Myers, Box 175, Litchfield, CT 06759.

SOLAR ELECTRIC panels and system components. First quality Arco panels with 10 year warranty. Lowest prices in country. Catalog \$1 K8BDSS - Radiant Distributors, 3900 Dursum, Ada, MI 49301 616-874-8899.

CK7 Repairs KN5S 505-526-0917

WANTED BENCHER Paddle J. Waskowitz 580 83rd St. Brooklyn, NY 11209

AUTHORIZED DEALER SALE, including new and display models of current amateur products from Kenwood, ICOM, Cushcraft, Kenpro, Tokyo Amp, Hustler, A/S, Nye and others. Mastercard, Visa. Real Bargains for a limited time. Write or phone for current listing. Reliable company in Amateur business 40 years. Douglas Electronics, Box 30994, Corpus Christi, TX 78404 512-883-5103.

COAXIAL RELAYS Dow-Key Type DK-77 BNC 12 V.D.C. coil, Teillon, New Condition Useful to 1300 MHz latest style \$15 EACH W32D, 520 Centennial Rd., Warminster PA 18974 215-675-4539

LEARN CODE on your IBM-PC (or compatible), Commodore C64/128, or Macintosh. CODE-PRO takes you from no knowledge to proficient copy. Specify computer. \$10 plus \$2 S&H Trio Technology, Dept 862, PO Box 402, Palm Bay, FL 32906

FOC SAMPLE EXAMS and study help on Commodore 64 disks! Technician/General \$12.95, Advanced \$14.95 postpaid. Clubs and schools, 20 percent less. Dr. G. Schilling, Alibi 37251 Sage Road, Hemet, CA 92343

COLLINS KWM-380. Fully updated. Full service manual W3IRE 8436 Howes Rd. Dunkirk, MD 20754 301-257-3041

WANTED: YAESU 726R, FT102, VFO, H-F. Amplifier Henry 2K-3K series, BTI, TL-922A, L4B SB-220. Sell - Microwave Module 432-2mtr IF \$175. Steve (KIGUB), 617-222-1261

ROBOT 400 SSTV Converter, AC/DC Monitor, Camera. Tripod, Manuals, cables, \$375. Heath HW101, HP23B, HP10, Shure Brothers Mike, manuals \$275. Will ship. WD8DWR 313-385-9479

FOR SALE: COLLINS KWM-2 Transceiver with Noise Blanker, Power Supply with Speaker, Collins Mike, Manuals. Excellent condition \$475. Ben Butkus, WA9RFO, 14420 State, Chicago IL 60627 312-849-1855

DYNAMIC COLOR NEWS: Monthly newsletter provides programming instruction for Radio Shack Color Computers. Includes Ham Radio Section. Free sample. Dynamic Electronics, Box 896, Hartselle, AL 35640 205-773-2758

ANTENNA PARADISE - 125 acres at Mt. Vernon, KY. Totally wooded, no restrictions, 1 1/2 miles to I-75. On good road with city water. \$232/acre, \$29,000, Owner financing. Mort Caldwell WB8FN, 1363 Cedar Grove Blvd. Columbia, MO 65201 314-449-4705

RTTY JOURNAL, published 10 times per year for those interested in digital communications. Read about RTTY, AMTOR, MSO, Packet Radio, RTTY DX and Contests, and Technical Articles concerning the digital modes. \$10 per year (foreign higher). RTTY Journal, 9085 La Casita Avenue, Fountain Valley, CA 92708.

ICOM, KENWOOD, & Yaesu Separate Newsletters: 7 years of back issues for ICOM & Kenwood. Cumulative index available on each. T9930S & 430S Users Modifications Supplement available. For free brochure send SASE (\$3.99) to: International Radio Inc., 747 South Macado Blvd., Port St. Lucie, FL 33452.

WANTED: TWO 8874.K4NBN "No Bad News"

WANTED YAESU FT-7B portable in good or excellent condition. C. Keith, 351 Ferdinand, Longwood, FL 92750, W45TX.

T1-99/4A RTTY TERMINAL Program. Split-screen 64 column display. Type-ahead buffer, File transmit, More. \$30 or SASE for details. KF4FL, 2212 Lakeland Drive, Johnson City, TN 37601.

WANTED: KWM-380 Control Interface keypad and cable. AC1Y 203-653-3664.

WANTED FT757GX, K4NBN. "No Bad News"

SONY ICF-2002, \$160, Collins 51J3 pickup \$125, Kenwood SMC25 Mike \$25, Heath HW16 \$110, NSJEF, 6617B Rhine, Corpus Christi, TX 78412.

WANT POWER SUPPLY LV 480V Filter Choke. Winding resistance 280 to 300 Ohms, for 57 Viking smtr. Write W7PDS, 507 S. Sheridan Avenue, Sheridan, WY 82801.

KENWOOD TS130S with PS 30 Power Supply Mint condition, K1BL, Herb, 904-383-2290.

OLD CALLBOOKS WANTED: W2OC, 2 Barnard Road, Armonk, NY 10504, 914-273-3058.

WANTED: YAESU FT-208R HT. WA6KAH, 415-933-6364.

SHORT DIPOLES for 160/80, 160/40, 80/40, . . . coax-fed, no tuning, \$59.50 postpaid. . . G5RV all-band \$35. SASE Tom Evans, W1JC, 113 Stratton Brook, Simsbury, CT 06070.

TNT RADIO SALES INC.

1-800-328-0250

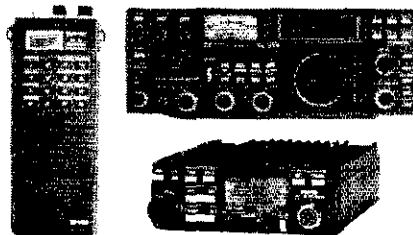
IN MINN.: (612) 535-5050
SERVICE: (612) 535-7533

ICOM Quality at TNT Prices!

THE STANDARD OF EXCELLENCE!

ONLY ICOM OFFERS:

- Broad band coverage
- Loads of memory
- High stability
- Wide range of filters
- Compact versatility
- Exceptional receivers
- Advanced electronic design



AUTHORIZED ICOM FULL SERVICE CENTER

BENCH TESTED previously owned ham gear!

COLLINS 7424 w/waters ret \$279 2551 wing \$249 3859 wing w/pwr sup \$249 4159A wing \$149 5169 w/water pwr sup \$109 7553B w/water filter \$389 2551 w/water w/pwr sup \$289 31264 wing \$189 3844 receiver \$269 51J3 \$175 9WA2 microphone \$50 DRAKE TR-7 w/PS-2 \$849 6V AC remote vfo \$69 9C with BCG \$149 TC-6 meter coil \$179 TC-2 meter coil \$179 CC1 w/2M A.M. coil \$179 A/C Drake Accy Call ICOM 751 w/500 Hz \$839 730 \$439 740 w/pwr sup \$629 PS-55 pwr sup \$145 R20 \$479 AH-1 mobile antenna \$189 KENWOOD TS-890S HF \$499 TS-900E \$429 TS-180S \$429 TS-180S \$449 TS-890S w/w/whl \$649 TS-950 w/w/whl \$1049 7FO 890 \$109 VFO 500 \$109 DFC-920 \$139 KPS-12 12 amp pwr sup \$59	SWAN 500 w/pwr sup \$289 Astro 102BK \$599 250 \$175 VCOX unit \$29 YAESU FT-102 \$649 FT-757AT \$229 FT-107M \$599 FT 107AA w/FP107E \$599 FT-107M \$499 FT-107Z Mark II SP-901P speaker phone patch \$59 FT-107E HF ac vfo w/fan \$429 FT-107EE \$389 FT-107EE \$409 FT-107EK \$369 VO-100 monitor scope \$169 RV-950 \$179 FT-301D w/FP301 \$425 FT-301AD w/w/whl \$475 RV-101Z remote vfo for ICOM \$199 FP-4 pwr sup \$59 TENITEC Corsair II loaded \$1049 260 pwr sup \$139 Corsair w/CW filter CW/SD 1B \$259 Trifon 544 \$399 Trifon IV \$399 285 pwr sup \$79 242 antenna tuner \$99 242 vfo \$89 HAND HELD RADIOS: KENWOOD TR-2500 \$189 TR-4500 \$199 TR-91AT \$169 TR-31A1 \$195 TR-41A1 \$175	YAESU FT-706R \$199 FT-207R \$109 FT-202R \$89 FT-202 \$69 ICOM SAT \$169 KANTRICK ST-144 \$179 AZD8A \$149 PCS 330 \$179 HANDHELD ACCESSORIES: ICOM HS-10 headset \$15 HS-105A w/w/whl \$15 YAESU NC-1A charger \$25 NC-1A charger \$29 PA 1 charger \$19 PA 2 charger \$15 KENWOOD SC-6 quick charger \$75 PB-21H \$84 MISCELLANEOUS Speaker mics, all HT's \$25 Leather cases, all HT's \$25 HF LINEARS Amp Supply Mint \$899 ANTENNA TUNERS: DENTRON RD-101 \$49 HEATH SA9340 \$109 NYE MD-113Kw \$299 RTTY EQUIPMENT: DOVETRON MPC-1000 \$995	A.E.A. Software Call CP-1 interface \$139 HAL DS-3000 \$199 SFA- \$149 BT-500 \$99 KANTRICK Software Call Interface \$79 CONTACT-50 Interface & software for OS-80 II \$99 MR. RTTY Terminal unit \$99 VHF/UHF: KENWOOD TR-9000 all mode. 10 watt \$299 TR-7800 14 memory. 25 watt \$199 TR-7955 \$199 TR-7950 \$295 TR-7950 KJ-2714 45 watt mobile \$309 KJ-2714A dual band mobile. 45 watts \$439 YAESU FT-480R & FT-706R \$849 AZD8A PCS-3000 \$169 KLM CA-10 100BL linear \$129 MIRAGE BR-1A 2 in 30 out amp \$99 MISCELLANEOUS: LAMBDA 33 amp 1V vdc \$149 MFJ 723 CW filter \$25
---	---	--	---

VISA/MASTER CARD
FREE SHIPPING
ON MOST PKGS FOR CASH!



S.A.S.E. FOR OUR
"BENCH-TESTED"
USED EQUIPMENT LISTING

MON-FRI 9 AM - 6 PM CENTRAL TIME
SATURDAY 9 AM - 5 PM

4124 West Broadway, Robbinsdale, MN 55422 (Mpls./St. Paul)

FT-757GX & IC-735 QSYers

Add keypad frequency selection to your '757 or '735 with a QSYer terminal. Only \$89.50 plus \$2.50 S&H. 10-day money back guarantee. Visa and MC accepted.

Stone Mountain Engineering Co., 404-879-0241
P.O. Box 1573, Stone Mtn., GA. 30088
CANADA: Atlantic Ham Radio Ltd., 416-636-3636

AMATEUR RADIO MAIL LISTS

Self-stick 1x3 labels

*** NEWLY LICENSED HAMS ***
*** ALL NEW UPGRADES ***
*** UPDATED EACH WEEK ***

Total List = 462,728 (ZIP sorted)
Price is 2.5 cents each (4-up Cheshire)

BUCKMASTER PUBLISHING
Mineral, Virginia 23117
703:894-5777

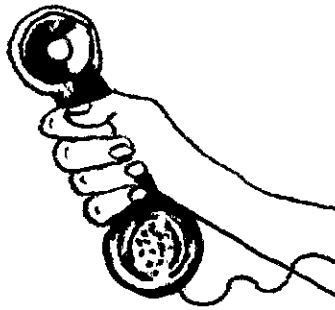


Toroid Cores.
Iron Powder
& Ferrite.
Ferrite Beads.
Ferrite Rods.

Free catalog and winding chart on request.

PALOMAR ENGINEERS

Box 455, Escondido, CA 92025
Phone: (619) 747-3343



For your best price on **KENWOOD, YAESU, ICOM** and all **MAJOR BRANDS** dial

800-227-7373

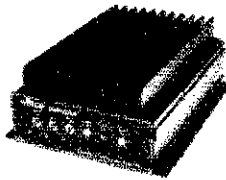


COLORADO COMM CENTER

303-288-7373
525 E. 70th Suite 1W



CODS Welcome
Denver, CO 80229



The **ORIGINATOR** of the VHF AMP/PREAMP COMBO!
YOU KNOW THE LUNAR NAME...NOW OWN THE BEST.

- Complete Line of Multi-Mode Amps, all with Low-Noise Preamp Built-In •
- NEW! UHF Models with GaAs FET Performance •

2 METERS	220 MHZ	440 MHZ
2M2-100P	1.3M2-80P	70CM2-50PG
2M4-40P	1.3M4-30P	70CM10-100PG
2M10-80P	1.3M10-80P	70CM30-100PG
2M30-160P	1.3M30-140P	

Lunar Model # shows: Band, Drive Pwr, Output Pwr (nominal), Preamp included.

Six meter, special purpose, and repeater versions available.
AT FINE DEALERS EVERYWHERE



7930 Arjons Drive • San Diego, CA 92126 • Telephone (619) 549-9555 • Telex 181747

WORLD FAMOUS

CURTIS KEYPERS

Write for Brochures
8044/8044B still \$16.70 ppd



CURTIS ELECTRO DEVICES, INC.
(415) 964-3846
Box 4090, Mountain View CA 94040



K5-\$44.95
(plus shipping)

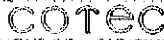


CW RTTY CW RTTY CW RTTY CW RTTY CW

APPLE II USERS

TRANSMIT/RECEIVE SOFTWARE FOR THE APPLE II
NO OTHER HARDWARE REQUIRED

CODE MACHINE \$29.95
RTTY MACHINE \$29.95



13462 HAMMONS AVE - SARATOGA, CA 95070



STILL LOOKING FOR QUALITY WIRE & CABLE AT THE RIGHT PRICE?

RG-213 MIL. SPEC. 97% SHIELD	28.5¢/ft.
RG-214 MIL. SPEC. DBL. SILVER SHIELD	\$1.50/ft.
RG-174 MIL. SPEC. 97% SHIELD	10¢/ft.
RG-8X (MINI 8) FOAM. 95% SHIELD	12.5¢/ft.
RG-8U FOAM 95% SHIELD	24.5¢/ft.
RG-58A/U MIL. SPEC. 97% SHIELD	12¢/ft.
RG-11A/U MIL. SPEC. 97% SHIELD	78¢/ft.
RG-59J MIL. SPEC. 97% SHIELD	12¢/ft.
300 OHM KW TWIN LEAD	18¢/ft.
450 OHM HD LADDER LINE, POLY INS.	118¢/ft.
450 OHM HD LADDER LINE, BARE, 250' ROLL	\$30.00
4 CONDUCTOR ROTOR CABLE	8¢/ft.
6 CONDUCTOR ROTOR CABLE	14¢/ft.
8 CONDUCTOR ROTOR CABLE (2#18/6#22)	16.5¢/ft.
8 CONDUCTOR ROTOR CABLE HD (2#18/6#18)	34¢/ft.
14 GA STRANDED COPPERWELD	6¢/ft.
14 GA HD SOLID COPPERWELD	8¢/ft.

*SOLD IN CONTINUOUS LENGTHS TO 5000 FT. IN 50 FT. MULTIPLES ONLY

MINIMUM WIRE ORDER-100 FEET
PHILLYSTRAN GUY CABLE



HPTG 2100 (2100H/RATING)	24¢/ft.
HPTG 4000 (4000H/RATING)	40¢/ft.
9901 CABLE END	7.50
SOCKETFAST POTTING COMPOUND	14.50

AVANTI ANTENNAS
(ANTENNA SPECIALISTS)



AP-151 3G 2M ON GLASS ANTENNA	30.95
AP-450 3G 440 ON GLASS ANTENNA	30.95
APR450 5G 440 ON GLASS ANTENNA	34.00



ASTRON POWER SUPPLIES

RS7A/RS12A	44.99/82.50
RS20A/RS20M	79.75/96.00
RS35A/RS35M	123.50/138.50
RS50A/RS50M	179.50/202.99
VS20M/VS35M	113.99/156.50
VS50M	222.99

MINIMUM ORDER 20.00

814-536-5500

SHIPPING CHARGES ADDITIONAL

LA CUE inc.



132 Village Street
Johnstown, PA 15902



Mon.-Fri. 8:30-5:00



It's Incredible!

Now You Can...

Master code or upgrade in a matter of days. Code Quick is a unique breakthrough which simplifies learning Morse Code. Instead of a confusing maze of dits and dahs, each letter will magically begin to call out its own name! Stop torturing yourself! Thousands have proved Code Quick to be the fastest way to master code. Your amazing kit containing 5 power-packed cassettes, visual breakthrough cards and original manual is only \$39.95! Send check or money order today to WHEELER APPLIED RESEARCH LAB, P.O. Box 3261, Industry, CA 91744. Calif. add 6%.

Your success guaranteed or money back!

COMING SOON - Code Quick for personal computer. Write for information.

HI-MOUNT KEYING MECHANISM. Finest most extensive line of hand keys, mobile keys, lambic paddles. Write for free catalogue of all our communications products. Skywave Radio, Box Q-1, 943 Boblett Blaine, WA 98230.

SALE HEATHKIT Linear Amplifier. Mod. 201 with 10 meters and one extra 572B tube nearly new excellent condition with manual. \$350. KC4EP, Ernest Magnuson, Box 3255, Nalcrest, FL 32856, Tel. 813-696-2554

DENTRON AMPLIFIER, MLA 2500, 80/10, not working, replace finals or strip for parts, will ship, make offer, Steve, W5LXG, 713-771-9052.

6 METER MOBILE Gear wanted, Yaesu FT-680R and FT-627FA. Info to K3SAE, Box 214, RD1, Pittston, PA 18643, 717-393-6863.

IBM/PC RTTY/CW. New CompRtty II is the complete RTTY/CW program for IBM-PC's and compatibles. Now with larger buffers, better support for packet units, pictures, much more. Virtually any speed ASCII, BAUDOT, CW. Text entry via built-in buffer, select calling, text file transfer, customizable full screen logging, 24 programmable 1000 character messages. Ideal for MARS and traffic handling. Requires 256k PC or AT compatible, serial port, RS-232C T.U. \$65. Send call letters (including MARS) with order. David A. Rice, KC2HO, 25 Village View Bluff, Ballston Lake, NY 12019.

QRPI HW-8 & PS, HM-9 Wattmeter, and HFT-9 tuner, manuals, all work fine. \$150 free shipping. Tom Parker, 19293 Benson Lane, Fort Bragg, CA 95437.

WANTED: ESTES Engineering Electro Shield System for 1979 Ford F150. K5DED, 12240 E. Arkansas Ave, Aurora, CO 80012.

WANTED: 1. UHF Oscilloscope, to cover the frequency range of 100 MHz to at least 1 GHz, will consider scopes up to 4 GHz. 2. Spectrum Analyzers - plug-ins for Tektronix scope 530, 540, 550 series, types 1L5, 1L10 or L10'A, L20 or L120, L30 or L130, 1L40. 3. RF Generator, prefer sine wave output, to cover the frequency range of 100 MHz to at least 1 GHz, will consider up to 4 GHz. Mr. S.L. Courtney, 323 Daisy Ave, Berea, OH 44017.

PRINTED CIRCUIT BOARDS - Low quotes, High quality, Quick service. Single, Double Sided, Multilayered Boards. Prototypes through Production Quantities. Design/Layout Capabilities. Board Assembly /Project Enclosures/Turnkey Facilities. Call or write for quotes and info. - T.O.R.C.C.C., 1131 Tower, Schaumburg, IL 60195, 312-490-1374.

R-390A RECEIVER: \$195 checked; \$115 repairable. Parts, tubes, sections, info SASE. CPC-26 six meter transceiver (see HR, March 1985) \$17.50 apiece, \$32.50 pair (add \$4.50/unit shipping). Baytronics, Box 591, Sandusky, OH 44870, 419-627-0460 evenings.

WHERE IS CEUTA? How far to Bajo Nuevo?? Let me plot the direction and distance from your QTH to over 450 locations in over 200 countries. Send your longitude and latitude and check or money order to: J. Timm, 595 Avery, San Bernardino, CA 92404.

FOR SALE: complete set-up, Yaesu 560 500 watt Transceiver, also ICOM 230 2-meter Transceiver with Transformer, Power and SWR Bridge, Key, Antenna included. \$500. Mel Price, 214-885-1546 days.

TRADE YOUR Excess/Unwanted Gear or whatever the Electric Barter House way. P.O. Box 44, Goshen, IN 46526.

TOWERS FOR SALE: 80' Universal Aluminum \$600 and 66' Universal Aluminum \$500 each with S.S. hardware and rotor. Also available Hy-Gain 204BA, 153BA and 104BA monobanders. Dave, K1DP, P.O. Box 1265, Orange, VA 22960, 703-854-4540.

WANTED TO BUY, Collins General coverage Receiver in good condition. Pete Hons, 100 Popular Street, Portage, PA 15946, 814-736-3883.

PACKET: AEA PK-64 with HF modem \$200. Commodore C-64, 1541 Drive, 1701 Color Monitor \$275. Also AEA CP-1 interface with HAMSOFIT-64 \$125. Ameritron AL-80 1kW amplifier with 10M \$350. Heath SA-2080 2kW Tuner \$125. All in excellent condition, except 1541 needs alignment. KC2GE1, Doug, 617-366-3916, evenings.

BEST OFFER: Drake L4B linear amplifier, power supply, spare finals. Mrs. Gritsevitz, 1-717-735-3190.

KENWOOD TS-520 Transceiver. Has cw filter installed, matching speaker, vfo-520. Bought new, one owner. Mrs. Gritsevitz, 1-717-735-3190.

DRAKE T4XCR4C with all filters and 15 SWL crystals FS-4 Synthesizer, AC4, Datong RF Speech Processor, EV-544 mike, 2 extra sets matched finals and extra tubes, manuals and cables, complete station \$800. Call Dan Zdanowicz K1YPB, 313-739-0125.

TEMPO S1 Hand Held, new battery, checked mint \$115. Kantronics HAMEXTX C64 new \$65. Bencher Key, AEA Keyer CK-1 as new \$95. Regency HR2, mount, pad, amplifier, crystalad, \$100. Murch Antenna Transmatch, mint \$95. Kenwood TS180S/DFC, SSB, CW Filters, absolute mint, original owner, \$425. Shipping extra, KD7FE E5085 Highland Drive, Post Falls, ID 83854.

MULTI-MODE TWO METER Rig: ICOM IC260A, digital, with Microphone, Power Cord and Manual, \$220. Daiwa two meter linear - 10 in, 70 out, GaAsFET preamp, 3 months old, \$100. Mike WB6CNE, 818-707-0083.

FOR SALE - Wilson 45' foldover crankup tower - TH33 3el Beam ODR Rotator, all cables. \$500- Milton - WB2GFI - 516-748-6389.

RADIO SHACK Model II Computer - 64K w/ 8 Meg Hard Disk, OSCAR Tracking Programs, several programs system sold new for over \$8000 mint for \$3500. KB5GU, 806-273-5540.

P.C. ELECTRONICS ATV Down converter never used. \$50 with A.C. supply. MFJ model 408/406 deluxe electronics keyer. \$25. Vibroplex key for an electronics keyer. \$30. Kantronics Hamsol/AMTOR ROM for TRS 80C computer. \$45. MFJ model 1224 RTTY Terminal Unit. \$50. Heath model HDP-121A. Hi-Z microphone. \$25. W1OER 617-891-5287.

HAM RADIO HOME STUDY NOVICE VOICE COURSE



- Updated novice-voice questions
- 6 stereo code & theory cassette tapes
- 2 text books, code oscillator, key & battery
- Color Ham Bands wall chart & frequency list
- Sealed novice exam for a Ham friend to give you the code & theory test in your home
- FCC license application forms & instructions to your examiner. **Ideal for spouse & the kids!**

\$49.95

NOVICE CODE COURSE \$39.95

4 tape stereo code course for learning the code from scratch plus a deluxe CW oscillator set.

NOVICE THEORY COURSE \$19.95

2 stereo tapes & 2 books for theory, including 5 wpm CW practice exam & examiner's packet for the CW test. Includes FCC rulebook, too!

THE COMPLETE GENERAL \$49.95

4 tapes & 2 books for theory plus 6 tape stereo code set for CW speed building 5 wpm to 13 wpm plus all FCC paperwork.

GENERAL CODE COURSE \$39.95

6 tape stereo code course for CW speed building from 5 wpm to 13 wpm.

TECHNICIAN THEORY CLASS \$19.95

4 tape stereo theory plus fully illustrated theory book and FCC rulebook.

THE COMPLETE ADVANCED \$49.95

4 tapes & 2 books for theory plus 6 tape stereo general or extra class code course. Specify which CW tapes you want.

ADVANCED THEORY CLASS \$19.95

4 tape stereo theory course plus fully illustrated theory book & FCC rulebook.

THE COMPLETE EXTRA \$49.95

4 tapes & 2 books for theory plus 6 tape stereo code set for CW speed building 13 wpm to 22 wpm-H. Includes all VEC and FCC paperwork.

EXTRA CODE COURSE \$39.95

6 tape stereo code course for CW speed building from 13 wpm to 22 wpm-H.

EXTRA THEORY CLASS \$19.95

4 tape stereo theory plus fully illustrated theory book and FCC rulebook.

GORDON WEST ELECTRONICS BOOK

200 page marine electronics book plus mobile antenna hints. **\$9.95**

INDIVIDUAL CODE TAPES

- 5 wpm Novice QSO Test Prep Tape \$9.95
- 5 wpm Random Code Practice \$9.95
- 5 wpm Symphonic Sleep Tape \$9.95
- 5-7 wpm Speed Builder \$9.95
- 7-10 wpm Speed Builder \$9.95
- 10 wpm Plateau Breaker QSO's \$9.95
- 10-12 wpm Speed Builder \$9.95
- 12-15 wpm Calls & Numbers Speed Build \$9.95
- 13-15 wpm Random Code Practice \$9.95
- 13 wpm Symphonic Sleep Tape \$9.95
- 13 wpm General QSO Test Prep Tape \$9.95
- 13-15 wpm Speed Builder \$9.95
- 17-19 wpm Speed Builder \$9.95
- 20-22 wpm Random Code Practice \$9.95
- 20 wpm Symphonic Sleep Tape \$9.95
- 20 wpm Extra QSO Test Prep Tape \$9.95

Slow Code Tapes use 13 wpm character speed. We ship most orders same day. Add \$4.00 P & H on the sets. Add \$1.00 P & H on a single tape.

GORDON WEST RADIO SCHOOL
2414 COLLEGE DR., COSTA MESA, CA 92626
Mon.-Fri. 10-4pm (714) 549-5000

AUTHORIZED KENWOOD I-COM RADIO DEALER



H. L. HEASTER, INC., 203 Buckhannon Pike, Clarksburg, W. Va. 26301 Clarksburg Phone (304) 624-5485 or W. Va. Toll-Free 1-800-352-3177

HAROLD HEASTER KA80HX, 91 Ridgefield Place, Ormond Beach, Fl. 32074 Florida Phone (904) 673-4066

NEW NATION-WIDE TOLL-FREE TELEPHONE

1-800-84-RADIO

1-800-84-72346

Call us for a quotation, WE WILL SAVE YOU MONEY!



1-800-433-WIRE

FOR ALL AMATEUR WIRE & CABLE

Belden & Equivalent

(803) 895-4195 (So. Caro. & Ragchew)

CERTIFIED COMMUNICATIONS

ROUTE 2 - PITTMAN RD., LANDRUM, SC 29356

Where's my CATALOG?



What? You haven't seen the FREE DICK SMITH ELECTRONICS catalog? Or did someone steal your copy again? After all, who can resist 148 colorful pages crammed with 1000's of electronic goodies ranging from kits & components to computers & radio-controlled cars. The selection is incredible, the values are even better! Top it all off with our exclusive 15-page electronic data section, and you'll have more than a catalog, more than a reference: it's a totally entertaining experience for the electronic enthusiast, and it's FREE! All we ask is your name, address and \$1.00 for first-class postage. What are you waiting for? Order yours today!

YES! Send my copy of the 1986/87 DSE catalog today! Enclosed is \$1.00 for postage!

Name _____

Address _____

City _____ State _____ Zip _____

DICK SMITH ELECTRONICS, INC.
P.O. Box 2249, Redwood City, CA 94063



ARRL BOOKSHELF

Prices are subject to change without notice. Shipping and handling: add \$2.50 for book rate or \$3.50 for UPS. Payment must be in US funds.

ARRL, 225 MAIN STREET, NEWINGTON, CT 06111

THE 1987 ARRL 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 64th edition is

packed with information on digital communication modes as well as new power supplies and amplifiers. Ready-to-use etching patterns are provided for many projects. This *Handbook* belongs in every ham shack.

Paper #064X \$18 US, \$19 elsewhere. Cloth #1646 \$27 US, \$29 elsewhere

ANTENNA BOOKS

THE ARRL ANTENNA BOOK represents the best and most highly regarded information on antenna fundamentals, transmission lines, and propagation. There are practical construction details of antennas for 160-meters through microwaves, and those for mobile or restricted space use. Covers use of Smith charts and equipment for antenna and transmission line measurements. 328 pages copyright 1982.

Paper #4149 \$8 US, \$8.50 elsewhere
Cloth #0038 \$12.50 US, \$13.50 elsewhere

ANTENNA COMPENDIUM Packed with new material on quads, yagis and other interesting topics.

©1985 178 pages #0194 \$10 US, \$11 elsewhere

HF ANTENNAS FOR ALL LOCATIONS

G6XN's look at antennas with practical construction data.

©1982 264 pages #R576 \$12

YAGI ANTENNA DESIGN by Dr. James L. Lawson, W2PV. Over 210 pages of practical theory and design information.

©1986 #0410 \$15

OPERATING

The ARRL Operating Manual 192 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.

©1985 2nd ed. #1086 \$7 US, \$7.50 elsewhere

The RSGB Operating Manual The third edition published in 1985 is packed with practical operating tips, techniques and tables . . . #R69X \$10 #R69X \$10

The ARRL Repeater Directory, 1987-88 ed. should be available for shipping by mid-April.

#0437 \$4
The ARRL Net Directory-free shipping. . . #0275 \$1

Field Resource Directory Lists thousands of ARRL officials and appointees, packed with organizational material. 1986 514 pages.

#0321 \$10
HOLA CQ Learn to communicate with Spanish-speaking radio amateurs. 90 min. cassette and 15 page text.

#901N \$7
Radio Database International 350 pages of information and listings of shortwave broadcast stations with frequency, times, and languages. 1987 ed.

#RDB1 \$13
1987 Callbooks pub. 12/1/86

North American Ed. #C087 \$25
International (outside N. America) . . . #C187 \$25

PACKET RADIO/COMPUTERS

Computer Networking Conferences 1-4 from 1981-1985. Pioneer Papers on Packet Radio #0224 \$18.

RSGB Amateur Radio Software Contains 86 BASIC programs, 6 in assembly language covering CW, RTTY, Amtor, Packet, Antenna Design, Satellite Predictions, Distances, Bearings and Locators.

©1985 328 pages, hardbound #R711 \$15

5th Computer Networking Conference Papers

©1986 #033X \$10

AX.25 Link Layer Protocol #0119 \$8
Get *Connected to Packet Radio** . . . #Q221 \$13

DX
The Complete DX'er by W9KNI covers all aspects of the DX'er's life both in and out of the pile-ups: listening, the chase, capture and quest for elusive QSL cards. #0283 \$10 US, \$11 elsewhere

DX Power by K5RSG #T740 \$10
DXCC Countries List - free shipping. . . #0291 \$1

QRP

QRP Notebook by Doug DeMaw, W1FB. An exciting book for the low power enthusiast and experimenter.

There are many useful construction projects described. Copyright 1986, 112 pages . . . #0348 \$5

OTHER PUBLICATIONS

Fifty Years of ARRL #0135 \$4

GIL: Collection of cartoons from QST . . #0364 \$5

Instructor Guide-Novice #0305 \$4

Instructor Guide-Tech./General #0313 \$6

Oscarlocator #3037 \$8.50 US, \$9.50 elsewhere

200 Meters and Down #0011 \$4

The Satellite Experimenter's Handbook by Martin Davidoff, K2UBC. Packed with information on amateur satellites and how to communicate through them. 208 pages, copyright 1985

#0046 \$10 US, \$11 elsewhere

Solid State Design for the Radio Amateur. First published in 1977, just reprinted by popular demand.

#0402 \$12

RSGB VHF/UHF Manual #R630 \$17.50

RSGB Radio Communications Hdbk. . . #R584 \$22

RSGB Teleprinter Handbook #R592 \$21

RSGB Test Equipment #41X \$11

RSGB Data Book #R673 \$15

RSGB Microwave Newsletter Col. #R000 \$10

PASSING POWER! - THESE PUBLICATIONS WILL HELP YOU THROUGH THE EXAMS

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. **The ARRL Code Kit** has a booklet and two C-60 cassettes to take you from 5 to 13 WPM quickly. **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 UNIVERSITY is a trademark of AEA, Inc.

Tune in the World with Ham Radio 1987 edition
Kit with book and cassette #0380 \$10
Book only #0399 \$ 8

License Manual Series

Technician/General Class #0143 \$ 5

Advanced Class #016X \$ 5

Extra Class #0178 \$ 5

FCC Rule Book #0216 \$ 4

Code Proficiency

Code Kit #5501 \$ 8

Morse University #0259 \$40

C-60 Code Practice Cassettes

30 min. each at 5 and 7½ WPM* #1030 \$ 5

30 min. each at 10 and 13 WPM* . . . #1040 \$ 5

30 min. each at 15 and 20 WPM . . . #2050 \$ 5

*Same tapes included in *Code Kit*

Morse Code: The Essential Language covers sending, receiving, high speed operation and history ©1986 #0356 \$ 5

First Steps in Radio #2286 \$ 5

ADVENTURE

Tommy Rockford, K6ATX is back on the trail of high adventure! In **Death Valley QTH**, what starts as a typical field day operation becomes a matter of life and death for K6ATX and the Santa Bonita Amateur Radio Club. **SOS at Midnight** finds Tommy up against the Purple Shirt Mob and ham radio saves the day! The beachcomer seemed like a harmless character, but what did he have to hide in **CQ Ghost Ship?** Underwater adventure and ham radio join together to form the exciting conclusion to **DX Brings Danger**. Coming soon is a fifth ham radio adventure, **Grand Canyon QSO**.

The author of this series is Walker Tompkins who is K6ATX in real life. He is noted screenwriter, newspaper columnist, historian and biographer. His knowledge of the areas where these stories take place makes them even more true-to-life. You'll want to read all of these classics in Amateur Radio fiction.

SOS at Midnight #5005 \$ 5

CQ Ghost Ship #5013 \$ 5

DX Brings Danger #5021 \$ 5

Death Valley QTH #503X \$ 5

Set of 4 Tompkin's books #1490 \$15

CALL TOLL FREE 1-800-238-6168

(In Tennessee, call 901-683-9125)

For The Deal You Want—On The Brands You Know!

Authorized dealer for:

KENWOOD, ICOM, NYE-VIKING, TEN-TEC, BUTTERNUT, HUSTLER, MIRAGE, MFJ, AEA, B&W, ASTRON, CUSHCRAFT, LARSEN, HI-GAIN & MORE! Also many fine used rigs, too! CALL FOR DETAILS.

WE TRADE!

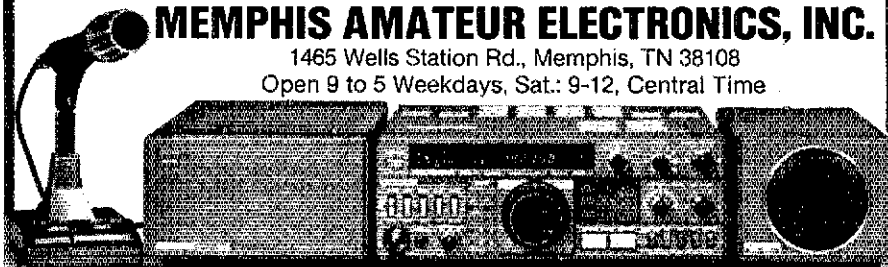
CALL FOR A FREE APPRAISAL!

Send us your name & address. We will put you on our catalog mailing list!

MEMPHIS AMATEUR ELECTRONICS, INC.

1465 Wells Station Rd., Memphis, TN 38108

Open 9 to 5 Weekdays, Sat.: 9-12, Central Time



CONTINUOUS COVERAGE ANTENNAS FOR COMMERCIAL & AMATEUR SERVICE

Model AC 1.8-30 1.8 to 30 MHz

- SWR Max 2:1, 1.4:1 average from 1.8 to 30 MHz
- Can be installed in approximately 80 ft. space
- Ideal for commercial services for multi frequency operation without the need for antenna tuners or additional antennas
- Handles 1 KW, 2 KW PEP ICAS
- Higher power models available on special order. Contact your dealer or factory.



U.S. Patent No. 4,511,898

\$159.50

SHIPPING & HANDLING ADD \$4.00

Model AC 3.5-30 3.5 to 30 MHz

- SWR less than 2:1 from 3.5 to 30 MHz
- Complete assembled. Balun terminated with standard SO-239 connector
- Power capability 1 KW - 2 KW PEP ICAS. Higher power model is available on special order.
- Designed for 50 ohm feedline
- Weather proof balun and balancing network



U.S. Patent No. 4,423,423

\$167.50

SHIPPING & HANDLING ADD \$4.00



BARKER & WILLIAMSON

ALL OUR PRODUCTS MADE IN USA

Quality Communication Products Since 1932
At your Distributors. Write or Call
10 Canal Street, Bristol, PA 19007
(215) 788-5561



ELECTRONIC EQUIPMENT REGISTRY
Box 304 • Wallingford, CT 06492 • 203-266-7388

The ELECTRONIC EQUIPMENT REGISTRY's purpose is help prevent the loss of and facilitate the recovery of equipment listed by us. The ELECTRONIC EQUIPMENT REGISTRY provides temper resistant labels that are UL and CSA approved and meet MIL specifications. They are to be applied to equipment to discourage theft by letting it be known that the specific equipment has been registered by a central agency.

The ELECTRONIC EQUIPMENT REGISTRY provides a service of notifying all state police agencies of any losses or thefts with all necessary identifications. All dealers that handle used equipment of the type reported lost, stolen or missing will be notified. In addition any organization that has auctions or flea markets or any such activities may request a list of reported equipment at no cost. This information will also be made available upon request at no charge to any insurance company or proper representative or agency investigating any loss.

Registration cost is \$15.00 per year including 4 labels and \$2.00 for each extra label desired. Renewal is \$15.00 per year regardless of how many labels have been previously requested.



HARDLINE

7/8" -50Ω

\$150/Foot

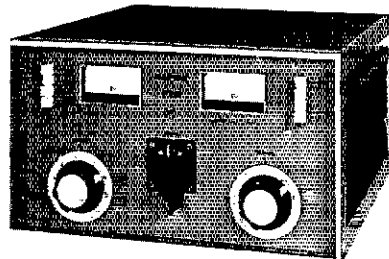
A.G.W. ENTERPRISES

Route 206-RD 10
Vincentown, N.J.
08088

DISCOVER THE ULTIMATE POTENTIAL OF YOUR STATION 609-268-8166

ET ALPHA 77DX

If you want the finest



SPECIAL SALE — ALL ALPHAS

Model	List	Sale
77DX	\$5450	
78	\$3495	CALL FOR LATEST PRICE
374A	\$2595	
76A	\$1985	
76PA	\$2395	
76CA	\$2695	

Phone Don Payne, K4ID, for Brochure

Personal Phone — (615) 384-2224
P.O. Box 100

Springfield, Tenn. 37172

PAYNE RADIO

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

STATION FOR SALE, six foot Bud cabinet with two linears, 4-1000A in one, pair 4-400A in other, with super heavy power supply, TR-7, PS-7, antenna tower, scope, and more, KBØO, 218-863-5419.

YAESU FRG8800, FRV8800, FRA7700 all band receiver, active antenna, 0.2-30 plus 118-174 MHz as new in boxes. List \$750, send \$499 or call. Mike Neldich, 145 E. 15th St, New York, NY 10003, 212-777-1332.

NEED SCHEMATIC/Instructions for Philco Model 7001 VTVM. John Rains, WA4TWK, 1628 Sigler Ave, Mobile, AL 36605.

LEARN MORSE CODE in 1 hour. Amazing new easy technique. Moneyback guarantee. \$10. Bahr, 2549G Temple, Palmbay, FL 32905.

SACRIFICE QST 1971 through 1986. Most in binders. \$35 plus shipping. WA2PYN, 95 Somerset, Bridgewater, NJ 08807-2023.

RTTY EQUIPMENT Hal ST-5000 Demodulator \$225. HAL-DS3100 ASR-ASCI, RTTY, CW Terminal sold new for \$1800 asking \$950. Converted 11M to 10 Meter SSB rig \$125. Dentron MLA2500 amplifier 10M-80M \$400. KB5GU - 80S-273-6540.

SUPERFAST MORSE CODE Supereasy. Subliminal cassette. Moneyback guarantee. \$10. Bahr, 2549G Temple, Palmbay, FL 32905.

WANTED: A RECENT quality HF transceiver, prefer ICOM, Kenwood, or Yaesu. NF1V, 803-293-7937.

SELLING: ICOM U-18 with rapid charger handles 440 easily, \$650. Excellent condition. N5GSE, Bob Clark, 5430 Markwood Ln. Houston, TX 77053, 713-434-0425.

SWAN 350 - NEED source of factory original type repair parts. NDBKP, David Owen, Rt. 2, Box 480, Billings, MO 65610.

WANTED - A DRAKE L-7 or L-75, WØMS, 303-694-2145.

APPLE 2X, 2E, 2C with accessories and software. Will swap for older lab-quality test equipment, recent HF and VHF gear with cash adjustments. Write only please. Guy Black, W4PSJ, 12317 Hanger Rd., Fairfax, VA 22033.

UNIVERSAL TOWER Base Legs B30. Brand New. Three legs. \$80. K8JH, 816-874-8057.

TIMES SQUARE, BROADWAY, MISS LIBERTY are all part of the Big Apple. Why do they call it that? Send your QSL card today to WB2JKJ and the Crew at Junior High 22 on Manhattan's Lower East Side. We will not only tell you but enter your card in our famed QSL Of The Week Award contest.

WANTED: GPR-92 Receiver (TMC). Also 250TH tubes. W6RNC, P.O. Box 478, Nevada City, CA 95959.

SELL: ICOM IC-471H, \$700, and IC-127A, \$600. Both include internal power supplies and microphones. Like new condition. SASE for list of additional equipment. Bill Gilfen, KEØFM, P.O. Box 25602, Colorado Springs, CO 80936, 303-481-4885.

FOR SALE Yaesu FT-901-DM like new with FV-101-Z VFO, never used. Includes 3 extender boards and large service manuals. \$700. W8WAL, 404-754-5030.

FOR SALE: ICOM 720A, PS20 with Service Manual, excellent condition. New Eimac 8877. Weekdays after 6 PM, W3TMZ, 301-931-7086.

TRADE ALMOST NEW 8877 tube in original carton. Removed from commercial service 400 hours. Want late model two meter handheld or AEA PK232 or PK64 with HF Modem. No troubles. E. Flanagan, W8RHS, 1532 Fenton Circle, Nitro, WV 25143, tel 304-727-4826.

TRIELECTRIC COMMERCIAL grade VHF amplifier. 2W in/40W out. Workable on 2FM. Like new - barely used. \$75. 618-874-8057, K8JH.

GEM QUAD ANTENNA - 2 element, 3 band Fiberglass Spider Quad. Brand new never assembled. \$185. You ship. Ben Taylor, WA4LAW, 44 Hancock, Fort Leavenworth, KS 66027, 913-682-6945.

CRYSTALS: BUILD something, or reactivate and old C-W or AM phone rig. Try QRP, it's easy with crystals. Inexpensive FT-243's made to order. 40M \$2.50, five or more \$1.95. 30M \$2.95, five \$2.50. 80M \$2.95, five \$2.50/ 180M \$3.95, five \$2.95. 12M overtones \$4.95. Sockets 75 cents. SPECIAL - 100 Kilocycle Standards, with octal socket \$2.95 plus 90 cents airmail. Airmail 30 cents per crystal. Stamp or long SASE for listings-circuits. 1700 - 60,000 kilocycles. Crystals Since 1933. WØLPS, C-W Crystals, Marshfield, MO 65706.

YAESU FT-101B - two power cords for AC/DC operation, mobile microphone, and Fox Tango 250Hz CW Filter. Excellent condition. \$350 shipping included: MFJ Keyer - Model 422X electronic keyer unit that mounts on Bencher paddle only 2 months old. \$50. Scott, NØHOT, 8060 Nwot Rd. #205, Longmont, CO 80501, 303-652-2143.

FOR SALE two Eimac Sockets, #6634, please make offer. WA2EUS, 149 Dry Gulch Path, Amityville, NY 11701.

ICOM 551D 6 meter 80 Watt all mode with FM Unit, mint condition. I'll ship UPS. \$499. WA3HVR 4167 Winchester Road, Allentown, PA 18104.

FREE HAM-Software (IBM-PC). SASE details. Fred Maas, Rt. 9, Box 86-H, Sante Fe, NM 87505.

FOR SALE: Brand New Ten-Tel 2510 Satellite Station \$400. Jim, N1EJF, P.O. Box 1101, Hillsboro, NH 03244, 603-478-3262.

KANTRONICS INTERFACE-II \$176. Hamsport TI-99 \$36. Manuals. N3ETF, 20 High Point Circle, Churchville, PA 18966.

ICOM IC-502 6 meter SSB in original box with all accessories \$125 ppd. Regency HR-220 10 watt 220 FM mobile with 7 channels installed \$110 ppd. Steve Mottola, WB3GUS, 12 Earth Star Court, Gaithersburg, MD 20878, 301-330-9263.

MACHINE PARTS for your project. One piece or Production. SASE for information. WA9IDZ, 6201 N. 125 W., Laporte, IN 46350, 219-324-2706.

MULTI BAND TRAP ANTENNAS

TRAP DIPOLES:				
Model	Bands	Traps	Length	Price
D-42	10/15/20/40	2	52"	\$29.95
D-45	10/15/20/40/80	2	105"	64.95
D-56	10/15/20/40/80	6	82"	109.95
D-66	10/15/20/40/80/160	6	163"	129.95

TRAP VERTICALS - "SLOPERS" - *				
Model	Bands	Traps	Length	Price
V4-41	10/15/20/40	2	32"	44.95
V4-52	10/15/20/40/80	2	49"	59.95
V4-53	10/15/20/40/80	3	42"	69.95
V4-64	10/15/20/40/80/160	4	73"	89.95

* Can be used without radials
* Feed line can be buried if desired
* Permanent or Portable Use

ALL TRAP ANTENNAS are Ready to use - Factory assembled - Commercial Quality - Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all Transmitters, Receivers & Transceivers - For all class amateurs - One feedline works all bands - Instructions included - 10 day money back guarantee!

SINGLE BAND DIPOLES (Kit form):				
Model	Band	Length	Price	
D-15	15	52"	18.95	
D-20	20	33"	19.95	
D-40	40	96"	22.95	
D-80	80/175	132"	25.95	
D-160	160	160"	34.95	


Includes assembly instructions, Deluxe center connector, 14 ga Stranded CopperWeld Antenna wire and End Insulators.

COAX CABLE: (includes PL-259 connector on each end)				
Type	Length	With antenna purchase	Separately	
RG-58	50'	\$9.00	\$11.95	
RG-58	90'	17.00	16.95	

DELUXE CENTER CONNECTOR

- NO RUST! Brass Terminals
- NO Jumper Wires Used
- NO Soldering
- Built-in Lightning Arrestor
- With SO-239 Receptacle
- Handles Full Power
- Completely Sealed Weatherproof
- Easy Mount Adjustments
- Commercial Quality

CE-1 \$8.95



DELUXE ANTENNA TRAPS: Completely sealed & weatherproof - Solid brass terminals - Handles Full Power - NO jumpers - NO Soldering - Instructions included.


For 4-band Dipole Ant. 40/20/15/10 \$36.00/pr.
For 5-band Dipole Ant. 80/40/20/15/10 \$38.00/pr.

ORDER DIRECT FROM FACTORY. All orders shipped US Postpaid VISA/MC - give card #, Exp. date, Signature

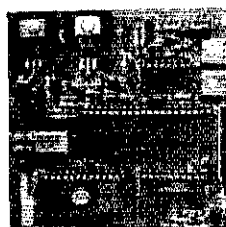
SPI-RO MANUFACTURING, INC.

Dept. 106, P.O. Box 1538
Hendersonville, NC 28793

Dealer Inquiries Invited



MICROCOMPUTER REPEATER CONTROL



\$129

Introducing the MICRO REPEATER CONTROLLER RPT-2A, a new concept in LOW COST, EASY TO INTERFACE, microcomputer repeater control. Replace old logic boards with a state of the art microcomputer that adds NEW FEATURES, HIGH RELIABILITY, LOW POWER, SMALL SIZE, and FULL DOCUMENTATION to your system. Direct interface (drop in) with most repeaters. Detailed interface information included Original MICRO REPEATER CONTROL article featured in QST Dec. 1983.

- * TWO CW ID MESSAGES
 - * TIME OUT TIMER
 - * PRE-TIMEOUT WARNING MSG
 - * POST TIMEOUT CW MSG
 - * COURTESY BEEP
 - * AUXILIARY INPUTS
 - * RECONFIGURABLE-COR INPUT
 - * HIGH CURRENT PTT INTERFACE
 - * SINE WAVE TONE GENERATOR
 - * LOW POWER 9-15 VDC @200ma
 - * SIZE 3.5" x 3.5"
 - * ALL CONNECTORS INCLUDED
- RPT-2A KIT ONLY . . . \$129 plus \$3.00 shipping

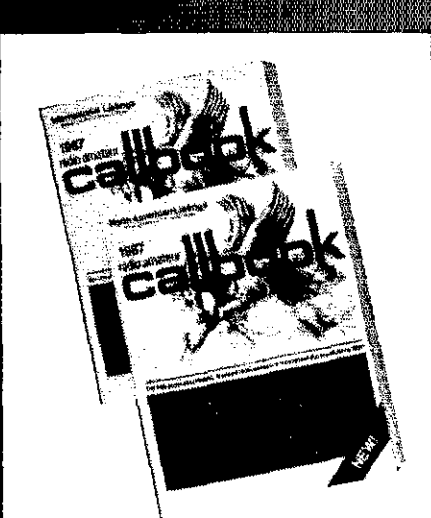
PROCESSOR CONCEPTS

P.O. BOX 26023
ST. PAUL, MN 55126

612-484-9176 7 PM-10 PM WEEKDAYS
CALL OR WRITE FOR FREE CATALOG AND SPECIFICATIONS




1987 CALLBOOKS



The "Flying Horse" sets the standards

Continuing a 66 year tradition, there are three new Callbooks for 1987.

The North American Callbook lists the calls, names, and address information for licensed amateurs in all countries from Canada to Panama including Greenland, Bermuda, and the Caribbean islands plus Hawaii and the U.S. possessions.

The International Callbook lists the amateurs in countries outside North America. Coverage includes South America, Europe, Africa, Asia, and the Pacific area.

The 1987 Callbook Supplement is a new idea in Callbook updates; it lists the activity in both the North American and International Callbooks. Published June 1, 1987, this Supplement will include all the new licenses, address changes, and call sign changes for the preceding 6 months.

Publication date for the 1987 Callbooks is December 1, 1986. See your dealer or order now directly from the publisher.

- North American Callbook incl. shipping within USA \$28.00
incl. shipping to foreign countries 30.00
- International Callbook incl. shipping within USA \$28.00
incl. shipping to foreign countries 30.00
- Callbook Supplement, published June 1st incl. shipping within USA \$13.00
incl. shipping to foreign countries 14.00


SPECIAL OFFER

- Both N.A. & International Callbooks incl. shipping within USA \$53.00
incl. shipping to foreign countries 58.00



Illinois residents please add 6 1/2% tax. All payments must be in U.S. funds.

RADIO AMATEUR callbook INC.

Dept. A
925 Sherwood Dr., Box 247
Lake Bluff, IL 60044, USA



Tel: (312) 234-6600

*** QUALITY PARTS * DISCOUNT PRICES**
*** FAST SHIPPING!**

ALL ELECTRONICS CORP.
905 S. VERMONT • P.O. BOX 20408 • LOS ANGELES, CA 90008

SEND FOR FREE CATALOG... 48 PAGES!

COMPUTER GRADE CAPACITORS

1,400 mfd. 200 Vdc
3" x 2" dia. \$2.00

6,400 mfd 60 Vdc
4 1/4" x 1 3/8" dia. \$2.50

7,500 mfd 200 Vdc
3 3/4" x 3" dia. \$4.00

12,000 mfd 40 Vdc
4 1/4" x 2" dia. \$2.50

22,000 mfd 25 Vdc
4 3/4" x 2" dia. \$2.50

48,000 mfd 10 Vdc
3" x 2 1/2" dia. \$2.50

66,000 mfd 15 Vdc
3 3/4" x 3" dia. \$3.00

72,000 mfd 15 Vdc
4" x 2" dia. \$3.50

100,000 mfd 10 Vdc
6" x 2 1/2" dia. \$1.00

10 AMP SOLID STATE RELAY

CONTROL: 3-32 vdc
LOAD: 140 vac 10 amp
SIZE: 2 1/2" x 4 1/2" x 3"

\$9.50 EACH 10 FOR \$90.00

POLARITY SWITCH

Designed to control an external coaxial relay on a satellite TV system. IDEAL FOR THE EXPERIMENTER AS PARTS. Heavy chassis box containing a 5 Vdc relay, CA 358 op amp and other parts.

Catalog # RHP5 \$1.75 each 10 for \$15.00

TELEPHONE COUPLING TRANSFORMER

Stator # TTPC-5 or Tread # TV-3045
600 ohms ct to 600 ohms ct
P.C. board mount
3/4" x 5/8" x 3/4"

\$1.25 each

RECHARGEABLE NI-CAD BATTERIES

AAA SIZE 1.2V 500MAH \$1.85
AA SIZE 1.2V 500MAH \$1.85
AA with solder tab \$2.00
C SIZE 1.2V 1200MAH \$3.50
SUB-C SIZE solder tab \$3.50
D SIZE 1.2V 1200MAH \$3.50

3rd TAIL LIGHT ?

Sleek high-tech lamp assembly. Could be used as a third auto tail light, emergency warning light, or special-effects lamp. Red reflective lens is 2 3/4" x 5 1/2" is mounted on a 4" high pedestal with up-down swivel adjustment. Includes 12V replaceable bulb. CAT# 218 \$3.95 each.

EDGE CONNECTORS

ALL ARE 1.56" SPACING.

22/44 EDGE CONNECTOR PC style \$2.00 each

22/44 EDGE CONNECTOR solder lug style \$2.50 each

28/56 EDGE CONNECTOR PC style \$2.50 each

MINI-PUSH BUTTON

5 PS I momentary normally open Red button.
35¢ each
10 for \$3.00

NI-CAD BATTERY CHARGER TESTER

Will charge most every size Ni-cad battery available.

Cat # UNCC-N \$12.50

MINIATURE TOGGLE SWITCHES

S.P.D.T. (on-on) Solder lug terminals. \$1.00 each 10 for \$9.00

S.P.D.T. (on-off-on) Solder lug terminals. \$1.00 each 10 for \$9.00

TOLL FREE ORDERS • 1-800-826-5432
(IN CA: 1-800-258-6666) INFO • (213) 380-8000 TWX • 5101010163 ALL ELECTRONIC

EVERY ISSUE OF QST on Microfiche!!!

We are now accepting orders for the entire run of QST from December, 1915 thru December, 1985.

Now you can have access to the treasures of QST without several hundred pounds of back issues and the space they take on the shelf. Our 24 x microfiche have 98 pages each and will fit in a card file on your desk. We offer a hand held viewer for \$50.00 and a desk model for \$135.00 (or use your library).

The price is \$350 for over 1600 microfiche. Please include \$5 for shipping (USA).

Your full satisfaction is guaranteed or your money back. VISA/Mastercard accepted.

HI-VOLTAGE RECTIFIERS

14,000 VOLTS - 1 AMPERE

REPLACES 866-872 3B28 ETC.

IDEAL FOR 2 KW. LINEARS 250 A. SURGE

4 FOR \$30.00 POSTPAID
K2AW's "SILICON ALLEY"

175 FRIENDS LANE WESTBURY, N.Y. 11590

5 1/4" DISKETTE HOLE PUNCH

SAVE MONEY! NOW USE BOTH SIDES OF YOUR DISKETTE

only \$10.00 add \$2.00 shipping each CHECK OR MONEY ORDER (215)

N.P.S. Inc. 1138 Boxwood Rd., Jenkintown, PA 19046 884-6010

AZDEN Service Manuals

PCS 4000 300-3000
\$9.00 \$5.00 EACH (215)

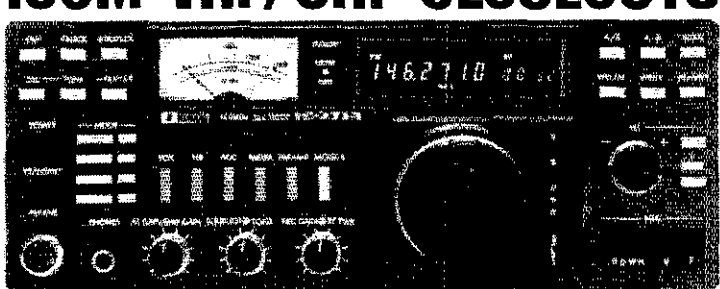
N.P.S. Inc. 1138 Boxwood Rd., Jenkintown, PA 19046 884-6010

BUCKMASTER PUBLISHING

"Whitehall" — Route 3, Box 56
Mineral, Virginia 23117

703: 894-5777

ICOM VHF/UHF CLOSEOUTS



IC-271A 25W, 143.8-148.2 MHz
SAVE \$159 + Preamp ONLY \$995**
List \$859 - **Closeout \$69995**

IC-471A 25W, 430-450 MHz
SAVE \$209 + Preamp ONLY \$995**
List \$979 - **Closeout \$76995**

IC-471H 75W, 430-450 MHz
SAVE \$339 + Preamp ONLY \$995**
List \$1339 - **Closeout \$99995**

Features - all Models: Multi-mode (FM/SSB/CW) Base Station • 32 full function memories with lithium battery back-up • 32 built-in subaudible tones • PLL locked to 10 Hz • Two-color luminescent display • Scanning • Dual VFOs • Optional switchable receive preamplifier • 12V DC or 117V AC with optional AC supply • 11 1/4" w x 4 3/4" h x 10 3/4" d

★ Quantity Limited - Order Today! ★ MASTERCARD/VISA

Order Toll Free: 1-800-558-0411 In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

AMATEUR ELECTRONIC SUPPLY[®] Inc.

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 - Phone (414) 442-4200

AES BRANCH STORES

<p>WICKLIFFE, Ohio 44092 28940 Euclid Avenue Phone (216) 585-7388 Ohio WATS 1-800-362-0290 Outside Ohio 1-800-321-3594</p>	<p>ORLANDO, Fla. 32803 621 Commonwealth Ave. Phone (305) 894-3238 Fla. WATS 1-800-432-9424 Outside Florida 1-800-327-1917</p>	<p>CLEARWATER, Fla. 33575 1898 Drew Street Phone (813) 461-4267 No In-State WATS No Nationwide WATS</p>	<p>LAS VEGAS, Nev. 89106 1072 N. Rancho Drive Phone (702) 647-3114 No In-State WATS Outside Nevada 1-800-634-6227</p>
---	--	--	--

Associate Store
CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
15 min. from O'Hare!

MURCH TRANSMATCH UT2000A, Heathkit HW-7 HWA-7-1 long untested, Stoner Autopatch, El-key Paddle, Turner 454K Microphone, Best offers, W9NSZ, Traister, 2400 Lakeview, Chicago 60614.

KENWOOD 21AT; with PB-21, DC-21, AJ-3. All mint \$125. KA3LUY, 301-859-0018.

PCIMS-DOS Ham Software, \$6.50 for sample disk and new catalog, Rockford Systems, 7474 Hessler, Rockford, MI 49341.

WANTED: OMEGA T Noise Bridge TE7-02, 1 to 300 MHz, W1PSG, 13 Douglas Ave, Beverly, MA 01915, 617-922-8282.

TRADE: ICOM 2AT and Bearcat 250, both in very good condition, for ICOM 02AT, KA1GGG, 334 Peter Green Road, Toiland, CT 06084.

TUBES WANTED, Sell Signal/One: Want 8K74 and 3CV1500A7 Vapor Tubes, new or used. Signal/One CX-11, mint, original owner, will trade, 1995, Don Payne, K4ID, Box 100, Springfield, TN 37172, 615-384-2224.

TS-130S, \$395; Cushcraft 43Z Boomers in boxes, \$75; IC-2A, \$159; new 500W/15KV vacuum variables, \$68; 1-5/8" Heliax, \$2.25/ft. Wanted: IC-271/471, T6-43D/660, Paul Husby, 1482 Midway Parkway, St. Paul, MN 55108, 612-642-1559.

FOR SALE: Ten Tec Century 21 Xcvt and matching Xtal Calib. Infr. Manual, spare final xstors. \$170 for all. WB8CFO, 216-447-9738.

SELL: ICOM IC-230 with ICOM IC-5P Power Supply, New Microphone, Manual, Cables for fixed and mobile operation. Excellent condition. \$125 delivered. W9FUP/4, 305-972-8766.

SB-102, CW Filter, HP23B, Extra Tubes, \$125, Includes Shipping, WB9GFY, 701-642-4278 evenings.

WANTED: HEATH HW-18 transceiver. W2ANB.

KENWOOD TS-670 6-10-15-40 meter transceiver, GC-10 General Coverage Receiver Unit, like new, boxes, manuals, \$995; MC-85 Microphone \$75; TR2600A, extra battery, 5/8 wave antenna, boxes, manual, \$225; ICOM EX-106 FM Adaptor 551/D, \$95; Heath SA2500 Auto-Tune Antenna Tuner with Balun, \$250; Antenna Noise Bridge HD-1422, \$30; Active Antenna HD-1424, \$30. K6KUQ, 209-564-3960, PST early evenings.

WANTED, USED 2-meter mobile transceiver. Call Mike, W1FGE, evenings. 617-758-4362.

160MTR ECONO AMP \$165, Heil Mike Equalizer \$39, 941C Antenna Tuner \$45, W9INN 160, 80, 40 sloper antenna \$19, W4NTS, 919-692-3331.

WANTED YAESU FT-2700RH dual bander in very good condition. Best offer under \$300 accepted. Call Jim, WB2REM, 609-771-8070.

FREE PERSONAL ads will be accepted until April 18, 1987 by the Ham Shopper. No obligations. Mail to: Ham Shopper, Box 522, Lincoln, IL 62658.

WANTED: HEATH HO-10 Monitor Scope, 730 ICOM trans. Please send price and condition. N26L, 793 W. Johnston, Hemet, CA 92343.

APPLE IIC SOFTWARE for Packet RTTY, AMTOR, CW, Ham Database, etc. \$19.95. SASE for information. K5HI, 2215 Goldsmith, Houston, TX 77030.

DIRECT AND LONG PATH headings (degrees); Great Circle Distances (kilometers and statute miles); From your QTH to over 4000 worldwide locations including 50 within Continental U.S.A. Nine pages. Send \$4.50 and include name of city or town from which headings are desired; to W4HET, Engineering Systems Inc., P.O. Box 939, Vienna, VA 22180.

SELL MINT Swan 350; 117-XC Power Supply; VX-1 Voice Control; Shure 444 Microphone; Hustler folding mast with 20 Meter Resonator; all manuals. \$400 plus UPS, William Campbell, 1950 E. 24th St., Space 149, Yuma, AZ 85365.

HEATH SB100, HP23C PS, Matching Speaker, Mic, HM102 SWR/Wattmeter, excellent condition, Recent alignment and checkout by Heath, Manuals, \$200. Dentron GLA1000 Linear, good condition, Manual, needs inexpensive finals, \$175. KA5ZVB, 3600 Greystone, #830, Austin, TX 78731, 512-345-6322.

COLLINS: 75S3B, 32S3, 62S1, R388URR, KWS-1, W3SV - Mike 215-286-9203.

FOR SALE KENWOOD 520 with CW Filter \$350, Johnson Matchbox 250 with SWR Meter \$50, Hammarlund Outcom FM50A \$50, EICO 753 CW SSB Transceiver with matching Power Supply \$125, Simpson-35 Low Band \$50, KA4UJZ, 608 West Thompson Lane, Murfreesboro, TN 37130, 615-893-5344.

WANTED: "ASTRO 200" HF Rig Write Dave Kleindl, P.O. Box 278, Vernon Center, MN 56090, 507-549-3578.

ALM-203T OWNERS - Add an external Band Switch. Switch bands in a second without removing battery. No electronic knowledge required. No screws to remove. No need to get inside radio. Easy step by step instructions with photos. Satisfaction guaranteed. Send \$10. KE7GY, David Hunt, Route 1, Box 1486, Roosevelt, UT 84066.

WANTED: HEATH HG-10 or HG-10B VFO. State condition and price. Philip Schmit, WA8JXE, 800 South Kendall Ave., Kalamazoo, MI 49007.

KENWOOD TM-201A 25 watts 2 meter FM and 7 Amp DC Supply \$225. Paul Adler, KW1L, 203-259-9376.

TEN-TEC, now shipping new boxed USA made latest 1987 factory models Corsair II, Century 22, Argosy II Transceivers, Titan Linear Amplifier, 229A 2kW Antenna Tuner, plus accessories, antennas. For the best Ten-Tec deal, write or phone Bill Slep, 704-524-7519, Slep Electronics Company, Highway 441, Otto, NC 28763.

PRINTED CIRCUIT BOARD Artwork—Computer generated from your circuit designs. Prototype or Production quality artwork supplied. Send SASE for info packet and sample. P.C. Design Co., R.D. #1, Box 162, Dallastown, PA 17313, 717-246-2296.

YOUR NET NEEDS The RP Report. The cassette-based Amateur program service. To subscribe, make check payable to Hap Holly, KC9RRP-964 S. 3rd Ave., Des Plaines, IL 60018. One year (26 programs) \$55; 6 months (12 programs) \$30; 1 time subscription (4 programs) \$15; for further info call 312-298-LINK.

VIBROPLEX ORIGINAL Deluxe w/carrying case, exc. condn. \$60. K4MSG, 204 S. Harrison Road, Sterling, VA 22170.

SEEKING "SPARKS" - S/S John Mosby - (1952) and later various lethman ships; Paul (?) Contact Capt. Robert Harris, 1812 Wilshire, Berkley, MI 48072.

FOR SALE: 2-Meter Repeater: VHF Engineering CW-10R & Transmitter, Hamtronics Receiver, SST 15 Watt Amplifier Crystals 146.37/146.97. Works and will trade for 2-meter rig or \$180. N4GAK, Fayetteville, TN, 615-433-1123.

ROSS'S\$\$\$ New Specials (March only): Kenwood TS-430S \$694.90, TH-21AT \$194.90, TR-2600A \$239.90, AT-250 \$289.90, TS-780 \$759.90, ICOM IC-745 & PS-35 \$949.90, Yaesu FT-767GX \$1569.90, FT-2700RH \$469.90, FRG-7700 \$379.90, FRG-8800 \$499.90. All L.T.O. phone or send SASE for Over 7500 ham-related items in stock for immediate shipment. Mention ad. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830, P.O. Box 234.

ROSS'S\$\$\$ Used March Specials: Kenwood VFO-820 \$129.90, TS-700A \$329.90, VFO-520 \$109.90, TS-520S/WC/WFL \$409.90, Yaesu FT-101E \$429.90, FP-301 \$95.90, FRV-7700 \$75, Drake TH-7 w/Filters \$589.90, RV-7 \$139.90, WH-7 \$99.90, MN-2000 \$179.90. Phone or send SASE for Used Items List. Over 7,500 new ham items in stock. Mention ad. Prices, cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830, P.O. Box 234.

JOBS FOR HAMS

CAMP COUNSELOR/radio instructor, nine summer weeks in New Hampshire. Top facilities for DX, AM and Ham with long established activity. New rigs, triple-band tower. Write/call Alan Stolz, WA1LGI, 5 Lockwood Circle, Westport, CT 06880, 203-226-4389.

WANTED FOR summer of 1987: Instructors in Electronics, Ham Radio and computers. Small boys' science camp in Pennsylvania. Apply: Donatd Wacker, P.O. Box 356, Paupack, PA 18451.

COUNSELOR: Operator with General License to teach Ham Radio at Pennsylvania coed camp. Have completely equipped Ham Station. Write Trail's End Camp, 215 Adams Street, Brooklyn, NY 11201.

SWITCH TO SAFETY! 

ALL BAND TRAP VERTICAL ANTENNAS!

FULL 1/4 WAVE - All Bands! Automatic Selection with proven Hi-Q Traps. 5 Models-ALL self supporting - Ground or roof mount. HI STRENGTH FIBERGLASS TUBING OVER - ALL. NO WOBBLY, LUMPY TRAPS. NO UNSIGHTLY CLAMPS needed - Size 1 1/4" all the way up - 7' use 1/2" inside. You can use it in 1 ft. sq. Backyard FOR APARTMENTS, MOBILE HOMES, CONDOS, etc. where minimum space and neat appearance is MANDATORY! Instant "Drive In" ground mount (included). Use with or without radials (included). (All angle roof mount - Extra) COMPLETELY PRE-TUNED - NO ADJUSTMENTS NEEDED EVER! NO TUNER NEEDED FOR MOST TRANSCEIVERS! Use - RG8U feedline, any length! 2000 Watt PEP input power. Shipped - PREPAID in USA. Assembles in 10 min. using only one screwdriver. WEATHERPROOF!
No.-AVT 80-10 - 5 Band - 25'1" - \$199.95
No.-AVT 40-10 - 4 Band - 18'9" - \$139.95
No.-AVT 20-10 - 3 Band - 11'4" - \$109.95
No.-AVT 80-10 W - 8 Band - 22' - \$279.95
No.-AVT 40-10 W - 7 Band - 15'9" - \$199.95

SEND FULL PRICE FOR PP DEL IN USA (Canada is \$10.00 extra for postage, clerical, Customs) for order using VISA, MASTER CARD or AMER-EXP. Ph 1-309-236-5332 9AM-6PM weekdays. We ship in 2-3 days. All Antennas Guaranteed for 1 year - 10 day money back trial. Free Inf.

WESTERN ELECTRONICS

Dept. AQ Kearney Ne. 66647

THE ARRL DXCC COUNTRIES LIST

- COMPLETE DXCC RULES
- SHOWS COUNTRIES WHERE CARDS MAY BE SENT THROUGH THE ARRL OUTGOING QSL BUREAU
- LISTS ITU AND CQ ZONES PLUS THE CONTINENT OF EACH COUNTRY
- CHECK-OFF BOXES FOR MIXED, PHONE, CW, RTTY, SATELLITE, AND FOR EACH BAND.

Now keep all of your DXCC records on this handy and complete 12 page form. Available postpaid for \$1.00 a copy.

Available from:
ARRL, 225 Main Street,
Newington, CT 06111

WHERE ANTENNAS ARE RIGHTFULLY MORE IMPORTANT THAN RADIOS

H. C. Van Valzah Co.

1140 Hickory Trail
Downers Grove, IL
60515
(312) 852-0472

ContestAntennas

Send \$1.00 for 64 Page Catalog of Antennas & Related Accessories, or get one free by buying something on 1-800-HAM-0073

BALUNS



For beams. 1.7-30 MHz. 6-Kw PEP 1:1 or 4:1 ratio. Model BA-2000 \$62.95.



For dipoles. 1.7-30 MHz. 6-Kw PEP 1:1 or 4:1 ratio. Model 2K \$57.50.

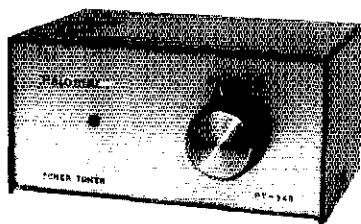


1.7-30 MHz. 1-Kw. 1:1 or 4:1 ratio. Model 1K \$39.95.



1.7-30 MHz. 350-w PEP. Ratios to match 50/75/100/150/200/250/300/375/450/600/800 ohms. Specify ratio. Model PB \$22.95. Add \$4 shipping/handling in U.S. & Canada. California residents add sales tax.

TUNER-TUNER™



- Tune your tuner without transmitting!
- Save that rig!

Do you use an antenna tuner? Then you need the new Palomar Tuner-Tuner to tune it to your operating frequency without transmitting. Just listen to the Tuner-Tuner's noise with your receiver. Adjust your tuner for a null and presto! you have 1:1 SWR. It's as simple as that.

Easy to install. Works with all rigs. Eliminates tuneup damage. Your rig will love it!

Model PT-340 \$99.95 + \$4 shipping/handling in U.S. & Canada. California residents add sales tax.



Send for FREE catalog that shows our complete line of noise bridges, SWR meters, pre-amplifiers, loop antennas, VLF converters, audio filters, baluns, RTTY equipment, toroids and more.

PALOMAR ENGINEERS

BOX 455, ESCONDIDO, CA 92025

Phone: (619) 747-3343

ADVERTISING DEPARTMENT STAFF

Lee Aurick, W1SE, Advertising Manager
Sandy Gerli, AC1Y, Deputy Adv. Mgr.
Angela Beebe, Advertising Assistant
203-667-2494 is a direct line, and will be answered only by Advertising Department personnel

Henry Radio Stores: Cov II
ICOM America Inc.: 2, 104,
105, 107, 108, 109
IIX Equipment LTD.: 143
Jan Crystals: 144
Jun's Electronics: 141
K2AW's Silicon Alley: 168
Kantronics: 133
La Cue Communications Inc.: 162
Lunar Industries Inc.: 162
Madison Electronics Supply: 145
MFJ Enterprises: 154, 155
Memphis Amateur Electronics Inc.:
166
Micro Control Specialties: 152
Microcraft Corp.: 143
Microlog: 147
Missouri Radio Center: 172
Motron Electronics: 102
N & G Electronics: 102
N.P.S. Inc.: 168
NRI Schools Inc.: 100
National Tower Company: 156
Nemal Electronics, Inc.: 146
Nye Co., William : 112
Orlando Hamcation: 138
PC Electronics: 141
PX Shack, The: 112
Palomar Engineers: 161, 170
Payne Radio: 166
Processor Concepts: 167
rf Enterprises: 147
RF Parts Co.: 144
Radio Amateur Callbook: 167
Radio Kit: 98
R & L Electronics: 99
Ross Distributing Co.: 138
Space Electronics Corp.: 158
Spectrum Communications Corp.:
158
Spiro Mfg. Inc.: 167
Spider Antennas: 146
Stone Mountain Engineering Co.:
102, 161
TNT Radio Sales: 161
Telex Communications: 110
Telrex Labs: 120
Ten Tec: 116, 117
Texas Towers Inc.: 159, 171
Timberline Electronics: 138
Toledo Mobile Radio Assoc.: 146
Trio Kenwood Communications:
Cov IV, 1, 6, 7, 111, 113, 115
UPI Communications Systems Inc.:
146
US Tower: 98
Universal Amateur Radio: 140
Van Gorden Engineering: 148
Van Valzah Co, H.C.: 169
Varian/Eimac Division: 106
W9INN Antennas: 140
Wacom Product: 166
Western Electronics: 169
Wheeler Applied Research: 162
Wrightapes: 140
Yaesu Electronics Inc.: Cov. III,
10, 119, 123, 124, 125

Index of Advertisers

AEA: Advanced Electronics
Applications Inc: 4
AGW Enterprises: 166
AVC Innovations Inc.: 148
Advanced Computer Controls: 136
Advanced Receiver Research: 134
Alinco Electronics Corp.: 118
All Electronics: 168
Alpha Delta Communications: 122
Amateur Electronics Supply: 135,
137, 139, 152, 168
American Radio Relay League: 120,
126, 127, 128, 129, 130, 131, 132,
164, 165, 169
Ameritron: 125
Amp Supply Company: 157
Associated Radio: 122
Austin Amateur Radio Supply: 101
Autocode: 144
Barker & Williamson Inc.: 166
Barry Electronics: 142
Buckmaster Publishing: 158, 161,
168
Butternut Electronics Co.: 138
CBC International: 158
C-Comm Inc.: 114
Certified Communications: 163
Charlotte Hamfest: 99
Colorado Comm Center: 162
Communication Concepts: 136
Cotec: 162
Courage Handi Hams: 140
Cover Craft: 134
Curtis Electro Devices: 162
Cushcraft Corp.: 5, 160
DX Edge, The: 142
Dayton Hamvention: 102, 103
Dick Smith Electronics: 163
EEB/Antenna Bank: 149
EGE Inc.: 150, 151
Electronic Equipment Registry: 166
Encomm Inc.: 121
Farout Amateur Radio Club: 143
Glen Martin Engineering: 148
Gorden West Radio School: 163
Ham Radio Outlet: 94, 95, 96, 97
Ham Station, The: 124
Heath Co.: 153
Heaster Co., H. L.: 163

ANTENNA/TOWER SALE!

CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:

- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	\$CALL
HG52SS	52 ft	9 sq ft	\$CALL
HG54HD	54 ft	16 sq ft	\$CALL
HG70HD	70 ft	16 sq ft	\$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!

ROHN Self Supporting Towers On SALE!

FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save \$
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HGX40	40 ft	10 sq ft	228	\$329
HGX48	48 ft	10 sq ft	303	\$429
HGX56	56 ft	10 sq ft	385	\$499
HDX40	40 ft	18 sq ft	281	\$399
HDX48	48 ft	18 sq ft	363	\$489

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

ROHN Guyed Tower Packages

- World Famous Rohn Quality and Dependability
- Rugged high wind survival—provides safe installation
- Multi purpose towers satisfy a wide range of needs
- Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers specs.

Packages shown below are rated for wind zone "B" (86 mph wind). Zone "C" (100 mph wind) design prices slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

Model 25G	Model 45G	Model 55G
50' \$ 579	1079	1439
60' 639	1209	1609
70' 699	1329	1759
80' 849	1479	1929
90' 919	1749	2089
100' 989	1899	2259
110' 1189	2018	2639
120' 1259	2179	2819

TOWER CORPORATION

These rugged crankup towers and masts now available from Texas Towers!

Check these features:

- All steel construction
- Hot dipped galvanized
- Totally self-supporting—No guys needed

Coax arms, Thrust bearings Masts, Motor drives, Remote controls, Hinged bases, Rotor bases, & Raising fixtures also in stock.

CALL FOR SALE PRICES!

Model	Min. Ht.	Max. Ht.	Ant. load*	Sale price
MA40 mast	21'	40'	10 sq ft	\$ 548
MA50 mast	22'	50'	10 sq ft	888
TX458	22'	38'	18 sq ft	828
TX456	22'	35'	18 sq ft	1248
TX472	22'	72'	18 sq ft	2058
HDX555	22'	55'	30 sq ft	1878
HDX572	23'	72'	30 sq ft	3228

Note - US Towers Shipped Freight Collect From Visalia, CA Factory

*Note towers rated at 60 mph to EIA specifications.

RG-213U

\$.29/ft \$279/1000 ft Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

\$.19/ft \$179/1000 ft

- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086

\$.39/ft \$379/1000 ft

- Same specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

HARDLINE/HELIX®

Lowest Loss for VHF/UHF!

Model	Price/ft
1/2" LDF4-50 Andrew Helix®	\$.179/ft
1/4" LDF5-50 Andrew Helix®	\$.399/ft

select connectors below

Cable Type	Imped.	10MHz	30MHz	100MHz	450MHz
RG-213/U	50	6	9	2.3	5.2
RG8X	52	8	1.2	3.5	5.8
9086	50	4	.64	1.7	3.1
1/2" Alum	50	.3	.5	1.2	2.2
1/4" Helix	50	.2	.4	.9	1.6
1/2" Helix	50	1	.2	.5	.9

HARDLINE & HELIX® CONNECTORS

Cable Type	UHF FML	UHF MALEN	FML N	MALE
1/2" Alum	\$19	\$19	\$19	\$25
1/4" Helix®	\$25	\$25	\$25	\$25
1/2" Helix®	\$49	\$49	\$49	\$49

COAX CONNECTORS

Amphenol Silver PL259	\$.125
UG21B N Male	\$2.95
9086/9913 N Male Connector	\$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga. \$.10/ft

1/4 mil 18ga copper-clad steel wire \$30

Dog bone end Insulator \$.79 ea.

Van Gordon

1" Balun	\$.11	Center Insulator	\$.06
Dipole Kits	D80 \$31.95/D40 \$28.95		
Short Dipole Kits	S80 \$35.95/SD40 \$33.95		
All-band Dipole w/ladder line	\$29.95		
6SRV all band antenna	\$48.95		

ALPHA DELTA

DX-A 160-80-40 Sloper \$49

CUSHCRAFT

A3 3-el Tribander	\$.229
A4 4-el Tribander Beam	\$.299
A743 & A744, 30/40 mtr KIT for the A3 & A4 ea	\$79
R3 20, 15, 10mtr Vertical	\$.275
AV5 80-10mtr Vertical	\$.109
D40 40mtr Dipole	\$.159
40-2CD 2-el 40 mtr Beam	\$.299
A50-5-5-el 6 mtr Beam	\$.85
215 WB NEW 15-el 2 mtr Beam	\$.85
230 WB NEW 30-el 2 mtr Beam	\$.229
4218 XL 18-el 2 mtr Beam	\$.105
3219 19-el 2 mtr Beam	\$.99
220B 17-el 220MHz Beam	\$.99
424B 24-el 432MHz Beam	\$.85
ARX2B 2 mtr Vertical	\$.39

Discoverer 2-el 40-mtr Beam

Discoverer 3-el Conversion Kit

EXPLORER-14 SUPER-SPECIAL

DK710 30/40 mtr. Add-On-Kit.

V2S 2-mtr Base Vertical

V4S 440MHz Base Vertical

TH5MK2S Broad Band 5-el Tribander Beam.

TH7DXS 7-el Tribander Beam

TH3JRS 3-el Tribander Beam

205BAS 5-el 20-mtr Beam

205BAS 5-el 15-mtr Beam

105BAS 5-el 10-mtr Beam

204BAS 4-el 20-mtr Beam

64BS 4-el 6-mtr Beam

12 AVQ 20-10 mtr vertical.

14 AVQ 40-10 mtr vertical.

18 AVT/WB 80-10mtr Vertical.

18HTS 80-10 mtr Hy-Tower Vertical.

23BS 3-el 2 mtr Beam

25BS 5-el 2 mtr Beam

28BS 8-el 2 mtr Beam

214BS 14-el 2-mtr Beam

28DQ 80/40 mtr Trap Dipole

58DQ 80-10 mtr Trap Dipole

BN86 80-10 mtr KW Balun W/Coax Seal

HUSTLER

6BTV 80-10 mtr Vert	\$129	5BTV 80-10 mtr Vart	\$109
4BTV 40-10 mtr Vert	\$89	67-144 2-mtr Base	\$119
GG-144B 2-mtr Base	\$89		

Mobile Resonators	10m	15m	20m	40m	75m
40W Standard	\$16	\$17	\$19	\$22	\$26
2KW Super	\$20	\$22	\$25	\$29	\$39

Bumper Mounts • Springs • Folding Masts In Stock!

BUTTERNUT ELECTRONICS CO

HF6V 80-10m Vertical \$129 Delivered

- Full Legal Power
- Highest Q Tuning Circuits

HF2V 80-40m Vertical \$129 Delivered

- Full Legal Power
- Automatic Band Switching

Accessories:

RMK II Roof Mtg. Kit	\$.49
STR II Stub-Tuned Radials	\$.29
TBR160 160m Coil Kit	\$.49
30m Add-on Kit	\$.29
20m Add-on Kit	\$.29
17/12m Add-on Kit	\$.27

FREE UPS on ACCESSORIES when purchased w/antenna

MIRAGE/KLM

KT34A 4-el Broad Band Tribander Beam \$399.95

KT34XA 6-el Broad Band Tribander Beam \$599.95

HF4B "Butterfly" 20-10m Compact Beam \$169. Delivered

- Unique Design Reduces Size
- No Lossy Traps
- Turns w/TV Rotor

CREATE ANTENNAS CALL FOR DISCOUNT PRICING!

ROTORS

Daiwa MR 750 PE (16.1 sq ft rating)	\$.289
Additional Motor Units	\$.89
Alliance HD73 (10.7 sq ft rating)	\$119.95
Alliance U110 (3 sq ft rating)	\$.49
Telex CD 45II (8.5 sq ft rating)	\$CALL
Telex HAM 4 (15 sq ft rating)	\$CALL
Telex Tallwister (20 sq ft rating)	\$CALL
Telex HDR300 Heavy Duty (25 sq ft rating)	\$CALL
Kenpro KR500 Heavy Duty Elevator Rotor	\$.189
Kenpro KR5400 AZ/EL Rotor Package	\$319

ROTOR CABLE

Standard 8 cord cables \$.19/ft (vinyl jacket 2-#18 & 6-#22 ga)

Heavy Duty 8 Cord cable \$.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWER SECTIONS

10 FT. STACKED SECTIONS			
20G	\$39.50	45G	\$112.50
25G	\$49.50	55G	\$149.50

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	\$ 899.
FK2558	58 ft.	13.3 sq. ft.	\$ 949.
FK2568	68 ft.	11.7 sq. ft.	\$ 999.
FK4544	44 ft.	34.8 sq. ft.	\$1199.
FK4554	54 ft.	29.1 sq. ft.	\$1299.
FK4564	64 ft.	28.4 sq. ft.	\$1399.

258 Double Guy Kit \$348.

45R Double Guy Kit \$269.

*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

TOWER/GUY 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 7 x 7 Aircraft Cable (2700 lb rating)	\$ 15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	\$.45
1/4 CCM Cable Clamp (1/4" Cable)	\$.55
1/4 TH Thimble (fills all sizes)	\$.45
3/BEE (3/8" Eye & Eye Turnbuckle)	\$6.95
3/8 E (3/8" Eye & Jaw Turnbuckle)	\$7.95
1/2 x 9EE (1/2" x 9" Eye to Eye Turnbuckle)	\$9.95
1/2 x 9EJ (1/2" x 9" Eye & Jaw Turnbuckle)	\$10.95
1/2 x 12EE (1/2" x 12" Eye & Eye Turnbuckle)	\$12.95
1/2 x 12EJ (1/2" x 12" Eye & Jaw Turnbuckle)	\$13.95
5/8 x 12EJ (5/8" x 12" Eye & Jaw Turnbuckle)	\$16.95
3/16" Preformed Guy Grip	\$2.49
1/4" Preformed Guy Grip	\$2.99
6" Diam - 4 ft Long Earth Screw Anchor	\$14.95
500 D Guy Insulator (5/32" or 3/16" Cable)	\$1.69
502 Guy Insulator (1/4" Cable)	\$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	\$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	\$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	\$.49/ft
HPTG6700 Guy Cable (6700 lb rating)	\$.69/ft
9901LD Cable End (for 2100/4000 cable)	\$.89.95
9902LD Cable End (for 6700 cable)	\$.95.95
Socketlast Potting Compound (does 6-8 ends)	\$14.95

GALVANIZED STEEL MASTS

Length	5 FT	10 FT	15 FT	20 FT
12 in Wall	\$29	\$49	\$69	\$89
18 in Wall	\$39	\$69	\$99	\$129
25 in Wall	\$69	\$129	\$189	\$249

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

ORDER TOLL FREE 1-800-272-3467

Texas, Alaska & for information 1 (214) 422-7306

TEXAS TOWERS

Mon-Fri: 9am - 5 pm
Sat: 9am - 1 pm

Div. of Texas RF Distributors Inc. 1108 Summit Ave., Suite 4 • Plano, Texas 75074

(Prices & Availability Subject To Change Without Notice)

(Antenna/tower product prices do not include shipping unless noted otherwise)



MISSOURI RADIO CENTER

1-800-821-7323

KENWOOD



TS940S "DX-celence"

- Programmable Scanning
- High Stability, Dual Digital VFO's
- 40 Channel Memory
- General Coverage Receiver

KENWOOD



TS440S "DX-CITING"

- 100% Duty Cycle
 - 100 memories
 - Direct Keyboard Entry
 - Optional Built-In AT
- On Sale Now, Call For Price!

KENWOOD



TM2570 "ALL NEW"

- First 70 Watt FM Mobile
- First With Memory & Auto Dialer
- 23 Channel Memory
- Front Panel Programmable CTCSS

KENWOOD

TR2600 "SPECIAL"

- 2.5 W/300 MW 2 Meter HT
- LCD Readout
- 10 Memories
- Band And Memory Scan



TH-21AT "THE Smallest HT"

- Compact Pocket Size
- 1 Watt
- Optional 500mA Battery



YAESU



FT-757GX "CAT SYSTEM"

- All Mode Transceiver
 - Dual VFO's
 - Full Break-in CW
 - 100% Duty Cycle
- CALL FOR BEST PRICE!

YAESU



FT-767GX HF/VHF/UHF BASE STATION

- Add Optional 6m, 2m & 70cm Modules
- Dual VFO's
- Full CW Break-in
- Lots More Features

YAESU

FT23/73R

- Zinc-Aluminum Alloy Case
- 10 Memories
- 140-154 MHz, 440-450 MHz
- 600 MAH Standard Opt. SW New "super handle"



YAESU

FT-727R "DUAL BAND HT"

- 5 Watts on Both 2m & 440 MHz
- 10 Memories
- Battery Saver
- Remote Computer Control Capability



ICOM



IC-735 "NEW"

Can you put a price tag on reliability? Now ICOM offers a **ONE YEAR WARRANTY** on its HF Transceivers & Receivers purchased after August 1, 1986.

ICOM



IC-751A "NEW"

- 100 KHz - 30 MHz
- FM Standard
- 32 Memories
- QSK (Nominal Speed 40 WPM)

ICOM



IC-38A

- Full 85W SW low
 - 21 memories
 - Subtones built in
 - RX 215-230 MHz
- CALL FOR BEST PRICE

ICOM

IC-112AT

- 140-165 MHz
- 10 Memories
- 1W, 1.5W optional
- 32 tones built-in



IC-03AT

- 220 to 224.995 MHz
- 2 SW, 5W Optional
- Built in subtone
- 10 Memories



Kantronics

KAM

Kantronics All Mode

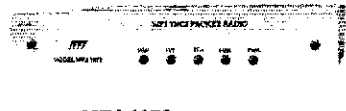
- CW, RTTY, ASCII, AMTOR, HF & VHF Packet
- HS-232/TTL, Universal Compatibility
- Transmit and Receive CW 6-99 wpm, RTTY/ASCII 45-300 Baud, ARQ, FEC, SELFC, Listen ARQ, VHF and HF Packet



MFJ 1270

MFJ

- 11 serial port
- Latest AX-25 version 2.0 software
- True Data Carrier detect for HF
- 16K Ram



ASTRON CORPORATION



Power Supply

- RS7A \$48
- RS12A \$68
- RS20A \$88
- RS20M \$105
- VS20M \$125
- RS35A \$133
- RS35M \$149
- VS35M \$165
- RS50A \$189
- RS50M \$215
- RMS0A \$219
- VS50M \$229

ANTENNA SALE

- | | |
|-----------------------------|--------------------------|
| HY-GAIN.....ON SALE | KENPRO, KR400 \$149.00 |
| HUSTLER 25% off mobile | KR500 \$189.00 |
| CUSHCRAFT | KR5400A \$299.00 |
| KLM | KR600 \$229.00 |
| BUTTERNUT | COLUMBIA CABLE |
| HF6V \$118.00 | RG-8X, 15/ft. |
| HF2V \$110.00 | RG-8 Superflex, 28/ft. |
| AEA 144SR \$42.00 | 9913 Type, 39/ft. |
| AVANTI 151.3G \$32.00 | Rotor Cable, 18/ft |
| QUATRON | H.D. Rotor Cable, 31/ft |

CALL FOR BEST PRICES



PK 232

- Make any RS-232 compatible computer or terminal a complete digital operating position.
- Morse, Baudot, ASCII, AMTOR, Packet
- Loaded with features.



• MOST ORDERS SHIPPED SAME DAY •

Decisions, decisions, decisions.

Should you choose one, two, or all three?

Choose one—Yaesu's FT-109RH, FT-209RH or FT-709R—and you gain the maximum performance available in any single-band HT.

Choose two—or even three, and you also get interchangeable accessories, options and operating procedures. Making it easy and affordable to work all your favorite VHF and UHF bands.

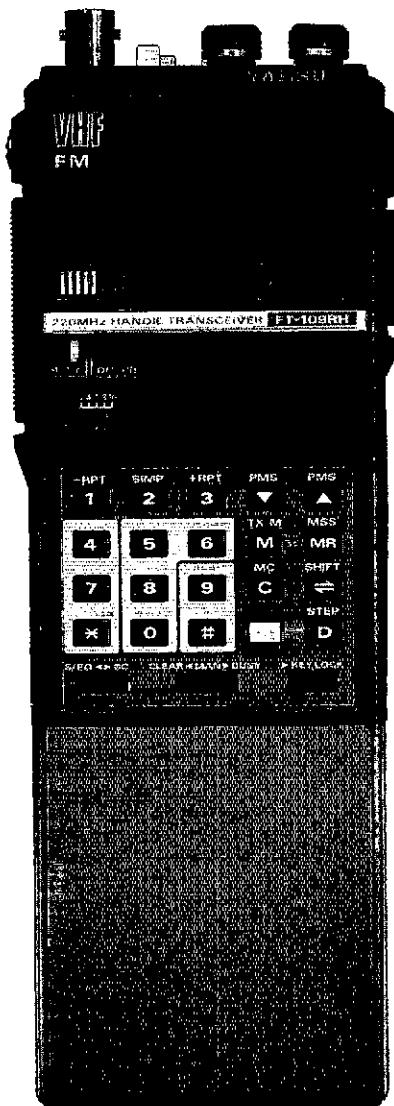
However you decide, you get all this operating flexibility: Powerful 5-watts output (4.5 watts on 440 MHz). Battery saver. Push-button recall of 10 memories, each that independently stores receive frequency, standard or non-standard offset, even optional tone encode and decode.

Push-button scanning routines for scanning all memory channels, selected ones, or all frequencies between adjacent memories. And a priority feature to return you to a special frequency.

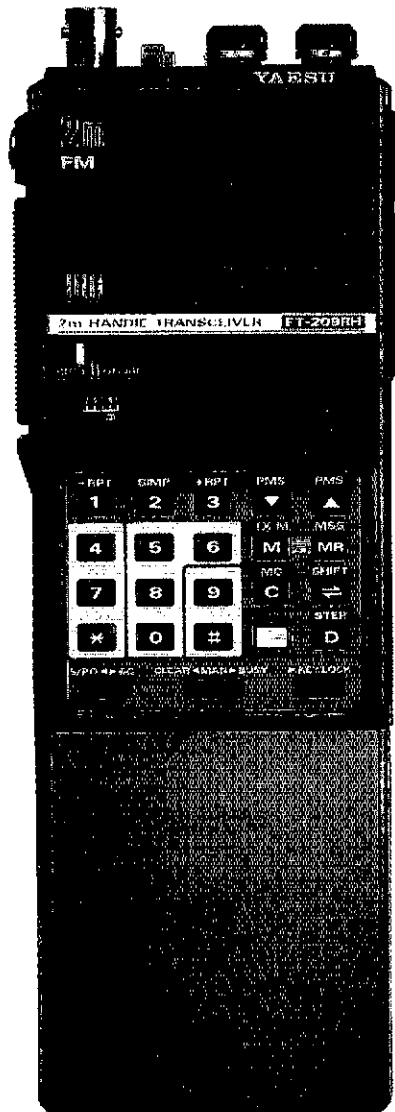
You also get a high/low power switch, power meter, backlit display, 500-mAh battery, wall charger, and soft case. Plus a choice of many interchangeable options, including a VOX headset, fast charger, hard leather case, and plug-in subaudible tone encoder/decoder for controlled-access repeaters.

Let Yaesu's 220-MHz FT-109RH, 2-Meter FT-209RH and 440-MHz FT-709R give you the decided advantage in HT performance and upgrade ability. It may be the most enjoyable HT buying decision you ever make.

220 MHz



2 Meters



440 MHz



YAESU

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. Repair Service: (213) 404-4884. Parts: (213) 404-4847.
Yaesu Cincinnati Service Center 9070 Gold Park Drive, Hamilton, OH 45011. (513) 874-3100.

Prices and specifications subject to change without notice.

KENWOOD

...pacesetter in Amateur radio

Power Supply

ALL NEW
FM mobile!

Here's One for You!

TM-221A/421A

2 m and 70 cm FM compact mobile transceivers

The all-new TM-221A and TM-421A FM transceivers represent the "New Generation" in Amateur radio equipment. The superior Kenwood GaAs FET front end receiver; reliable and clean RF amplifier circuits, and new features all add up to an outstanding value for mobile FM stations! The optional RC-10 handset/control unit is an exciting new accessory that will increase your mobile operating enjoyment!

- TM-221A provides 45 W. TM-421A is the first 35 W 70 cm mobile! Both models have adjustable 5 W low power.
- Selectable frequency steps for quick and easy QSY.

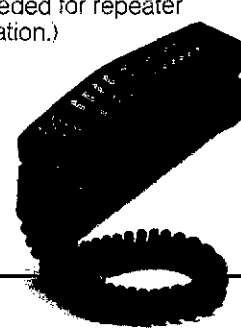
- TM-221A receives from 138-173.995 MHz. This includes the weather channels! Transmit range is 144-148 MHz. Modifiable for MARS and CAP operation. (MARS or CAP permit required.)
- The TM-421A covers 438-449.995 MHz. (Specifications guaranteed for Amateur band use only.)
- Built-in front panel selection of 38 CTCSS tones. TSU-5 programmable decoder optional.
- Simplified front panel controls – makes operating a snap!
- 16 key DTMF hand mic., mic. hook, mounting bracket, and DC power cable included.
- Packet radio compatible!
- Kenwood non-volatile operating system. All functions remain intact even when lithium battery back-up fails. (Lithium cell memory back-up – est. life 5 yrs.)

- 14 full-function memory channels store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2 m is automatically selected.** There are **two channels** for "odd split" operation.
- Programmable band scanning.
- Memory scan with memory channel lock-out.
- Super compact: approx. 1-1/2"Hx5-1/2"Wx7"D.
- New amber LCD display.
- Microphone test function on low power.
- High quality, top-mounted speaker.
- Rugged die-cast chassis and heat sink.



RC-10 Remote Controller

Optional telephone-style handset remote controller RC-10 is specially designed for mobile convenience and safety. All front panel controls (except DC power and RF output selection) are controllable from the RC-10. One RC-10 can be attached to either or both TM-221A and TM-421A with the optional PG-4G cable. When both transceivers are connected to the RC-10, **cross band, full duplex repeater** operation is possible. (A control operator is needed for repeater operation.)



Optional Accessories:

- RC-10 Multi-function handset remote controller
- PG-4G Extra control cable, allows TM-221A/TM-421A full duplex operation
- PS-50/PS-430 DC power supplies
- TSU-5 Programmable CTCSS decoder
- SW-100A Compact SWR/power/volt meter (1.8-150 MHz)
- SW-100B Compact SWR/power/volt meter (140-450 MHz)
- SW-200A SWR/power meter (1.8-150 MHz)
- SW-200B SWR/power meter (140-450 MHz)
- SWT-1 Compact 2 m

- antenna tuner (200 W PEP)
- SWT-2 Compact 70 cm antenna tuner (200 W PEP)
- SP-40 Compact mobile speaker
- SP-50B Mobile speaker
- PG-2N Extra DC cable
- PG-3B DC line noise filter
- MC-60A, MC-80, MC-85 Base station mics.
- MC-55 (8-pin) Mobile mic. with gooseneck and time-out timer
- MA-4000 Dual band antenna with duplexer (mount not supplied)
- MB-201 Extra mobile mount

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

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220